Compendium on Urban Performance Indicators

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Compendium on Urban Performance Indicators

Index

Chapter 1 Introduction

Chapter 2 Performance Measurement

Chapter 3 Performance Indicators

Chapter 4 Demographic and General Indicators

Chapter 5 Urban Service Indicators

A – Water Supply Service Indicators

B – Sewerage System, Waste Water & Sanitation Management Indicators

C – Solid Waste Management Indicators

D – Roads, Footpaths, Storm Water Drainage, Bridges Indicators

E – Streetlight Indicators

F – Traffic and Urban Transport Indicators

G – Health Indicators

H – Public Housing Indicators

Chapter 6 Financial Indicators

Chapter 7 Governance and Administration Indicators

Chapter 8 Way Forward

Appendix 1 Benchmarking

Appendix 2 Methods of Performance Measurement

Appendix 3 Municipal Performance Measurement – Case Studies

Appendix 4 Indicators for MPM – Recommendations of State Finance Commission – Tamil Nadu

Appendix 5 Developing Educational Indicators – Case Study

List of Figures and Table

Figure 1.1 Municipal Performance Measurements - Prerequisites

Figure 3-1 Classification of Indicators

Figure 6.1 - Generic Revenue and Expenditure Structure of Urban Local Bodies

Figure 7.1 - Good Urban Governance – An ULB Report Card

Figure 8.1 – Integrating Urban Performance Indicators Processes with City-wide Planning

Figure A.2.1 - Models for Efficiency Measurement

Figure A.5.1 - Main Components of PROOF: A Model of Ensuring Fiscal Accountability

Figure A.5.2 – The PROOF Process

Figure A.5.3 – Vicious Circle set in Public Education System

Figure A.5. 4 - Steps involved in PROOF in Education

Table 3.1 - Input Indicators

Table 3.2 - Output indicators

Table A.3.1 - Management PMIs for water production

Table A.3.2. - Technical PMIs on water quality surveillance

Table A.3.3 - Financial PMIs for revenue collection

Table: A.4.1 Sector Indicators – Weightages

Abbreviations

BOD	Biological Oxygen Demanding Substances
BPL	Below Poverty Line
CMAG	City Managers' Association - Gujarat
CSR	Condition Stress Response
DPT	Diphtheria, Pertussis and Tetanus
EIA	Environmental Impact Assessment
GASB	Government Accounting Standards Board
LCS	Low Cost Sanitation
LPCD	Litres per capita day
MBO	Management by Objectives
MGD	Million Gallons Day
MLPD	Million Litres Per Day
MPMP	Municipal Performance Measurement Programme
MTS	Municipal Transport System
NGOs	Non-Governmental Organisations
PM	Performance Measurement
PMI	Performance Measurement Indicators
PMS	Performance Measurement System
SEA	Service, Efforts and Accomplishment
SPS	Sewage Pumping Station
SS	Sewerage Service
STP	Sewerage Treatment Plant
SW	Solid Waste
SWM	Solid Waste Management
TNUDF	Tamil Nadu Urban Development Fund
UIPMP	Urban Indicators and Performance Measurement Program
ULB	Urban Local Body
ULBs	Urban Local Bodies
UNCHS	United Nations Centre for Human Settlements

UNDP	United Nations Development Programme
UPI	Urban Performance Indicators
UPIS	Urban Performance Indicators System
USERS	Urban Services Environmental Rating System
TERI	Tata Energy Research Institute
TQM	Total Quality Management
TSS	Total Suspended Solid
WHO	World Health Organisation
WQI	Water Quality Index
WSS	Water Supply Service
WSU	Water Supply Undertaking
WTC	Willingness to Charge
WTP	Willingness to Pay
WTPs	Water Treatment Plants

CHAPTER 1 - Introduction

Index

Growing Importance of Performance Improvement ____ *7*
Participatory Governance, Transparency, Accountability ____ *7*
The Traditional Systems ____ *7*
The Role of Urban Local Governments ____ *11*
Problems Faced by ULBs ____ *12*
Importance of Performance Measurement ____ *13*
Present Status of Performance Measurement in ULB ____ *13*
Global and Indian Efforts in the development and Use of Indicators ____ *14*
Relevance, Role, and Scope of the Compendium ____ *16*

CHAPTER 1 - Introduction

Growing Importance of Performance Improvement

Unprecedented rapid urban growth during the past decades, have compounded the problems of urban local governments, which face a daunting challenge to provide the necessary infrastructure for productive, sustainable and decent urban life, within the parameters of financial scarcity. Governance (at every level) can no longer afford to remain complacent with the past trends of performance. Rapid improvement in efficiency is the need of the hour, in all dimensions of the government.

Participatory Governance, Transparency, Accountability

Traditional unilateralism of the government is coming under increasing pressure to make way for the contemporary trend of participative governance. The government is no longer viewed as a paternalistic ruler, governing the citizens as its subjects. In the present day, the government is more of a 'producer/ supplier' and the citizens (comprising a wide spectrum of stakeholders) are 'consumers'. Therefore, governance has to be participatory. The essential attributes of the government that could make this meaningful, are transparency and accountability. The citizens as well as the government officials at all levels should have access to objective information that is properly documented.

The Traditional Systems

Notwithstanding India's tradition of reverence and official adherence to the ideal of democracy, governance at any level has not so far been effectively participatory. The traditional tools to achieve the objectives of transparency and accountability have been elections, legislative reviews and audits. These instruments have turned out to be inadequate because in developing and underdeveloped countries citizens do not have the effective power, appropriate knowledge and adequate incentives to demand better performance from the government, which is accountable and transparent to the public,. Further, these instruments are of a macro nature and therefore not only lack people's

participation but largely remain in the hands of the 'State'. As a result, the government is the provider, regulator and performance evaluator, making it possible for public officials to behave as unilateral monopolists, with little or no transparency of action. The problem is further compounded by the difficulty of measurement of adequacy of services and quantification of benefits. One needs to measure performance in order to improve it. As a result, Citizens in developing countries like India are unable to measure performance of governments and to hold them accountable.

Usually in a representative democratic set up political leaders, legislators and supervising bureaucrats act as proxies for the citizens. The effectiveness of these macro level mechanisms is eroding with the expansion of the role of 'State' and over- sizing of the governments. As there is lack of micro level participatory public accountability mechanisms, we find drastic reduction in performance, accountability and transparency as move from central level governments to local level governments. The legislative reviews of budgets and audit of the public expenditure are dominant public accountability mechanisms.

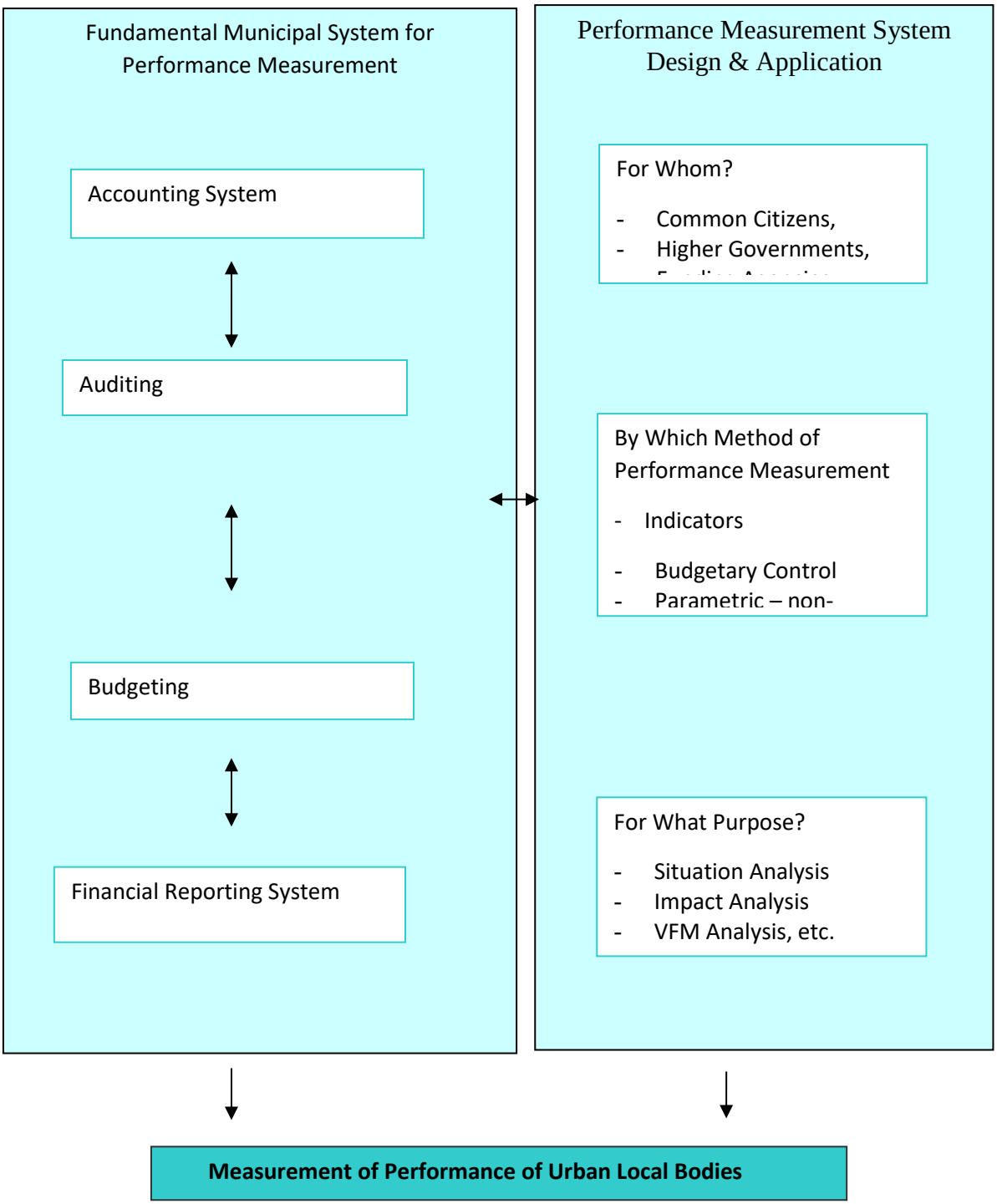
Most urban residents all over India remain dissatisfied at receiving less than good/fair value for the money that they pay to their ULB in the form of taxes and charges. Though there is widespread feeling of eroding performance of ULBs, one is not able to measure it in any meaningful way. Measuring performance of ULBs in the context of any service, activity, expenditure etc., essentially requires two prerequisites

- efficient accounting, auditing and budgeting system and
- Well-structured, performance measurement system.

At present, barring some exceptions, both of these pre-requisites are absent in the Indian urban local bodies.

Most of the Indian urban local bodies are said to follow the single entry cash based accounting system, but in practice, even this, (single entry accounting system) does not exist. What exists in Indian urban local bodies is mere booking and not the accounting system. It is common to find that the accounts of urban local bodies remain pending for years. Single entry accounting system itself, due to its intrinsic limitations, fails to provide information necessary to measure value for money (performance). Since even single entry, accounting system is not adequately implemented in the urban local bodies, and since urban local bodies do not follow standard accounting practices, any comparison between the urban local bodies is completely impossible. Also, there is no system of financial reporting and dissemination of accounting data or results.

Figure 1.1 Municipal Performance Measurements - Prerequisites



Auditing, especially new forms of auditing like management audit, efficiency auditing etc. can be very good tools for measuring value for money of the municipal expenditure. Unfortunately, it exists in a rudimentary form in the urban local bodies. In most of the urban local bodies, the prevalent system of audit, being of an inadequate proprietary form, does little to serve the purpose of performance measurement.

The budgeting system, which facilitates cost analysis and comparison for determining value for money, is totally underdeveloped, illogically structured and merely a quantitative ritualistic process in urban local bodies. Also, the municipal budgeting process is non-participative. Consequently, it fails to provide any information or any insight about the efficiency of municipal expenditure (services).

The municipal accounting and budgeting reforms have become the centre of attention for all stakeholders, that is, the Central Government, State Governments, Supreme Court, Finance Commission, and Multi-lateral Funding Agencies etc. The accounting and budgeting reforms will require a period of seven to ten years to be conducted and completed throughout the country. Probably only then will one be able to have comparable and reliable basic accounting and cost data to initiate performance measurement of municipal services.

If the municipal accounting, auditing and budgeting reforms take place in next ten years they will facilitate performance measurement of ULBs. Even so, these reforms will not serve the cause of performance measurement fully, because even the double entry accounting system (the Balance Sheet and other Financial Statements) or the auditing and budgeting system essentially based on it (accounting data) has inherent limitations to reveal the performance of any organisation. In the case of ULB, which is the third tier of governance, having a different set of objectives or purpose for existence, the intrinsic or theoretical limitations of accounting data to measure real value for money, get compounded. (For example, if the balance sheet of a business organization shows high accumulated reserves and if market situation is such that sitting on the heap of funds seems more profitable than expanding the business, that organization will prefer not to expand. If by doing so it achieves a fair rate of return it will get a high credit rating and the, entire financial market will view such an organization as creditworthy, and successful. An urban local body as an organisation or institution is intrinsically intended for prompt development at least cost. No organization should accumulate reserves or sit on them because non-expansion is profitable). Similarly while measuring performance of a ULB; the performance measurement in qualitative terms or in terms of satisfaction it is more important than in quantitative terms.

As the first instrument of performance measurement (accounting, auditing etc.) is not going to be adequately available for a minimum period of seven to ten years, and even after that its theoretical (intrinsic) limitations will render it partially incapable of serving the cause of performance measurement, we need to look at the other instruments of performance measurement, that is indicators based performance measurement system or model.

The Role of Urban Local Governments

Among all tiers of government, the local government is the most relevant in the context of meaningful participative governance, because of its own special characteristics and its unique place in the history of human society. It deals with services and activities, which have direct bearing on the quality of human life and should have highest level of public accountability, performance efficiency and transparency. Further, local government is closest to the people and therefore should be the government of the people, by the people and for the people. .This uniqueness, multidimensionality, and proximity to the people make the local government an organization, which has no parallel in the public or private sector. The proximity to the people is so intimate that it has to act or react by reflex action, having too little time (or space) for decision making. Being an integral part of society (more so than any other organ of the government) it is affected by societal dynamics and interplay. Ever since humanity moved away from pastoral life to settle down to agriculture, communities were formed and the impending need for regulation and governance brought the local government into being. The creation of the local government thus stemmed from the spontaneous development of society, and not from any political design. Management of information for such an organization has therefore to be natural, close to the people and societal, besides appropriate and scientific. Unfortunately, we find local governments[1] far removed from the citizens, inefficient, non-transparent and devoid of public accountability.

Urban areas are demographic magnets. They attract people for employment, income and a better quality of life. In-migration creates many, difficulties and adverse environmental impacts in terms of poor housing conditions, congestion, slums, undeveloped road systems and transportation, shortage of water, lack of sanitation, shrinkage of open spaces and poor health / educational facilities

The tasks of the urban local governments can be divided into 3 different categories; -

- the routine day – to - day duties of service provision,
- the strategic duties of long term planning (assessment of future needs, projection and anticipation of costs, choice of technological options, etc.), and
- Dealing with unprecedented and unanticipated incidents on an emergency footing.

[1] The present discussion is confined to urban local governments only (municipal corporations and municipalities).

Complexities of dealing with these tasks are further aggravated due to data inadequacy, and inappropriate prioritisation in the allocation of financial and human resources. The local governments and the citizens are seeking information systems, performance assessment mechanisms and management solutions that will ensure a decision support framework and maintain ecological and socio-economic balance needed for “sustainable urban development”.

Problems Faced by ULBs

Access to adequate levels of urban infrastructure presents a major constraint to improved urban productivity. Economic activity depends vitally on infrastructure such as power, roads and water supply. Similarly, the health of urban populations living in high densities is dependent on sanitation, clean water supply, and clean air. Failures of public management and inadequacy of technical and financial capacity have resulted in deficiencies in water supply, sanitation, electricity, transportation, communications and solid waste management thereby directly affecting the physical environment and the quality of life of the citizens and the productivity and efficiency of the cities.

The urban areas of the country face severe constraints emerging from the gap between the demand and supply of urban services owing to inadequate finance, unsustainable population growth and ineffective governance.

Pollution and environmental decay have also emerged as very serious problems in the urban areas. Poverty in urban areas is on the increase with people living in increasingly unhealthy circumstances. This can lead to increasing social tension and affect the fabric of urban life.

There is a pressing shortage of documented information on the municipal system in India, in terms of theoretical literature, fact based analysis, or field level data. There have been reviews, on the municipalities by committees/commissions/ task forces appointed by higher tiers of government and also some sporadic individual research, but most of them were focused on macro aspects. Since they are not in touch with the more relevant aspects at the micro level, the information they give does not get through to their targets, e.g. municipal officers, elected members etc. There is lack of appropriate framework or guidelines to document municipal information. This is why ULBs over the country have been working in isolation. Officers have hardly ever documented their rich experience. One major reason for the lack of professional fraternity and non-sharing of experience is lack of basic, background literature which would have made it easier to express professional experience and provided a standardized platform for communication

The need for comparison of cities on a level playing has led to exploration of appropriate benchmarks and grading scales for rating the cities. The rating is based on quantification of perceptible characteristics of the urban area with regard to the quality of the environment, availability of physical infrastructure, access and coverage of services, efficiency of governance and administration, financial strengths of the local bodies and perception of the citizens' quality of life, etc., This brings us to the concept of **performance measurement.** In all walks of life, goals are set and indicators are used to measure progress towards those goals.

Importance of Performance Measurement

Performance measurement may be described as measurement, assessment or appraisal of the results (and outcomes) and efficiency of services or programmes. Its central function is to provide regular valid data on indicators of performance outcomes. Ideally, instead of constraining itself to data on outcomes, it should provide insight into the causes of the outcomes.

It is formally defined as measurement of results and efficiency of a service or programs on a regular basis.

Performance measurement and information gathered for this purpose, help to fulfil one or more of the following objectives:-

- Respond to public demand s for accountability
- Help in making resource allocation decisions
- Help in highlighting and remedying performance problems
- Motivate personnel to continue improvement efforts
- Provide data for program evaluations
- Support strategic and other long term planning efforts
- Communicate better with the public to foster public trust
- Provide better services more effectively

Present Status of Performance Measurement in ULB

In spite of the fact that the role and philosophy of government is undergoing a change in the post industrialization global society, and the traditional instrument of performance measurement is becoming absolute, there is no move to introduce formal, scientific and modern performance measurement in urban local governance by ULBs. Similarly higher level governments (centre and state) have also not adopted modern methods of performance measurement to evaluate, rank and reward ULBs. Devolutions, transfers and sharing of funds by higher level government with ULBs are

based of factors other than performance of ULBs. Thus, there is almost complete vacuum (barring one or two exception) as far as urban governance and ULBs are concerned.

Recently with the introduction of system Municipal Bonds and borrowing from public by ULBs in India, Indian Credit Rating agencies have developed necessary methodologies for rating ULBs. But performance measurement by these rating agencies of ULBs is constrained by two factors. Primarily it is narrow in scope and confined to determine credibility and safety of investment by investors in ULBs and nothing more. An ULB having very high credit rating may be poor in governance, development administration, social equity aspects etc. Secondly, such rating is carried out only if an ULB decides to raise funds from instrument of Municipal Bond. Credit rating is not required for any other type of borrowing from market.

The academia usually does not undertake independent performance measurement of ULBs and whenever it is done, they follow traditional methods of performance measurement.

In past decade and half, civil society is becoming increasingly concerned about declining standards of urban governance, quality of life and the deteriorating situation of ULBs. Civil society is making certainly making qualitative attempts to assess performance of ULBs by applying modern methods of performance measurement. This book is primarily aimed to complement their efforts.

Global and Indian Efforts in the development and Use of Indicators

It can be said that God gave Adam and Eve a self-assessment indicator – the Tree of Knowledge in the Garden of Eden. The tree untouched was an indicator of good human behaviour and good governance of their own affairs.

Since then, the indicators movement has taken numerous positions, directions and shapes, rekindling and refining human quest for higher attainments and more content living.

Until recently, the world's statistics bureaus courted simple but seemingly composite indicators like Gross Domestic Product or National Per Capita Income to measure the growth path of nations. Similarly, the lack of economic progress too does not mean lack of human progress. But accelerated economic development does not necessarily lead to human progress. Realising the inadequacy of the conventional wealth-centric economic indicators, in the 1970s, the United Nations institutions introduced the Physical Quality of Life Index (PQLT) and Human Development Indicators (HDI) to measure human progress.

With regard to urban development, such efforts started with the Summit Goals for Children adopted in 1990. Then came many others including the indicators for Rapid Urban Environmental Assessment UNDP, 1993), WHO's 27 Indicators for Healthy Cities (1994) and UNDP's 130 Indicators for Sustainable Development (1996) and UNCHS/HABITAT Global Urban Observatory's 49 core indicators and 124 supplementary indicators (1997). Again in 1999 UNDP undertook initiative and come out with two sets of good governance indicators known as TUGI Indicators (The Urban Governance Initiative Indicators). Canadian Government has, through legislation, introduced statutory municipal performance measurement and reporting using selected 25 indicators. (Refer Appendix 3 for details)

In recent years urban indicators movement is spreading in all directions and dimensions. Even few cities have commenced experimenting with different indicators and tool to assess municipal performance and governance. In India City Managers Association – Gujarat carried out Urban Indicators and Performance Measurement Programme (UIPMP) in 2001-02, which has inspired other City Managers Associations of Karnataka and Madhya Pradesh State and at present, they are in process of developing and conducting UIPMP in their States.

Similarly, during 2000-2003, Tata Energy Research Institute (TERI) in association with UNDP, GOI carried out Urban Services Environmental Rating Systems (USERS) Programme and developed set of Indicators for Kanpur and Delhi. Tamil Nadu Urban Development Fund (TNUDF) - Chennai and Centre for Good Governance (CGC) - Hyderabad have developed system of urban performance indicators for ULBs of Tamil Nadu and Andhra Pradesh respectively. Even Second State Finance Commission of Tamil Nadu has paid attention to this issue and has recommended set of indicators and composite system of performance measurement of ULBs of Tamil Nadu. (Please refer Appendix 4)

Still others have tried to measure performance of ULBs through other modes. Two such experiments, which received international acclaim, are Citizens' (Public) Report Card by Public Affairs Centre – Bangalore and Public Record of Operations and Finance (PROOF)[2] – by group of civil societies of Bangalore. PROOF initiative also involved development of education indicators for measuring municipal schools, which is described in Appendix 5. The above mentioned experiments are illustrative and not exhaustive attempt to document all such initiatives. The book has immensely benefited from these Global and Indian efforts to develop urban performance indicators.

[2] One of the authors of this book Ravikant Joshi is associated with PROOF initiative from its beginning.

Relevance, Role, and Scope of the Compendium

This book is a modest attempt to address the lacuna of micro based performance measurement of urban local governments. It primarily aims to serve citizens and citizens based organizations to overcome limitations of the macro level formal accountability mechanism. It will also help other entities like -

- Higher-tier governments,
- Research and academic institutions,
- Rating agencies etc. to measure performance of ULBs.
- Finally, it will help urban local bodies themselves to measure their own performance to ensure efficiency, public accountability and transparency.

As explained earlier, at present, neither higher-level governments nor urban local bodies themselves carry out objective and formal performance measurement. This book hopes to address the absence of appropriate 'State' sponsored formal performance measurement mechanism to ensure efficiency and accountability in urban governance. The compendium is not an academic treatise, it is in the form of a source book about one of the most important and user-friendly tools of performance measurement, that is, the performance indicator. Further, this compendium is not an exhaustive compilation of performance indicators for ULBs; at the most, it is illustrative and Authors will feel amply rewarded if it enthuses others to improve upon it. Authors would like to mention that this book does not contain indicators pertaining to various functions performed by ULBs e.g., Education, Fire Safety, Parks, Open Places, Town Planning and Building Regulations, Crematorium/Burial Places etc. Authors would like to cover them in the next revised edition. The authors do not claim invention of new indicators or new concepts. They attempt to compile various urban indicators scattered around in various books, studies, reports, etc. The authors have simply compiled them and have tried to explain or interpret them in their own order and manner for various stakeholders of urban life and governance.

In Chapter 2, this book begins by attempts to familiarize the user with the relevance and concept of performance measurement and briefly describes how it can be used in the context of urban local government. The user is given an explanation and description of the process of performance measurement, its relevance, implementation, and the problems that are likely to occur.

In Chapter 3, the book briefly mentions of some of the methods and tools that can be used for performance measurement before users focus on the tool that the manual is about---the Urban Performance Indicator. The user is then given a detailed elaboration of the Urban Performance Indicator, how and why it is the most appropriate tool for performance measurement of Urban Local Bodies (ULBs), and what it is expected to measure and its limitations. The characteristics of a good indicator are mentioned and explained and how, most commonly used indicators should be classified into groups. An overall perspective is given on the various steps by which the concept of performance measurement condenses into the formation and use of the indicator as a tool.

Subsequently, the main part of, the book elaborates on various aspects of urban local government and in each of them describes indicators by which performance may be measured. Chapter 4 to 7 comprise discussions on urban performance indicators under the following heads –

Chapter 4 – Demographic, Social and General Indicators

Chapter 5 – Urban Services Related Indicators

Chapter 6 – Financial Indicators

Chapter 7 – Administrative and Governance Indicators

In the end of book Chapter 8 – discusses the possibilities of using Urban Performance Indicators in ULBs. It also tries to chart of roadmap for introducing performance measurement system for ULBs.

The book is supplemented by five appendixes. Appendix 1 deals with the very important concept and process of Benchmarking, which is essential for any performance measurement system. Appendix 2 describes various methods of performance measurement referred to in Chapter 3. Appendix 3 contains case studies regarding efforts to introduce performance measurement based on indicators in ULBs in recent years. Appendix 4 also lists similar case but in this, the 2nd State Finance Commission of Tamil Nadu State has designed and recommended performance measurement system for implementation in ULBs of Tamil Nadu. Appendix 5 contains case study of PROOF initiative to develop indicators through collaboration and participation for assessment of government and municipal schools.

Chapter 2 - Performance Measurement

Index

Introduction ____ ***20***

Importance of Performance Measurement ____ ***20***

Advantages of Performance Measurement ____ ***21***

Purposes of Performance Measurement ____ ***22***

Accountability / Communication ____ 23

Planning Support ____ 23

Management Assistance ____ 23

Budgeting Support ____ 23

Financial Monitoring ____ 24

Operational Improvement Motivation ____ 24

Program Evaluation ____ 24

Resource Reallocation ____ 24

Directing operations / contract monitoring ____ 24

Public Image / Perception Problem Improvement ____ 25

Concepts of Efficacy, Efficiency and Economy in PM ____ ***25***

Conceptual Framework of the PM Process ____ ***29***

Methods of Data collection ____ ***30***

Collection of Secondary Data ____ 30

Collection of Primary Data ____ 30

Observations and Recording of Outcomes by Experts ____ 31

Preparing Data for Performance Measurement ____ ***31***

Disaggregation ____ 31

Benchmarking ____ 32

Other Steps in Preparing Data for PM ____ 32

Preliminary Round of Data Analysis ____ ***33***

Methodology of Performance Measurement ____ ***33***

Efficiency Evaluation Design ____ 34

Data Gathering Decision ____ 34

Evaluation Strategy ____ 34

Instruments of Performance Measurement ____ ***34***

Indicators ____ 34

Audit and Quality Control ____ 35

Quality Control ____ 36

Limitations and Problems of Performance Measurement 36

Other Problems of Performance Measurement 37

Personnel Training Needs: 37

Changes in legislative and Agency Priorities 37

Maintaining Indicator's stability over time 38

Documentation 38

Fear and resistance from staff 38

Politics 38

Overcoming Resistance to PM 38

Summing Up 39

Chapter 2 - Performance Measurement

Introduction

The process of Performance Measurement has always been an integral part of life. Ever since one can remember, one has instinctively or consciously measured and compared, for instance, which of us got the biggest toy, how many marks has one scored in the examination and how close or far it was from the highest score, how much money has to be saved to enable one to buy something one desires. Examples abound. Among those stated, the size of the toy, the score in an exam, the amount of pocket money saved, are all examples of performance measurement/indicators. The highest score in the exam, and the cost of the object of one's desire, are examples of goals. This process of comparing and measuring has to be perceived in the perspective of the urban local bodies' performance as a government agency and service provider.

Importance of Performance Measurement

Why is performance measurement important? What is the reason for this new emphasis? The motivating force is the greater competitive nature of the global economy, and specifically in the public realm, the tighter fiscal policies of international agencies and national governments around the world. In the private sector, companies cannot afford to waste resources in their struggle for survival in the market. Performance measures enable them to determine whether they are working consistently towards their organization's goal, how well they are meeting the needs of their clients, and how productive they are. The motivation in the government sector is not very different. Today, government agencies all over the world are under tremendous pressure to cut back on spending, and their "customers", or citizens are more demanding. Therefore, government officials must have sound information on their financial standing as well as on the effectiveness and efficiency of existing services so that they can make sound decisions in support of programs and policies. Regular and periodic measurement of progress is a major input in the process of striving towards maximum consumer benefit from the services that are provided for them. Thus, the process of performance measurement must ideally be "customer" oriented.[3]

[3] Hatry

PM is defined as measurement of results and efficiency of a service or programs on a regular basis. PM should be regarded as an integral part of Good Urban Governance. It is a tool for good governance which

- Heightens awareness/sensitivity
- Offers a measure to gauge performance
- Enhances accountability, transparency
- Focuses attention on problem areas
- Improves performance

It can help to ensure equity in service delivery and therefore build public trust, and improve performance.[4] Performance measurement of government services and programs in the present discussion addresses the following questions -

- How much?
- How efficiently
- What quality?
- To what effect?
- What is the impact of PM on the recipient community?[5]

Advantages of Performance Measurement

Setting and tracking clear performance goals is very important for effective administration and management. Performance measurement is essential for good public administration. In addition to tracking and ensuring a strong financial position through which a government can consistently meet the needs of its citizens, performance measurement can also improve the effectiveness and efficiency of governmental programs and services. In the evaluation of programs and services, performance measures are most effective when agreed upon in the planning phase, before a commitment of resources is made. During the implementation phase, the tracking and analysis of measures is an excellent management tool. The budgeting function of any organization is greatly rationalized and clarified through the use of performance measures.

[4] Background note about the USERS program by TERI- June 2001)
[5] Background note

Purposes of Performance Measurement

Performance measurement can benefit ULBs in a number of ways. It improves accountability, helps planning and management. It can help budget making, monitor financial performance and provide motivation for operational improvement. It can provide building blocks for program evaluation and accordingly, guide appropriate resource allocation. It can clarify the image of the ULB as perceived by the public.

Several groups of actors on the ULB scene need to use and apply performance measurement.

Urban local bodies deal with the provision of basic services and local level governance, as result there are many stakeholders who will be interested in the performance measurement of urban local bodies. For example at the first instance, we, the common people of each city, would like to know about the performance of our municipal body. Secondly, higher-level governments (State Government), who finance more than 60 per cent of municipal expenditure, will be interested to know PM of ULBs. Financial institutions that lend money to urban local bodies and the credit rating agencies have all the reasons to know about PM over and above financial creditworthiness analysis. International funding agencies giving loans and financial aid is another group of stakeholder who are interested in application of PM to urban governance. Lastly, an urban local body itself will like to know about its performance for improved decision-making. Each group on this list of stakeholders has a distinct purpose and objective to know about performance of ULB, consequently each one would like to have an appropriate urban performance measurement system to serve their specific needs.

Besides multiplicity of stakeholders, another aspect associated with performance measurement is the methodology and techniques to be used. At present, there is neither an agreement on the choice and design of the methodology nor on the use of instruments for the performance measurement.

In order to assess performance measurement it is essentially necessary to obtain information both on the efficacy in the achievement of the results and on the economy in the use of resources in such entities, both at management unit level and at program level.

Accountability / Communication

Performance measurement documents what various departments or units did and, ideally, how well it was done and what difference it made. Through this kind of documentation, outstanding departments and entire ULB can earn the trust of their clients or citizens as they demonstrate a good return in service for the tax received.

Planning Support

Performance measurement can improve the planning process by providing administrators with information on the effectiveness of existing programs and services, as well as important insights into the needs and concerns of citizens. This information is very useful in designing and adjusting programs and programs objectives. It is very advantageous to initiate a program with a clear idea of what aspects of performance will be measured and what defines success.

Management Assistance

Performance goals and measures can help to improve ability to set directions, reallocate resources and staff, and set priorities. The use of performance measures alerts the authorities to problems and allows them to be addressed quickly, improving performance and implementation.

Budgeting Support

Performance measurement and the data generated by the process help to make a more convincing case for the budget recommendations. In budgeting, resources are allocated to different purposes. In order to ensure that the objectives and goals of a local authority or program are met, this allocation of resources should be tied to performance. This is especially important in the present situation of financial constraint. When the allocation of funds is based on performance, authorities are able to make informed decisions (for which performance measurement can provide baseline data) and rational trade-offs between programs and services. One needs to know where one is if one has to determine where to go. Past performance data can help to set realistic targets for future accomplishments6

[6] :Hatry

Financial Monitoring

In the same way as corporations use financial ratios and indicators to gain important insight into the health of their enterprise and ways to improve it, local governments can use similar financial ratios. Carefully tracking key financial indicators can alert administrators and policy makers to potential problems and trends before a crisis comes upon them. Financial strength and robustness, along with rigorous and effective management is vital to any local government as it attempts to meet consistently the needs of its citizens, as well as in its attempts to seek capital financing of any kind.

Operational Improvement Motivation

Municipalities that measure performance can detect operational deficiencies at an earlier stage. PM records improve their ability to confirm the effectiveness of corrective action7

Program Evaluation

Carefully developed performance measures can provide valuable information for systematic information on performance effectiveness.

Resource Reallocation

An objective indication of program effectiveness and unit costs can help decision makers on reallocation of resources especially in conditions of financial scarcity.

Directing operations / contract monitoring

Authorities equipped with a good set of performance measures are better able to detect operational strengths and weaknesses, to provide relevant feedback to employees and work units, and to deploy close supervision when and where it is needed the most. Performance measures also provide evidence useful in determining whether the service quality specified in contractual arrangements is, in fact being achieved.

[7] : Ammons; Book.

Public Image / Perception Problem Improvement

ULBs face the problem of negative perception of public service employees[8]. A crucial outcome characteristic of a program or service is equity. A well- designed measurement system enables authorities to assess the fairness of a program and make appropriate adjustments. A good performance measurement system will help officials to demonstrate to the public and policy makers that services are delivered fairly. This would build trust.[9]

A typical PM exercise should aim at

- Improving the service delivery and financial capabilities of the local bodies through appropriate financial and technical assistance.
- Provide a guiding mechanism for deciding the type and extent of funding.[10]

Concepts of Efficacy, Efficiency and Economy in PM

There are certain concepts associated with performance measurement. Before going into methodology of performance measurement, it will be appropriate to understand these concepts such as efficacy, efficiency and economy in view of their importance in the evaluation and control of ULBs. In order to reach efficiency levels on behalf of ULBs it becomes necessary, undoubtedly, to have control, both of the achievement of the objectives (efficacy control) and of the costs of the resources applied in the performance of the activities for their fulfilment (economy control). Accordingly, at first instance, a general analysis has been made on the convenience of this type of evaluation, as well as on the problems and their relation with the evaluation and control of efficiency in ULBs.

Sansegundo[11] defines the three concepts economy, efficiency and efficacy on the basis of the activities performed by a certain entity: Economy constitutes "that operation taking up the necessary resources in terms of quality and amount at the lower cost". Efficiency means, "The resources applied to an

[8] From presentation by David Ammons, Instructor, USERS project
[9] Tamil Nadu Urban Development Fund (TNUDF)
[10] Presentation of TNUDF (at USERS Workshop, TERI); under Indo- USAID, FIRE (D)
[11] Sansegundo A. (1991): Working Group, 'La Auditoria Operativa y las 3 E Economia, Eficiencia y Eficacia' IV Technical Conference on Auditing R.E.A. / Basque Economists' Association. As quoted in paper, ' Methodology for evaluating the efficiency of Public Entities' by Teresa Garcia Valderrama & Yolanda Calzado Cejas in International Journal of Public Budget – Nove/Dece. 1997 year XXIV.

activity or service, obtaining the highest rate of goods or services". Efficacy is defined as "the results obtained corresponding to those expected'.

According to Suarez Suarez[12], "the principles of efficiency and economy are the same thing. A company, either private or public, acts according to the efficiency and economy principles when, based on certain costs or expense budget, it generates a production whose market is maximum, or else, when in order to achieve a production volume with a certain value, resources are applied whose cost is minimal". (Either product maximization with cost constraint, or cost minimization with goal of fixed product)

For Saurez Saurez[13], efficiency and economy are "two complementary versions". In addition, he states, "When value units are used instead of physical units, we no longer speak about economic efficiency but technical efficiency".

Duquete and Stowe [14]analyze the costs and outcome of the public programs and define their efficacy and efficiency as follows: "the output ratio by outcome unit" and "the input ratio by output produced", respectively. Besides, they consider another two concepts to be evaluated and controlled: the relevance or "outcome ratio by impact unit" and substanciability or "the degree of program's benefits in time".

The problems inherent to the implementation of systems for the evaluation and control of efficacy, efficiency and economy are derived, mainly, from the characteristics of non-profit public entities. One of the aggravating factors is the lack of economic objectives and the existence of a multiplicity of objectives, all of them wrongly defined and communicated to the organization members in the wrong manner. On the other hand, there is a lack of consensus when it comes to defining measures adequate for each objective (efficacy control).

[12] Suares Suarez A. S. (1983): 'El Control de economia, Eficiencia y Eficacia en la Constitution y en la Ley Organica del Tribunal de Cuentas'. Spanish Public Finance, n 80 as quoted in article by Teresa Garcia Valderrama & Yolanda Calzado Cejas as mentioned above.
[13] Ibid
[14] Duquette D. J. y Stowe A. M. (1992): Enter the Era of Performance Measurement Reporting', Government Accountants Journal, Summer Pages 19 – 28.

Another serious problem concerns policy decisions, sometimes irrational, which do not allow for the achievement of efficacy, efficiency and economy standards. Likewise, the strictness of the laws and bureaucracy, together with the lack of adequate accountancy impede the quantification of the service costs, making the efficacy, efficiency and economy control, a difficult task.

Over the past years, public organizations having the objective of measuring the outcome of their performances, have experimented with a large variety of models and instruments. Most of them have been focused on decision making over budgetary allocation and haven't been very useful for the aims related to management of these types of entities in view of their characteristics.

The development of such information implies problems concerning their own nature, thus becoming necessary to pay more attention to the definition and quantification of indicators, the measurement and quantification of output and activities in terms of quality and quantity, and to the introduction of objectives and public policies relevant for the implementation of adequate measurement systems.

The consequences of all such difficulties have been made manifest in various forms. Traditionally speaking, the Public sector activities were focused on the resources and the amount of money spent rather than towards the output control. The financial control usually provided information on cash flow rather than the identification of the activities carried out in the cost centers, if defined. Consequently, the most significant problems in the implementation of the efficacy and economy control are summarized as follows:

- The pursuit of social objectives and the absence of economic benefits.
- Lack of consensus in the definition and fixing of the objectives.
- Lack of identification of the individual objectives with the organization's general objectives.
- Political decisions that hinder the accomplishment of results in efficient and economic manner.
- Inadequate accounting systems.
- Ill-defined cost centers.
- Strict regulations and bureaucracy.
- Quantitative measurement criteria not accepted by managers

When the concept of PM is applied to purely commercial, privately owned production units, authorities and managers use it to achieve efficacy, efficiency and economy.

- Efficacy means achievement of the organization's objectives
- Efficiency means maximizing product given a fixed resource constraint,
- Economy means (the mirror image of efficiency) minimization of cost in the process of achieving a certain level of production.

When this approach is applied to ULBs or any governmental entity, complexities arise because they are not purely commercial entities. They have different goals to achieve and different organizational structure. The most significant problems in the implementation of the efficacy and economy control are summarized as follows:

- The pursuit of social objectives and the absence of economic benefits.
- Lack of consensus in the definition and fixing of the objectives.
- Lack of identification of the individual objectives with the organization's general objectives.
- Political decisions that hinder the accomplishment of results in efficient and economic manner.
- Inadequate accounting systems.
- Ill-defined cost centers.
- Strict regulations and bureaucracy.
- Quantitative measurement criteria not accepted or understood by employees.

Therefore, the use of PM in case of ULBs should be carefully carried out on the basis of clearly defined objectives and understanding of the special characteristics of a non-profit making socio-political organization[15].

[15] Sansegundo, Suarez Suarez, Douket & Straw

Conceptual Framework of the PM Process

Performance management should be based on a consistent and universally accepted set of definitions of

- various resources that go into the process of service delivery entities that are involved in the delivery process, and
- results that are generated

In the first category, we have ***inputs*****, which** are defined as the resources that are actually used for the production of the service (usually expressed either in terms of money or in terms of employee – years, or both). In the second category, we have the work that is to be done to carry out the task in question. These entities are usually referred to as **workload***.* Though they are strictly not performance indicators, they do help to keep track of the process. In the third category, we have ***outputs*** and ***outcome****s*.

- *Outputs* are products and services delivered during the reporting period. By themselves, they don't say much about the impact, consequences and results they are expected to generate.
- *Outcomes* are consequences and effects that are generated by the output of the program at the individual and societal level, in the short run and in the long run, obviously including side effects

This broad classification as it relates to the particular entities to be measured varies from program to program, because, the output or outcome of one may be an input for another. For example, the amount of water used for neighbourhood maintenance is an output of a water supply program, but may be an input for a community park and garden maintenance program.

In general, performance measurement can be readily accomplished by using appropriate ratios, usually of inputs and outputs/outcomes. The ratio of input to output is a measure of **efficiency,** whereas the ratio of output to input is that of **productivity**. One should exercise caution using such ratios indiscriminately because they can be enhanced by using less inputs (thereby reducing costs), at the expense of the quality of output /outcome16.

[16] Hatry

The expected benefits of a Performance Measurement (in a nutshell) are

- a rating framework which would help to assess municipal bodies
- an analytical base which would help in prioritizing issues and setting targets by planners / decision makers, and self-monitoring of the urban agencies
- a store of information of desirable operating practices/systems which would lead to quicker dissemination of best practices and identification of corrective actions
- a road map for the next phase of the project, which would encompass dissemination, application across cities and service areas, and institutionalization of the concept of Performance Measurement17

Methods of Data collection

Making a rational choice of the appropriate method of data collection is an essential step towards the construction of indicators. Data is usually collected in either of the following ways:

Collection of Secondary Data

The relevant information may be obtained from existing documented evidence and then tabulated and used appropriately. The data thus collected is called secondary data. In addition to providing data on outputs, secondary data is usually a good source of information on inputs and demographic characteristics. It is easy and inexpensive to collect and can readily be used by personnel. The disadvantage is that, since they have been collected and used for some other specific purpose, they may be inadequate for immediate needs, and appropriate adaptation may be difficult. The collection process may stumble over administrative, bureaucratic and legal hurdles.

Collection of Primary Data

Customer surveys are appropriate and useful, if they are professionally prepared and statistically valid. The information that they yield is called primary data. This method is appropriate for customer conditions, behaviour, experiences, etc. Collection of primary data requires skill, expertise and time. Responses may be biased by respondents' perception. This problem may be solved by sufficient expertise in interviewing and question framing. Surveys may be carried out on all households in a

[17] USERS pilot project, background note

certain area, or only on the users of a certain program. The respondents may be questioned in either of the following ways:

a. mailed questionnaires
b. telephone questions
c. door-to-door survey by trained personnel

Observations and Recording of Outcomes by Experts

Trained observers may observe and record outcome. This method ranks high by way of reliability. It can be used more effectively, not only for observing, but also for tracking. Data is usually very accurate and appropriately formatted, though expensive, laborious and time consuming to collect.

Given the constraints of time and resources, data should be collected as frequently as possible.

Preparing Data for Performance Measurement

Collection of the required data is only a first step towards Performance Measurement. Some further steps are necessary to make collected data useful and most effective for the purpose.

Disaggregation

Appropriate disaggregation of data helps to identify differences in performance of various relevant groups and helps to address the issues that lead to better performance of some groups (and how their performance can be replicated), and those causing sub optimal performance in other groups. Disaggregation can be conducted by various categories, for example, by organisational units (individual facilities, offices responsible for services, groups of officers at various levels), or by customer characteristics (age, demographic and anthropological characteristics, household income, etc.), geographical location, climatic conditions, seasons etc.

Decisions on the categories and extent of disaggregation should be finalized before deciding on the mode and content of data collection. This way, the disaggregation would be built into the data

collection process and so would be more cost effective and efficient than going back on the data collected and trying to disaggregate it later.

The extent and nature of disaggregation desired would be an important determinant of the data collection procedure and on the desired level of accuracy. It will also depend on the resources available for data collection. Help from statistical experts is useful at this stage.

Benchmarking

The next stage of preparing the data for the use of performance measurement is Benchmarking18. In order to judge whether the performance of an indicator (that measures the output of a program), is good or bad, appropriate comparisons should be made to benchmarks – which are measures of what should be expected. In simple terms, PM is a planning tool, whereas benchmarking is an improvement tool.19

The PM process generates measures (indicators in our case) that are relevant for all services/departments across municipalities. But each municipality has to set its own benchmark in the context of its own local conditions. Indicators should measure the progress towards these benchmarks for performance measurement to be meaningful, e.g., Water availability per capita is an indicator that is appropriate for both Rajasthan and Kerala, but the Benchmark value for this indicator is vastly different in these two States.

Other Steps in Preparing Data for PM

- Identify the recipients of this service i.e., the "customers"
- Understand the needs and expectations of the "customers"
- Identify those that are indirectly affected by the service 20

[18] See Appendix 1 for detailed discussion on Benchmarking
[19] Tata Energy Research Institute, USERS Project; background note
[20] Ammons, Presentation

Preliminary Round of Data Analysis

A well-conceived performance measurement system should be able to capture and generate some guidelines that would foster automatic improvement of a service. This should preferably be an extension of the data gathering process itself by way of a preliminary round of analysis of the data. It can identify conditions under which a process of performance measurement is doing well or poorly, raise questions regarding improvement strategies, provide clues to problems and assess remedial actions.

The following suggestions should be adopted for obtaining better perspective to analyse data to improve process of performance measurement -

1. Examine changes over time (to identify both trends and spurts)
2. Carefully examine and assess outcome break-ups of output indicators
3. Compare indicators of similar programs and thereby look for best practices.
4. Look for outside the target range
5. Examine multiple outcome indicators together for understanding overall performance.

Methodology of Performance Measurement

At present, there is neither an agreement on the choice and design of the methodology nor on the use of instruments for the performance measurement, that is, efficiency evaluation. It is certain that in order to assess efficiency (performance measurement) it is necessary to obtain information both on the efficacy in the achievement of the results and on the economy in the use of resources in such entities, both at management unit level and at program level.

The methodological designs of performance measurement differ depending on the type of unit evaluated. Again, performance measurement can be of two forms – one, performance measurement of the entity itself and two, performance measurement of the programmes of the entity. The methodological designs will be in principle similar, with some differences in the detailed approach21.

In general, the methodology comprises three phases.

[21] See Appendix

Efficiency Evaluation Design

The first phase is called Efficiency Evaluation Design. This phase involves the determination of the type of study to be carried out, i.e., of the same entity or program over time (Time Series) or a comparison among various entities or programs at the same point of time (Cross Section).

Data Gathering Decision

The second phase is called Data Gathering Decision, and involves the choice of the appropriate technique (mode) of data collection.

Evaluation Strategy

The third phase is called Evaluation Strategy and comprises the evaluation process itself. At this stage, the evaluator decides upon the selection of those techniques best adapted to the evaluation objectives previously designed.

Instruments of Performance Measurement

The instruments generally applied in this evaluation strategy phase are the following:

1. the indicators,
2. the budgetary control,
3. the models for the estimation of production borders – both in parametric and non-parametric form and the
4. Models not using the border production function

Indicators

They constitute the instruments most widely used in this evaluation phase. For their correct application, the objectives are clarified. This tool of performance measurement is discussed at length in the next Chapter.

The word indicator means ‘pointer’ to a desirable outcome. Indicators are basically statistics, related to specific programs and policy concerns, and are used as pointers to the desirable choices from

among policy options. In the context of urban complexities in developing countries and inadequate information and financial resource flow, indicators can be immensely useful for providing quick access to processed information. Indicators are highly cost and time effective multipurpose tools that can be used to detect specific problem areas, monitor and evaluate policy programs and also to examine issues of sustainability.

The use of indicator is a way to measure, indicate, point out or point with more or less exactness. Indicator is something that is a sign, symptom or index, or in other words, is something used to visualize the condition of the system.

Audit and Quality Control

Once the efficiency values are determined, the efficiency audit will try to verify those values through the analysis of the causes that have given rise to those values.

Auditing constitutes the support technique most widely used in the performance measurement, that is, control of the efficacy, efficiency and economy of non-profit public entities. Its implementation and development will require the use of both accounting and non-accounting information systems, which will provide the basis for work performance on behalf of the auditors.

In the United States, the General Accounting Office (GAO, 1993) has drafted a document called Government Auditing Standards, where the following types of auditing are set out:

- Financial Auditing
- Management Auditing
- Economy and Efficiency Auditing
- Programs Auditing

According to the GAO (1993), management audits include the following two auditing groups:

- The operative audits (of efficacy, efficiency and economy).
- The programs audits.

The efficiency and economy audits allow us to determine whether the objectives are being accomplished at the best-cost possible or not, and they are usually implemented in joint manner. Therefore, the economy auditing would form part of the efficiency auditing since its objective is to minimize the resources price, a fact that would necessarily contribute to the achievement of efficiency levels.

Quality Control

The Performance measurement process should have an inbuilt mechanism to ensure quality of the information generated by way of accuracy and usefulness. It should ensure that the initial goals are in place and the information generated is complete, accurate and consistent enough to support decision-making. The process should ensure that much of the information generated should be used to achieve goals, that there is a reasonable degree of accountability.22

For the present, and as far as this compendium is concerned, we shall confine the discussion to the most widely used instrument in the performance measurement of urban local governments, namely Indicators. (The other instruments are discussed in the Appendix 2)

Limitations and Problems of Performance Measurement

The problem with performance measurement is that sometimes it becomes negative and self-defeating, that is, the goal tends to go out of sight as the focus narrows down on the indicators. The measurement becomes more important l than the goal, and we start to define ourselves in terms of what we measure, not what we want to be. For example, how many teachers have ever heard a student asking, “What do I need to do to really learn the material in this course and apply it to my life?” And how many teachers have ever heard a student asking, “What do I need to do to get an A?” This is an example of the measurement itself becoming the goal. What is really more important? That the student understands and becomes able to apply the course content, or that the student be assigned a higher grade? When the student focuses on the grade instead of learning, the measurement has become more important that the goal. As a society, we also have goals and measurements, and in many cases, the measurement has become more important than the goal. Keeping this problem of performance measurement itself becoming the goal in mind, each local government or other agency that wishes to measure performance, should design or apply only those indicators, which are of relevance and lead to, improved efficiency. The whole approach towards

[22] Hatry

performance measurement, that is, internal efficiency auditing and social auditing by external agencies has to be positive and constructive rather than negative and demoralizing.

The implementation of a system of measuring financial condition, administrative productivity and service effectiveness, is expensive and time consuming. . Performance indicators require data collection and analysis. Additionally, some indicators can be misleading. A performance measure that simply tracks the amount of work accomplished does not provide any indication of the quality or effectiveness of the work performed. For example, an increase in the number of repairs made to a system may not be an indication of improved efficiency. It may be that work crews are simply working more overtime. Therefore, when considering a system of performance measurement, it is necessary for key officials to evaluate and discuss which indicators make sense for their jurisdiction and develop a viable implementation plan. Some outcomes cannot be measured directly (e.g., extent of crime prevention, reduction of gender bias in construction jobs). In such cases, proxy variables or surrogates may be used.

Performance indicators do not by themselves reflect how or why the outcomes have occurred. They would be more useful if they could have a built in mechanism by which the details of the program could be assessed and explanations of the outcomes could be found. This issue points to the controversy of accountability.

Other Problems of Performance Measurement

Personnel Training Needs:

Most staff have very little or no exposure to performance measurement. Training is required at all levels.

Changes in legislative and Agency Priorities

Changes in officials, funding uncertainties tend to discourage or destabilize performance measurement. This can easily be solved since the changes do not generally affect broad objectives. They only affect the means of achieving them.

Maintaining Indicator's stability over time

A major use of Performance Measurement is to compare changes over time; indicators need to remain stable in the face of related parametric changes, so that comparisons remain valid.

Documentation

Clarity, simplicity, and systematic rigor should characterize documentation of performance information, so that the process is not affected by staff changes.

Fear and resistance from staff

Staff is likely to be resistant to performance measurement, because the results of the process are likely to reflect on their accountability, efficiency and quality and make such issues more transparent to public. That can make them feel threatened

Politics

Political concerns will at times have considerable effects on the results based information that is developed and reported. This applies to annual performance reporting, to strategic plans, and to information provided as justification to budgets especially projected performance targets.

All these problems are real life situations where compromises would have to be made.[23]

Overcoming Resistance to PM

It is very likely that some form of resistance will confront the effort to design a performance measurement system. The starting point to develop a coping strategy is to understand the reason for the resistance

[23] Hatry

Certain groups may see PM as a threat to their status and a likelihood of having to work under tougher work standards. This is particularly so of officials who believe that by virtue of their political adeptness and membership in the dominant political coalition their preferences are more likely to prevail in political negotiations without the influence of performance facts and figures. Usually these fears are overblown. Rarely are PM efforts inspired by blaming motives24.

Officials are resistant because they often do not believe that their work or contribution can be measured. This problem usually occurs when work is non-routine and a data collection system doesn't exist. These factors do indeed make measurement difficult, though certainly not impossible. Proxy measures are necessary and interviewing skills would be helpful.

Resistance may arise on the grounds of financial constraints. In this case, the situation can be compared to that of an overburdened woodcutter who faces piles of uncut logs and is unable to find the time to sharpen his blunt axe. Officials have to be persuaded to value the importance of PM, if they are to improve their services and use their scarce resources more productively25.

Summing Up

Finally, measuring performance is only half the story. After measurements have been documented, policy makers and administrators must evaluate the results and implement changes based on the findings. **Performance measures are only tools, not solutions. Its prime role is to raise questions rather than provide answers**

Performance measures are merely tools. They can identify deficiencies and inadequacy but cannot prescribe remedies for either. They should be pertinent to and consistent with a department's goals and objectives, should emphasize the quality of services and be customer sensitive. A meaningful connection should be established between the performance measurement system and the organization's decision-making and goal setting process.[26]

[24] Ammons, Book
[25] Ammoins
[26] D. Ammons; presentation

CHAPTER 3 - Urban Performance Indicators

Index

Introduction ____ ***42***

Performance Indicators – Definition ____ ***44***

Need for Indicators ____ ***45***

Purposes of Indicators ____ ***46***

Measure Progress ____ 46

Explain Performance and Sustainability ____ 46

Educate ____ 46

Show Linkages ____ 47

Motivate ____ 47

Focus Action on the Issues ____ 47

Characteristics of Good Indicators ____ ***48***

Consistent and Rigorous ____ 48

Address Carrying Capacity ____ 48

Relevant to Community ____ 48

Long Term View ____ 49

Not At the Expense of Others ____ 49

Easily Understandable ____ 50

Limitations of the Tool of Indicators ____ ***51***

Types of Indicators ____ ***51***

Integral Indicators ____ 52

Trend Indicators ____ 52

Distributive Indicators ____ 52

Predictive Indicators ____ 53

Conditional Indicators ____ 53

CSR Indicators ____ 53

Classification of Indicators ____ ***53***

Input Indicators: ____ 53

Output Indicators: ____ 54

Outcome indicators ____ 54

Impact Indicators ____ 54

Significance Indicators ____ 54

GASB (USA) Classification of Performance Indicators ____ 57

- Input indicator ____ 57
- Output Indicators: ____ 57
- Outcome Indicators: ____ 57
- Efficiency (and cost effectiveness) Indicators: ____ 58
- Explanatory Indicators:____ 58

Tata Energy Research Institute's USERS Programme Classification of Indicators: ____ 59

- Workload Related -____ 59
- Efficiency Related ____ 59
- Effectiveness related ____ 59

From Performance Measurement to the Construction of Performance Indicators ____ 59

Developing and Improving Performance Indicators ____ 62

Pressure – State – Response Framework for Developing Indicators: ____ 62

Issues in Application of Indicators ____ 63

Users and Uses of Urban Performance Indicators System ____ 64

Service Users/ Consumers, / NGOs: ____ 64

City Management:____ 65

State Government: ____ 65

National Government: ____ 65

Credit Rating agencies/Investors/ Financial Institutions: ____ 65

Media:____ 66

Indicators and Community ____ 66

Indicators and Sustainability____ 68

Summing Up____ 70

CHAPTER 3 - Urban Performance Indicators

Introduction

There is great emphasis on performance measurement, both in private industry and the public sector. In addition to stressing on more practical applications of traditional performance measures, this new emphasis focuses on performance indicators, which are less financial in nature. These indicators are designed to support organizational strategies, not just short-term goals, and they should measure actual effectiveness and quality of services and operations to the direct or indirect "customer".

Citizens who support their government by paying taxes expect effective services in exchange for this support. In fact, if a populace does not see the connection between its tax contributions and the services performed by its government, the motivation to pay taxes can be lost. To be more responsive to the public, local governments are refocusing on their performance measurement in order to evaluate the effectiveness of their programs and services.

The PM concept is becoming increasingly relevant and necessary in the wake of changing relationship between the government and people. The relationship is becoming contractual. People are no more viewing themselves as a 'subjects' of the 'State'; rather they view themselves as consumers or customers of the government.

Among all tiers of government, the municipal government (ULBs) is closest to the people and they render basic urban services upon which quality of life depends. So, in the context of municipal governments (ULBs) the concept of PM to assess their performance is becoming more relevant than ever before. It is relevant from the point of consumer rights protection movement as the municipal body provides various services and citizens of the city are its consumers. At present, the concept is new in India but very soon, it will gain rigorous ground and then municipal governments will be under its constant surveillance.

PM essentially involves measurement and evaluation of performance or output in the context of input. But the basic systems necessary for PM like accounting; budgeting, auditing and financial reporting, presently exist in Indian urban local bodies in highly unaugmented, archaic and neglected forms. As it will take a minimum period of seven to ten years to modernize these basic systems in Indian urban local bodies, we will have to look for other models of performance measurement for ULBs. But most of the performance measurement techniques are too complex for any municipal body in the world (especially for in India) One technique or tool of performance measurement, which can be easily and effectively used for the PM of ULBs, is Analysis by Urban Performance Indicators. At various places in the world municipal performance measurement programmes have been structured based on the selected performance indicators. Indicators are tools of performance measurement. In determining the causes of urban dysfunction and in monitoring progress towards achieving sustainable cities, it is increasingly necessary to rely on effective tools to analyse the performance of cities, within countries and on a worldwide basis. It is also important to have accurate and timely data on key policy variables and performance indicators, which measure urban conditions and changes.

Kinds of information available, and the relevance of that information affect indicators given the complexity of cities, there may be differences, obstacles, or even conflicts between groups who use of environmental, health, housing, economic, social and other components of cities. Therefore some degree of coordination and standardization are necessary. It is essential to distinguish between indicators of those components of cities that can be measured objectively, and their qualitative dimensions, which include subjective evaluations founded on perceptions, judgements and ethics[27].

These performance measures/indicators must address the following customer driven issues:

- Quality
- Productivity
- Flexibility
- On-time delivery of goods or services
- Innovation
- Customer relationships

[27] Background note of UNCHS urban indicators program,1988

Urban indicators can serve a number of purposes including

- Represent complex conditions and processes in cities in a simplified way in order to promote public awareness.
- Assist scientific studies of the components of cities and especially to help improve current understanding of the interrelations between these components.
- Facilitate national and international comparisons between cities.
- Serve as data for policy decisions by administrators.
- Provide internal and external audit for public and private sector enterprises.
- Aid citizen participation at the urban neighborhood level
- Help identify and diagnose recent trends in cities including dysfunctions and perceived risks
- Promote formation and implementation of innovative urban policies
- Help anticipate urban developments and encourage proactive policies
- Promote public understanding of goals by indicating goals and achievements

The urban indicator program is not primarily a data collection program. It is a policy and strategy development and technical cooperation program that are a part of the national and local development policy. It is an enabling process, measuring sector-wide progress of all action towards achievement of social goals. They are not to be regarded as a narrow measure of government activity.[28]

Performance Indicators – Definition[29]

The word indicator means 'pointer' to a desirable outcome. Indicators are basically statistics, related to specific programmes and policy concerns and are used as pointers to the desirable choices form among policy options. In the context of urban complexities in developing countries and inadequate information and financial resource flow, indicators can be immensely useful for providing quick access to processed information. Indicators are highly cost and time effective multipurpose tools that can be used to detect specific problem areas, monitor and evaluate policy programmes and also to examine issues of sustainability.

[28] Background note of UNCHS urban indicators program,1988

[29] Some of the theoretical part of this chapter is based on Article of Teresa Garcia Valderrama and Yolanda Calzado Cejas entitled 'Methodology for evaluating the efficiency of public utilities' in International Journal of Public Budget – November-December 1997 Vol. No. 35.

Indicator is a way to measure, indicate, point out or point with more or less exactness. Indicator is something that is a sign, symptom or index. In other words the indicator is something used to visualize the condition of the system.

Kells[30] defines them as: "systems of quantifiable elements or numerical ratios to measure certain aspects of the input of public entities, their operation and their results".

Need for Indicators

According to Stowe[31], the need for performance measurement arises from the following:

- The need to make a correct allocation of scarce resources, there exists nowadays a clear tendency to draw the attention towards efficiency in the performance of the activities, setting aside the traditional tasks of control over fraud, loss and abuse.
- The improvement of accountancy as a management instrument, applying it, mainly, to the control of efficiency in the allocation of resources, especially in between programs. The accounting report must include, therefore, information both of the financial type and measurement of the results of the diverse programs carried out by the entity.
- The tendency to adhere to the processes of Management by Objectives (MBO), and Total Quality Management (TQM). In Management by Objectives, the mangers negotiate which objectives must be accomplished. The aim of Total Quality Management is, apart from the objectives accomplishment, to ensure the quality of relations –both at a customer and supplier level- as well as the quality in decision making and in general management.

Jackson[32] considers that such measures may be used both by users within or without the organization and each of these groups will use the information depending on their separate interests.

[30] Kells. H.R. (1991) – The Inadequacy of Performance Indicators for Higher Education p The Need for a More Comprehensive and Development Construct – Higher Education Management. Vol 2 no 3

[31]

[32] Jackson. P. (1988) – The Management of Performance in the Public Sector – Public Money and Management, Winter, Pages 11 – 16.

Purposes of Indicators

Performance Indicators serve several different purposes such as –

Measure Progress

Indicators should seek to answer the following type of questions: Does a local government have enough money, revenue surplus or own resources to undertake required or planned development? Does a local government have enough resources to meet increased O & M expenses if planned development is carried out? Or how many new water connections or sewerage connections have been given in the year completed? And what is the ratio of performance when compared with the target/progress planned.

Explain Performance and Sustainability

The process of describing indicators helps diverse members of a community reach consensus on what performance, or improvement in the efficiency, and its sustainability mean. Indicators help put performance and its sustainability in concrete terms that demonstrate a new way to measure progress

Educate

The process of describing indicators helps to educate the community. As a nation India has been commendably successful over the last 25 years at addressing the issue of food production (green revolution) and milk production (white revolution). Population growth has gone down and the quality of our health system has improved to some extent. However, increasingly the environmental degradation that we face is due to our collective individual actions. Air and water pollution is in large part due to release of untreated sewerage (both domestic and industrial), non-point sources such as fertilizer, pesticides, and emissions from cars, industries. It was easy to point to a large polluter and say, “Clean it up”. We now need to point to ourselves as individuals and as society and say, “Change how we do things”. Indicators should help to track, monitor and measure such changes.

The process of performance measurement using various indicators and placing results to the people/community helps to educate the citizens about the cause and effects of the particular action, activity or policy.

Show Linkages

The following example shows how indicators can show linkages between different performance on different fronts: Infant mortality — the number of children that do not live past their first year—is frequently used as an indicator of early childhood health. However, a better indicator might be the number of infants being born to unwed women under the age of 18 who have not finished high school. These infants are more likely to have had no prenatal care, have low birth weight, and live in abject poverty. Poverty is linked to crime, poor health and education, which reduce the chances that future generations can become self-supporting members of the community. A more widespread knowledge and understanding of these linkages among the populace, is likely to generate and develop more solutions that address the full range of problems. Understanding the linkages between various causes and results and factors, imbibes a holistic approach among the decision makers of the local government and among the people at large.

Motivate

The Government can use Indicators to mobilize the competitive urge of its citizens to its advantage competitive spirit to our advantage. For example, the Toxic Release Inventory (usually referred to as the T-R-I) – USA, is a great example of this. In 1987, manufacturing facilities in the U.S. were first required to report the amount of pollution they were releasing into the environment. This issue had never been confronted before. There was shock and outrage when the numbers came out: 3.5 billion pounds had been released in 1988. By 1994, emissions had been reduced to 2 billion pounds.

Similarly in our country, we have experienced that whenever the government or governmental organizations honestly and candidly share the results of performance measurement or social problems with the people, or the management shares them with its employees, people get motivated and various solutions come forth spontaneously.

Focus Action on the Issues

Indicators can help focus people's actions and make sure that people know where to put their efforts. What can I do to help? How many people have an electric meter in their house or apartment? Where is it? Is it in the basement? How many people ever go and look at how much energy they are using? In the Netherlands, a recent building regulation required that new houses be built with the electricity meter in the front hall instead of in the basement. The result was energy use in those houses was 1/3 less than what was expected. Even the initial step of knowing what a measurement is, can be effective and useful.

Characteristics of Good Indicators

Good indicators should have the following characteristics:

Consistent and Rigorous

Indicators should be based on a consistent set of definitions categorizing various types of performance information that can be used across programs. That is the cornerstone of any meaningful performance measurement system33.

Address Carrying Capacity

An indicator of sustainability needs to address the carrying capacity. It should be able to indicate whether the community is using resources at a rate faster than they are being renewed or restored, or whether the community is using up its capital or is living off the interest and reinvesting or enhancing its community capital. In many cases measurement in terms of monetary value may not be appropriate. It is not the total rupee value of housing stock in a community that is important to sustainability; it is whether or not there are enough houses that people can afford.

Relevant to Community

What is sustainable in one city may not be sustainable in another. Sustainable solutions in metropolitan areas will be different from sustainable solutions in rural areas. Communities should select indicators that are relevant to their situations. They should relate to the perceptions of the community, for example, - how many people have ever seen a part per billion? We need to develop indicators that speak to people, so that they understand what they are doing that is causing problems and what steps, however small, they might be able to take to help solve the problem. Examples of appropriate measures are pounds of pollution per mile or gallon, tons of pollution per year, etc. This will also help the general public understand why some laws go into effect and help prevent backlash against regulations that work. They should also be useable by the community - If the community does not use indicators, they will not have any effect on what people do. Indicators need to help people see how they can change their behavior to have a positive effect on community sustainability.

[33] Hatry

Indicators would be much more useful if they are expressed in local language for Indian cities[34].

Long Term View

Sustainability is a long-term goal. We need long-term indicators (this means 25 or 50 years in the future, not 5 or 10 years) that show linkages. Traditional indicators tend to be narrowly focused on one aspect of a community. For example, when the focus is on increasing the number of jobs without looking at the details—the types of jobs, whether the jobs are long term, and whether they have health benefits— the community may just be set up for more problems down the road. The town of North Conway, New Hampshire, saw incredible job growth during the 1980s. Unfortunately, the jobs were all retail sales jobs: seasonal work dependent on the tourist trade, with low wages and no benefits. When a downturn hit the economy of Massachusetts, New Hampshire's tourist industry took the hardest hit, and North Conway's jobs were affected. Then, when Massachusetts' economy bounced back, job growth returned, but all of a sudden there was an incredible traffic problem in town. The indicator of jobs wasn't linked to the social or environmental aspects of the community.

Not At the Expense of Others

Another quality which an indicator should possess is that it should not propagate or postulate inequality or performance at the expense of others or progress at the cost of others. It should work towards promotion of better performance within a certain area, without conflicting with or harming any other area. This quality is very difficult to adhere to but one should make every effort to ensure it. If we develop an indicator that makes our community better at the expense of another community (local, regional, or global), then we are not measuring performance and its sustainability. For example: If the indicator is "amount of solid waste land filled in our community," and to have better performance under this indicator if we stop land filling by dumping everything in the ocean, then we are neither measuring performance nor the environment sustainability. This does not mean that one community will not be better than another. It just can't get there at the expense of another community. Instead of median income compared to other places, measure whether local people can afford local basic needs on the local wage. Instead of measuring the amount of solid wasteland filled in the particular area of the city, we should measure the amount of solid waste produced and work to reduce its quantity or its harm to the environment.

[34] FIRE project – Debt Market / Infrastructure component, Draft Meera Mehta, May 1996New Delhi.

Easily Understandable

The number of good air quality days is certainly an indicator that can be easily understood by members of a community. However, it is a one-dimensional, short-term measure of a problem. It answers the immediate question “Is it okay to breathe today?” but does not link the answer to causes or effects of poor air quality. The disadvantage of number of good air quality days as an indicator is that it does not show links between air quality and other economic or social issues. Sustainable community indicators do show these links. For example, asthma-related admissions show the link between air quality and health. Vehicle miles traveled show the link between social and economic behavior and environmental results.

Good indicators should have the following additional qualities

- Timely
- Resistant to undesired behavior
- Comprehensive
- Non redundant
- Sensitive to data collection costs
- Focused on controllable facets of performance35

The use of urban indicators would have to be based on the collection, compilation and the analysis of data on the cities in question. That being a laborious process, requiring extensive data collection, constant monitoring and periodic updating, the urban indicators should ideally be simple enough to compute, relying on basic data.

An important element of the indicators is consistency of data, standardization of methodology, and mutual compatibility to ensure adequate base for comparison between cities. As opposed to national level indicators, urban indicators require micro level data and more detailed information on quality of life and urban governance.

[35] Ammons, book

The quantification of data requires substantial and scientific statistical backing, as data would be partly based on sample surveys. Information, which cannot be quantified without loss of accuracy, could be best represented through qualitative indicators with appropriate grading for performance within the range of stipulated benchmarks36.

Limitations of the Tool of Indicators[37]

- Constructing indicators from outcomes is a process that is often complicated by measurement problems. Often data sources and data collection procedures may prompt the wording of an indicator.
- Unwarranted preference and attention to indicators that can be easily measured may exclude other outcome effects and thereby in the long run generate undesirable bias in resource allocation. A judicious mix of indicators should be adopted for the benefit of society at large, in the short and long run.
- Often several indicators may be required to measure one outcome, (depending on the latter's base and coverage)
- An indicator should not be excluded, once the goal/target that it relates to, is achieved. Monitoring should continue so that there is constant touch with the parameters of good performance, and also to take immediate cognizance of any possible set-back.

Types of Indicators[38]

Indicators are of different types. Each type of indicators offer distinct advantages and disadvantages because each type has its own

- specific rationale for existence,
- direction and purpose,
- methodological complexities
- data requirements
- purposive standards & conditions and
- application modes

[36] V. Suresh
[37] Hatry
[38] Based on the works of Jeb Brugmann and Graham Pinfield that appered Local Environent, Vol 2 No. 1&2 CLEPS, South Bank University, London, Feb. & June 1997 under the titles 'is there a Method in Our Measurement?' and 'Use of Indicators in Local Sustainable Development Planning'.

The indicators at first instance are of three broad categories of them are as follows –

- Input-output level indicators – used to assess quantitatively the performance of functionaries and systems. They depict the extent of resource investment made to bring about desired change or level of service. Not helpful to understand behavioral and procedural processes of the entity.
- Output-impact level indicators – help in assessing the effectiveness of the efforts put in and can be used in summative evaluations at the end of long-term effort.
- Condition-Stress-Response (CSR) indicators – measure the ground realities (condition), the challenges (stress) and the systemic approach applied to meet these challenges (response).

More detailed description of these categories is given under next section on classification of indicators. Some other categories of indicators are as follows

Integral Indicators

Portray the results of linkage between or among different sectors and factors. E.g. rate of employment, which points ULB's facilitation processes, economic credibility level of the city, confidence of investors in city governance, municipal planning priorities etc., or

Rate of malnutrition, for it points to the impact of numerous interactions among many causative sectors. They indicate the performance levels of income distributions, household food security, consumption habits and patterns, food storage and handling systems etc.

Trend Indicators

Those which are linked to processes pointing to quantity or speed patterns of change. E.g. rate of change in ULB's expenditure in select areas, for it indicates the direction or trend of ULB's spending or priority areas of concern.

Distributive Indicators

Those indicators which are linked to equity issues of resources, income and services. E.g. GINI index of Income Disparity for it establishes a standard and estimates the distance between the standard and state of performance.

Predictive Indicators[39]

Linked to assessing trends and processes and making futuristic projections. These are basically forecasting models e.g. estimated rate of increase in ULB's revenue. It determines possible projections into the future on the basis of past patterns and probable future trends.

Conditional Indicators

To portray results achievable under assumed conditions or changes or both. E.g. Rate of female participation in urban governance. It assumes that neither the life style patterns of urban women nor the constitutional and statutory provisions for such participation will change.

CSR Indicators

These indicators are mix of the above and are linked to Condition, Stress & Response (CSR). It is simple model for measuring local conditions but not for comparative purposes. This particular type of indicators is directly responsive to needs of ULBs. It measures how the urban governance system is responding to either Condition, Stress or Response or to all three factors. CSR indicators are logical amalgam of many of the above categories pointing either to input or outcome or impact level accomplishments, as needed. E.g., percentage of time of the council meetings devoted to review basic urban needs of poor people or slum dwellers.

Classification of Indicators

There are different ways to classify various performance indicators. In general, the Public Sector indicators may be classified based on the diverse outcome components, establishing the difference among the input, output, outcome, and impact and significance indicators.

Input Indicators:

They provide information on the resources used by the area or program involved. They are usually expressed through volume or amount units such as: man hours spent, hours of equipment use, etc.…They may also include program costs, establishing the difference between direct costs, indirect costs, marginal costs and economic costs.

[39] This book has not explored these type of indicators.

The use of direct costs is preferred only when they may be controlled by most of the organization's management levels. As regards marginal costs, they may by measured through the calculation of the cost increase generated by the production of additional goods or services by the entity or program, also including both direct and indirect costs. The economic costs involve those related to the legal provisions or to the budget implementation.

Output Indicators:

They refer to the amount of goods and/or services generated by an entity or program, generally measured in terms of volume or economic units.

Outcome indicators

They provide information on the direct results achieved and they are usually expressed qualitatively in terms of quality or in degrees of satisfaction of service users.

Impact Indicators

Through the calculation of this indicator we could get to know the repercussion of the results of a certain program or activity both at internal and external level.

Significance Indicators

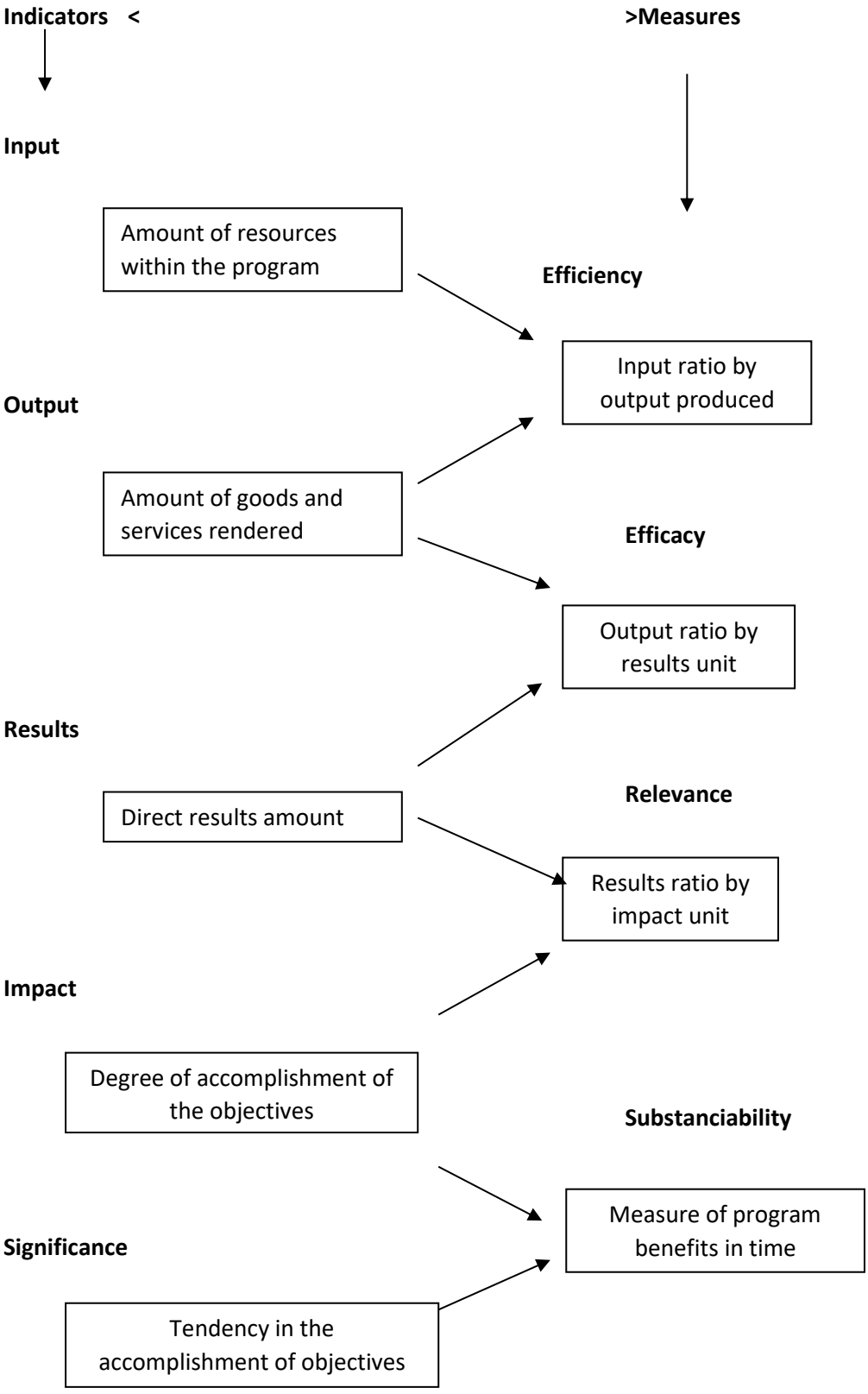
They provide data on the behaviour of the results over time.

In tables No.3.1 and No. 3.2 below, some examples are given on the input and output indicators to be used both in the efficacy and efficiency evaluation.

Cutt, Trotter and Lee link the measurement of efficacy, efficiency, impact and substanciability with the nature of the information derived from the use of indicators at the university institutions, setting the difference between the input, output, results, impact and significance indicators as shown in table no.3.1

Each of these indicators will allow the management bodies to know whether the objectives of their own departments or programs have accomplished the efficacy and efficiency levels projected, evaluating, at the same time, the impact and consistency of the results in time.

Figure 3-1 Classification of Indicators [40]



[40] Adapted from Cutt J., Trotter L. Y. and Lee C. (1993) – Performance Measurement and Accounting in Canadian Universities – Making a Start in the Area of Teaching – Financial Accounting and Management. Vol 9 No. 4 pages 255 - 255

Table 3.1 - Input Indicators

Measure	Attribute	Method	Example
Volume	Quantitative	Accounting	Hours worked Infrastructure Km. Traveled
	Direct	Cash or accumulated	Cost of materials
	Indirect	Allocation	Surface covered
Costs	Economic	Cost according to Regulations	Costs supervised
	Total costs	Total costs of a policy	Staff reduction cost
	Marginal	Calculated costs Output increases	Costs per output increases

Source – Duquete D. J. and Stowe A. M. (1992) – Enter the Era of Performance Measurement Reporting – Government Accountants Journal – summer – pages 19 – 28.

Table 3.2 - Output indicators

Measure	Attribute	Method	Example
Volume	Quantitative	Objectives achieved	Number of publications Number of patients cured
Currency units	Money	Money spent on program	Assistance given for research Loans granted

Source – Duquete and Stowe as mentioned above.

The use of indicators will differ at each organization's management level. Thus, the efficiency and efficacy measurement will be controlled by each department or officials; the impact, in a more general manner, will be controlled by the departments and the significance measure by the entity itself.

GASB (USA) Classification of Performance Indicators

The performance indicators can be classified in another way. The classification described below is developed and utilised by the Government Accounting Standards Board (GASB) of USA. GASB published a series of research reports in 1990 entitled, 'Service Efforts and Accomplishments (SEA) Reporting: Its Time Has Come.' Five types of performance indicators are commonly used in USA when reporting the efforts and accomplishments of a program or service of a local government:

- Input Indicators
- Output Indicators
- Outcome Indicators
- Efficiency (and cost effectiveness) Indicators
- Explanatory Indicators

- **Input indicator**

These measure the amount or resources needed (either monetary, personnel or other) to implement a program or provide a service. Input measures show not only the total amount and cost of resources needed, but also give insight into the appropriate mix of resources necessary: money versus equipment versus staff. Examples of input indicators are:

  - Number of person-months of labour by category
  - Number of vehicles or vehicle hours employed
  - Acres of land utilized
  - Program expenditures
  - Capital investment needed

- **Output Indicators:**

These indicators focus on work accomplished (no focus is given to effectiveness or quality). They measure the activity or services provided by a particular function or program. Examples of such measures are:

  - Number of homes services
  - Number of repairs made per time period
  - Number of kilometers of roads paved
  - Tons of solid waste collected

- **Outcome Indicators:**

These are designed to measure whether or not a particular program or service is meeting it goals. Their focus is primarily on quality and effectiveness. They measure the extent to which a need or goal

is or is not met. These types of indicators are very useful to local government officials, but they also require a great deal of data collection, sometimes requiring special surveys or evaluations, and therefore these measures are often costly to track. Some examples include:

- Number of crimes per capita
- Value of property lost to crime
- Number of interruptions in water service
- Average time required to respond to reported water leak
- Percentage of streets meeting cleanliness criteria

- **Efficiency (and cost effectiveness) Indicators:**

These indicators measure the cost for a particular program or service in terms of money spent or personnel required. In general they are in the form of a ratio of cost per unit output or cost per unit outcome. Understanding the cost-effectiveness of a program or service is very important to all the functions of local government; planning, program management and budgeting. These measures also indicate the productivity of public services or programs. Productivity measure is especially important in the face of decreasing funding prospects. Examples of efficiency measures are:

- Cost per tons of solid waste collected
- Cost per million liters of water treated
- Employee hour for a particular type of road repair
- Monetary cost for material and equipment used in a particular service call
- Operating cost per capita for police protection

- **Explanatory Indicators:**

These include a number of indicators, which clarify environmental, political, economic and organizational factors that could affect the evaluation of program performance. Often these factors are out of the control of the effected government agency. Examples include:

- Demographic information on serviced community
- Quality of water source
- Unusual weather conditions
- Terrain and road conditions in collection area
- Square kilometers served

Tata Energy Research Institute's USERS Programme Classification of Indicators[41]:

There are 3 types of Performance measures

- **Workload Related -**

(They relate to the amount of effort made, or work done and address questions like 'how much' or 'how many')

- **Efficiency Related**

(They relate outputs to costs/revenues)

- **Effectiveness related**

(How far the goals of the service and programs are being achieved)

The classification that the authors of this book have adopted for the urban service related indicators is

- Coverage or Explanatory Indicators
- Quantity or status or resources committed Indicators,
- Quality Indicators,
- Efficiency or Expansion Indicators
- Consumer Satisfaction

This classification has strictly not been followed for the Demographic, General, Administrative, Financial and Governance indicators.

From Performance Measurement to the Construction of Performance Indicators

One of the important tools of Performance Measurement is indicator. There can be hundreds of indicator but may not be suitable for measurement of the task on hand. One will have to move from conceptual understanding of PM to actual construction of appropriate indicators. The suggested steps to move from concept of the performance measurement to the construction of indicators could be as follows[42]"

[41] USERS Background Note

[42] Hatry

- Determine the program objectives to include in the exercise of performance measurement. List the various objectives of the program and arrange them in order of priority.
- Establish a working group to monitor the performance measurement process. This working group should consist of representatives from the following stakeholders of the program: program officials, members of target groups, central implementing / funding agencies, financial experts, and information processing experts. Working group meetings should be preplanned in meticulous detail.
- Such a working group should take the following initial steps :
    1. Decide and establish its own scope and purpose
    2. Define the program's aims, goals, and target population
    3. Specify the outcomes expected from the program
    4. Construct Indicators to measure outcomes and efficiency

    1. An objective/goal statement should be prepared. This should neither be too general (to avoid blurring of focus) or too specific (to avoid possible exclusion of outcomes that may eventually emerge as relevant)
    2. At this stage objectives of the program should be stated in strictly qualitative terms (not yet quantitative so that they remain stable through temporary variations of data and measurement conditions). The focus should be on the effect on 'customers', multiplicity of objectives, and inclusion of negative impacts. Cognizance should be taken of the need to balance conflicting objectives. Quality control and efficiency should be given due importance. Sometimes sources of information do help in articulating objectives. Vague and obscure wording should be avoided as far as possible to minimize confusion and the need for guessing. Programs are likely to have multiple customers who have to be appropriately grouped or categorized. Many programs have a mix of end objectives, intermediate objectives and means. They have to be sorted out correctly, grouped and arranged into a hierarchy.
    3. This stage comprises two steps. In the first step, the basic outcomes to be tracked should be identified. Outcomes will be of several types –

        (i) Those producing results sought by the program

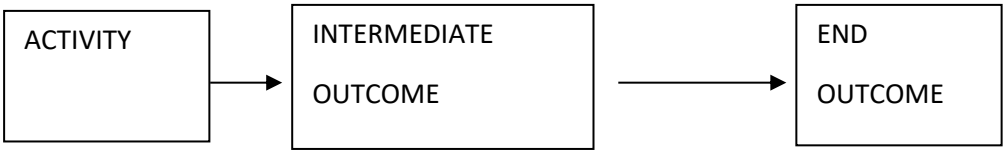
        (ii) Those minimizing negative side effects

        (iii) Those that improve service delivery

        (iv) Those reducing service gap (unmet need)

        (v) Those rendering benefits to the general population.

        In the second step an "output sequence chart" (logic model) should be constructed. This involves the creation of a schematic flow chart representing the vision of the program starting from its objectives and moving on to the outcomes, showing clearly how one outcome leads to another. Caution should be exercised not to narrowly restrict the program to the sequence chart. There should always be room for innovation. Output sequence charts may be divided into 3 broad sequential areas



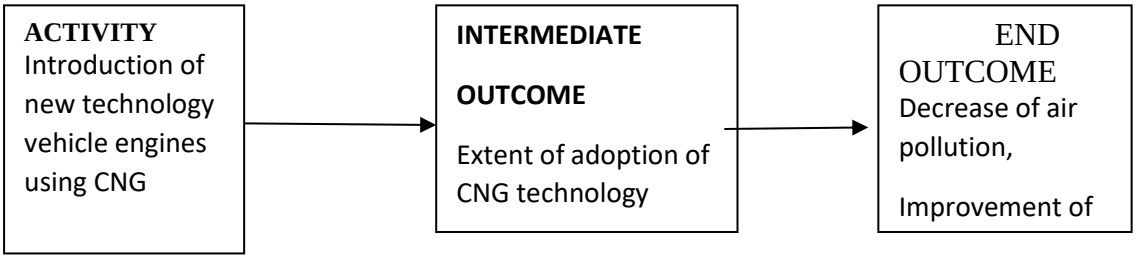
Note: The further away one goes from the 'activity' towards the 'end outcome' higher the influence of factors external to the program.

4. Outputs and outcomes thus identified can be translated to specific indicators, which are essentially numerical measurements that indicate progress towards a certain outcome. They are expressed in quantitative terms, e.g., "the number of…", "percentage of….", "ratio between." etc.

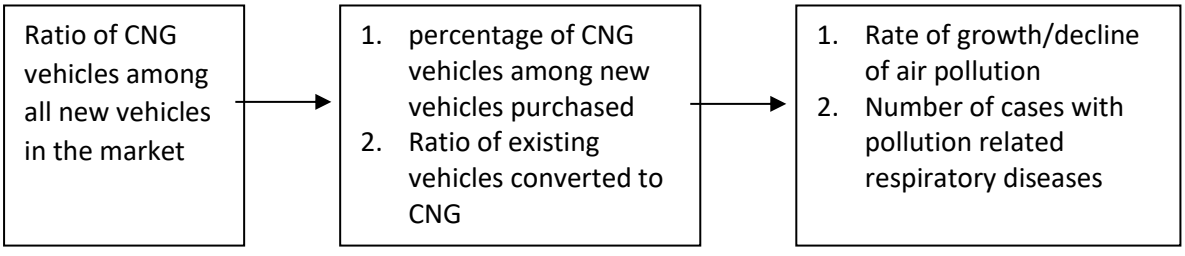
EXAMPLE:

There is a program of introducing CNG as an alternative fuel for automobiles, with a vision to reduce vehicular pollution

Outcome sequence



Indicators



In sum, the process of framing indicators[43] involves following four steps -

- Single out service or program
- For each of them spell out goals
- List out the expected outcomes. Disaggregate.
- Accordingly frame indicators quantitative or qualitative (use appropriate proxies.

Developing and Improving Performance Indicators

We have just looked at some of the factors that go into the making of a good indicator. Now we need to talk about how to make even better indicators. There are three things to consider when you are developing indicators.

- **First,** indicators need to be focused on the right goal. Before you use an indicator, make sure that the indicator is truly measuring what you want to.

- **Second,** make sure the indicators you develop are ones that people understand and can use.

- **Third,** when you have a group of indicators, make sure that some of them measure the causes of the problems, not just the results.

Pressure – State – Response Framework for Developing Indicators:

Traditionally, organizations tend to measure conditions that exist. This is called the state. For example, an environmental agency measures the condition of the air—the air quality—by measuring how many parts per million of a pollutant are in the air or how many days the air quality is rated “good”. These are measures of the state of air quality. An agency may also measure responses to that state: how many air permits were issued or what emissions standards have been set for automobiles? These are measures of response to the state of air quality. However, frequently what is not measured is the activity that is causing the state to exist. This activity is called the pressure. In the case of air quality, examples of pressure are the number of cars being driven and the amount that they are driven. When we develop indicators, we should make sure to pay attention and measure pressures in addition to states and responses.

[43] Background Note

The pressure-state-response framework was developed for environmental issues and works well for those types of indicators. It is harder to apply this framework to social and economic issues. It helps to establish a context and draw a boundary around a problem before deciding what the pressures, states, and responses are. For example, if the issue is crime, as defined by "the number of robberies", then the context is "safety". The number of crimes is the "state". A response might be to hire more police officers. The number of police officers is a measure of the "response". There are a number of "pressures" that may be causing the "state" to exist, including drug use and poverty. The amount of drug used or the lack of jobs is measures of the "pressures". These pressures and responses define the boundary of the issue. However, it is possible to see the lack of jobs as a "state" if the context is "economic well-being". In this case, welfare and job training are both "responses" to the state; as a society, two responses that we have to the lack of jobs are: giving people money (welfare) and helping people develop skills (job training). Both of these responses need to be measured, but there should also be a measure of the pressures causing the lack of jobs. Examples of pressures causing lack of jobs include increased mechanization and the shifting of jobs to places with lower wage rates. In a sense, the shifting of jobs to places with lower wage rates can be seen as a pressure causing crime (a state) and job training (a response to crime), but they are both outside the boundary of the original context of "safety." Setting the boundary of the context helps to keep the discussion focused.

Another difficulty with pressure-state-response discussions is that some situations may be a pressure in one context and a state or response in another. For example, if the context is air quality, then the amount of air pollution is the state and a pressure would be the number of cars being driven. However, if the context is transportation, the state becomes the number of cars driven and a pressure may by the distance between where people live and where they work. Again, it is important to understand the context and the boundaries. Discussions of pressure-state-response can be like the ripples caused by throwing a stone into a pond – one thing leads to another. Understanding the ripples of the cause and effect relationships is an important part of developing better indicators.

Issues in Application of Indicators[44]

The users of the indicators should keep following cautions in mind. These issues will put them in constant state of preparedness when confronting issues of definition and analysis.

[44] the discussion under this section of book is based on UNDP – The Urban Governance Initiative for Asia-Pacific, ' Indicators – Tools for Assessment and Analysis of City Governance.

- Indicators are value laden. Users must decide beforehand the moral minima or the minimum set of values that their indicators must represent.
- The conflict between scientific rigor required of any indicator and the available municipal and community capacity to use them, if not properly resolved at the outset can cause dilemma to the user and also can render indicator redundant or irrelevant.
- Public participation is an important corollary to collection and analysis of data for indicators... Public participation definitely helps but there are numerous data that the public cannot collect process and analyse for the lack of technical and scientific knowledge and skills. Indicators are not simple to use, they are simplification of complex problems.
- Managerial usage requires diverse set of indicators while for social construct it is not necessary. Mere academic appraisals will not help bring about benefits of indicators. The best is to weave both managerial information and social experience into one set of indicators.
- However simple the tool of indicators is, it must always be subject to scientific scrutiny.
- Without properly understanding the end results required, indicators must not be developed. E.g. if 'good governance' is not properly defined and understood, there is no way that indicators can be developed to measure it.
- The indicators should automatically pursue some priority interventions established by community.
- Indicators should be precise; they are expected to measure very precise, targeted objectives or things.

Users and Uses of Urban Performance Indicators System[45]

In general at least six major user groups may be identified.

Service Users/ Consumers, / NGOs:

The effectiveness of urban management has been severely constrained by inadequate participation by these groups which is caused by inadequate information and lack of transparency in the operations of the city government. A city level UPIS, if designed carefully may help to remedy this lacuna. This city level UPIS needs to be simple, disaggregated at appropriate levels, and available in local language.

[45] Meera Mehta, Draft Report, FIRE D, 1996. New Delhi.

City Management:

An UPIS would enable the city government to set its performance targets, monitor its own performance over time, and help to make rational financial and planning decisions. The city government can also include a report based on some key indicators as a part of its annual budget documents. The set of indicators when used as a time trend analysis will also help to detect warning trends for service and financial situation. Similarly a city may also detect warning trends in its performance and competitiveness by comparing its position in relation to other comparable cities.

State Government:

A State government plays both a regulatory and monitoring role for the city governments. At present these roles are severely constrained by a lack of information on the performance of different cities. The State government is also involved with the transfer of resources for different local entities and for decisions regarding local plan projects. A comparative Performance indicator system will help the city governments to make these decisions in a more rational and transparent manner.

National Government:

It requires comparative information across cities in the country and the major use of this will be in planning and program related decisions. Just as for the State government an indicator system will enable the national government to make these decisions in a more rational and transparent manner.

Credit Rating agencies/Investors/ Financial Institutions:

With economic Liberalization and Financial sector reforms in recent years, there is an increasing need for comparative information to make appropriate investment decisions in a more competitive environment. The users in this case are a variety of financial institutions that may wish to lend to local governments and to other entities or credit rating agencies that provide the analysis to potential investors through their credit rating. It would also be useful for entrepreneurs seeking to make location decisions. A comparative indicator system will help to provide norms and benchmarks for assessing performance of local entities and help to assess urban competitiveness of individual cities. In addition, a city level indicator system will also help to ease the credit rating process for individual cities and enable financial institutions to do rapid credit assessment of cities and local entities.

Media:

In recent years, the role of the media in influencing public opinion and generating public debates on important developmental concerns has been considerable. Media would benefit from both the city and comparative systems. Further use by the media will enable wider dissemination of developmental issues.

Indicators and Community

Community participation is an invariable element of service provision. The involvement of citizens has demonstrated enhanced effectiveness and quality in service delivery. Communities being the ultimate beneficiaries representing the demand side of urban services the indicators become meaningful only if service provision and environmental quality match the community perception. Hence it is important to ensure the participation of the community in urban management besides devoting due weightage for their judgment in the urban indicators. For example, it is often seen that the Willingness to Pay (WTP) is a subject of detailed study in framing customer perception indicators as well as fixing appropriate tariffs. However it important that the indicators should take into account the Willingness to Charge (WTC) on the part of political administration.

The role of the media and appropriate publicity also needs to be stressed in wider dissemination of the rating system. The urban indicators would be successful in their elementary goal if and only if they elicit a sensitive response from the public in general and the urban administration as well as the utility providers in particular, which would be instrumental in improving the urban governance system in the country and ensuring a better quality of life to our future citizens.46

The micro level participatory performance measurement by the citizens can only force to better public accountability and transparency in our local governments and thereby improve their performance in turn the quality of our life. The contemporary pressing issue of better urban governance calls for better and more interactive linkages between the government and the citizens. Links are numerous, multidimensional and often complex. PM is very important because it documents objective information. This would enable both government and citizens to have meaningful mutual interaction47.

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[46] V. Suresh

[47] *21st Century Community Governance :Better results by linking Citizens, Government, and Performance Measurement;* Marshall, Wray, Epstein, and Grifel ; Project of "Citizen's LEAGUE; ICMA, 1999

The indicators, a user-friendly tool of performance measurement, were developed and exist for the community use. At the same time the structure of the set of indicators also reveal their view of the community. Some of the measures or indicators, the traditional ones, are presented as follows –

- What is the quality of water supplied?
- Air quality of a city over the period of time?
- What is the depletion rate of natural resources?
- How much money do you make?
- What is the unemployment rate?
- Dropout rate by the 5th standard?

The traditional measures that we use tend to show a community as disconnected segments: the environment, the economy and the society. An environmentalist wants to improve air quality. A businessperson wants to increase profits. The health professional wants to improve people's health. However, the traditional ways we use to measure progress in these areas don't take into account the connections between these three areas. As a result, the three groups may work at cross-purposes. For example: Shutting down a factory may improve air quality, but if many people were out of work they would not be able to afford health care. Ignoring air quality regulations may improve profits in the short term, but poor air quality can affect worker health, which can in turn cause health insurance costs to go up and therefore hurt profits in the long run. Rather than being three disconnected boxes, communities are actually a complex web of interactions. Air and water quality affect the quality of other natural resources, which in turn are used as materials for production. Having materials for production allows people to have jobs, which in turn affect their health and the general poverty levels. An important point to note here is that although there is a tendency to think of 'stockholders' as someone other than ourselves, we are all stockholders in some sense. Even if one doesn't own stock personally, ownership of a pension fund, a mortgage, a car loan, a bank account, or a credit card, makes him a stockholder in the community. We are all part of the economic system and we all need to become more aware of how measures of wellbeing in these different areas are reported and how they connect to each other.

A community is an intricately connected web. Here is an example of a web for a community that derives part of its support from a forest. The forest provides materials for production, which generates employment, i.e., creates jobs. Jobs help to ameliorate poverty. Education improves the skills of workers, further reducing poverty. There is also a link between education and health. Crime can affect

health. People with jobs may enjoy the forest by appreciating and probably hunting for wildlife. All these links are like connections in a complex piece of machinery. Sustainability is about understanding the connections and figuring out how to make the machinery run more smoothly. Alan AtKisson, one of the founders of Sustainable Seattle, gives the analogy of using a monkey wrench to adjust the system. He says that the idea is to figure out where in the system a slight tweak with a monkey wrench will have the most positive effect. For example, crime is an issue in many communities, but solving crime by hiring more police or building more jails may not do as much to improve the sustainability of a community as using the monkey wrench on the education or employment. Key linkages can be understood by drawing linkage pictures. This helps in the developing of indicators of sustainable communities. For example, although crime and deer population may be connected, when the focus is on employment, they do not hold the key to ensuring jobs. For jobs, education and materials for production are key links.

Indicators and Sustainability

The following qualities of indicators may ensure their sustainability:

- Relevant to the community it will be used by
- Understandable and useable by that community
- Looking at the long term (20 or 50 years, not just 5 or 10 years)
- Helping to show the links among economy, environment and society
- Incorporating the concept of limits, carrying capacity, or ecological Footprint.

Think about whether the indicator is looking at the pressure, the state, or the response. Make sure that at least some of the indicators are measuring the causes. One should not focus on just the effects alone. It is also important to think about the type of capital that one is attempting to measure. Communities are made up of social and natural capital as well as financial capital. Social and natural capital is much more difficult to quantify, but they are just as important for a community.

At this juncture it would be appropriate to look at a number of different indicators in several different areas and use these criteria of sustainability for evaluating them.

“Waiting time at intersection” and “Number of cars at peak period” is traditional measures of the traffic flow that are very countered productive to sustainability. Although they are measures of the

“carrying capacity” of a particular road, they are not good measures of the overall “carrying capacity” of the entire community. A number of studies have shown that widening roads generally results in increasing amounts of traffic, which, in turn, requires even wider roads. There is a limit to the amount of land in a community that can be devoted to transportation and neither of these indicators addresses those limits. Nor do these two measures link transportation to other aspects of the community.

In contrast, “Time devoted to non-recreational travel” links transportation to work and to free time. In effect, this measures a piece of a person’s social carrying capacity—the amount of time available in a day—by indicating how a person is able to use that time. Time spent commuting results in less time for family, friends, community, and personal leisure. “Portion of household expenses spent on transportation” links transportation to personal income and therefore to the number of hours needed to support basic needs. As with time spent commuting,

The larger the percentage of household income used to pay for transportation, the smaller the percentage of income available for other basic needs. “Percent of vehicles powered by renewable energy” links transportation to energy use and speaks to the type of energy used. “Ability of non-drivers to reach employment centers” links transportation to work as well as to social equity and housing.

For example, “number of permits issued”, and “number of housing starts”, although good measures for a housing department or a real estate developer, do not address carrying capacity or have links to other aspects of the community. Some aspects that are missing include: how much land is being used up in creating new houses, whether those houses are affordable to people living in the area or only to people moving in from outside the area, whether the housing results in more transportation needs or whether the housing is close to existing places of employment, shopping, education, and recreation. “Change in urban area versus change in population” addresses “carrying capacity” in that many communities have increased the amount of land that they use at a much greater rate than the population is increasing. Clearly this is not a sustainable trend. “Acres of farmland lost to development” and “land per capita used for transportation” also address carrying capacity in that there is a fixed amount of land available. These indicators also link land use to other areas, specifically food production and transportation. “Change in the amount of impervious surfaces” links

transportation and land use to water quality and addresses carrying capacity in that the impervious surfaces do not absorb water and increase the risk of flooding.

Very often, we measure is only what we pay attention to. When a measurement tells us something is broken, we make sure it gets fixed. However, because we have traditionally viewed our communities as isolated categories of economy, environment, and society, we have measures of progress in these different areas that often work at cross-purposes. We need to start taking a hard look at our traditional measures and find new ways to measure where we want to go.

To conclude, appropriate awareness of and attention to the linkages (future and present) of an indicator are of utmost importance in ensuring their sustainability. Indicators conceived and used in isolation are not likely to be sustainable.

Summing Up

This chapter has attempted to condense the concept of performance measurement into the most commonly used and convenient tangible tool…..the indicator, to be more specific, the urban performance indicator.

After defining the indicator and understanding its need and the purpose it is expected to serve, the reader is familiarized with the desired qualities of a good indicator

The process of performance measurement by using indicators has many limitations and may have to face some obstacles. The reader is alerted about these problems.

As far as they can be generalized, indicators of various kinds have been enlisted and briefly described, according to attributes they are expected to measure and the scope and dimensions of performance measurement they are dealing with.

Different indicators are grouped together and classified into groups depending on the component or stage of performance they are trying to measure. A general classification is presented, and two other conventional classifications are also illustrated.

The next major part of this chapter dwells upon the formation of urban performance indicators. It gives the reader a brief description of the rigors of the schematic approach through which the idea of performance measurement should lead to the framing of the desired indicator. Following such an objective approach the usage of the indicator is expected to be well geared to the specific goal of the performance measurement exercise, and capable of measuring multidimensional outcomes and their far reaching all round effects. The reader is further reminded of some of the issues at stake and cautioned about some difficulties that may emerge.

The reader is then introduced briefly to the various groups of users of the urban performance indicator system. The discussion then moves on to the way performance indicators relate to the urban community as a complex web of multidimensional interactions.

Lastly, some desirable qualities of indicators are enlisted, so that they are sustainable in the long run – which means that they should be mindful of the interactions of the economy, environment and society, and factor in the limits of ecology, and carrying capacity. Over the years they should continue to be relevant to the community.

CHAPTER 4 - Demographic, Social and Economic Indicators

Index

INTRODUCTION 74

DEMOGRAPHIC INDICATOR 74

- City Population by Sex and Age Group 74
- Annual Population Growth Rate 74
- Net Migration Rate 75
- Net Natural Population Growth Rate 75
- Crude Birth Rate 76
- Death Rate 76
- Child Mortality 77
- Maternal Mortality 77
- Average household size 77
- Household formation rate 78
- Housing tenure type: 78
- Population density 78
- Land Use 79

SOCIOLOGICAL INDICATORS 80

- Literacy (by age and sex) 80
- Literacy of poor 80
- Refugees 81
- Deaths due to violence 81
- Local participation 81
- Voluntary associations per 10000 people 82
- Citizen involvement 82

Poverty 82

- Population below poverty line 82
- Minimum wage coverage 83
- Malnourished children 83
- Slum Population 84
- Children in Slum Population 84
- Social Safety Nets 84

Employment 84

- Unemployment Rate _____ 84
- Sectoral employment profile _____ 85
- Net employment growth _____ 85
- Child labour rate _____ 85
- Households with adequate income _____ 85

ECONOMIC INDICATORS _____ 86

- Power availability _____ 86
- Telecom facilities _____ 86
- Bank use _____ 86
- Connectivity _____ 86
- Road length _____ 86
- City investment _____ 87
- New investment _____ 87
- Industrial employment growth _____ 87

ECONOMY and ENVIRONMENT INDICATORS _____ 87

- Diesel and petrol use _____ 88
- Vehicle ownership _____ 88

CHAPTER 4 - Demographic, Social and Economic Indicators

INTRODUCTION

This chapter presents a special category of indicators that are not intended to measure performance of ULBs. This aims primarily to furnish background information on the jurisdiction of an ULB. The ULB itself has no control over the performance of most of the following indicators but it is important to know about them, since it gives an idea of the local conditions and characteristics of the demographic, social and economic environment within which ULB is existing. It reveals some parameters within which an ULB has to operate, and it highlights its prime responsibilities. This can help an ULB set its own priorities. This is the objective with which this chapter has been written.

DEMOGRAPHIC INDICATOR

The following indicators are not about urban performance measurement. In relevant cases, they may be a reflection of other aspects of municipal performance e.g., municipal public health-care, supply of potable water, effectiveness of family planning measures, etc.

City Population by Sex and Age Group

INDICATOR FORMULA: Total Population and population by sex and age group in: a) the metropolitan area b) the urban agglomeration to be calculated using following formula

$$\frac{\text{Male population or population over age of 60 years}}{\text{Total population in the city}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: absolute number and percentage

SIGNFICANCE: This gives an idea of the magnitude of population, which is a base of its all responsibilities. Population and its sex and age group wise disaggregation is necessary for planning and implementation of various service delivery options.

Annual Population Growth Rate

INDICATOR FORMULA: annual rate of population growth, which includes net migration rates and natural growth rate in the city.

(Yn-Yo) / n * 100

Where Yo is the population in year o , Yn is the population after n years and n is the number of years.

UNIT OF MEASUREMENT: per cent

SIGNFICANCE: This gives the ULB an idea of the magnitude of future increase in its responsibilities, to cater to a greater population. Accordingly, it has to anticipate and plan the dimension of expansion and development in its service coverage.

Net Migration Rate

INDICATOR FORMULA:

$$\frac{\text{(Number of people migrating in – number of people migrating out)}}{\text{Town population}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: per cent

SIGNFICANCE: This gives an idea of the net population that has moved into the city. This would have a number of implications for the magnitude and type of additional city services that the ULB has to provide to house this incoming population. This could be better understood with additional information about the source and cause of migration, and the socio-economic, age and gender profile of the migrants.

Net Natural Population Growth Rate

INDICATOR FORMULA: $\frac{\text{(Number of live births – number of deaths)}}{\text{Town population}} * \frac{100}{1}$ UNIT OF MEASUREMENT: per cent

SIGNFICANCE: This gives an idea of the net natural addition to the population of the city. This would have a number of implications for the magnitude and type of additional city services that the ULB has to provide. For example low natural population growth rate may be due to high rate of literary and per capital income coupled with efficient family planning programme or it may be due to very bad public health system resulting into high death rate. In such case, ULB will have to take steps to reduce high death rate by improving public health service. This could be better understood with additional information about the source and cause of low or high natural growth rate.

Crude Birth Rate

INDICATOR FORMULA: Number of live births (During the a stipulated period *1000

Population 1

UNIT OF MEASUREMENT: Number per 1000

SIGNIFICANCE: This measure helps to pin-point ULBs where the birth rate is higher and therefore project potential areas of urban crowding, with implications about future demand for urban services.

INFERENCE: Comparisons and implications should be carried out with caution since projections about future population density may not turn out to be correct, being subject to unforeseen circumstances (like migration).

Death Rate

INDICATOR FORMULA: Number of deaths (during a stipulated period) * 1000

Population 1

UNIT OF MEASUREMENT: Number per 1000

SIGNIFICANCE: This measure helps to pin-point ULBs where the death rate is higher, and whether this is caused by any failure of the ULB that needs to be corrected (e.g., precedence of infectious, communicable diseases, quality of drinking water, etc.) Beside aggregate death rate, disaggregate death rate as per types of ailments/disease and as per cases of death should also me calculated to plan exact preventive and remedial courses of action.

e.g. Deaths due to Malaria or Jaundice, or cholera etc. * 100

Total Deaths during stipulated period 1

Or

Deaths due to disease or accidents or violence or suicides etc. * 100

Total Deaths during stipulated period 1

INFERENCE: The stipulated period chosen to calculate this measure, should not be biased by sporadic phenomena like epidemics, natural calamities, political strife, etc.

Child Mortality

INDICATOR FORMULA:

$$\frac{\text{Number of deaths for children below five years during the year}}{\text{Average number of live births during the last five years}} * \frac{1000}{1}$$

UNIT OF MEASUREMENT: Number per 1000

SIGNIFICANCE: This is a measure health and safety conditions of the ULB and has implications for the wellbeing of future citizens. ULBs having a higher figure than others have to pay more attention to its responsibilities of public health delivery i.e. disease prevention, epidemic control, etc.

INFERENCE: The source of information for this indicator (Death and Birth Registration Wing of ULB), may not be entirely reliable. The causes for child mortality may be external to the ULB.

Maternal Mortality

INDICATOR FORMULA: $$\frac{\text{Number of maternal deaths}}{\text{Number of live births}} * \frac{1000}{1}$$

UNIT OF MEASUREMENT: Number per 1000 live births

SIGNIFICANCE: This indicator is a composite reflection of a number of interrelated socio-cultural-economic and health conditions of the residents of the ULBs. Higher figures warrant greater attention to the ULB's health delivery functions of immunization and antenatal care and even social that is prevention of child marriages.

INFERENCE: As mentioned, comparisons (to be meaningful at the municipal level) should be restricted to ULBs with the same socio-cultural-economic composition of the resident population. The source of information for this indicator (Death and Birth Registration Wing of ULB), may not be entirely reliable. The causes for maternal mortality may be external to ULB.

Average household size

INDICATOR FORMULA: $$\frac{\text{Total population}}{\text{Total households}}$$

UNIT OF MEASUREMENT: number

SIGNFICANCE: This gives the ULB an idea of the magnitude of population in terms of number of households. As most of the services of ULB are delivered on household basis this information becomes quite useful. Even data provided by this indicator become useful for cross referencing for example comparison of number of property tax payers with number of household or number of slum households and number of households receiving subsidized services can indicate mismatch which can lead to appropriate steps.

Household formation rate

INDICATOR FORMULA: annual rate of growth of numbers of households.

$$\frac{\text{Number of Households at the end of specific period}}{\text{Number of Households at the starting of specific period}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: number and percentage

SIGNFICANCE: This gives the ULB an idea of the magnitude of increase in population in terms of number of households. This is useful for planning delivery expansion of urban services in terms of household increase.

Housing tenure type:

This and other related indicators are explained under 'Public Housing Indicators' section

Population density

INDICATOR FORMULA: Number of persons per square kilometre.

$$\frac{\text{Total Population}}{\text{Total Area (sq. kms)}}$$

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Population exists in special context and relationship of population to given area creates different kind of magnitude of service requirement, which forms basis for service delivery by ULB. The working of this indicator has to be disaggregated into smaller areas (e.g., wards). This will help the ULB to plan for a more efficient geographical distribution for its services. Additional information on the characteristics of the population in each area would help further in planning the type, distribution and magnitude of urban services.

Land Use

INDICATOR FORMULA: Surface of land (sq. km.) in the urban agglomeration and/or in the metropolitan area used for

a. residential formal;

b) residential informal;

c) business;

d) agriculture;

e) services;

f) transport;

g) industry

h) other;

$$\frac{\text{Area used for residential formal}}{\text{Total Area of the urban agglomeration or metropolitan area}} * \frac{100}{1}$$

Requisites: Total area of the land within the Development area

% Distribution of land for various uses as per planning standards

Actual % of land allocated for various uses.

Land use map showing decadal % change in various uses.

Source of Information: Development Plan (Town Planning Department.)

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: It helps to know the direction of city development, based on that the ULB can provide necessary civic and Infrastructure services. The chronological decadal land use maps help the decision makers to reserve the land for future developments.

INFERENCE: If there is any inbuilt bias in the pattern of land use of the city that detracts the development of the city from the path of balanced growth, is inequitable or isn't conducive to the long term strategy or vision of the city plan, then provision of infrastructure services going by this indicator may strengthen or reiterate this undesirable skew ness.

SOCIOLOGICAL INDICATORS

Literacy (by age and sex)

INDICATOR FORMULA: $\frac{\text{Total Number of literates}}{\text{Population}} * \frac{100}{1}$

This can be disaggregated by age and sex for example

$\frac{\text{Number of male/female literates or number of literates in 20 to 50 age group}}{\text{Total Population of the City}} * \frac{100}{1}$

UNIT OF MEASUREMENT: number and percentage

SIGNFICANCE: This gives an idea of the literacy level of population in terms of age and sex. Higher level of literacy results in to positive externalities for social services like public education, public health provided by ULB. It also helps in better delivery of public education service by ULB[48]. High rate of literacy may lead to higher demand for participation in governance and higher level of transparency, accountability from ULB.

Literacy of poor

INDICATOR FORMULA: $\frac{\text{Number of literates below poverty line}}{\text{Population below poverty line}} * \frac{100}{1}$

UNIT OF MEASUREMENT: number and percentage

SIGNIFICANCE: This gives an indication of the orientation and type of services that are expected of the ULB. A literate population is better able to appreciate, maintain and articulate their demand for necessary municipal services, as they can understand what they are entitled to. They respond more to services like primary preventive healthcare and are able to learn from public awareness programs through the media. A key to better participatory municipal governance is literacy. As far as the ULB has to confront poverty related problems (like low levels of living and expectation, squalor, resistance to health and family planning services, crime, etc.), they can communicate more easily with a literate poor population. Where illiteracy and poverty coexist, problems confronting ULBs are more complex, and public awareness programs have to be designed with special care. Where there is rampant illiteracy

[48] Public Education is State Subject in India but in many states primary education component is delegated exclusively to ULBs while in some states it is shared by both State and ULBs but in most of states it is exclusively with State Government.

among the poor, primary schooling and adult literacy programs may be expected of the ULB with inbuilt measures to improve school enrolment.

Refugees

INDICATOR FORMULA: $\frac{\text{Number of refugees}}{\text{Total population}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: The percentage of refugees indicates the magnitude of responsibility of the ULB to provide temporary shelter backed by adequate services of potable water supply, sanitation, garbage disposal and primary health delivery.

Deaths due to violence

INDICATOR FORMULA: Proportion of deaths that have occurred in the past three years because of violence. It can be calculated in average or percentage terms -

$$\frac{\text{Deaths due to violence during specific period}}{\text{Total deaths during specific period}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: This is an indication of the incidence of crime, whose deep rooted causes usually lie in social problems like unemployment, poverty, etc. They are beyond the scope of the ULB, but the latter is usually confronted by the responsibility of providing some service support by way of emergency services (medical, ambulatory and sometimes police), proper street-lighting, monitoring sale of narcotics and alcohol, etc.

Local participation

INDICATOR FORMULA: Voter participation in local election also in terms of sex, age or area.

$$\frac{\text{Number of people who voted in the last municipal election}}{\text{Total Number of Voters}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: number and percentage

SIGNIFICANCE: This signifies the extent to which elected office bearers of the ULB are actually (effectively) accountable to the citizens

Voluntary associations per 10000 people

INDICATOR FORMULA: $\frac{\text{Total Number of voluntary associations in the City}}{\text{Total Population}} * \frac{10000}{1}$

UNIT OF MEASUREMENT: number per 10000

SIGNIFICANCE: Depending on what they are working on, voluntary associations and ULBs can complement each other in delivering services to the population. The ULBs can streamline and converge their resources by working in collaboration with voluntary organisations on whatever areas and issues they have in common.

Citizen involvement

INDICATOR FORMULA: In how many major planning decisions in the last 5 years were citizens involved

SIGNIFICANCE: This shows the extent to which governance is participatory.

INFERENCE: number (quantity) of people participated is important but quality of participation and representation of all stakeholders is equally important for participatory governance.

Poverty

Population below poverty line

INDICATOR FORMULA: $\frac{\text{People living Below Poverty Line (BPL)}}{\text{Total population}} * \frac{100}{1}$

DEFINITION: Economic literature defines the absolute standards of minimum physical quantities of cereals, pulses, milk oil, etc. for a subsistence level of living. Then the price quotations convert them into monetary terms. Aggregating all the quantities included, a figure expressing per capita consumer expenditure is determined. The person (or household) whose income (or consumer expenditure) is below the figure is considered to be below the poverty line. The conventions about minimum consumption signifying some minimal level of living, its acceptability, and the prices that are used, are open to debate.

SIGNIFICANCE: One of the most basic sociological indicators. Useful for determining expenditure priorities, subsidy structure of the government. It also indicates limit to earnings of government (ULB) and necessity to run more poverty related programmes.

INFERENCE: Though the message is loud and clear, there exists definitional problems (definitional of poverty) and many times, defining poverty gets more attention than the issue of poverty itself.

Minimum wage coverage

INDICATOR FORMULA: $\frac{\text{People getting wage above minimum wage fixed}}{\text{Total population}} * \frac{100}{1}$

Proportion of population whose salary or wage income is above minimum wage legislation

SIGNIFICANCE: A higher proportion signifies better economic well-being of the population as a whole. For ULB it implies less responsibility to provide poverty support. The residents are more likely to have the ability to pay of at least some of the essential city services.

INFERENCE: In some cases, people may have wages or income more than minimum wage stipulated but still they may be under poverty line because of number of people dependent upon them and due to various other reasons.

Malnourished children

INDICATOR FORMULA:

$\frac{\text{Children (aged 1 to 5) have weight lower than standard fixed}}{\text{Total number of children between 1 to 5 age}} * \frac{100}{1}$

DEFINITION: Percentage of children aged one to five years who are more than two standard deviations away from the median weight of the reference population

SIGNIFICANCE: both these indicators signify the extent of abject poverty that plagues the population in the ULB's jurisdiction. This implies that the provisions of basic services will never be financially self-sufficient because the recipients are unlikely to be able to pay for them (charges, fees, taxes, etc.). In addition it may have to shoulder the burden of providing relief through nutritional supplements directly, free or at a subsidy, or indirectly provide necessary infrastructure for shops and markets of subsidised goods provided by higher tier governments (PDS ration shops etc.). It may have to provide for free primary healthcare and education and arrange for awareness programmes on cleanliness, health and nutrition.

Slum Population

INDICATOR FORMULA: People living in Slums * 100

Total population 1

SIGNIFICANCE: These indicators alert the ULB about the magnitude of responsibility that they have, in providing and ensuring basic services (water supply, sanitation, garbage collection, street lighting etc.) to slum settlements where no payment for the latter will be received, since they cater to poverty stricken, shifting population (may be seasonal) with questionable legal locus standi. For planning public education, it is necessary to know children staying in slum population by using following variation.

Children in Slum Population

INDICATOR FORMULA:

Children (aged 1 to 5) living in slums* 100

Total number of children between 1 to 5 age 1

Social Safety Nets

DEFINITION: Financial or other support provided nationally or internationally for disabled population.

SIGNIFICANCE: The ULB may have to provide some required backup services.

Employment

Unemployment Rate

INDICATOR FORMULA: Total unemployed persons * 100

Total labour force 1

SIGNIFICANCE: This figure indicates to an ULB, the extent of difficulty in cost recovery for provision of basic services. Unemployed residents, not having a regular income cannot afford to pay regularly for the basic civic services that they need. With 74th Constitutional Amendment ULBs are expected to do economic and social planning as a result this indicator has become important for ULBs also.

Sectoral employment profile

Percentage of work force employed in manufacturing

INDICATOR FORMULA: $\frac{\text{Work force employed in manufacturing}}{\text{Total Work Force}} * \frac{100}{1}$

Percentage of workforce employed in construction

Percentage of workforce employed in trade and business

Percentage of workforce employed in white collared skilled jobs

Percentage of workforce employed in informal sector services

SIGNIFICANCE: Each of the above determines the infrastructural service support that an ULB has to provide and environmental protection measures it has to take.

Net employment growth

DEFINITION: Percentage growth of employment

SIGNIFICANCE: This gives ULB a long term view of its financial burden and liabilities.

Child labour rate

INDICATOR FORMULA:

$$\frac{\text{Number of employed or economically active population aged below fifteen}}{\text{Total Population}} * \frac{100}{1}$$

SIGNIFICANCE: This is an indicator of the existence of poverty, illiteracy and malnourishment among children. The ULB can launch public awareness programmes against child labour and provide primary schooling facilities for these children with built in incentives to boost enrolment ratio (EG, provide mid-day school meal), and bring them under primary healthcare.

Households with adequate income

INDICATOR FORMULA:

$$\frac{\text{Households able to survive after paying for basic services}}{\text{Total number of Households}} * \frac{100}{1}$$

SIGNIFICANCE: This determines the financial burden that the ULB has to shoulder.

ECONOMIC INDICATORS

All the following indicators and many more (as this is a mere illustrative list) point towards the ease with which economic activity can run smoothly, grow, and flourish (communications, connectivity and financial services). More economic activity is likely to be drawn to these ULBs, by way of industry, construction, services, trade and businesses. Accordingly, ULBs will have to keep pace with the growing demand for appropriate shelter, basic services and infrastructure. Most sections of the population is likely to be able to pay for municipal services. But that has the danger of furthering any imbalance of regional development. That means, economically vibrant ULBs will do even better while their poorer counterparts may further stagnate.

Power availability

INDICATOR FORMULA: $\frac{\text{Power availability}}{\text{Demand for power in the next 5 years}}$

Telecom facilities

INDICATOR FORMULA: $\frac{\text{Total Telephone Connections}}{\text{Total Population}} * \frac{100}{1}$

Bank use

INDICATOR FORMULA:

Total deposit per capita per year

Total credit distributed per capita per year

Connectivity

INDICATOR FORMULA: Weighted index, of time and frequency of connection to nearest metro, by road, rail, and air respectively.

Road length

INDICATOR FORMULA: Total km of motorable road per unit area (sq. km) (please refer to Road indicators)

City investment

INDICATOR FORMULA: Gross capital formation in the city / City product

New investment

INDICATOR FORMULA: Estimated flow of investment based on approved letter of intent to manufacturing units.

Industrial employment growth

INDICATOR FORMULA:

$$\frac{(\text{Employment in industry in final year} - \text{Employment in industry in initial year})}{\text{Number of interim years}} * \frac{100}{1}$$

SIGNIFICANCE: These indicators reveal the relative size of the industrial manufacturing sector in the city economy. This determines the extent to which people will be drawn to live in the city and work in the industry., i.e., the secondary sector of the economy, and the inevitable larger number of people who will follow, to provide them a wide spectrum of services , (tertiary sector,- formal or informal). The income distribution and socio economic composition of the population that will thus grow will depend on the nature of the industry itself. That will have important implications for the ULB to provide shelter, infrastructure and basic services necessary. Unfortunately, this may have the effect of reinforcing existing undesirable biases in settlement and regional development patterns. These indicators are only broad pointers. No conclusion should be drawn before a more in-depth local micro level study of industry, services and occupational patterns

ECONOMY and ENVIRONMENT INDICATORS

This group of indicators though listed here as example purposes show relationship between economic development and environmental degradation. On one side, we need economic development but many times, it brings in environmental degradation. We need development without environmental damage (sustainable development). ULB needs to use this category indicators to plan and to achieve sustainable development of the city.

Diesel and petrol use

INDICATOR FORMULA: Volume of petrol / diesel sold

Population

Volume of petrol/ diesel sold

Area

Vehicle ownership

INDICATOR FORMULA: Number of vehicles owned

Population

These two can be disaggregated into motorized and non-motorized vehicles.

SIGNIFICANCE: From the perspective of ULB, they are meant to act as pointers to its responsibility to provide and maintain adequate (in magnitude and quality) motor-able and non-motor able roads and also to control and reduce vehicular pollution.

Chapter 5 A - Indicators for Water Supply Service

Index

WATER SUPPLY SERVICE ***93***

INTRODUCTION 93

COVERAGE INDICATORS 94

- Total Water Demand -Supply Gap 94
- Access to water 94
- Population Catered to by Water Supply Service 95
- Slum Population Coverage by Water Supply System 95
- Area Catered to by Water Supply Service 96
- Extent of Metering of Water Connections 96
- Slum Population per Public Stand Post 97
- Price of water 97

QUANTITY/STATUS/RESOURCES COMMITED INDICATORS 98

- Quantity of Water Supplied per capita per day (For different seasons/ localities) 98
- Average Quantity of Water Provided per day by Pipeline 99
- Average Quantity of Water Provided Per Day by Other Means 99

Assessing the Suitability of Supplies 100

- Variation Factor for peak hourly demand 100
- Variation Factor for Peak Daily Demand 100
- Time Duration of Continuous Water Supply (For- different seasons, localities) 100
- Average Water Pressure for the Supply Hours 101
- Share of Non-domestic Supply 101
- Per Capita Resource Commitment for Water Supply Service 102
- Adequacy of Storage for Raw Water 102
- Adequacy of Treatment Capacity 102
- Adequacy of Treated Water Storage 103
- Adequacy of Storage of Chemicals 103
- Adequacy of Power Supply 104

Adequacy of Quality Control Facilities 104

- Adequacy of Lab Facilities for Monitoring WQI 104
- Adequacy of Surveillance Audit 104

Adequacy of Manpower 105

- Adequacy of Technical Quality Staff 105

- Adequacy of Quality Control Staff _____ 105
- Adequacy of Maintenance Staff _____ 106
- Share of Operation and Maintenance Staff in Total Staff _____ 106

QUALITY INDICATORS _____ 106

- Test Results for Municipal Water Treatment and Distribution Systems _____ 106
- Average Quality of Water Provided _____ 107
- Variations in Water Quality with Seasons (the microbial content in particular) _____ 108
- Decrease in the WQI during the Distribution Process _____ 108
- Proportion of Adverse Quality (Failed) Water Tests _____ 109

EFFICIENCY INDICATORS _____ 109

- Efficiency in Water Resource Tapping _____ 109
- Breakdown of the Water Mains during the period _____ 110
- Utilisation Efficiency of the Pipe Length Provided on Ground _____ 110
- Efficiency in Maintenance of Pipe Lines/Network _____ 111
- Percentage Utilisation of Installed Pumping Capacity _____ 111
- % Utilisation of Water Treatment Capacity _____ 111
- Losses from the Intake to the WTP _____ 112
- Water Treatment Plant / Process Efficiency _____ 112
- Water Losses during the Treatment _____ 113
- Breakdown of Water Treatment Plant during the Period _____ 113
- Working Efficiency of the WTP _____ 114
- Running Condition of the Distribution System _____ 114
- Regularity of Supply _____ 115
- Tankers (other infrastructure) Available for Normal and Emergency Supplies _____ 115
- Unaccounted Water _____ 115
- Water Supply Billed as Percentage of Water Supply Produced _____ 116
- Theft Losses in the Distribution Network _____ 116
- Frequency of Water Quality Monitoring _____ 117
- Promptness of Repair _____ 117
- Percentage of customers with functional meter at their end _____ 118

EXPANSION/DEVELOPMENT INDICATORS _____ 118

- Percentage Increase in Total Water Sourced and Total Water Supplied _____ 118
- Growth in Percentage Population Served _____ 119
- Percentage Decrease in Unaccounted for Water _____ 119
- Percentage Increase in Area Coverage by Formal Water Supply System _____ 120

- Percentage increase in Water Treatment Capacity_____ 120
- Expansion of Water Supply Service against desired or planned development_____ 121
- Upgrading Staff Quality _____ 121

CUSTOMER/CONSUMER SATISFACTION INDICATORS _____ 121

- Number of Consumers Satisfied with Overall Water Supply Service _____ 122
- Satisfaction with Pressure of Supply _____ 122
- Satisfaction with Water Quality_____ 123
- Complaints frequency _____ 123
- Response to Customers_____ 123
- Promptness of Response_____ 124
- Review of Complaints Redressal Machinery _____ 124

ADMINISTRATATIVE / GENERAL INDICATORS_____ 125

- Percentage of Total Workforce Covered by Personnel Systems_____ 125
- Expenditure on WSS staff _____ 125
- Weightage of Administration _____ 126

FINANCIAL INDICATORS _____ 126

Cost Related Indicators_____ 126

- Total Cost of Operations per kilometre of Distribution Pipe_____ 127
- Total Cost of Salary per kilometre of Distribution Pipe_____ 127
- Total Administration Cost per kilometre of Distribution Pipe, _____ 127
- Total O & M Cost per kilometre of Distribution Pipe, and _____ 127
- Total Interest Payment and Financing Cost per kilometre of Distribution Pipe _____ 127
- Cost per Kilolitres of Water Delivered (or Produced or Treated) _____ 127
- Total Cost per Kilolitres of water produced, _____ 127
- Total Cost per Kilolitres of water treated or _____ 127
- Sourcing Cost per Kilolitre of Water _____ 128
- Treatment Cost per Kilolitre of Water_____ 128
- Transmission Cost per Kilolitre of Water_____ 128
- Delivery Cost of per Kilolitre of Water _____ 128
- Salary Cost per Kilolitres of water, _____ 128
- Administrative Cost per Kilolitres of water _____ 128
- O&M cost per Kilolitres of water; etc _____ 128
- Total Cost per Household _____ 128
- Cost incurred per capita for Water Supply System _____ 129
- Cost per capita of water treatment_____ 129

- Cost per capita of water distribution or, _____ 129
- Per capita Establishment (Salary) cost of WSS _____ 129
- Per capita Operation & Maintenance Cost of WSS _____ 129
- Average / Annual Growth in Total Revenue Expenditure of WSS _____ 129
- Average/Annual Growth in Salary Expenditure _____ 130
- Average /Annual Growth in O & M Expenditure _____ 130
- Average / Annual Growth in Interest /Finance Charge Expenditure, etc _____ 130
- Cost of Administration _____ 130

Revenue or Earnings Related Indicators _____ 130

Cost vs. Earnings Relational Indicators _____ 131

Debt Related Indicators _____ 131

Financial Structural Indicators _____ 131

ENVIRONMENTAL CONSERVATION INDICATORS _____ 132

WATER SUPPLY SERVICE

INTRODUCTION

Water is a basic human need, it represents right to life. It is an intrinsic local service and hence traditionally delivered by a local government. In some places, due to the increase in the size, volume, complexity of this service, and its importance in public health, welfare and politics, it has come to be managed by parastatal or special purpose agencies instead of local governments. In some places with the advent of public private partnership, the service is getting unbundled and its various components are being managed by different arrangements by with different institutions e.g. water sourcing may be done by private firms, transmission by some other agency and distribution a local government.

The major components of the water supply chain are:

- Source (Reservoir) capacity and augmentation
- Obtaining water from the source and its storage
- Transmission from source to treatment cum usage point
- Water treatment process and its storage
- Water distribution
- Water Supply Service Management
    - Giving New connections, Billing Consumers for water used, Recovery of water Bills, Attending consumers' complaints etc.

Being the most important urban service by far, maximum numbers of indicators have been constructed pertaining to each component/aspect of this service. Here an attempt has been made to enlist and discuss all of them, so that they can be used as models to construct similar indicator whenever required for other services. For classifying indicators, the 'COVERAGE /EXPLANATORY – QUANTITY/STATUS/RESOURCES COMMITED – QUALITY – EFFICIANCY - EXPANSION - CONSUMER SATISFACTION model has been adopted. Within this model then service component sub-classification has been adopted. As discussed earlier indicators pertaining to Governance, Financial and other internal support services have been grouped under separate chapters but water supply service specific administrative and financial indicators have been included in this chapter.

COVERAGE[49] INDICATORS

Coverage indicators are service level indicators. They describe and measure existing level of service in the context of area, people or quantum the service is supposed to handle or provide. At the aggregate level, they express overall status of service and at disaggregate level they show equity in allocation of resources till date.

- ### Total Water Demand -Supply Gap

INDICATOR FORMULA: $\frac{\text{Total Water Supplied to the City (MGD/MLPD)}}{\text{Total Water Demand of the City (MGD/MLPD)}} * \frac{100}{1}$

UNIT OF MEASUREMENT: (MGD/MLPD) and per cent[50]

SIGNIFICANCE: Most common indicator, which calculates shortfall in service provision.

INFERENCE: It is quick ratio, gives a general idea about status of water supply and the gap in service provision.

It provides only broad (quantitative aspect) perspective and no information about the constraints – non-availability of water in near vicinity or service quality aspects – frequency of water, sufficiency of water, reliability of water etc.

- ### Access[51] to water

INDICATOR FORMULA: $\frac{\text{Number of People having Access to Water}}{\text{Total Number of Households}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: Water is one of the great necessities of human life, which is taken for granted in the developed world. A supply of clean water is absolutely necessary for life and health, yet 1.4 billion people lack access to adequate water supply or can only obtain it at high prices. In many cities,

[49] Coverage has definite geographical context. An urban local body or any other authority responsible for service provision always has a specific geographical area to cater.

[50] Whenever an indicator is a ratio that is a pure number, this heading is not repeated. Only when indicator contains a specific unit of measurement it is indicated using this heading.

51 Access is defined as having water located within 200 meters of the dwelling. It refers to housing units where the piped water is available within the unit and to those where it is not available to occupants within their housing unit, but is accessible within the range of 200 metres, assuming that access to piped water within that distance allows occupants to provide water for household needs without being subjected to extreme effort.

households in informal settlements are rarely connected to the network and can only rely on water from vendors at up to 200 times the tap price. Improving access to safe water implies less burden on people, mostly women, to collect water from available sources. It also means reducing the global burden of water-related diseases and the improvement of quality of life.

This indicator should be used to address gender since, when water is not available; it is usually women and girls who will bear the daily burden of fetching water. When a large proportion of households do not have access to water, it might be useful to obtain the average time spent in fetching water, which is a good complementary indicator. It is defined as the average daily time in hours spent by households fetching water. Time spent fetching water measures the burden women have to face during their daytime and the constraints limiting their productive work.

INFERENCE: It measures the first and foremost important aspect associated with water supply service. Unless there is access, there is no meaning to most of the other indicators. This indicator helps to focus all the energy of ULB to improve access to water at first place.

Access to water is most important aspect but even with access, there may not be affordability or water quality and quantity (sufficiency) may not be adequate. Thus along with access to water it is necessary to measure access to affordable water, access to safe or potable water and access to sufficient water.

- Population Catered to by Water Supply Service

INDICATOR FORMULA: $\frac{\text{Households with water connections}}{\text{Total number of households}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: Again a quick ratio, a macro-level indicator but can be utilised to find out locality-wise or season-wise population coverage by water supply service. One of such important disaggregate level indicator would be slum population coverage by WSS.

- Slum Population Coverage by Water Supply System

INDICATOR FORMULA: $\frac{\text{Slum Households with water connections}}{\text{Total number of slum households in the City}} * \frac{100}{1}$

INFERENCE: This gives a measure of the installed capacity and competence of the concerned Utility, and the wellbeing (effortless access to water) of the people.

It provides only coverage (quantitative aspect) details and no information about quality aspects – frequency of water-supply, sufficiency and reliability of water etc. or the people using both pipeline water and water from other private sources. A large part of the population itself may be impermanent /floating (commuters, or shifting daily wage contract labour). Also, people may have taken water connection illegally.

- Area Catered to by Water Supply Service

INDICATOR FORMULA: $\frac{\text{Area (sq. km.) Served by Water Supply System}}{\text{Total Area (sq. km.) to be served (under habitation)}^{52}} * \frac{100}{1}$

SIGNIFICANCE: A quick ratio, a macro-level indicator but can be utilised to find out locality-wise or season-wise area coverage by water supply service.

INFERENCE: This gives a measure of the installed capacity and competence of the concerned Utility, and the wellbeing (effortless access to water) of the people.

Some areas may be technically infeasible to be served by pipeline or other means. This indicator provides only coverage (quantitative aspect) details and no information about quality aspects – frequency of water, sufficiency of water, reliability of water etc. or of the people using both pipeline water and water from other private sources.

- Extent of Metering of Water Connections

INDICATOR FORMULA: $\frac{\text{Number of consumers with meters}}{\text{Total number of consumers/water connections}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE /INFERENCE: This measure gives an indication of the installed capacity and the efficiency with which the amount of water supplied can be accounted for, and monitored and appropriately paid for.

[52] Total area under jurisdiction is not taken as a denominator because instead of total area, area under habitation is more important where water supply has become must.

Many times water meters are faulty so this indicator should be backed by another indicator 'percentage of meters in functional condition', to be meaningful.

- Slum Population per Public Stand Post

INDICATOR FORMULA: $\frac{\text{Slum population not covered by piped connections}}{\text{Total Public stand posts in slum areas.}}$

SIGNIFICANCE: This is a measure of water service coverage in slums.

INFERENCE: This indicator measures not only service coverage of slums but also the indirect pressure that is created on the regular distribution system and other sources of water. High values may imply unauthorized use of water, illegal connections, and dependence on private ground water resources, dependence on neighbours' connections etc. and help to estimate and anticipate resultant health hazards.

High values may indicate poor service coverage in slums, but the converse is not necessarily true. Very often, public stand posts are in a state of disrepair. Sometimes they may be under the control of the local mafia, who distribute water to residents charging an arbitrary price. In this situation water from existing stand posts is not freely available to the very people it is intended for. When data is collected on the number of stand posts note should be taken of their effectiveness.

- Price of water

INDICATOR FORMULA: Median price paid per 1000 litters of water in rupees, at the time of year when water is most expensive.

SIGNIFICANCE: This measures the cost of water at times when it is most scarce. It should be provided for all types of settlements at the city level, as well as in informal settlements, when relevant. The median price is the one for which 50% of the water is priced below it, and 50% of the water priced above it. The estimation of the median price of water should, therefore include water sold in all types and areas. If, for example the majority of water in sold by vendors, then, the median price will be the vendors' price. If it is the municipal corporation water, then the corporation price will be the median price. If more than 50% of households have piped water, then this will be the user-pays marginal cost of water.

INFERENCE: Very important indicator as it indicates pricing level of water, which can be used to compare with affordability level of consumers and poor section of the city and also can be used for inter-ULB comparison.

But in many cities, households living in informal settlements are not connected to the network and can only rely on water from vendors at up to 200 times the tap price. The price of water may rise to very high levels in some areas at some times, and can take a significant proportion of the household budget. How much an average household is spending in water varies tremendously from city to city.

QUANTITY/STATUS/RESOURCES COMMITED INDICATORS

This group includes indicators, which describe the present situation of water supply system or measure the existing efforts in quantitative terms. It also includes indicators, which measure resources committed or earmarked for the WSS by an urban local body. These indicators help in measuring the adequacy of system in terms of manpower, equipment etc. to take care of the water supply service.

- ### Quantity of Water Supplied per capita per day (For different seasons/ localities)

INDICATOR TYPE: Outcome Indicator

INDICATOR FORMULA: $\frac{\text{Total amount of water supplied to the city per day}}{\text{Total population of the city}}$

UNIT OF MEASUREMENT: LPCD (Litres per Capita per Day)

SIGNIFICANCE: figures of water supply per day have to be averaged over peak periods and lean periods and can be disaggregated for different season and localities.

INFERENCE: computed values of this indicator reflect sufficiency of water supplied (on comparison with appropriate benchmarks). Disaggregated values, appropriately tabulated can pinpoint areas and times of deficiency and clearly present spatial distribution biases.

The values of this indicator may not present a true picture or be a platform for comparison, if a large body of commuters travel in and out of the city on a daily basis, or where there is a large body of seasonal migrant labour.

- Average Quantity of Water Provided per day by Pipeline

INDICATOR FORMULA: Average amount of water supplied to the city by pipeline * 100

Average amount of water supplied to the city per day 1

SIGNIFICANCE: A high figure for this indicates better coverage of population by formal piped water supply system, that is, better availability of safe water to most users without substantial effort. The averages are calculated over peak periods and lean periods. If necessary, it can be disaggregated over peak periods, lean periods and different localities. In similar manner average quantity of water provided through other means should be measured, ideally means wise using following variant of the indicator.

- Average Quantity of Water Provided Per Day by Other Means

INDICATOR FORMULA:

Average amount of water supplied to the city by means other than pipeline * 100

Average amount of water supplied to the city per day 1

INFERENCE: It is a measure of the ability of an ULB or WSU to provide piped water supply to the population. The disaggregated values of this indicator for various regions provide the spatial distribution of piped water supply and identify areas of deficiency

The amount of water is measured at source. So it fails to account for the failures in the pipeline network, water leakage. It also does not take in to account people who have voluntarily not opted for piped water supply even though network exists. Expansion of piped water supply in deficient localities should not be carried through on the basis of this indicator alone. Other factors should be considered before making such an investment, for example characteristics of the local population with respect to security of employment, permanence of residence, difficulties of metering, etc. If this information is readily, available investments and settlements will crowd around places where pipeline water is available and in the long run may aggravate the bias.

Assessing the Suitability of Supplies

- ### Variation Factor for peak hourly demand

INDICATOR FORMULA: $(1/24) \times \sqrt{[\sum (Ai - \bar{A})^2]}$; where Ai =demand for water for ith hour, $\bar{A}$=average hourly demand for water, "i" ranges from 1to 24, so $\sum$ is taken over 24 readings

UNIT OF MEASUREMENT: Volumetric Unit (e.g., Litres,)

. It should also be calculated on daily basis using following formula

- ### Variation Factor for Peak Daily Demand

INDICATOR FORMULA: $1/365 \times \sqrt{[\sum (Ai - \bar{A})^2]}$; where Ai =demand for water for ith day, $\bar{A}$=average (annual) daily demand for water, "i" ranges from 1to 365, so $\sum$ is taken over 365 readings

SIGNIFICANCE: This indicator may be computed for the entire jurisdiction of the Authority. Values for different seasons and various localities may also be useful

INFERENCE: Values of these indicators may help the Authority to take decisions on the optimal allocation of resources like electricity, manpower etc. during various hours of the day, and days of the year respectively.

Where value is higher, every effort should be made to mobilize resources for maximum use during peak periods. Where values are low, there should be round the clock (or round the year) uniform resource use to ensure service

High values of these indicator may prompt undesirable callousness and sub-optimal service during low demand.

- ### Time Duration of Continuous Water Supply (For- different seasons, localities)

INDICATOR FORMULA: Number of hours per day for which continuous supply of water is available

UNIT OF MEASUREMENT: Hours per day

SIGNIFICANCE: As an aggregate figure, it has to be averaged over peak and slack periods of the year. Disaggregated figures can be recorded for various seasons, various localities, water supply through pipeline, and supply by means other than pipeline.

INFERENCE: If 24 hours water supply is an aim to be achieved, then properly recorded values of this indicator will quantify and specifically locate the gap in service provision.

But time duration is not the only important consideration. Pressure of water supply, an equally important consideration, is ignored by this indicator. Also, it does not indicate quality aspects.

- Average Water Pressure for the Supply Hours

INDICATOR FORMULA: Amount of force per unit area per second

UNIT OF MEASUREMENT: Kg /sq. meter/second

SIGNIFICANCE: 1) This measure is more relevant for areas with piped water supply.

2) The average reading of figures during each supply hour should be recorded. If the figure is not available in the documented sources, it can be computed as follows -:

- For a certain length of uniform width of pipe, measure the weight of the water that is supplied (x Kg) for a certain length of time (t seconds)
- Measure the diameter of the pipe, and from that figure, and the length, calculate the inner surface area of the given length of pipe (y sq. meters)
- Water pressure = x/(y*t)

3) Disaggregated figures should be computed and tabulated for peak and lean periods and for different localities and for different times of the day

INFERENCE: This indicator highlights the end point effectiveness of water supply. It indicates areas where water is received with low pressure, thus helps agency to take corrective actions (increasing water supply time, frequency or supply through other means).

Without availability of locality specific appropriate benchmarks, this indicator will not be very useful.

- Share[53] of Non-domestic Supply

INDICATOR FORMULA: $\frac{\text{Water supplied to non-domestic users}}{\text{Total Water Supplied.}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage.

[53] CMAG, Using similar formulae share of various components of water supply – domestic, industrial, institutional etc. should be calculated to get holistic picture.

SIGNIFICANCE: Composite values of this measure are useful as an index of the pressures and constraints of the service provider. It is likely to be financially better off since higher pricing of water for commercial use is less politically sensitive Comparison of disaggregated values between peak and lean periods is indicative of the Authority's priorities – economic, social and ethical.

INFERENCE: This indicator may be indirectly harmful in the following way. If water supply service is privately owned and operates mainly on profit maximising motive, then, even in the face of scarcity, water will be supplied preferentially to commercial user dominated localities since they are more able to pay. Domestic users may be marginalized.

- Per Capita Resource Commitment for Water Supply Service

Please refer to Streetlight Section of the Chapter for working out this Indicator

- Adequacy of Storage for Raw Water

INDICATOR FORMULA: $\frac{\text{Capacity provided for raw water storage (MLD)}}{\text{Capacity required for raw water storage (MLD)}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Storage is an important infrastructure component of WSS. It must be adequate with respect to the needs; otherwise, efficient supply of water will not become possible.

INFERENCE: This gives an idea of the adequacy of storage for raw water, and the necessity and urgency to increase storage capacity for the same.

Comparisons based on this indicator should be restricted to groups of ULBs having similar need for storage (depending on their sources of water supply).

- Adequacy of Treatment Capacity

INDICATOR FORMULA: $\frac{\text{Total water treatment capacity available (MLD)}}{\text{Water treatment capacity required (MLD)}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This offers a measure of the necessity and urgency of improving treatment capacity of water.

INFERENCE: Like the previous indicator this may not be used to compare competence and efficiency of service providers (except within appropriate subgroups of similar quality), since there are differences in the initial quality of the raw water because of which the treatment requirements will also vary and so will the demands and expectation from the respective Authorities. The only thing that can be compared is the urgency of remedial measures required.

- ## Adequacy of Treated Water Storage

INDICATOR FORMULA: $\frac{\text{Capacity provided for treated water storage (MLD)}}{\text{Capacity required for treated water storage (MLD)}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This gives a measure of the need to provide for additional storage of treated water.

INFERENCE: This will be sensitive to variations in the initial quality of raw water, and each component of the WQI, (better the initial quality, less the need for storage), and in the seasonal variations in water quality. Therefore, across the board comparisons are to be made with caution and judgment

- ## Adequacy of Storage of Chemicals

INDICATOR FORMULA: $\frac{\text{Capacity provided for storage of chemicals at WTP}}{\text{Capacity required (or Inventory) for storage of chemicals at WTP}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: These two measures provide an indication of how much more of which chemicals are to be provided for and how much more capacity should be generated for storing the chemicals respectively, at the WTP.

INFERENCE: These are sensitive to the quality of the raw water (and every component of the WQI) and the seasonal variation of the WQI (and its respective components). So, comparisons across the board need to be made with caution.

Secondly, these measures (being intrinsically quantitative) do not in themselves address the issue of safety requirements of hazardous chemicals and the related safety measures that should be built into their storage facilities.

- Adequacy of Power Supply

INDICATOR FORMULA: $\frac{\text{Power available to run the water supply system}}{\text{Total power required to run the system}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This may be one of the reasons for underutilisation of installed capacity.

INFERENCE: It helps ULB/agency to know how inadequate power supply is affecting their performance and how much more power should be procured to maintain a desired level of water supply.

This again is very general .A deeper insight will be gained by disaggregating across each step of the water supply process E.g., extraction, storage, treatment and delivery.

Adequacy of Quality Control Facilities

- Adequacy of Lab Facilities for Monitoring WQI

INDICATOR FORMULA: $\frac{\text{Lab Facilities available for monitoring WQI}}{\text{Lab facilities required on regular basis as per standards stipulated}}$

SIGNIFICANCE: “Lab Facilities” is an aggregate entity. Ideally, (for dimensional homogeneity) disaggregated values (for each component instrument of facility) should be recorded by counting each similar item.

INFERENCE: This provides a measure of adequacy of quality control.

It does not reveal anything about the efficiency with which facilities were utilised and quality of analysis. A great deal is likely to depend on the skill of the analyst

- Adequacy of Surveillance Audit

INDICATOR FORMULA: $\frac{\text{Lab Facilities available for surveillance audit}}{\text{Lab facilities required for surveillance audit as standards stipulated}}$

SIGNIFICANCE: “Lab Facilities” is an aggregate entity. Ideally, (for dimensional homogeneity) disaggregated values (for each component instrument of facility) should be recorded by counting each similar item

INFERENCE: This provides a measure of adequacy of surveillance audit

It indicates capabilities to undertake surveillance audit but not the quality and efficiency with which it was carried out.

Adequacy of Manpower

- ### Adequacy of Technical Quality Staff

INDICATOR FORMULA: $\frac{\text{Number of technically qualified staff}}{\text{Billion kilolitres of water (supplied or billed)}}$

UNIT OF MEASUREMENT: number per billion kilolitres

SIGNIFICANCE: This is a proxy for the technical quality of the staff responsible for supply of water

INFERENCE: Technical quality is more important for some jobs involving water supply, than for others. Ideally, disaggregated values should be recorded for each different step of the water supply process. This may not be an exact proxy. Sometimes experience improves technical quality of the staff as much as (maybe even more than) the attainment of formal qualifications of technical training.

- ### Adequacy of Quality Control Staff

INDICATOR FORMULA: $\frac{\text{Number of lab personnel}}{\text{Billion kilolitres of water treated}}$

UNIT OF MEASUREMENT: number per billion kilolitres

SIGNIFICANCE: This measure indicates how scientifically the supplied water has been treated

INFERENCE: The needs for scientific treatment will vary according to the source of the water and local characteristics, so appropriate disaggregation and grouping should precede comparison across Authorities

- Adequacy of Maintenance Staff

INDICATOR FORMULA: $\frac{\text{Number of maintenance personnel}}{\text{Km of pipe length}}$

UNIT OF MEASUREMENT: number per km of pipe length

SIGNIFICANCE: This is a proxy for the efficiency of maintenance of the distribution network

INFERENCE: The value of this indicator would depend on the condition of the pipeline in the particular locality.

- Share of Operation and Maintenance Staff in Total Staff

INDICATOR FORMULA: $\frac{\text{Number of operation and maintenance staff}}{\text{Total Staff Employed for WSS}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: very simple ratio, to be used along with earlier indicator. Same formulae should be used to calculate share of each type of staff working in WSS.

INFERENCE: This measure reflects the relative importance given to maintaining regularity and quality of service in the staff profile of the Authority.

ULB or agency may not have development function at all, as it is the case with many cities in India. In such circumstance, this ratio may not be useful, as entire staff will be doing operation and maintenance work.

QUALITY INDICATORS

- Test Results for Municipal Water Treatment and Distribution Systems

INDICATOR FORMULA: $\frac{\text{Water Tests that showed adverse Water Quality}}{\text{Total Number of Water Test Results}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCE: A water test is an analysis conducted on a water sample taken from a storage point, water treatment plant or distribution system, owned by the water supplying Authority. The words, "water test results showed adverse water quality or exceeded maximum concentrations as prescribed" refer to requirements prescribed by the local legal system.

INFERENCE: This measure helps to pinpoint the areas where water quality is lower than the required minimum and the extent of quality deficiency. This information helps to anticipate impending public health hazards and focus resources efficiently for rectification.

On its own, this indicator gives no information on the nature or causes of inadequate quality, without which it would be difficult to undertake remedial measures. Secondly, this measure would not be meaningful if the process and equipment of testing are not uniform.

- Average Quality of Water Provided

INDICATOR FORMULA: $\frac{\text{Value of Water Quality Index}}{\text{1ml of water}}$

UNIT OF MEASUREMENT: This will depend upon the unit of the composite WQI

SIGNIFICANCE: The WQI has to be framed and defined by an appropriate Authority.[54] It will be location specific, subject to conditions of climate, terrain, soil. The Composite indicator value, and the disaggregated indicator values for each element of the WQI, may be computed and tabulated for various localities and seasons.

54 In India, this task is entrusted to Central and State Level Pollution Control Boards. Also Indian Standards Institute has fixed water quality norms for different type of usage. A few widely accepted determinants of the composite WQI are -

- Bacteria count per millilitre (Which may point towards seepage of human or animal excreta in the water supply and cause water- borne diseases like hepatitis, gastroenteritis, etc.)
- Ph level (this may indicate that the water is corrosive and can damage pipes and plumbing apparatus)
- Extent of nitrate/nitrite presence.(this may be an indication of seepage of agricultural putrefying wastes e.g., biological manure of decaying dead plants, into the water distribution system)
- Presence of Arsenic, lead and other harmful chemicals like chlorides, fluoride, phosphates, sulphates, bicarbonates of sodium, potassium (suggests high presence of industrial waste)
- Presence of pesticides (harmful for human consumption)
- Hardness (presence of dissolved salts like carbonates/bicarbonates of calcium or magnesium)
- TDS (total dissolved solids) index –which is directly proportional to and can be measured by Electrical Conductivity.

The relative weightage given to each element will depend on the specific characteristics of the locality. For the numerator to be quantitatively meaningful, each element, for computing ease, should be brought down to a pure number by expressing it as a ratio (to which an appropriate weight can be given). The denominator of the ratios should be the corresponding benchmarks, e.g., Bacteria count per millilitre / bacteria count per millilitre recommended for safe consumption.

INFERENCE: The composite indicator gives an estimate of the overall quality of the water and the disaggregated values pinpoint the nature of the impurity and the extent to which it affects overall quality. The information generated will help Authorities to embark on remedial actions with maximum efficiency.

Once this indicator is defined for a certain region, then it can be used to compare the quality of water only across localities with the same conditions of climate, terrain, soil conditions, and dominant economic activity (agricultural, industrial, trade, etc.). Thus, its scope is rather limited. This process requires expensive equipment.

- Variations in Water Quality with Seasons (the microbial content in particular)

INDICATOR FORMULA: $I/5 \times \sqrt{\Sigma (Ai- \bar{A})^2}$

Where Ai denotes the water quality index (its composite value, or that of any of its constituent elements, e.g., microbial content – actual bacteria count for 1ml / bacteria count for 1ml, which is recommended for safe consumption) for the ith season. There being 5 seasons (summer, monsoon, autumn, winter, spring) Σ (summation) is taken over 5 elements. $\bar{A}$ is the average value over 5 seasons.

UNIT OF MEASUREMENT: The same unit as that of the WQI.

SIGNIFICANCE: High values of this indicator (composite or disaggregated individual) show that the quality of water supplied is highly sensitive to seasonal variations of ecology and environment.

INFERENCE: Clearly tabulated values across localities would help the relevant authorities to allocate their resources according to needs of various seasons.

Measurement and data gathering would be resource and skill intensive

- Decrease in the WQI during the Distribution Process

INDICATOR FORMULA: $\dfrac{(\text{WQI at point of origin} - \text{WQI at point of destination})}{\text{Average WQI}}$

SIGNIFICANCE: Acts as a pointer to the quality of the distribution network.

INFERENCE: Higher values would pinpoint the need to repair the defects in the distribution systems at the required points.

This indicator viewed in isolation has little significance since both WQI at origin and destination may be lower than desired or higher than average. , It should not be viewed in isolation, but conjunction in perspective of an Absolute value of the WQI. (Even though the denominator has the average WQI to facilitate comparison)

- Proportion of Adverse Quality (Failed) Water Tests

INDICATOR FORMULA: $\frac{\text{Number of water tests that showed adverse water quality or exceeded maximum concentrations as prescribed}}{\text{Total number of water test results}} *100$

UNIT OF MEASUREMENT: Percentage

SIGNIFICANCE: This gives a measure of the effectiveness of water treatment and water quality control telling us whether water is safe and meets local needs.

INFERENCE: This is only a broad guideline. Tests are likely to be of various kinds and. Also, the samples taken may be less or may not be adequately represent of all the areas of the city.

EFFICIENCY INDICATORS

Throughout the WSS, there will be people to 'operate' it by running it and keeping it functioning. There will be maintenance personnel to keep it going in order, technical personnel in charge of monitoring and improving quality of service and lab personnel to test the effectiveness of treatment. Efficiency of WSS depends heavily on efficiency of human element. Efficiency also depends on utilisation of installed capacity of plant and machinery and other infrastructure.

- Efficiency in Water Resource Tapping

INDICATOR FORMULA: $\frac{\text{Amount of Water Resources Tapped}}{\text{Total Available Water resources}}$

UNIT OF MEASUREMENT: This is a Ratio, so no unit.

SIGNIFICANCE: This measure would indicate whether the water authority has fully exploited, all the sources of water that are available within its jurisdiction.

INFERENCE: On the basis of this indicator, it may not be appropriate to compare between various water providing authorities. Each area may have its own water resources (e.g., river, tank groundwater, piped water from various distances) and extraction processes would vary accordingly. This indicator is therefore very location specific.

- Breakdown of the Water Mains during the period[55]

INDICATOR FORMULA: $\frac{\text{Number of breaks in Water Mains in a Year}}{\text{Total Kilometres of Water Mains Pipe}}$

UNIT OF MEASUREMENT: Number per year/ km

SIGNIFICANCE: This is a proxy for the effectiveness of the water mains and can be used to minimize water loss (raw and treated) and lessen hardship to the people.

INFERENCE: Though it indicates need for proper maintenance of water mains but it is difficult to predict breakdowns of water mains on basis of past trends. Breakdowns of water mains are caused because of various reasons that are out of the municipality's control.

- Utilisation Efficiency of the Pipe Length Provided on Ground

INDICATOR FORMULA: $\frac{\text{Total pipe length put in to use}}{\text{Total pipe length provided on the ground.}}$

SIGNIFICANCE: It is important to compute this measure over the jurisdiction of the Authority, and at the same time, disaggregated values should be meticulously tabulated for each locality.

INFERENCE: This indicator is an eye opener to the extent of sub optimal use of a resource, namely, pipe length provided. Disaggregated (locality-wise) information will be useful to put to use the unutilised length of pipeline by focusing on the specific problems of each locality.

The causes of underutilisation are likely to be locality specific (e.g., unsuitable terrain wherein pipes should be re-located, engineering defects that may be corrected, change of the amount and kind of traffic over roads under which pipes were laid very long ago, presence of electric or telephone cables laid in an unplanned, uncoordinated fashion, etc.). These differences should be noted while making comparisons.

[55] Canadian

- Efficiency in Maintenance of Pipe Lines/Network

INDICATOR FORMULA: $\frac{\text{Kilometre of pipe repaired in a year}}{\text{Total km of the pipe length}}$

SIGNIFICANCE: Aggregate and disaggregated figures of this indicator measure the authority's quality and efficiency of maintenance for the entire jurisdiction, and also for each locality. So this could help to evaluate maintenance personnel and keep vigilance on them.

INFERENCE: High figures for this indicator may not necessarily reflect well on the maintenance quality of the Authority. They may indicate that too many repairs have been necessary because previous repairs were inadequate, or the initial pipelines are of very bad quality or there is something wrong with maintenance itself.

- Percentage Utilisation of Installed Pumping Capacity

INDICATOR FORMULA: $\frac{\text{Water pumped by pumping stations}}{\text{Installed Capacity of pumping stations}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: it is necessary to monitor the capacity utilisation of pumps continuously. Some may not be having adequate water level at the same time some may be having inadequate operational capacity or may not be working efficiently due to lack of maintenance.

INFERENCE: It is an output indicator. This indicator helps ULBs to know how best their water pumping capacity is put to use. It also helps in deciding upgradation plan.

The pumping capacity may not be put to best use due to non-availability of power supply or inadequate capacity of water lines or water table may not be adequate. One needs to use other indicators to know complete picture.

- % Utilisation of Water Treatment Capacity

INDICATOR FORMULA: $\frac{\text{Water Treated By WTP/WTPs}}{\text{Water Treatment Capacity of WTP or WTPs}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Treatment being an important process needs continuous monitoring.

INFERENCE: An output indicator, very useful to measure utilisation efficiency of the capacity created. If utilisation is less than 95 per cent, ULB should look into all possible reasons.

It is quantitative in nature, does not reveal quality/effectiveness with which waste water was treated. It should be used in combination with quality indicators to get real picture.

- Losses from the Intake to the WTP

INDICATOR FORMULA: $\frac{\text{(Intake of water at source – intake of water at WTP)}}{\text{Intake of water at source}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This gives a general idea of the quality of the arterial pipes (transmission mains) and storage tanks (and therefore of the efficiency of maintenance) linking intake water to the WTP and the amount of water lost in transit

INFERENCE: It indicates loss of water but not its causes. Water Treatment Plant / Process Efficiency

INDICATOR FORMULA:

$\frac{\text{Value of WQI after treatment – Value of WQI before treatment}}{\text{Value of WQI before treatment}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This is a measure of the effectiveness of the treatment process. It can be disaggregated in two ways.

1. Values may be recorded of each component of overall WQI, or,
2. For each individual step in the treatment process

INFERENCE: This is highly sensitive to the technology used, the quality of treatment infrastructure, and the way treatment process carried out.

- Water Losses during the Treatment

INDICATOR FORMULA:

$$\frac{\text{(Amount of water entering the treatment plant – Amount of water leaving the treatment plant for delivery)}}{\text{Amount of water entering the treatment plant}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Not much loss of water takes place, but it is always better to calculate this to have proper water accounting.

INFERENCE: This gives an idea of the price paid in terms of lost water because of enhancing its quality and the necessity of a more efficient treatment process.

The availability of this information in a chronically water deficient area may prompt the Authority (through popular pressure) to make short term compromises on water quality at the long term risk of causing public health and environmental hazards.

- Breakdown of Water Treatment Plant during the Period

INDICATOR FORMULA: $\frac{\text{Major failures in the water treatment plant}}{\text{Year}}$

UNIT OF MEASUREMENT: Number per year

SIGNIFICANCE: This indicates the working condition of the WTP and points out whether or not it needs repair or replacement. An average figure should be taken for at least five years, to smooth out unusual and emergency figures.

INFERENCE: At its best, this is only a proxy. A WTP may not have had many failures but may still be very inefficient and obsolete.

- ## Working Efficiency of the WTP[56]

INDICATOR FORMULA:

$$\frac{\text{Number of hrs/days that the WTP was inoperative due to technical problems}}{\text{24 hr or 365days}}$$

UNIT OF MEASUREMENT: Number per day/year

SIGNIFICANCE: This indicates the working condition of the WTP and points out whether or not it needs repair or replacement. An average figure should be taken for at least five years, to smooth out unusual and emergency incidents.

INFERENCE: At its best, this is only a proxy. A WTP may not have been inoperative but may still be very inefficient and obsolete and qualitatively unsatisfactory. It may have remained inoperative due to non-availability of water, power or chemicals etc.

- ## Running Condition of the Distribution System

INDICATOR FORMULA:

$$\frac{\text{Number of hours/days that the distribution system was inoperative due to technical problems}}{\text{24 hours or 365 days}}$$

UNIT OF MEASUREMENT: Number per day/year

SIGNIFICANCE: This indicates the working condition of the distribution system and points out whether or not it needs repair or replacement. An average figure should be taken for at least five years, to smooth out unusual and emergency incidents. Disaggregated figures may be recorded per month to indicate seasonal vulnerabilities of the distribution system if any.

INFERENCE: At its best, this is only a proxy. A distribution system may not have been inoperative but may still be very inefficient and obsolete and qualitatively unsatisfactory.

56 Number of working hrs/ days that the WTP was inoperative due to technical problems – Water – USAID - Egypt

- Regularity of Supply

INDICATOR FORMULA: percentage of time water supply facilities provide uninterrupted service

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This is a measure of the reliability of water supply, and can help to focus on areas that need urgent attention.

INFERENCE: No serious weakness associated with it, but it should not be used in isolation.

- Tankers (other infrastructure) Available for Normal and Emergency Supplies

INDICATOR FORMULA:

$$\frac{\text{Tankers (other infrastructure) available for normal and emergency supplies}}{\text{Tankers (Infrastructure) provided (installed) for such supplies}} * \frac{100}{1}$$

UNIT OF MEASUREMENT:

SIGNIFICANCE: Aggregate figures of this indicator would assess the overall effectiveness maintenance of the Infrastructure (mainly tankers).

INFERENCE: Low figures of this measure would help to recognise and locate the gap in maintenance of Tanker or other infrastructure provided and thus help redressing the problem, e.g., some tankers may be mechanically unfit to operate due to age.

Low figures represent a gap in service, but the converse is not necessarily true. High figures may be recorded if the denominator is small or even if adequate tankers are available, they may be in a state of poor maintenance. They often have leaky holes or taps may not have been closed properly. Tankers may not get cleaned properly, so water may be foul smelling and unfit for use.

- Unaccounted Water

INDICATOR FORMULA:

$$\frac{\text{(Volume of water delivered to the distribution system – Volume of water sold)}}{\text{Volume of water delivered to the distribution system}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This is a good proxy for the overall efficiency of operations of the Authority. It includes physical losses (pipe breaks and overflows) and commercial losses (meter under- registration, illegal use including theft, fraudulent connections and legal but not usually metered uses like firefighting.)

INFERENCE: Disaggregation is necessary and appropriate, but difficult. Caution should be used in interpretation because full metering is not usually in place and Authorities may differ on the above definitions.

- Water[57] Supply Billed as Percentage of Water Supply Produced

INDICATOR FORMULA: $\frac{\text{Water Supply Billed}}{\text{Total Water Produced}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This is a corollary indicator to earlier one 'Unaccounted for Water'. It expresses similar assessment but in general terms. It takes into account total water produced.

INFERENCE: This is a good proxy for the overall efficiency of operations of the WSS. It includes all physical losses (pipe breaks and overflows) from source to billing of water and commercial losses (meter under- registration, illegal use including theft, fraudulent connections and legal but not usually metered uses like firefighting, watering of gardens.)

Disaggregation is necessary and appropriate, but difficult. Caution should be used in interpretation because full metering is not usually in place and Authorities may differ on the above definitions.

- Theft Losses in the Distribution Network

INDICATOR FORMULA:

$$\frac{\text{Volume of water delivered to the distribution system - (Volume of water sold + Water loss on technical account}^{58}\text{)}}{\text{Volume of water delivered to the distribution system}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percent

[57] Water, USAID, Egypt

[58] Water loss on technical account means water loss taking place due to pipe breaks and overflows and legal but not usually metered or accounted uses like fire fighting, gardens, watering of road side plants .

SIGNIFICANCE: Water loss as noted earlier occurs due to technical reasons (pipe breaks and overflows)

INFERENCE: It indicates water loss taking place due to theft or illegal use (meter under- registration, illegal connections, and fraudulent connections) clearly and thus indicates how much earnings ULB or WSA is losing.

Area-wise disaggregation is necessary and appropriate, but difficult .Caution should be used in interpretation because full metering is not usually in place and Authorities may differ on the above definitions.

- ## Frequency of Water Quality Monitoring

INDICATOR FORMULA: $\frac{\text{Number of times water quality is checked /samples taken}}{\text{Number of times water quality is required to be checked during the period}}$

UNIT OF MEASUREMENT: number per year /no. per year =pure number. So no unit

SIGNIFICANCE: This indicator shows the Authority's commitment in monitoring water quality. Disaggregated values must be calculated for source points, transit points and usage points

INFERENCE: There may be variations across years due to exogenous factors. Therefore, an annual average figure would be more suitable.

- ## Promptness of Repair

INDICATOR FORMULA: Time taken to attend failures in the water supply system

UNIT OF MEASUREMENT: Hours

SIGNIFICANCE: The failures include breakdown of water mains, WTP to distribution lines or individual connections. It is necessary to construct benchmarks for time to be taken to repair each type of failure/breakdown in the WSS and disaggregated values should be worked out.

INFERENCE: This offers a proxy for the promptness and alertness of the Authority in maintaining the regularity of supply of treated water.

Comparisons on aggregate level may be unfair since no distinction is made between various causes of WSS failures. It would be better to compare between failures of the same type.

- Percentage of customers with functional meter at their end

INDICATOR FORMULA: $\frac{\text{Number of Customers with functional meters}}{\text{Total Number of Customers with metered connection}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: Functional meters at the customer end are most important for water accounting, billing and conservation.

INFERENCE: This indicator shows the Authority's efficiency in detecting non-functional meters and then maintaining them.

It gives indication of problems whose causes have to be looked into.

EXPANSION/DEVELOPMENT INDICATORS

As population and area of the city keeps on increasing, an urban service must expand and develop. An urban service should not only be sufficient to meet demand and efficient in operation, but it must upgrade, expand or develop sufficiently.

- Percentage Increase in Total Water Sourced and Total Water Supplied

INDICATOR FORMULA: $\{(Yi - Yo) / Yo\} * 100$

Where Yo is total water sourced or supplied in the initial year, Yi is that in the final year

UNIT OF MEASUREMENT: Percent.

SIGNIFICANCE: The first indicator to measure expansion or development of water supply. ULB need to increase water supply to take care of increased population and to improve availability of water per capita.

INFERENCE: This indicator is a measure of the Service Provider's, ability/competence to meet the growing demand for water by appropriate expansion of sourcing and supply.

The availability of more water supplies may not result in increase in percentage of population or area served or equitable distribution of additional water sourced. It must be backed by indicators pertaining to these aspects.

- Growth in Percentage Population Served[59]

INDICATOR FORMULA: {(Yi –Yo) / Yo} * 100

Where Yo is Population served by WSS in the initial year, Yi is that in the final year

UNIT OF MEASUREMENT: Percent.

SIGNIFICANCE: This indicator is a measure of the Service Provider's, ability/competence to meet the growing demand for water. Disaggregated values should also be recorded for different seasons and different localities

INFERENCE: Disaggregated values for different localities help to pinpoint places where the demand for water has increased the most and whether proportionate resources and efforts have been deployed or not. This can be a starting point of understanding and recording the causes for this increase in demand (e.g., growth in industrial activity generating in-migration; spurt of commercial activity and subsequent tertiary sector activity, formal or informal; rural poverty driven in- migration, etc., all leading to a sudden spurt of population).

This indicator, on the positive side measures efficiency and competence of the Authority to meet growing demand, but on the negative side it should also be recognized as a measure of the additional pressure on the resources of the Authority, in various areas. To minimize (and anticipate) this pressure in the long term, tabulated disaggregated values may be used by city planners and higher tier governments, to achieve better spatial balance in regional development,-economic and social.

- Percentage [60] Decrease in Unaccounted for Water

INDICATOR FORMULA: {(Yo –Yi) / Y_0} * 100

Where Yo is UFW in the initial year, Yi in the final year

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Improvement and sustainability of WSS depends on its ability to reduce decrease in unaccounted for water. This becomes possible through upgrading of water infrastructure, improving quality of maintenance and improving metering/billing operations.

[59] Water indicators, USAID, Egypt

[60] Water Indicators, USAID, Egypt

INFERENCE: It is a very good indicator of efficiency. It measures ULB's/Authority's performance in reducing unaccounted for water, which not only avoids wastage of precious water resource but also improves profitability of service provider.

One has to be careful about data. There should not be change in method of tabulating unaccounted for water.

- Percentage Increase in Area Coverage by Formal Water Supply System

INDICATOR FORMULA: {(Yi –Yo) / Yo} * 100

Where Yo is total area served by WSS in the initial year, Yi is that in the final year

UNIT OF MEASUREMENT: Percent.

SIGNIFICANCE: The indicator to measure expansion or development of water supply in spatial terms. ULB need to expand water supply network in new or unserved areas to take care of increased area of the city or to improve availability of water in unserved areas of past.

INFERENCE: This indicator is a measure of the Service Provider's, ability/competence to meet the growing demand for water by expanding supply network spatially.

The expansion of water supply system may not result in increase in increase of water supply or percentage of population served or pressure of water at consumer end. It must be backed by indicators pertaining to these aspects.

- Percentage increase in Water Treatment Capacity

INDICATOR FORMULA: {(Yi –Yo) / Yo} * 100

Where Yo is total water treatment capacity in the initial year, Yi is that in the final year

UNIT OF MEASUREMENT: Percent.

SIGNIFICANCE: Along with increase in water sourcing or supply, ULB need to increase water treatment capacity to take care of increased water supply otherwise water will become available but it can be treated properly and hence cannot be put to potable use.

INFERENCE: This indicator is a measure of the Service Provider's, ability/competence to meet the growing demand for water treatment by constructing more capacity or by utilising existing capacity more efficiently.

Increase in treatment capacity may not result in increased efficient utilisation of treatment pants or equitable distribution of additional water sourced. It must be backed by indicators pertaining to these aspects.

- Expansion of Water Supply Service against desired or planned development

This indicator has been explained later on under Road and Storm Water Service. Following that explanation, it should be calculated for water supply service also. Also it should be worked out on disaggregate level to cover various components of water supply service like source augmentation, conveyance/transmission mains, distribution network, treatment etc.

- Upgrading Staff Quality

INDICATOR FORMULA: $\frac{\text{Total amount spent on staff training and HRD Activities}}{\text{Total Expenditure of WSS by an agency}}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Improvement and sustainability of WSS depends to large extent on quality of staff. Upgrading staff quality is the final frontier and involves sizeable cost.

INFERENCE: This is a measure of the attention paid to upgrade the quality of the staff in order to deliver better quality of service.

Comparisons should be restricted to those with approximately similar initial level staff quality. It is quantitative indicator; expenditure may not result in improvement in staff quality. Quality and effectiveness indicators should also be considered to judge agencies' efforts.

CUSTOMER/CONSUMER SATISFACTION INDICATORS

Any urban service is managed or delivered ultimately for the consumers. Any performance measurement will be incomplete without measuring consumers' satisfaction about the service. This section dwells upon indicators that measure the extent to which customers (residents of the urban area being serviced by the ULB's WSS) are satisfied with the state of maintenance and the efficiency of existing WSS network.

- Number of Consumers Satisfied with Overall Water Supply Service

INDICATOR FORMULA: $\frac{\text{Number of consumers satisfied with service}}{\text{Total number of consumers}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: It is one of the quick ratios to understand overall satisfaction of people about WSS.

INFERENCE: If value is very high then agency can focus its attention on expansion and improving higher order sophistication, if value is moderate or low then it gives strong message that agency need to address shortages and basic problems and should undertake exhaustive review of WSS to know what is exactly wrong with it.

This should be used with caution as a normative measure in a social milieu where consumers may not be aware of their rights and may be complacently accustomed to using less water than they should (and living with the associated evils), by a basic conventional standard. Questionnaires should be carefully phrased to take care of this problem. Secondly, thresholds of satisfaction vary across consumers. So, adding up the number of 'satisfied customers' may not make much sense. Comparisons (and aggregations) should be over consumers with similar expectations.

- Satisfaction with Pressure of Supply

INDICATOR FORMULA: $\frac{\text{Number of consumers satisfied with water pressure}}{\text{Total number of consumers}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This is a quick ratio to measure the extent of consumers' satisfaction with the pressure of water supply. If this is lower than a stipulated benchmark, steps should be taken to look into the causes of low water-pressure and accordingly, steps should be taken for improvement.

INFERENCE: This is meaningful only where there is uniformity of consumer awareness and expectations.

- Satisfaction with Water Quality

INDICATOR FORMULA: $\frac{\text{Number of consumers satisfied with water quality}}{\text{Total number of consumers}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This indicator can be used in the case of overall quality as well as in that of disaggregated values of each component of water quality

INFERENCE: This gives a measure of the perceived efficiency of the water supply service. Also, it indicates urgency of improving the quality of water supplied.

The significance of this indicator (and the appropriateness of adding over consumers) would depend upon the extent of public knowledge about water quality and its various components and modalities, and some commonality of expectations thereof.

- Complaints frequency

INDICATOR FORMULA: Number of complaints per year

UNIT OF MEASUREMENT: Number per year

SIGNIFICANCE: This would help to capture the frequency with which the water supply service falls short of the residents' satisfaction, and thus act as a pointer to the necessity of large scale overhaul of pipelines, apparatus or staff

INFERENCE: This indicator would help to locate and focus on areas where there is a major gap in the expected and actual quality of service delivery.

The frequency of complaints would vary with the residents' awareness, ability to complain (articulate), education, and culture. Thus, complain frequency would tend to vary with the residents' profiles and expectations.

- Response to Customers

INDICATOR FORMULA: $\frac{\text{Number of customers satisfied with response to complaints}}{\text{Number of customers who complained}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Complaints may occur because of various reasons some of which may not be in the hands of ULBs. As a result, it may not be possible to reduce number of complaints beyond a point but in such circumstances, what is more important is how well complaints were handled by ULB or how satisfied the consumers are with complaints' redressal by ULB and not the number of complaints.

INFERENCE: This measure enables users to compare quality response to complaints over ULBs, locate and focus on gaps between actual and expected performance.

Satisfaction of customers would depend on their expectations. Different customers have different expectations, depending on their education level, exposure and cultural background. Therefore, comparisons should be made with caution.

- ## Promptness of Response

INDICATOR FORMULA: $\frac{\text{Number of Complaints redressed in time}}{\text{Number of Complaints}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: The most important characteristic of any response to consumer complaint. It is the promptness, which generate maximum satisfaction, hence very important measure of consumer satisfaction.

INFERENCE: This is a measure of the promptness with which complaints are attended by ULB. This helps to locate areas having a significant gap between expected and actual performance.

It says nothing about the quality of repair service and the overall state of maintenance of the sewerage distribution system. Ideally, there should not be a high number of complaints to necessitate a high number of redresses. Also needs benchmarks in terms of ideal response time for each type of complaint.

- ## Review of Complaints Redressal Machinery

INDICATOR FORMULA: Number of times a year complaints have been reviewed.

UNIT OF MEASUREMENT: Number per year.

SIGNIFICANCE: Creating a system of complaints' redressal is not sufficient, it requires constant monitoring and through review at specified interval.

INFERENCE: This can help to locate areas having a significant gap between expected and actual performance of the working of the entire complaints' redressal machinery.

Good performance on this indicator may reflect commitment towards better long run service but it does not ensure that the lessons, conclusions and guidelines of the review are actually implemented.

ADMINISTRATATIVE / GENERAL INDICATORS

- ### Percentage[61] of Total Workforce Covered by Personnel Systems

INDICATOR FORMULA: $\frac{\text{WSS Workforce Covered by Personnel Systems}}{\text{Total Workforce Employed for WSS}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: At many places WSS employees workforce on temporary or daily-wage basis. Such workforce is not covered personnel system and does not get various benefits. This leads to motivational and work quality problems.

INFERENCE: If this measure indicates very high proportion of workforce outside personnel system then that ULB or Authority is likely to face motivational and quality problem.

Cases where this figure is too high should be approached with caution. Bringing maximum workforce under personnel system depends on legal, administrative and political aspects.

- ### Expenditure on WSS staff

INDICATOR FORMULA: $\frac{\text{Expenditure on Water supply services Staff}}{\text{Total Expenditure or Establishment Expenditure of ULB}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCE: This is a measure of the proportion of resources spent on staff for the running Water Supply Department. This ratio should be worked against total expenditure of ULB and total establishment expenditure of ULB.

[61] Water, USAID - Egypt

INFERENCE: This gives a clear idea of the resources spent on staff in comparison with other expenditures on operation, maintenance and investment (in new or updated equipment) of the sewerage service. When it is compared to total expenditure, it shows share of sewerage service in total establishment expenditure.

The usefulness of this indicator varies from case to case. On a general level, it is ambiguous. It is hard to tell whether fewer resources spent on the upkeep of staff compare to those spent on operations and maintenance is necessarily better or worse for ULB. The relative necessity of staff and, resources for operations and maintenance depends on a number of factors, such as labour intensity of existing network and equipment, necessity of highly paid technical staff, geo-climatic conditions, etc.

- Weightage of Administration

INDICATOR FORMULA: $\frac{\text{Number of Administrative personnel}}{\text{Number of Operations and maintenance personnel}}$

UNIT OF MEASUREMENT: Ratio, so pure number

SIGNIFICANCE: This measures the extent to which human resources are diverted to administration compare to operations and maintenance that actually makes a difference to the quality of sewerage and sanitation service. The lower this figures the more efficient and effective the use of the manpower employed.

INFERENCE: This helps to locate areas burdened with administrative overstaffing.

It is difficult to have benchmark for this, and so it will be difficult to know how many people are in excess.

FINANCIAL INDICATORS

Cost Related Indicators

Cost can and should be examined from various angles to find out areas of inefficiency. This group contains aggregate cost ratios and disaggregate cost ratios. Main aggregate level ratios have been explained while disaggregate cost ratios have been explained up to the formula stage.

- Total Cost of Operations[62] per kilometre of Distribution Pipe

INDICATOR FORMULA: $\frac{\text{Total Operating costs for water distribution}}{\text{Kilometres of distribution pipe}}$

SIGNIFICANCE: It is an aggregate indicator but can be used to calculate disaggregated values of each component of cost. –

- Total Cost of Salary per kilometre of Distribution Pipe
- Total Administration Cost per kilometre of Distribution Pipe,
- Total O & M Cost per kilometre of Distribution Pipe, and
- Total Interest Payment and Financing Cost per kilometre of Distribution Pipe

INFERENCE: It gives a clear picture of overall level of expenditure and cost efficiency

This depends on precisely calculated city specific benchmarks. For example, a city may have a flat terrain that may warrant constructions of elevated water supply tanks and may have to place 'on line boosters' to improve water supply pressure. This will involve increase in electricity consumption and will boost the cost per unit of water produced

- Cost per Kilolitres of Water Delivered (or Produced or Treated)

INDICATOR FORMULA: $\frac{\text{Total Expenditure of the WSS during a Financial Year}}{\text{Million kilolitres of water delivered or could be delivered}}$

SIGNIFICANCE: This is an aggregate level, quick ratio, used for inter ULB /agency comparison. Using the same formula one can work out disaggregated indicators like

- Total Cost per Kilolitres of water produced,
- Total Cost per Kilolitres of water treated or

Cost as per different process from water sourcing to delivery

[62] Canadian

- Sourcing Cost per Kilolitre of Water
- Treatment Cost per Kilolitre of Water
- Transmission Cost per Kilolitre of Water
- Delivery Cost of per Kilolitre of Water

Cost as per components of cost like –

- Salary Cost per Kilolitres of water,
- Administrative Cost per Kilolitres of water
- O&M cost per Kilolitres of water; etc.

INFERENCE: This provides an overall level of expenditure and cost efficiency per kilolitres of water. The disaggregated indicators if worked out along with this broad indicator can give a complete picture of cost incurred, and specifically locate inefficiency.

These ratios will have no meaning on standalone basis. Effectiveness of analysis will be dependent on precisely calculated city specific benchmarks.

- Total Cost per Household

INDICATOR FORMULA: $\frac{\text{Total Operating costs for water distribution}}{\text{Total Number of Households connected to the WSS}}$

SIGNIFICANCE: It is an aggregate indicator but can be used to calculate disaggregated values of each component of cost – Salary, Administrative, O & M, and Interest Payment. A host of such indicators can be constructed but one should calculate disaggregate value indicators only if they are useful and economical.

INFERENCE: This gives an overall average expenditure per household, which can be compared with earnings per household.

Though this gives another dimension for calculation of aggregate or disaggregates costs, it is not as meaningful as to knowing cost per kilolitre of water or cost per capita.

- Cost incurred per capita for Water Supply System

INDICATOR FORMULA: $\frac{\text{Total cost incurred on water supply system}}{\text{Total Population of the city}}$

SIGNIFICANCE: Per capita cost is the third basis for grouping various cost indicators beside cost per kilolitres of water and cost per km. of pipe line. Per capita cost of WSS is an aggregate indicator but can be calculated in disaggregate terms. In fact, each type of component cost of WSS can be calculated on per capita basis by using above formulae. The indicative list of such indicators is as follows –

- Cost per capita of water treatment
- Cost per capita of water distribution or,
- Per capita Establishment (Salary) cost of WSS
- Per capita Operation & Maintenance Cost of WSS

INFERENCE: per capita cost basis indicators give net value as increase in population brings down cost or revenues of WSS to real level and may help more meaningful analysis.

Though this gives another dimension for calculation of aggregate or disaggregates costs, it depends on what constitutes population figure and if population figure is not correct then it can lead to wrong analysis.

- Average / Annual Growth in Total Revenue Expenditure of WSS

INDICATOR FORMULA: $\frac{\text{Total Revenue Expenditure of WSS in Year 1}}{\text{Total Revenue Expenditure of WSS in Year 0}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Aggregate Indicator and a quick ratio. It is always necessary to know movement of cost over the period to do forecasting of future trends and to know pockets of efficiency. Again using this formulae one can work out all disaggregate level indicators listed above like –

- Average/Annual Growth in Salary Expenditure
- Average /Annual Growth in O & M Expenditure
- Average / Annual Growth in Interest /Finance Charge Expenditure, etc.

In a similar way, it can be used to know average or annual growth in various process related expenditures like – sourcing, treating, transmitting and distributing water.

INFERENCE: the main benefit of these indicators (aggregate & disaggregate level) is that they provide time series products, which help to understand movement in the cost/expenditure over the period.

Percentage growth analysis, particularly if done on annual basis is deceptive. Growth depends upon base year so high growth rate may be result of low base and vice versa. So wherever possible at least three year average growth should be taken into account.

- Cost of Administration

INDICATOR FORMULA: $\frac{\text{Expenditure Incurred on Administration of WSS}}{\text{Total Expenditure incurred on WSS}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: This gives an idea of the proportion of scarce resources that have to be spent on administration rather than on actually improving the water supply

INFERENCE: The judgmental value of this indicator rests on the debateable premise that administration is a necessary nuisance.

The following indicators have been discussed in a separate chapter on Financial Indicators, at the level of ULBs, but they can easily be used to measure financial performance of any service providing authority. .

Revenue or Earnings Related Indicators

- Revenue generated from Water Tax
- Revenue generated from billing for water/ revenue realised from water billing

- Revenue from sale of by-products less costs
- Revenue generated from all sources/ revenue realised (could be even over time, expected)
- Revenue mobilised from other sources/ total plan outlay

Cost vs. Earnings Relational Indicators

- Working Ratio (operating cost to operating revenue; should be below 1 if financial management good)
- Operating ratio (same; only difference is that depreciation included in cost; debt service included in neither.)63
- Excess expenditure incurred/ budgetary allocation
- Staff to revenue ratio
- Staff to expenditure ratio
- Non64 tariff revenue as percentage of operation and maintenance cost

Debt Related Indicators

- Operational debt
- Debt recovery over years
- Loan repayments to Total expenditure
- Debt service coverage ratio
- Debt equity ratio
- Current ratio

Financial Structural Indicators

- Return on net fixed assets
- Return on equity of WSS
- Area wise losses
- Budgetary allocation (changes over the years)

[63] TERI file (water and wastewater utilities) TWUWS
[64] Water, USAID-Egypt

- Deficit65 (subsidy) as percentage of operation and maintenance cost
- Deficit as percentage of total costs

ENVIRONMENTAL CONSERVATION INDICATORS

Issue of environmental conservation has become very important because provision of urban services may cause environmental degradation to the areas surrounding city. Periodic environmental impact assessment (EIA) of WSS should be done using following check list. The list is minimal and EIA should not restrict itself to these points only.

- Degree of adoption of specific measures (within the ULB's responsibility) to reduce pollution of water sources
- Degree of adoption of specific measures to eliminate contamination of water supply
- Degree of environmental-friendliness of Water Treatment Plants (in terms of chemicals used, manner of disposal of pollutants) covered in terms of sludge handling practice
- Degree of environmental friendliness of pumping stations, type of fuel, noise produced etc.,
- Degree of environmental-friendliness of pipelines
- Degree of adoption of specific measures to reduce water losses

[65] Water/ wastewater indicators - USAID, Egypt

Chapter 5 - B Indicators for Sewerage System, Waste Water & Sanitation Management

Index

SEWERAGE AND WASTEWATER MANAGEMENT ***136***

INTRODUCTION 136

COVERAGE INDICATORS 137

- Sewerage Generated – Collected Gap 137
- Sewerage Collected/Generated - Treatment Capacity Gap 138
- Coverage of Population by Underground Pipeline Network 138
- Coverage of Population by Open Drains 139
- Total Area Coverage by Sewerage Network 139
- Ratio of Under Ground Sewerage Network length to Road length 140
- % of Households Covered by Sewerage System 140
- Percentage Houses with LCS & Septic Tank Facility 141
- Slum Coverage by Sewerage System 141
- Population per seat of public convenience 142
- Coverage of Slum Population by Public Convenience 142
- Ratio of Pay and Use Toilets to Total Public Toilets 143
- Ratio of Community Owned and Managed Toilets to Total Public Toilets 143

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS 144

- Per Capita Generation of Sewerage 144
- Share of Non-domestic sewage 144
- Share of sewerage taken care by gravity 145
- Share of sewage requiring pumping and lifting 145
- Infiltration Vs Inflow 145
- Percentage of wastewater estimated to have by-passed treatment 146
- % Sewage effluents discharged through Land Disposal 146
- Protection of Usable Water 147
- Sludge Production 147
- Adequacy of Sewage Pumping Facilities 148
- Per Capita Resource Commitment for Sewerage and Sanitation Service 148
- Staff per 1000 Sewerage Connections 148
- Adequacy (Sufficiency) of Technical work-force 149

- Sufficiency of Maintenance workforce _____ 149
- Sufficiency of Operational Workforce _____ 149
- Sufficiency of Quality Control Workforce _____ 149
- Adequacy of Lab Facilities for Quality Control _____ 149
- Adequacy of Storage Facilities for Treated Sewage _____ 149
- Adequacy of quality control facility _____ 150

QUALITY INDICATORS _____ 151

- No of times Quality of Untreated Sewage Checked _____ 151
- Number of times quality of Sewage checked under treatment: _____ 151
- Number of time quality of Sewage checked after treatment: _____ 152
- Wastewater quality after Primary treatment _____ 152
- Wastewater quality after Secondary treatment _____ 153
- Wastewater quality after Tertiary treatment _____ 153
- Influent exceeding standard quantity _____ 154
- Effluent exceeding quality standards _____ 154

EFFICIENCY INDICATORS _____ 154

- % Utilisation of Sewage Pumping Capacity _____ 155
- % Utilisation of Sewage Treatment Capacity _____ 155
- Frequency of technical breakdowns of Sewerage System _____ 155
- Pipeline (Breaks) Repaired or Replaced during the year _____ 156
- Cleaning frequency _____ 157
- Efficiency in Manhole Cleaning _____ 157
- Sewer Blockage – Frequency, Days _____ 158
- Number of Sewer Backups per 100 kilometre of sewer lines per year _____ 158
- Working Efficiency of Sewage Pumping Stations _____ 158
- Working Efficiency of treatment plants _____ 159
- Frequency or Efficiency in Sewage Quality Monitoring _____ 159

EXPANSION & DEVELOPMENT INDICATORS _____ 160

- Growth in Population served by underground sewerage system _____ 160
- Percentage Decrease in uncollected sewage _____ 161
- Percentage Decrease in untreated sewage _____ 161
- Percentage Increase in Area Coverage by underground sewerage system _____ 161
- Percentage increase in Sewage Treatment Capacity _____ 161
- Expansion of Sewerage Service against desired or planned development _____ 161
- Upgrading of Human Resources _____ 162

CUSTOMER SATISFACTION INDICATORS 162
- Number of consumers satisfied with overall quality of Sewerage Service 162
- Complaints frequency 163
- Response to Customers 163
- Promptness of Response 164
- Review of Complaints Redressal Machinery 164

ADMINISTRATIVE & GENERAL INDICATORS 165
- Percentage of total sewerage workforce covered by personnel system 165
- Expenditure on Sewerage Staff 165
- Weightage of Administration 166

FINANCIAL INDICATORS 166
- Operating Costs for Wastewater per kilometre of Sewer Line 166
- Total Cost of Salary per kilometre of Sewer Lines 167
- Total Cost of Administrative per kilometre of Sewer Lines 167
- Total O & M Cost per kilometre of Sewer Lines, and 167
- Total Interest Payment and Financing Cost per kilometre of Sewer Lines 167
- Cost per Kilolitres of Sewage Treated 167
- Total Cost per Household 168
- Cost incurred per capita for sewerage system 168
- Cost per capita of waste sewage treated 168
- Average / Annual Growth in Total Revenue Expenditure of UGSS 168
- Average/Annual Growth in Salary Expenditure 168
- Average /Annual Growth in O & M Expenditure 168
- Average / Annual Growth in Interest /Finance Charge Expenditure, etc 168
- Cost of Administration 168
- Revenue mobilised from tax sources for Sewerage Service 168
- Revenue mobilised from non-tax sources for Sewerage Service 168
- Revenue from sale of by-products less costs 168
- Working Ratio 168
- Operating ratio 169
- Excess expenditure incurred/ budgetary allocation 169
- Staff to revenue ratio 169
- Staff to expenditure ratio 169
- Non-tariff revenue as percentage of operation and maintenance cost 169

SEWERAGE AND WASTEWATER MANAGEMENT

INTRODUCTION

The service, which has become as important as water supply due to modern crowded urban life, is sewerage or wastewater collection and disposal. As a rule of thumb out of total water supply to city, 75 to 80 per cent water flows into sewers as a wastewater. Consequently, it has to be collected and transferred to the place away from habitation. Simultaneously it has to be treated adequately otherwise present time wastewater which contains untreated pollutants can cause severe problems to public health and environmental degradation to water, soil and air of the surrounding and far away hinterlands. Its capacity to disrupt public life is such that it has now become part of modern military strategy to defeat enemy. The U.S. Air force in 1991 Iraq war targeted sewerage installations and networks of Baghdad and other cities to turn their lives in to nightmare, to win the war.

It is a local service and hence traditionally delivered by an urban local government. But due to increase in size, volume, complexity it requires huge capital outlay and high end technology, which is increasingly going beyond ULB's capabilities. Its importance in public health, welfare and political aspects is increasing, and as a result, at various places this service has come to be managed by parastatal agencies or special purpose agencies and not by urban local governments. The components of any sewage system are -

- Network for collecting sewage from individual houses
- Transmission of sewage to sewage treatment plant
- Primary, secondary and final treatment of wastewater
- Disposal of sewage effluents

In some places with the advent of public private partnership, the service is getting unbundled and its various components are being managed by different institutions with different compositions e.g. sewerage collection may be done by ULB, pumping and transmission by some other agency and treatment by a urban local body..

In Indian ULBs, the situation on collection and treatment of wastewater is very serious. Out of more than 4500 cities, only 200 cities have some sort of sewerage system. On and average only 50 per cent

waste water gets collected by formal sewerage system and only 10 per cent gets treated. More attention should be paid to the fact that untreated wastewater poses by far the greatest threat to the health of the environment in modern India.

For classifying sewerage indicators, 'COVERAGE/EXPLANATORY – QUANTITY/STATUS/RESOURCES COMMITED – QUALITY – EFFICIANCY-EXPANSION - CONSUMER SATISFACTION model has been adopted. Within this model then service component sub-classification has been adopted. As the case with other services, indicators pertaining to Governance, Financial and other internal support services have been grouped under separate chapters. Only specific administrative and financial indicators pertaining to sewerage service have been included in this chapter.

COVERAGE INDICATORS

Coverage indicators are service level indicators. They describe and measure existing level of service in the context of area, people or quantum the service is supposed to handle or provide. At aggregate level, they express overall status of service and at disaggregate level they show equity in allocation of resources till date.

- Sewerage Generated – Collected Gap

INDICATOR FORMULA: $\frac{\text{Amount (MLD) of Sewerage collected}}{\text{Amount of sewerage generated}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: This is the most basic indicator pertaining to sewerage system. One needs to know how much sewerage gets collected by a formal system against its generation. Public health of a city depends heavily on collection of sewerage at first instance and taking it away from habitation area.

INFERENCE: This is a measure of the efficiency of the Authority to collect the sewerage generated for the purpose of treatment and recycling Tabulated values of this indicators would be helpful in identifying and specifically locating the deficiency, lapses and gaps in the collection capacities of sewerage so that remedial measures can be appropriately undertaken and efficiently targeted. Figures represent the potential to re-use valuable wastewater for non-potable purposes, and to protect the environment (subsoil and water sources) from the harmful effects of untreated sewage.

This measure should only be treated as a 'first step'. It indicates only sewerage collected by formal system against its generation and does not indicate, anything more (e.g., hazard quotient, urgency, etc.)

- Sewerage Collected/Generated - Treatment Capacity Gap

INDICATOR FORMULA: $\frac{\text{Capacity available for sewage treatment}}{\text{Capacity required for treatment}} * \frac{100}{1}$

UNIT OF MESUREMENT: per cent, (can be expressed as a ratio)

SIGNIFICANCE: Untreated sewerage causes serious environmental degradation to the rural hinterlands around city. Consequently, it is second most basic indicator. In India, only 200 cities out of more than 4400 cities have sewerage system. Even in these cities the sewerage system suffers from serious inadequacy of treatment facility

INFERENCE: This measures the ability to treat the collected sewage to make it appropriately harmless for the environment and, perhaps, re-use as non-potable water.

Values of this indicator would help to identify, quantify, and locate deficiencies of treatment capacity and so improve the efficiency of targeting corrective action.

This measure is only about the potential available and does not give any information about the effectiveness of the treatment of sewage, nor the quality of treatment.

- Coverage of Population by Underground Pipeline Network

INDICATOR FORMULA: $\frac{\text{Population Catered to by Pipeline Network}}{\text{Total Population}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: Maximum coverage of population is essential for good public health in the city. A city may have good SS but may not be available in poor or slum areas.

INFERENCE: This gives a measure of the SS's ability to collect, contain and recycle wastewater generated by the population in its jurisdiction, and locate and draw attention to those areas where there is inadequacy of coverage.

More harm to the environment may be caused by defective (leaking) sewerage pipeline, overflowing sewers due to inadequate capacity in an overcrowded area, than in a less crowded area without pipeline connection but having effective means of dealing with sewerage (septic tank).

- Coverage of Population by Open Drains

INDICATOR FORMULA: $\frac{\text{Population catered to by open drains}}{\text{Total population}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: This is corollary to earlier indicator. People may be covered by sewerage service but by open drains, which is better than no coverage but not desirable from point of public health and safety. One needs to know proportion of population covered by open drains for taking appropriate decisions about improving SS.

INFERENCE: This gives an idea of the exposure of the community to the harmful effects of exposed sewage and the impending danger to the environment (atmosphere, subsoil and natural drainage system) by potential overflow of open drains. Values tabulated over different areas, help to pinpoint the gap in service provision of adequate sewerage disposal service.

There is a case for viewing this indicator positively where resources are too stringent to build piped sewerage network. Then, open drains may be a better temporary solution than no service at all.

- Total Area Coverage by Sewerage Network

INDICATOR FORMULA: $\frac{\text{Area covered by collection network}}{\text{Total Area}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: Another important coverage indicator. It is a quick ratio, a macro indicator but can be utilised to find out locality-wise or season-wise area coverage by sewage supply service.

INFERENCE: This indicator measures the extent of geographical coverage of the sewerage collection network in the jurisdiction of the Authority, and points out regions where coverage is inadequate, and the extent of inadequacy.

This indicator is meaningful only if it is viewed together with distribution of population of the area. It does not discount areas, which are technically infeasible for laying SS, and does not indicate quality, sufficiency of SS.

- Ratio of Under Ground Sewerage Network length to Road length[66]

INDICATOR FORMULA: Road length accompanied by sewerage network * 100

Total Road Length 1

UNIT OF MESUREMENT: percent

SIGNIFICANCE: This is another way to measure area coverage by sewerage network. Sewer lines are always laid along the road side; as a result, it can be good indicator of area coverage. It is a quick ratio, a macro indicator but can be utilised to find out locality-wise or season-wise area coverage by sewage supply service.

INFERENCE: This indicator measures the road length coverage by the sewerage collection network in the jurisdiction of the Authority, and points out regions where coverage is inadequate, and the extent of inadequacy.

This indicator is meaningful only if it is viewed together with the area by road network itself. The road network of the city itself may be underdeveloped. It does not discount areas, which are technically infeasible for laying SS, and does not indicate quality, sufficiency of SS.

- % of Households Covered by Sewerage System[67]

INDICATOR FORMULA: Number of Domestic Connections * 100

Number of households 1

UNIT OF MESUREMENT: percent

SIGNIFICANCE: Another variant of population coverage indicator. One can use similar formulae to calculate user or purpose specific coverage by SS e.g. commercial, industrial, institutional etc.

INFERENCE: This is a measure of access coverage of service that would be helpful in locating and quantifying gaps at the stage of planning and focus attention to areas needing urgent attention. Better

[66] Recommended by Second SFC of Tamil Nadu

[67] Recommended by Second SFC of Tamil Nadu

performance on this indicator is expected to reflect less danger to the environment caused by household generated sewerage.

This indicator takes for granted the effectiveness of the pipeline distribution serving the households. Better performance may not reflect protection of the environment if the distribution network is in disrepair and leakage ridden.

- Percentage Houses with Low Cost Sanitation & Septic Tank Facility[68]

INDICATOR FORMULA: $\frac{\text{Number of House with LCS \& Septic Tank Facility}}{\text{Number of houses in the city}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: In some areas, it may not be possible to lay sewerage network, it may turn out advisable to have low cost sanitation, and septic tank facility till the time sewerage network gets developed.

INFERENCE: it indicates coverage of houses by LCS and septic tank facility. These houses should be treated under sewerage coverage. It helps decision makers to plan expansion of sewerage service.

It is a simple, limited indicator to be used for limited purpose.

- Slum Coverage by Sewerage System

INDICATOR FORMULA: $\frac{\text{Slum area with access to sewerage network}}{\text{Total slum area}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: it is necessary that service delivery and development is pro-poor.

INFERENCE: This reflects the extent of coverage of effective sewerage disposal service in crowded areas inhabited by lower –income groups. Apart from quantifying, locating and focusing attention on deficient regions, this indicator is useful as a proxy for the overall health and hygiene of the entire community.

[68] Recommended by Second SFC of Tamil Nadu

This indicator should be viewed together with the distribution of slum population. In many urban areas, slums and squatter settlements do not remain confined to any definite slum area but is inextricably interspersed with higher income dwellings. In such a case, this indicator is less than appropriate. Again, coverage of a: slum area does not say much about the actual access of slum people to sewerage disposal facilities.

- Population per seat of public convenience

INDICATOR FORMULA: $\frac{\text{Total Population}}{\text{Number public conveniences (Toilet Seats)}}$

UNIT OF MESUREMENT: Number

SIGNIFICANCE: There is acute shortage of access to public toilet facilities in urban India, causing great inconvenience and health hazards to male and female residents. Men are prompted to foul open spaces in violation to their own basic human right to privacy. Women, not having this option are unable to access a toilet in need, or forced to use toilets that are unclean due to overcrowding. Both these situations cause health hazards of prolonged and debilitating infection.

INFERENCE: Higher values of this indicator point to overcrowding and therefore lower access of the people to proper sanitation facilities, prompting them to generate sewerage in open public places causing great environmental and health risk to the community.

It fails to indicate state of maintenance and working order of the public conveniences.

- Coverage of Slum Population by Public Convenience[69]

INDICATOR FORMULA: $\frac{\text{Slum population}}{\text{Number public conveniences (Toilet Seats)}}$

UNIT OF MESUREMENT: Number

SIGNIFICANCE: There is acute shortage of access to public toilet facilities in slum areas of urban India, causing great inconvenience and health hazards to male and female residents. The resultant open dumping of sewage (human excreta) causes massive public health hazard and has the potential to damage severely every component of the environment (e.g., land, air, water)

[69] Recommended by Second SFC of Tamil Nadu

INFERENCE: Higher values of this indicator point to overcrowding and therefore lower access of the slum people to proper sanitation facilities, prompting them to defecate in public causing great environmental and health risk to the community.

Effective use of this indicator is contingent upon the state of maintenance and working order of the public convenience.

- Ratio of Pay and Use Toilets to Total Public Toilets[70]

INDICATOR FORMULA: $\frac{\text{Public Toilets under Pay and Use Scheme}}{\text{Total Public conveniences (Toilet Seats)}}$

UNIT OF MESUREMENT: Number

INFERENCE: Higher values of this indicator point to special efforts made by ULB to provide public toilets in general and specifically for the slum people to have proper sanitation facilities in the city.

It does not indicate sufficiency of public toilets in the city. Also, it will be wrong to presume that higher numbers of pay and use toilets mean better quality of public convenience service. Pay and Use Toilets may be maintained poorly in spite people are paying for it.

- Ratio of Community Owned and Managed Toilets to Total Public Toilets

INDICATOR FORMULA: $\frac{\text{Number of Community Owned-Managed Toilets}}{\text{Number total public conveniences (Toilet Seats)}}$

UNIT OF MESUREMENT: Number

SIGNIFICANCE: Most of the public conveniences after some time fall into disarray due to inadequate maintenance and involvement of users to maintain such infrastructure in working conditions. Pay and Use Toilets is one model to overcome this problem; another useful option is community owned-managed toilets.

INFERENCE: Higher values of this indicator point participation of community and civil sector in the management of Public Conveniences.

[70] City Managers Association – Gujarat – Urban Indicators and Performance Measurement Programme

It does not indicate state of maintenance and working order of the public convenience, primarily because it is difficult to measure or monitor community commitment.

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS

- Per Capita Generation of Sewerage

INDICATOR FORMULA: $\frac{\text{Total Sewerage Generated Per Day or Per Year}}{\text{Total Population of the City}}$

UNIT OF MEASUREMENT: Ratio, hence pure number

SIGNIFICANCE: It is a basic measure, which gives quick broad indication. For knowing and planning additional sewerage, infrastructure per capita basis is useful.

INFERENCE: It is a quantity indicator and helps us to know magnitude of sewerage issue on per capita basis

If a city is, has a sizable floating population then sewerage generated by floating population should be taken into account to arrive at a correct figure.

- Share of Non-domestic sewage

INDICATOR FORMULA: $\frac{\text{Domestic Sewage Generation per Day (MGD)}}{\text{Total Sewage Generation per Day (MGD)}}$

UNIT OF MEASUREMENT: Ratio

SIGNIFICANCE: Non-domestic or industrial sewerage is much more harmful than domestic sewerage. Depending upon its composition it damages sewerage lines and treatment plant machinery. Also with its presence in large quantity, the sludge loses quality as bio-fertilizer and becomes unsuitable for agriculture. It is necessary to create separate collection and treatment system for non-domestic sewage wherever possible.

INFERENCE: It indicates quantity, that is, magnitude of Non-domestic sewage, if one uses geographical disaggregation then it can even indicate where and how non-domestic sewage get generated and where it flows.

The extent of harm caused by non-domestic sewerage depends on its type. This indicator simply indicates quantity and not the quality of non-domestic sewage.

- Share of sewerage taken care by gravity

INDICATOR FORMULA: $\frac{\text{Sewage Transmission taken care by Gravity}}{\text{Total Sewage Transmitted}}$

SIGNIFICANCE: Pumping of sewage consumes lot of electricity, which makes running of sewerage system costly. Ideally, sewage lines should be laid with appropriate gravity to minimise pumping and thereby electricity cost.

INFERENCE: It indicates dependence of sewerage system on gravity. Higher the value, ULB can minimise its electricity consumption. It also indicates engineering quality in laying sewer lines. This ratio can be calculated by taking into account sewage requiring pumping and lifting for taking it to disposal point. One can use following formulae

- Share of sewage requiring pumping and lifting

$$\frac{\text{Sewage requiring pumping and lifting for flowing}}{\text{Total Sewage Transmitted or flowed to disposal point}}$$

Both variants of this indicator fail to indicate other reasons behind the value. The geographical situation may require pumping and lifting sewage at various locations in order to flow it to disposal point.

- Infiltration Vs Inflow

INDICATOR FORMULA: $\frac{\text{Volume of Sewage infiltration}}{\text{Volume of Sewage inflow}}$

SIGNIFICANCE: Sewage infiltration is a serious aspect as it contaminates water supply and when it percolates, further it contaminates ground water reserves.

INFERENCE: High figures of this indicate that the sewage generated is either higher than the capacity of the sewerage network created or the pipelines are not seepage-proof. This helps to locate areas

where expansion of capacity of the sewerage network and improvement of the quality of pipelines are urgently called for.

Disaggregating over seasons and geographical area is a must since resources are scarce and can be streamlined to address seasonal problems rather than investing in complete major overhaul.

- Percentage of wastewater estimated to have by-passed treatment [71]

INDICATOR FORMULA: Amount of Wastewater discharged without treatment * 100

Amount of wastewater generated 1

UNIT OF MESUREMENT: percent

SIGNIFICANCE: This gives an estimate of the inability of the Authority to treat, recycle and use the generated wastewater effectively and the extent of pollution caused to the subsoil and groundwater, as well as natural water sources (that is carried over downstream), by seepage of sewerage water.

INFERENCE: Values tabulated over different wards of the ULB would help to locate areas that need urgent attention for targeting resources for building wastewater treatment facilities.

As far as urgency is, concerned this measure does not say very much about the extent and spread of the pollution that is caused by this discharge of wastewater. For example, an upper riparian area may cause more devastating damage to itself and to lower riparian areas, even with much smaller amount of untreated sewage discharge. Before taking resource allocation decisions at the planning stage based on this indicator, the type, degree and nature of pollution must be considered in all dimensions.

- % Sewage effluents discharged through Land Disposal

INDICATOR FORMULA: Amount of Sewage effluents disposed by land disposal * 100

Amount of sewage generated 1

UNIT OF MESUREMENT: percent

SIGNIFICANCE: Oxidation ponds method is used to manage the sewage effluents in a way that protects the natural water sources from the hazards of potential contamination, but this method can lead to ground water contamination.

[71] Canadian Municipal Performance Measurement Programme

INFERENCE: Indicates different methods utilised and their share in disposal of waste water. Comparing tabulated values over areas are likely to provide some areas incentive to explore the potential for Land disposal of Sewerage effluents.

Comparisons are valid only for areas having similar geological conditions, terrain, land distribution patterns (land availability) and land values.

- Protection of Usable Water

INDICATOR FORMULA: Distance of sewage disposal point from the nearest downstream flow of usable water

UNIT OF MESUREMENT: Kilometre

SIGNIFICANCE: The higher this distance, lower would be the potential of contamination of usable water sources by sewage.

INFERENCE: Values tabulated across neighbouring localities would help to pinpoint places needing urgent relocation of sewage disposing points.

Comparison across localities should be restricted to similar geological and topographical conditions, like gradient, permeability of subsoil, etc. and benchmarks should be set accordingly.

- Sludge Production

INDICATOR FORMULA: Tons of Sludge produced per year

UNIT OF MEASUREMENT: Tons per year

SIGNIFICANCE: the different types of solid material dissolved in waste water needs to be removed at appropriate stages and some part of it can be used as very good bio fertilizer.

INFERENCE: This is a measure of the sewage system's ability to turn waste material into a useful and valuable resource (manure).and effectively separate solid materials from the sewerage. Comparing different Sewerage Treatment Plants by it helps to measure efficiency of sludge production.

There is a lack of uniform guidelines and standards regarding the treatment of sludge and quality of sludge produced. Production alone is not sufficient it must be of appropriate quality and cost and must get sold. Sale will depend on its price and quality.

- Adequacy of Sewage Pumping Facilities

INDICATOR FORMULA: $\frac{\text{Installed Capacity of Sewage Pumping Stations}}{\text{Total Sewage requiring pumping}}$

SIGNIFICANCE: though it is ideal, it is not possible due to technical reasons to flow entire sewage by using gravity. Thus, sewage-pumping stations are installed at the points where gravity levels do not match. Pumping capacity should match to pumping requirement.

INFERENCE: It helps both way if ratio is higher than one then it indicates installed capacity is not used adequately and if it is less than one then it indicates lack of pumping capacity against requirement. Calculating figures for each pumping station and comparison helps in assessing adequacy and need for upgradation.

Indicates requirement and adequacy of system installed but does not reflect efficiency of installed infrastructure.

- Per Capita Resource Commitment for Sewerage and Sanitation Service

Please refer to Streetlight Section of the Chapter for working out this Indicator

- Staff per 1000 Sewerage Connections[72]

INDICATOR FORMULA: $\frac{\text{Total Staff working in sewerage service}}{\text{Total number of sewerage connections}}$

SIGNIFICANCE: Any service requires certain number of staff. In order to run it efficiently .Less or excess staffs creates problems in running of the service at efficiently.

INFERENCE: The ratio indicates adequacy of staff and helps ULBs to carry out necessary correction in provision of staff to run service efficiently.

Requires carefully worked out benchmark as sewerage service differ from city to city and therefore require different level of staff to run it. Also it is necessary to work out different disaggregate level to know adequacy of staff like technical, maintenance, operational, quality control etc. as explained below.

[72] City Managers' Association – Gujarat – Urban Indicators and Performance Measurement Programme

- Adequacy (Sufficiency) of Technical work-force

INDICATOR FORMULA: $\frac{\text{Number of technical Staff}}{\text{10 km of pipe length}}$

UNIT OF MEASUREMENT: number per 100 km

SIGNIFICANCE: Sewerage service is traditionally labour intensive and with the passage of time, it has become highly complex and needs technical know-how and skill.

INFERENCE: This is a measure of the sufficiency of staff having technical know-how and skill with which sewerage is collected, treated and disposed. It will help to locate areas where additional staff is necessary.

This is no more than a preliminary indicator. This does not say anything about whether the technical skills available match those required on the spot, whether appropriate equipment is available to make the best use of technical skill, or whether technical staff actually functions with efficiency or commitment. Sometimes technical qualifications may not impart knowledge of the local requirements and the ability to handle them

Sewerage service beside technical staff requires different types of workforce –, maintenance, operational, quality control etc. Each type of staff and its sufficiency is important from overall efficiency of Sewerage Service. Accordingly, ratios should be calculated for other disaggregates values using above formulae.

- Sufficiency of Maintenance workforce
- Sufficiency of Operational Workforce
- Sufficiency of Quality Control Workforce
- Adequacy of Lab Facilities for Quality Control[73]
- Adequacy of Storage Facilities for Treated Sewage

INDICATOR FORMULA: $\frac{\text{Capacity to store treated sewage}}{\text{Capacity required for treated sewage}} * \frac{100}{1}$

[73] Tata Energy Research Institute – New Delhi – Urban Services Environmental Rating System

UNIT OF MESUREMENT: percent

SIGNIFICANCE: This gives an estimate of the ability to use treated wastewater.

INFERENCE: Properly documented values will help to locate and redress gaps in storage facility of safe, non-potable water.

This says nothing about whether the stored water is actually effectively distributed and used.

- Adequacy of quality control facility

INDICATOR FORMULA: $\frac{\text{Laboratory facilities available for monitoring WWQI}}{\text{Lab facilities required on regular basis as per standards}}$

UNIT OF MEASUREMENT: Ratio, so no unit.

SIGNIFICANCE: The composite nature of this indicator makes it very complex, since each 'laboratory facility' is dimensionally different from the other and so may not be added. It should ideally be appropriately disaggregated into the constituent components.

Each 'laboratory facility' (e.g., chemicals, apparatus, various grades of skilled personnel) has to be appropriately quantified and expressed as a ratio to the benchmark set by 'departmental protocol'. According to local priorities, an appropriate weightage should be attached to each component.

Disaggregated Values should be computed and tabulated for different stages of treatment and for various harmful substance that may be present in waste water

INFERENCE: This would help to identify and locate gaps, and focus on deficiencies in the testing of wastewater quality so that appropriate remedial action may be taken according to priority, given resource constraints.

The actual mathematical configuration of this indicator (or any of its disaggregated components) will have to be worked out by its particular user (planner, administrator, technician, researcher, etc.) according to need, priority and focus. This given formula is only a suggestion / clue and should be viewed as a broad structure.

QUALITY INDICATORS

- No of times Quality of Untreated Sewage Checked[74]

INDICATOR FORMULA: Number of times Sewage Quality is checked

before entering treatment plant

Standard Norms for checking untreated sewage

SIGNIFICANCE: It is necessary to check sewage at different places to know how it is changing in quality before entering it into treatment plants. Higher the figure greater is the efficiency with which the right kind of sewage is treated in the right kind of way, ensuring optimum, resource efficient use of the Treatment plant.

INFERENCE: It would be helpful to locate different types of sewerage flowing in the municipal sewers and the type of treatment required. Also, it will help to avoid damage to treatment plant due to high pollutants in sewage than the design capacity of STP.

This is relevant only where the treatment plant has the facilities for different treatment of different grades of sewage. The number of times sewage is checked says nothing about the effectiveness of checking, which in turn depends on the skills of the checking personnel.

- Number of times quality of Sewage checked under treatment:[75]

INDICATOR FORMULA: Number of times Sewerage quality checked in treatment plant

Standard Norms

SIGNIFICANCE: It is necessary to monitor quality of sewage during and after every process of treatment to ensure efficient functioning of STP.

INFERENCE: This would help to locate areas where frequent quality monitoring is necessary within the treatment plant and help to maintain overall quality of treatment.

This indicator only measures the commitment to frequent and efficient checking. The qualitative aspects of checking (depending on lab facilities and technical skill), which is very important to determine the effectiveness of treatment and disposal, falls outside its purview.

[74] Tata Energy Research Institute – New Delhi – Urban Services Environmental Rating System
[75] Tata Energy Research Institute – New Delhi – Urban Services Environmental Rating System

- Number of time quality of Sewage checked after treatment:[76]

INDICATOR FORMULA: Number of Times Sewage quality is checked after treatment

Standard norms for quality checking

SIGNIFICANCE: Ultimately, what is important is the quality of treated sewerage. This reflects the ULB's persistence and diligence in its commitment to protect the environment and health of the people within its jurisdiction, from the damaging effects of sewage.

INFERENCE: It helps ULB to know efficiency of STP in treating sewage. It also helps to locate ULBs that are not appropriately efficient in monitoring the quality of sewage before disposing it into the environment.

This indicator only measures the commitment to frequent and efficient checking. The qualitative aspects of checking (depending on lab facilities and technical skill), which is very important to determine the effectiveness of treatment and disposal, falls outside its purview.

- Wastewater quality after Primary treatment

INDICATOR FORMULA: Total Suspended Solid (TSS) particles per millilitre of sewage after primary treatment.

UNIT OF MEASUREMENT: Number per millilitre

SIGNIFICANCE: This measure is a reflection of the ability (higher the figure, less the ability) of the primary treatment process to separate and remove solid substances from the wastewater (causing potential health hazards or choking /blockage of the subsequent treatment network).

INFERENCE: This can help ULB to improve effectiveness of primary treatment.

This measure does not distinguish between various types of TSS (some maybe more harmful than others, e.g., radioactive) and so is not a completely reliable indicator of the extent of harm caused by the remaining TSS. Some STPs may receive sewage containing more but harmless TSS while others may have less but very harmful ones.

[76] Tata Energy Research Institute – New Delhi – Urban Services Environmental Rating System

- Wastewater quality after Secondary treatment

INDICATOR FORMULA: Pathogenic Bacteria count per millilitre + BOD (biological oxygen demanding substances, that is harmful for aquatic life) per millilitre + number other micro-organisms per millilitre

UNIT OF MEASUREMENT: Number per millilitre

SIGNIFICANCE: This indicator reflects the effectiveness of the secondary treatment that renders wastewater free from disease causing bacteria and safe for aquatic life, and therefore ready to be disposed into water bodies or used as non-potable water, e.g., horticulture.

INFERENCE: This can help ULBs to improve effectiveness of secondary treatment. It can be used for inter-municipal body comparison.

Water that has passed through secondary treatment may be relatively free from pathogenic bacteria but may have the potential to generate and build up slime and algae. Thus even if this figure is low enough to be regarded as safe, caution should be exercised regarding its use and disposal

- Wastewater quality after Tertiary treatment

INDICATOR FORMULA: $\frac{\text{Number of Samples containing Phosphates and/or Nitrates and/or BOD substances (left over from secondary treatment)}}{\text{Number of samples tested.}}$

UNIT OF MEASUREMENT: Ratio, so pure number.

SIGNIFICANCE: If this figure is lower than the stipulated benchmark, the treated wastewater is suitable for unrestricted horticultural/ agricultural use.

INFERENCE: This can help to locate STPs and the ULBs where the effectiveness of secondary and tertiary treatment can and needs to be improved.

By itself, good performance on this indicator does not mean much to the residents of the ULB if there is no separate distribution network for non – potable water. This water is certainly not safe for human consumption unless it is further treated by Ultra violet Radiation, Chlorination, Micro filtration, Peroxy -Acetic acid Addition, Distillation or Reverse Osmosis, all of which are too expensive for many Third World ULBs

- Influent exceeding standard quantity

INDICATOR FORMULA: Number of days per year that the influent exceeds standards

UNIT OF MEASUREMENT: Number per year

SIGNIFICANCE: This is a measure of the ULB's capacity to contain the generated sewage and wastewater within its service network.

INFERENCE: This measure helps to locate areas where the capacity of the sewage service needs to be expanded and storage facilities reinforced

The figures for this indicator are likely to follow a seasonal pattern. Appropriate desegregation is necessary

- Effluent exceeding quality standards

INDICATOR FORMULA: Number of days per year, the amount of effluent exceeds standards

UNIT OF MEASUREMENT: Number per year

SIGNIFICANCE: Out of two ultimate purposes of any sewerage system one is treating sewage to acceptable standard and then releasing it. In this context, this indicator acquires important place.

INFERENCE: If this number is too high then it clearly indicates that ULB is not adequately meeting its basic purpose of treating sewage generated. This helps to locate areas that need urgent expansion of disposal, storage or treatment options for sewage.

Figures should be disaggregated for various seasons.

EFFICIENCY INDICATORS

Throughout the sewerage system there will be people to 'operate' it by running it and keeping it functioning. There will be maintenance personnel to keep it going in order, technical personnel in charge of monitoring and improving quality of service and lab personnel to test the effectiveness of treatment and safety of disposal. Efficiency of sewerage service depends heavily on efficiency of human element. Efficiency also depends on utilisation of installed capacity of plant and machinery and other infrastructure.

- % Utilisation of Sewage Pumping Capacity

INDICATOR FORMULA: $\frac{\text{Sewage pumped by pumping stations}}{\text{Installed Capacity of pumping stations}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: it is necessary to monitor continuously capacity utilisation of sewage pumping stations. Some may not be receiving adequate sewerage at the same time some may be receiving sewage inflow more than their operational capacity

INFERENCE: It is an output indicator. This indicator helps ULBs to know how best their sewage pumping capacity is put to use. It also helps in deciding upgradation plan.

The pumping capacity may not be put to best use due to non-availability of power supply or inadequate capacity of sewer lines or sewage may not be flowing in adequately. One needs to use other indicators to know complete picture.

- % Utilisation of Sewage Treatment Capacity

INDICATOR FORMULA: $\frac{\text{Sewage Treated By STP/STPs}}{\text{Sewage Treatment Capacity of STP or STPs}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Treatment being important process needs, continuous monitoring.

INFERENCE: An output indicator, very useful to measure utilisation efficiency of the capacity created. If utilisation is less than 95 per cent, ULB should look into all possible reasons.

It is quantitative in nature, does not reveal quality/effectiveness with which waste water was treated. It should be used in combination with quality indicators to get real picture.

- Frequency of technical breakdowns of Sewerage System

INDICATOR FORMULA: $\frac{\text{Number of working days that the Sewerage system was inoperative due to technical problems}}{\text{Number of working days a year}}$

UNIT OF MEASUREMENT: Ratio, so pure number

SIGNIFICANCE: Sewerage service is required 24 hours for 365 days. Inoperative sewerage system cause great distress. It becomes therefore necessary to analyse frequency of breakdowns of sewerage system and causes underlying it. Disaggregate level indicators should be used to analyse each of the cause underlying breakdown. For example –

INDICATOR FORMULA: $\frac{\text{Average number of sewer breaks}}{\text{100 km of sewer network}}$

UNIT OF MEASUREMENT: number per 100 km

INFERENCE: This is a measure of the technical and operational consistency of sewerage service. It helps to locate areas where technical improvement (of equipment and /or staff) is necessary

It is not always easy to distinguish technical problems from operations and maintenance problems. The breakdown may in pipes, in pumping stations or in treatment plants or may be due to staff problems.

- Pipeline (Breaks) Repaired or Replaced during the year[77]

INDICATOR FORMULA: $\frac{\text{Km of pipe repaired or replaced in a year}}{\text{Total Km of pipeline}}$

UNIT OF MEASUREMENT Ratio, so pure number

SIGNIFICANCE: This indicator speaks of the running condition of the existing pipeline network of the sewerage system and the ULB's efficiency in repairing and replacing defective lines.

INFERENCE: This helps to locate areas where Pipes have had to be frequently repaired, and so the pipelines may need overhaul and major replacement. It can draw attention toward quality of pipes used or extra corrosive quality of soil in particular area.

The effectiveness of this indicator would depend greatly on the efficiency, commitment and alertness of staff. In some areas, even slightly defective pipes may have been promptly repaired while in others, very defective pipes may be functioning under neglect and apathy. Sometimes unnecessary

[77] Tata Energy Research Institute – New Delhi – Urban Services Environmental Rating System

repairs/replacement might have been undertaken due to pressures of unscrupulous contractors on corrupt officials.

- Cleaning frequency

INDICATOR FORMULA: $\frac{\text{Number of times sewers have been cleaned}}{\text{Month}}$

UNIT OF MEASUREMENT: Number per month

SIGNIFICANCE: Sewer lines become silted over time. If cleaned regularly then except in an extra-ordinary circumstance, sewer lines never get blocked and thereby save ULB from firefighting or crisis management exercise.

INFERENCE: This indicator is a measure of proactive maintenance to maintain smoothness of flows within the sewerage network. This locates areas where the sewers are not cleaned frequently enough, causing potential health hazard from blockage and resultant overflow

It does not address quality of cleaning operation and inadequacy of sewer lines compare to flow in particular area... Depending on local geo-climatic conditions, sewers in some areas may warrant more frequent cleaning than in others. Higher value may be suggestive of serious structural problems with sewerage system and not efficiency.

- Efficiency in Manhole Cleaning

INDICATOR FORMULA: $\frac{\text{Number of Manholes cleaned during the period}}{\text{Manholes required to be cleaned during the period}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: Surcharged or overflowing manhole is a nightmare and public health hazard. Most of the time it is a result of non-cleaning of manhole.

INFERENCE: This indicator clearly indicates proactive maintenance efficiency of ULB. It also provides information whether there is well laid cleaning and maintenance plan in ULB for manholes. Area and season wise analysis helps to locate inefficiency in the system.

It is an output indicator but of quantitative nature hence does not indicate the quality and effectiveness with which the manhole was cleaned. It should be backed by effectiveness analysis e.g. measuring how many manholes got chocked up within one month of cleaning operation.

- Sewer Blockage – Frequency, Days

INDICATOR FORMULA: $\frac{\text{Number of days or incidences when sewer is blocked}}{\text{Year}}$

UNIT OF MEASUREMENT: number per year

SIGNIFICANCE: This measures the authority's inability to keep the sewers clear of debris, and the residents' apathy in dumping solid particles into the sewerage system

INFERENCE: This helps to locate areas where staff should be more alert at keeping the sewers free of blockage causing objects and residents more aware of not dumping solids into the sewerage system.

Very simple ratio, not limited by serious limitation. It does not provide intensity of blockage or time take to clear blockage.

- Number of Sewer Backups per 100 kilometre of sewer lines per year[78]

INDICATOR FORMULA: Instances of Backward Sewer flow during the year or per km with area specific information.

UNIT OF MEASUREMENT: Number per km

SIGNIFICANCE: This is a measure of the hazard posed by backward flow of sewage causing potential threat of overflow

INFERENCE: This would help to locate points where there is urgent necessity of installing appropriate valves to prevent backward flow

This indicator is sensitive to geo-climatic conditions, particularly amount and seasonal distribution of rainfall

- Working Efficiency of Sewage Pumping Stations

[78] Canadian Municipal Performance Measurement Programme

INDICATOR FORMULA: Total working hours of the Sewage Pumping Station

(Total Hours Working in year -365*24)

SIGNIFICANCE: This is an efficiency indicator.

INFERENCE: This will help to locate the areas where the SPSs are not functioning at their best. By analysing causes behind inefficiency, ULB will be able to prepare upgradation plan.

Some SPSs may be technologically more advanced and so, may be able to deal with the same amount of Sewage in a shorter time span than others that are technologically backward. Therefore, there can be no 'across the board' comparison between SPSs. Only those operating with the same state of technology may be compared. SPS may not be able to function because of lack of power supply or sometime even sewage supply.

- Working Efficiency of treatment plants

INDICATOR FORMULA: Total working hours of the STP

(Total Hours Working in year -365*24)

SIGNIFICANCE: This is an efficiency indicator.

INFERENCE: This will help to locate the areas where the STP is not functioning at its best.

Some STPs may be technologically more advanced and so, may be able to deal with the same amount of Sewage in a shorter time span than others that are technologically backward. Therefore, there can be no 'across the board' comparison between STPs. Only those operating with the same state of technology may be compared. STP may not be able to function because of lack of power supply or sometime even sewage supply.

- Frequency or Efficiency in Sewage Quality Monitoring

INDICATOR FORMULA: Number of times Sewage quality is checked /samples taken

Number of times Sewage quality is required to be checked during the period

UNIT OF MEASUREMENT: number per year /no. per year; pure number. So no unit

OBSERVATIONS: This indicator shows the Authority's commitment in monitoring Sewage quality. Disaggregated values must be calculated for collection points, before treatment and after treatment points

INFERENCE: There may be variations across years due to exogenous factors. Therefore, an annual average figure would be more suitable.

EXPANSION & DEVELOPMENT INDICATORS

As population and area of the city keeps on increasing continuously, expansion and development of an urban service is inevitable. An urban service should not only be sufficient to meet demand and efficient in operation, but it must upgrade, expand or develop sufficiently.

- Growth in Population served by underground sewerage system

INDICATOR FORMULA: {(Yi –Yo) / Yo} * 100

Where Yo is Population served by UGSS in the initial year, Yi is that in the final year

UNIT OF MEASUREMENT: Percent.

SIGNIFICANCE: This indicator is a measure of the Service Provider's, ability/competence to meet the growing demand for water. Disaggregated values should also be recorded for different seasons and different localities

INFERENCE: Disaggregated values for different localities help to pinpoint places where the demand for Sewerage and sanitation service has increased the most and whether proportionate resources and efforts have been deployed or not. This can be a starting point of understanding and recording the causes for this increase in demand (e.g., growth in industrial activity generating in-migration; spurt of commercial activity and subsequent tertiary sector activity, formal or informal; rural poverty driven in- migration, etc., all leading to a sudden population growth).

This indicator, on the positive side measures efficiency and competence of the Authority to meet growing demand, but on the negative side it should also be recognized as a measure of the additional pressure on the resources of the Authority, in various areas. To minimize (and anticipate) this pressure in the long term, tabulated disaggregated values may be used by city planners and higher tier governments, to achieve better spatial balance in regional development,-economic and social.

- Percentage Decrease in uncollected sewage

INDICATOR FORMULA: {(Yo –Yi) / Y_0} * 100

Where Yo is uncollected sewage in the initial year, Yi uncollected sewage in the final year

UNIT OF MEASUR EMENT: Percent

SIGNIFICANCE: Improvement and sustainability of sewerage and sanitation service depends on its ability to reduce uncollected sewerage. This becomes possible through upgrading of sewerage collection network, treatment facilities and disposal options.

INFERENCE: It is a very good indicator of efficiency. It measures ULB's/Authority's performance in reducing uncollected sewerage.

One has to be careful about data. There should not be change in method of measuring and reporting uncollected sewerage.

- Percentage Decrease in untreated sewage

INDICATOR FORMULA: {(Yo –Yi) / Y_0} * 100

Where Yo is untreated sewage in the initial year, Yi is untreated sewage in the final year

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Improvement and sustainability of sewerage and sanitation service depends on its ability to reduce untreated sewerage. This becomes possible through upgrading of sewerage collection network, treatment facilities and disposal options.

INFERENCE: It is a very good indicator of efficiency. It measures ULB's/Authority's performance in reducing untreated sewerage

One has to be careful about data. There should not be change in method of measuring and reporting uncollected sewerage

- Percentage Increase in Area Coverage by underground sewerage system
- Percentage increase in Sewage Treatment Capacity
- Expansion of Sewerage Service against desired or planned development

This indicator has been explained later on under Road and Storm Water Service. Following that explanation, it should be calculated for sewerage service also. Also it should be worked out on disaggregate level to cover various components of sewerage service like collection network, pumping stations, treatment plants etc.

- Upgrading of Human Resources

INDICATOR FORMULA: Total amount spent on staff training and HRD Activities

Total Expenditure on Sewerage and Sanitation by an agency

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Improvement and sustainability of Sewerage and sanitation depends to large extent on quality of staff. Upgrading staff quality is the final frontier and involves sizeable cost.

INFERENCE: This is a measure of the attention paid to upgrade the quality of the staff in order to deliver better quality of service.

Comparisons should be restricted to those with approximately similar initial level staff quality. It is a quantitative indicator; expenditure may not result in improvement in staff quality. Quality and effectiveness indicators should also be considered to judge agencies' efforts.

CUSTOMER SATISFACTION INDICATORS

Any urban service is managed or delivered ultimately for the consumers. Any performance measurement will be incomplete without measuring consumers' satisfaction about the service. This section dwells upon indicators that measure the extent to which customers (residents of the urban area being serviced by the ULB's sewage disposal services) are satisfied with the state of maintenance and the efficiency of existing sewerage network.

- Number of consumers satisfied with overall quality of Sewerage Service

INDICATOR FORMULA: Number of consumers satisfied with service * 100

Total number of consumers 1

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: It is a sort of quick ratio to understand overall satisfaction of people about Sewerage and sanitation service.

INFERENCE: This is a quick ratio to measure the extent of consumers' satisfaction with the sewerage and sanitation service. If this is lower than a stipulated benchmark, steps should be taken to look into the causes of low water-pressure and accordingly, steps should be taken for improvement.

This is meaningful only where there is uniformity of consumer awareness and expectations

- Complaints frequency

INDICATOR FORMULA: Number of complaints per year

UNIT OF MEASUREMENT: Number per year

SIGNIFICANCE: This would help to capture the frequency with which the sewage disposal service falls short of the residents' satisfaction, and thus act as a pointer to the necessity of large scale overhaul of pipelines, apparatus or staff

INFERENCE: This indicator would help to locate and focus on areas where there is a major gap in the expected and actual quality of service delivery.

The frequency of complaints would vary with the residents' awareness, ability to complain (articulate), education, and culture. Thus, complain frequency would tend to vary with the residents' profiles and expectations.

- Response to Customers

INDICATOR FORMULA: $\frac{\text{Number of customers satisfied with response to complaints}}{\text{Number of customers who complained}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Complaints may occur because of various reasons some of which may not be in the hands of ULBs. As a result, it may not be possible to reduce number of complaints beyond a point but in such circumstances, what is more important is how well complaints were handled by ULB or how satisfied the consumers are with complaints' redressal by ULB and not the number of complaints.

INFERENCE: This measure enables users to compare quality response to complaints over ULBs, locate and focus on gaps between actual and expected performance.

Satisfaction of customers would depend on their expectations. Different customers have different expectations, depending on their education level, exposure and cultural background. Therefore, comparisons should be made with caution.

- Promptness of Response

INDICATOR FORMULA: $\frac{\text{Number of Complaints redressed in time}}{\text{Number of Complaints}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: The most important characteristic of any response to consumer complaint. It is the promptness, which generate maximum satisfaction, hence very important measure of consumer satisfaction.

INFERENCE: This is a measure of the promptness with which complaints are attended by ULB. This helps to locate areas having a significant gap between expected and actual performance.

It says nothing about the quality of repair service and the overall state of maintenance of the sewerage distribution system. Ideally, there should not be a high number of complaints to necessitate a high number of redresses. Also needs benchmarks in terms of ideal response time for each type of complaint.

- Review of Complaints Redressal Machinery

INDICATOR FORMULA: Number of times a year complaints have been reviewed.

UNIT OF MEASUREMENT: Number per year.

SIGNIFICANCE: Creating a system of complaints' redressal is not sufficient, it requires constant monitoring and through review at specified interval.

INFERENCE: This can help to locate areas having a significant gap between expected and actual performance of the working of the entire complaints' redressal machinery.

Good performance on this indicator may reflect commitment towards better long run service but it does not ensure that the lessons, conclusions and guidelines of the review are actually implemented.

ADMINISTRATIVE & GENERAL INDICATORS

- Percentage of total sewerage workforce covered by personnel system

INDICATOR FORMULA: $\frac{\text{WSS Workforce Covered by Personnel Systems}}{\text{Total Workforce Employed for Sewerage and Sanitation}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: At many places, Sewerage and Sanitation employees (workforce) are on temporary or daily-wage basis. Such workforce is not covered personnel system and does not get various benefits. This leads to motivational and work quality problems.

INFERENCE: If this measure indicates very high proportion of workforce outside personnel system than that ULB or Authority is likely to face motivational and quality problem.

Cases where this figure is too high should be approached with caution. Bringing maximum workforce under personnel system depends on legal, administrative and political aspects

- Expenditure on Sewerage Staff

INDICATOR FORMULA: $\frac{\text{Expenditure on Sewerage Staff}}{\text{Total Expenditure or Establishment Expenditure of ULB}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCE: This is a measure of the proportion of resources spent on staff for the running sewerage and sanitation department. This ratio should be worked against total expenditure of ULB and total establishment expenditure of ULB.

INFERENCE: This gives a clear idea of the resources spent on staff in comparison with other expenditures on operation, maintenance and investment (in new or updated equipment) of the sewerage service. When it is compared to total expenditure, it shows share of sewerage service in total establishment expenditure.

The usefulness of this indicator varies from case to case. On a general level, it is ambiguous. It is hard to tell whether fewer resources spent on the upkeep of staff compare to those spent on operations and maintenance is necessarily better or worse for ULB. The relative necessity of staff and, resources

for operations and maintenance depends on a number of factors, such as labour intensity of existing network and equipment, necessity of highly paid technical staff, geo-climatic conditions, etc.

- Weightage of Administration

INDICATOR FORMULA: $\frac{\text{Number of Administrative personnel}}{\text{Number of Operations and maintenance personnel}}$

UNIT OF MEASUREMENT: Ratio, so pure number

SIGNIFICANCE: This measures the extent to which human resources are diverted to administration compare to operations and maintenance that actually makes a difference to the quality of sewerage and sanitation service. The lower this figures the more efficient and effective the use of the manpower employed.

INFERENCE: This helps to locate areas burdened with administrative overstaffing.

It is difficult to have benchmark for this, and so it will be difficult to know how many people are in excess.

FINANCIAL INDICATORS

Cost Related Indicators

Cost can and should be examined from various angles to find out areas of inefficiency. This group contains aggregate cost ratios and disaggregate cost ratios. Main aggregate level ratios have been explained while disaggregate cost ratios have been explained up to the formula stage.

- Operating Costs for Wastewater per kilometre of Sewer Line[79]

INDICATOR FORMULA: $\frac{\text{Total Operating costs of Sewerage Service}}{\text{Kilometres of sewer lines}}$

SIGNIFICANCE: It is an aggregate indicator but can be used to calculate disaggregated values of each component of cost. –

[79] Canadian Municipal Performance Measurement Programme

- Total Cost of Salary per kilometre of Sewer Lines
- Total Cost of Administrative per kilometre of Sewer Lines
- Total O & M Cost per kilometre of Sewer Lines, and
- Total Interest Payment and Financing Cost per kilometre of Sewer Lines

INFERENCE: It gives the overall level of expenditure and cost efficiency

This is dependent on precisely calculated city specific benchmarks, for example, a city may have highly flat terrain and problem of matching of gravity levels. It may warrant more sewage pumping stations and may have to lay pressure lines to improve flow of sewerage. This will involve increase in electricity consumption and will boost cost per unit of waste water collected and disposed.

- Cost per Kilolitres of Sewage Treated

INDICATOR FORMULA: $\frac{\text{Total Expenditure of the UGSS during a Financial Year}}{\text{Million kilolitres of Sewage Treated}}$

SIGNIFICANCE: This is an aggregate level quick ratio, used for inter ULB /agency comparison. Using the same formula one can work out disaggregated indicators like

- Total Cost per Kilolitres of sewage produced,
- Total Cost per Kilolitres of sewage treated or

Cost as per different process from sewage sourcing to delivery

- Sourcing Cost per Kilolitre of Sewage
- Treatment Cost per Kilolitre of Sewage
- Transmission Cost per Kilolitre of Sewage
- Delivery Cost of per Kilolitre of Sewage

Cost as per components of cost like –

- Salary Cost per Kilolitres of sewage,
- Administrative Cost per Kilolitres of sewage
- O&M cost per Kilolitres of sewage; etc.

INFERENCE: This provides an overall level of expenditure and cost efficiency per kilolitres of sewage. The disaggregated indicators if worked out along with this broad indicator can give a complete picture of cost incurred, and specifically locate inefficiency.

These ratios will have no meaning on standalone basis. Effectiveness of analysis will be dependent on precisely calculated city specific benchmarks.

Following indicators which are applicable to sewerage service and should be utilised as per necessity but have not been explained here for want of space and as they have been explained under water supply indicators head of this chapter and in the chapter on financial indicators.

- Total Cost per Household
- Cost incurred per capita for sewerage system
- Cost per capita of waste sewage treated
- Average / Annual Growth in Total Revenue Expenditure of UGSS
- Average/Annual Growth in Salary Expenditure
- Average /Annual Growth in O & M Expenditure
- Average / Annual Growth in Interest /Finance Charge Expenditure, etc.
- Cost of Administration

Revenue or Earnings Related

- Revenue mobilised from tax sources for Sewerage Service
- Revenue mobilised from non-tax sources for Sewerage Service
- Revenue from sale of by-products less costs

Cost vs. Earnings Relational Indicators

- Working Ratio

Operating cost to operating revenue; should be below 1 if financial management good

- Operating ratio

Same as working ratio; only difference is that depreciation included in cost; debt service included in neither.80

- Excess expenditure incurred/ budgetary allocation
- Staff to revenue ratio
- Staff to expenditure ratio
- Non-tariff revenue as percentage of operation and maintenance cost

[80] TERI file (water and wastewater utilities) TWUWS

Chapter 5 -C Indicators for Solid Waste Service

Index

MUNICIPAL SOLID WASTE MANAGEMENT _____ 174

INTRODUCTION _____ 174

COVERAGE/EXPLANATORY INDICATORS _____ 175

- Coverage by Door to Door Solid Waste Collection Network _____ 175
- Average number of customers per collection route kilometre _____ 175
- Population Covered by Solid Waste Collection (Community Bins) Service _____ 175
- Population Disposing Waste in Open (Not Covered by SW Collection System) ____ 176
- Slum Population Coverage by Solid Waste Management Service _____ 176
- Area Covered under Formal Solid Waste Service _____ 176
- Solid Waste Collection against Generation _____ 177
- Per Capita Generation of Solid Waste _____ 177
- Population or Households per Collection Bins _____ 178
- Population or Households per Sweeper _____ 178
- Area per Sweeper _____ 178
- Compostability of Solid Waste Collected _____ 178
- Recyclability of Non-compostable Waste _____ 179
- Access to Solid Waste Collection Network _____ 179
- Frequency of Street Sweeping _____ 180

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS _____ 180

- Solid Waste Recycled or Reused _____ 180
- Number of Dustbins per kilometre of Road length _____ 181
- Number of Dustbins per Waste Collection Depot _____ 181
- Number of Dustbins per 100 tons of Solid Waste Generated _____ 182
- Solid Waste Storage Capacity at Local Level _____ 182
- Solid Waste Capacity at Neighbourhood Level _____ 183
- Solid Waste Storage Capacity at Zonal Level _____ 183
- Solid Waste Storage Capacity at Treatment Centre _____ 183
- Per Capita Resource Commitment for Solid Waste Management Service _____ 184
- Solid Waste Workload per Employee _____ 184
- Manpower per Ton of Waste _____ 184
- Adequacy of Manpower for Collection _____ 185

- Adequacy of Manpower for Transportation _____ 185
- Adequacy of Manpower for Treatment and Disposal _____ 185
- Sweepers per Kilometre Road Length or per Sq. Kms. of Area _____ 186
- Adequacy of Wheel Barrows _____ 186
- Ratio of Mechanised Loading of Solid Waste _____ 186
- Adequacy of Vehicle Capacity to Transport Solid Waste _____ 187
- Age Analysis of Vehicles _____ 187
- Solid Waste Disposal by Composting _____ 188
- Solid Waste Disposal by Incineration _____ 189
- Solid Waste Disposal by Land Filling _____ 189
- Adequacy of Solid Waste Treatment Capacity _____ 190
- Adequacy of Disposal by Incineration Capacity _____ 190
- Adequacy of Land for Solid Waste Disposal _____ 191

QUALITY INDICATORS _____ 191

- Quality of Soil around Landfill Site _____ 191
- Water Quality around Landfill _____ 191
- Air quality around landfill _____ 192
- Air quality around incinerating plant _____ 192
- Quality of the Compost produced _____ 193
- Aesthetics _____ 193

.EFFICIENCY/EFFECTIVENESS INDICATORS _____ 194

- Collection Efficiency _____ 194
- Percentage of residential solid waste diverted (transported) _____ 194
- Transportation Efficiency _____ 195
- Efficiency in Transportation of Solid Waste-Household to Community Bins _____ 195
- Efficiency in Transportation of Solid Waste - Community Bins to Depots _____ 195
- Efficiency in Transportation of Solid Waste from Depots (Transfer Stations) to Disposal sites 195
- Aesthetics of Transportation _____ 195
- Regularity of solid waste transport (Vehicles) operations _____ 196
- Average Working Hours of Compost Plant/Incineration Plant or Mechanisation Plan per Day 196
- Effectiveness of Treatment _____ 196

EXPANSION/DEVELOPMENT INDICATORS _____ 197

- Growth in Population served by formal solid waste management service _____ 197

- Decrease in uncollected garbage _____ 197
- Expansion of Solid Waste Management Service against desired or planned development 198
- Upgrading human resources _____ 198
- Increase in the Area Served by the Solid Waste Management Service _____ 198

CUSTOMER SATISFACTION INDICATORS _____ 199

- Number of Complaints per Year /Day or Per Household _____ 199
- Customer Satisfaction about overall SWM Services _____ 200
- Customer Satisfaction about Response and Review by SWM Agency _____ 200
- Customer Satisfaction about Redressal of Complaints by SWM Agency _____ 200

ADMINISTRATIVE /GENERAL INDICATORS _____ 201

- Percentage of total Solid Waste Management workforce covered by personnel costs201
- Expenditure on SWM staff _____ 201
- Weightage of Administration _____ 202

FINANCIAL INDICATORS _____ 202

- Total Cost per Ton of Waste Collected or per household _____ 202
- Operating costs for solid waste collection, transfer and disposal per tonne or per household. _____ 203
- Operating costs for solid waste diversion per tonne or per household. _____ 203
- Average operating costs for solid waste management per tonne or per household. 203
- Cost of Transportation per tonne waste collected _____ 203
- Cost of Disposal per tonne waste collected _____ 203
- Cost Recovery _____ 203
- Revenue generated from recycling of waste materials _____ 204

ENVIRONMENTAL CONSERVATION INDICATORS _____ 204

- Regulatory Framework _____ 204
- Land Disposal – Site Identification _____ 205
- Leachate Collection System _____ 205
- Recovery of Resources/Energy _____ 206
- Monitoring of Air and Water _____ 206
- Use of Landfill site _____ 207

MUNICIPAL SOLID WASTE MANAGEMENT

INTRODUCTION

After Water Supply and Waste Water, the third most important service of modern urban life is solid waste management. The issue of collection and disposal of solid waste generated in an environmental friendly manner is acquiring alarming proportion. With growing population, size of city, environmental considerations and changing consumption pattern, solid waste management service is becoming more and more complex, technology intensive and expensive. Municipal bodies are required to spend more than 10 per cent of their resources on this service. The main components of any Municipal Solid Waste Management System –

- Generation
- Collection
- Transportation
- Treatment
- Disposal
- Recycle and re-use

In order to classify and describe indicators pertaining to solid waste, the same structure comprising COVERAGE/EXPLANATORY – QUANTITY/STATUS/RESOURCES COMMITED – QUALITY – EFFICIANCY - EXPANSION - CONSUMER SATISFACTION – ADMINISTRATIVE/GENERAL ASPECTS – FINANCIAL – ENVIRONMENT has been retained. Hundreds of indicators have been evolved to measure solid waste service and still further can be created, but it is not possible to take stock of all of them. Consequently, indicators provided here are illustrative and minimal. The indicators pertaining to Governance, Financial and other internal support services have been grouped under separate chapters but service specific administrative and financial indicators have been included in this chapter.

COVERAGE/EXPLANATORY INDICATORS

- ### Coverage by Door to Door Solid Waste Collection Network

INDICATOR FORMULA: $\frac{\text{Population Serviced by door to door garbage collection} * 100}{\text{Total population}} \quad 1$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: It is said that the cost of solid waste disposal doubles as soon as it falls on the ground. Door to door, solid waste collection in segregated manner is the ultimate test of solid waste collection efficiency. Unfortunately, in India, there exists a paradoxical situation – Indian municipal bodies do not have adequate resources, and indiscriminate dumping of solid waste in the open by everyone actually quadruples resources required for solid waste management but very few municipal bodies have implemented door to door garbage collection network. The complementary indicator while giving contract to private party for house to house collection of solid waste is –

- ### Average number of customers per collection route kilometre

INDICATOR FORMULA: $\frac{\text{Number of customers on collection routes}}{\text{Number of collection routes} * \text{Length in Kms}}$

INFERENCE: This measure indicates the extent to which people of the city have been covered by efficient garbage collection system. This helps to focus on localities that need more coverage in terms of door-to-door solid waste collection.

The effectiveness of door-to-door garbage collection depends a great deal on the quality of service at the micro-level. Irregularity and unpredictability may prompt residents to dump garbage more indiscriminately, than areas where residents are not covered by door-to-door collection and therefore are accustomed to adhere to some specific alternative arrangement.

- ### Population Covered by Solid Waste Collection (Community Bins) Service

INDICATOR FORMULA: $\frac{\text{Population serviced by Community Bins} * 100}{\text{Total population}} \quad 1$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCE: For solid waste collection, second best alternative is providing dustbins/community bins in sufficient number and within the reach of people and ensuring regular cleaning of these dustbins/community bins. In this, people are expected to take solid waste generated in their houses/shops/workplace to these bins.

INFERENCE: It measures the availability of infrastructure to the people to dispose of the garbage generated in their houses or workplace. This also helps to locate areas that need more community/ULB bins to collect garbage.

The extent to which more bins would result in greater cleanliness depends upon how frequently those bins are emptied, how motivated the residents are and how strictly ULB enforces people to throw garbage in bins only, in using them effectively. (This will depend on neighbourhood cooperation, basic awareness of the necessity of hygiene, and the nature of the bins themselves)

- Population Disposing Waste in Open (Not Covered by SW Collection System)

INDICATOR FORMULA: $\frac{\text{Population dumping waste on the streets or in open} * 100}{\text{Total population (including slum population)}}$ 1

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: Waste when is disposed by people in the open because of absence of dustbins, community bins and door to door collection network, numerous problems arise, e.g., health hazard, high SWM cost, filth, low image etc. One needs to know how many people, and which areas are not covered by solid waste collection network for assessment and improvement of any solid waste service.

INFERENCE: This clearly indicates the failure of the ULB to serve people with SWM service and helps to locate ULBs requiring urgent attention for providing garbage collection and disposal facilities.

- Slum Population Coverage by Solid Waste Management Service

Refer to Water and Sewerage Service chapters.

- Area Covered under Formal Solid Waste Service

INDICATOR FORMULA: $\frac{\text{Area serviced by Solid Waste Service}}{\text{Total Area of the Service (Sq. Kms)}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percentage

SIGNIFICANCE: One needs to know not only number of people not covered by SWM but also the areas, which are not served by SWM service.

INFERENCE: This helps the ULB to know areas, which are not served presently by SWM. It does indicate the areas, locations but does not provide information about population density. Depending upon population –density, generation of solid waste will change from area to area.

- Solid Waste Collection against Generation

INDICATOR FORMULA: $\frac{\text{Amount of solid waste collected per day}}{\text{Amount of solid waste generated per day}}$

UNIT OF MEASUREMENT: Ratio, so, no unit.

SIGNIFICANCE: This is another basic coverage ratio. Besides, information on population and area are not covered. It is necessary to know how much waste was generated but not collected, to assess the status of solid waste service of any city.

INFERENCE: This measure indicates the capacity of the ULB to collect the waste generated in its jurisdiction. Tabulated across ULBs it indicates, which ULBs are likely to face SW related health hazards due to inadequate clearing of garbage from the city.

This indicator does not give a complete picture of effective cleanliness or environmental degradation caused by solid waste. This is so because collection is only a preliminary step that has to be followed up by effective transportation and disposal

- Per Capita Generation of Solid Waste

INDICATOR FORMULA: $\frac{\text{Total Solid Waste generated per day}}{\text{Population in the ULB jurisdiction}}$

UNIT OF MEASUREMENT: kilograms per capita

SIGNIFICANCE: Per capita basis analysis gives an overall indication of workload regarding solid waste in a particular city or area.

INFERENCE: This measure indicates the magnitude of solid waste per person that the ULB has to handle. Tabulated across ULBs, this gives us valuable insight about the waste generating potential of each ULB and helps to focus on ULBs that need to reduce solid waste generation.

The lessons to be learnt from this indicator are only broad and general. It does not help to relate the amount of waste generated by different socio-economic and cultural groups. The amount of solid waste generated has a lot to do with lifestyles. Moreover, no difference is made in the nature of waste generated. Wastes that are difficult to compost or re-use and recycle (even if they are smaller in amount) are much more difficult to dispose.

- Population or Households per Collection Bins
- Population or Households per Sweeper
- Area per Sweeper

Composition of Solid Waste

- Compostability of Solid Waste Collected

INDICATOR FORMULA: $\frac{\text{Solid waste collected that can be composted}}{\text{Tons of Solid Waste Collected}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: It is possible to generate wealth from waste. Waste can be converted in to quality bio-fertilizer (compost), but not all waste is compostable. There is a need for promoting public awareness on the use of articles that tend to be disposed as non-compostable waste, and the need to frame appropriate regulations for segregation of waste.

INFERENCE: This indicates feasibility to generate a resource (compost) from waste material. Figures should be averaged over different seasons, since fallen and dry leaves and other decaying flora may form a significant part of solid waste. Tabulated over different homogenous neighbourhoods, this gives valuable insight into the various kinds of waste generated by different economic strata and different socio-cultural groups in the resident population.

This indicator measures only the potential to generate a resource. The actual realisation of the potential (turning compostable garbage to compost as an economically viable venture) depends on other factors, for example, (1) the composting facilities available according to requirement and scale

and financial constraints of the ULB, (2) The market demand and the marketing facilities for compost (the compost can be used for horticulture, agriculture or as filling material for land disposal sites) (3) existence of subsidies for alternative chemical fertilizers.

- Recyclability of Non-compostable Waste

INDICATOR FORMULA: $\frac{\text{Tons of solid waste that can be recycled}}{\text{Solid waste that is non compostable}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: Beside compost, it is possible to derive valuable resources from non-compostable solid waste. It is necessary to know feasibility and impact of such recovery.

INFERENCE: This indicates the extent of reduction in quantum of solid waste responsibility to dispose as non-compostable waste.

The proportion of the waste that is recyclable may be large but that does not guarantee that it is actually recycled and the disposal burden on the ULB is reduced. The more poverty there is, the greater the market for recycled products; more effective is the actual recycling. In relatively affluent (consumerism driven) areas, low incentive to recycle does not sustain a viable market for recycled goods.

- Access to Solid Waste Collection Network

INDICATOR FORMULA: Average spacing between Household and SW storage bins

UNIT OF MEASUREMENT: Kilometres

SIGNIFICANCE: Existence of collection network in the form of dustbins or community bins is not sufficient. Bins should be easily accessible and appropriately spaced.

INFERENCE: Lower this figure, greater is the ease with which garbage can be collected and stored without creating nuisance and less the pressure on the capacity of the storage bins. It helps to know where the storage bins are more far apart than in others

Spatial placement of storage bins should depend on the special characteristics of an area e.g., population density, socio-cultural characteristics, etc.

- Frequency of Street Sweeping

INDICATOR FORMULA: Number of times streets are swept

Per week

UNIT OF MEASUREMENT: number per week

SIGNIFICANCE: This is an indication of the cleanliness of the streets in the jurisdiction of the ULB. This figure should be averaged over seasons and locations.

INFERENCE: This would help to draw attention to ULBs where street sweeping is less frequent.

The need to sweep the streets may vary from one area to another, according to density of population, economic activities and the socio cultural strata of the population. The effective cleanliness resulting from street sweeping depends on the quality of work delivered by the individual sweepers and the extent of effective supervision they are subject to.

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS

This group includes indicators, which describe the present situation of solid waste management system or measure the existing efforts in quantitative terms. It also includes indicators, which measure resources earmarked for the SWM Service by an urban local body. These indicators help in measuring the adequacy of system in terms of manpower, equipment etc. to take care of the solid waste service.

- Solid Waste Recycled or Reused

INDICATOR FORMULA: Solid Waste Recycled or Reused * 100

Total Solid Waste Generated 1

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This measures the efficiency with which the volume of waste is reduced before treatment and disposal, and the extent to which the waste generated and collected, is turned into a potentially valuable resource.

INFERENCE: This focuses on ULBs where recycling and reuse is less than that in others, so that they are given more opportunities and incentives to do so. They may also be educated on the benefits of re-use and recycling.

The extent of recycling and re-use depends on many factors, which are out of the ULB's control, for example, the socio-economic and cultural characteristics of the resident population. (an affluent , consumerism driven high income group has less incentive for recycling or reusing used objects unless they adhere to traditional values of frugality), the existence and network of a market for recycled products that is a typical part of the informal sector of the economy (that sustains low income groups), etc.

Collection Infrastructure

- Number of Dustbins per kilometre of Road length

INDICATOR FORMULA: $\frac{\text{Number dustbins provided}}{\text{Total length of Roads in km}}$

UNIT OF MEASUREMENT: Number per km

SIGNIFICANCE: Since population density and length of road is likely to vary, this figure should be disaggregated over various neighbourhoods of the ULB.

INFERENCE: This indicates the adequacy of dustbins/community bins in the streets of the ULB, and helps to locate areas where more roadside dustbins are necessary.

The actual adequacy depends on some other factors also, like the way the bins are use (sometimes garbage is littered around empty dustbins), promptness with which bins are cleared, the nature of the bins themselves (whether, properly covered, user friendly, or not)

- Number of Dustbins per Waste Collection Depot

INDICATOR FORMULA: $\frac{\text{Total Number of bins}}{\text{Number of Waste collection depot}}$

UNIT OF MEASUREMENT: number per collection depot

SIGNIFICANCE: Dust bins and community bins have forward linkage to collection depots (transfer stations). Adequate number of collection depots should be created to take care of garbage collected in bins before taking it for disposal – composting, incineration, land fill site etc.

INFERENCE: This focuses on those ULBs that should have more collection depots to take care of bins or more bins to improve efficiency of waste collection depots.

The effective benefit of bins depends on the extent to which the bins themselves are user-friendly, and how far the workers know how best to use them .The user of this indicator may be misled if he goes only by its magnitude. Higher figure may either imply sufficient (or greater) number of bins, or, insufficient collection depots (which is not such a good thing)

- Number of Dustbins per 100 tons of Solid Waste Generated

INDICATOR FORMULA: $\frac{\text{Number of bins}}{\text{Tons of solid waste generated}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Number/100tons

SIGNIFICANCE: This is another way to measure adequacy of bins for collection of waste. Solid waste represents the volume and needs space as a result bins must be in adequate numbers and their storage capacity should sufficient to take care of load of solid waste.

INFERENCE: This highlights ULBs that need more bins for the amount of solid waste generated.

The effectiveness of the bins depends on the way they are used by the people (user-friendliness and training) and maintained by the ULB.

Storage Capacity

- Solid Waste Storage Capacity at Local Level

INDICATOR FORMULA: $\frac{\text{Storage volume available at local collection centre}}{\text{Storage capacity required at local level}}$

UNIT OF MEASUREMENT: Ratio, so no unit.

SIGNIFICANCE: Management of solid waste requires storage capacity at different places and at different stages of transit or processing, for example at the local level, which is when solid waste comes out from households and workplaces. Subsequently storage capacity is required when solid waste gets collected and transferred to waste depots or transfer stations. Later on solid waste requires adequate storage space at compost plant or any other treatment plant and finally in the form of land fill site. The ratios should be worked out in disaggregate manner using following formulae –

- Solid Waste Capacity at Neighbourhood Level

INDICATOR FORMULA: $\frac{\text{Storage volume available at primary collection centre}}{\text{Storage capacity required (neighbourhood level}}$

- Solid Waste Storage Capacity at Zonal Level

INDICATOR FORMULA: $\frac{\text{Storage volume available at Zonal Depots}}{\text{Storage capacity required (zonal level)}}$

- Solid Waste Storage Capacity at Treatment Centre

INDICATOR FORMULA: $\frac{\text{Storage volume available for segregated solid waste at treatment centre}}{\text{Storage capacity required (treatment centre)}}$

INFERENCE: These indicators give an indication of the ULB's capacity to store and deal with the garbage that it collects at the different level. Tabulated over localities, stages of transit or processes these indicators can help to pinpoint where additional storage capacity is required and what is the relative urgency of this deficiency.

A high figure of this does not necessarily imply that the waste is properly stored and is safe. That depends on the nature of the waste, particularly whether or not it can cause health and environmental hazards (for example, radioactive wastes). Higher storage capacity need may arise because solid waste collection to disposal system may not be efficient. Further, presence of adequate storage facilities does not warrant any complaisance on the part of the ULB on the urgency of quick and safe disposal.

- Per Capita Resource Commitment for Solid Waste Management Service

Please refer to Streetlight Section of the Chapter for working out this Indicator

Manpower in Solid Waste

- Solid Waste Workload per Employee

INDICATOR FORMULA: $\frac{\text{Total amount of solid waste generated}}{\text{Number of employees}}$

UNIT OF MEASUREMENT: Tons per employee

SIGNIFICANCE: an employee can handle certain amount of solid waste beyond that there is will be need of additional hands or mechanical support. The relationship between amount of solid waste and manpower can also be worked by using following indicator

- Manpower per Ton of Waste[81]

INDICATOR FORMULA: $\frac{\text{Number of employees}}{\text{Total amount of solid waste generated}}$

INFERENCE: These indicators measure the workload shouldered by the workforce of the solid waste management department of the ULB. This measure draws attention to those ULBs where the employees shoulder a larger burden than average, and so call for hiring of more staff.

This indicator, as a composite figure may not convey a true picture of the burden if all categories of staff are aggregated. For example, employees of the administration, or finance wing would not be actually handling the waste and in moreover if those wings are overstaffed, a true picture of workload will not emerge. Careful desegregation is called for. Different compositions of solid waste call for different magnitude and quality of labour. So, only those ULBs with similar composition of solid waste can be unambiguously compared.

[81] Included in City Managers' Association – Gujarat – Urban Indicators and Performance Measurement Programme

- Adequacy of Manpower for Collection

INDICATOR FORMULA: Manpower (various categories) available for collection of solid waste / Manpower required for Collection

UNIT OF MEASUREMENT: Ratio, no unit

SIGNIFICANCE: Various benchmarks have been evolved regarding ideal requirement of manpower for solid waste collection and other processes of solid waste management like transportation, treatment, disposal etc. Using these general benchmarks city specific benchmarks should be worked out. Calculating adequacy of manpower at an aggregate level has no meaning; it should be calculated by using following disaggregated indicators.

- Adequacy of Manpower for Transportation

INDICATOR FORMULA: Manpower (various categories) available for transportation of solid waste / Manpower required for Transportation

- Adequacy of Manpower for Treatment and Disposal

INDICATOR FORMULA: Number of manpower (various categories) available for treatment and disposal of Solid Waste / Manpower required for Treatment and Disposal

INFERENCE: These indicators measure adequacy of manpower for various aspects of solid waste management, which can draw attention of ULBs that need to employ more staff for specific process or stage of Solid Waste.

While using these indicators, it is appropriate to compare only those ULBs with the same degree of mechanisation of various processes of solid waste.

Comparisons should be restricted to ULBs generating the similar kind of garbage and using the same treatment and disposal options.

- Sweepers per Kilometre Road Length or per Sq. Kms. of Area

INDICATOR FORMULA: Total Number of sweepers

Road Length (in kms) or Area (sq. kms.)

UNIT OF MEASUREMENT: Sweepers per km. Road length or per sq. kms.

SIGNIFICANCE: A sweeper can clean specific length of road or sq. mts. area. Beyond that, the quality of his work will deteriorate. There are generic benchmarks available for this but ideally; a ULB should work out suitable benchmarks for its city and different types of localities.

INFERENCE: It measures the number of sweepers per km road length or per sq. km. and thus helps ULB to know adequacy of sweepers and if tabulated across different areas of the city, this would help to focus on areas that need more sweepers.

It does not measure quality of work. The effective cleanliness of the roads depends not only on the number of sweepers but also on the quality of their work.

Tools and Equipments

- Adequacy of Wheel Barrows

INDICATOR FORMULA: Actual Availability of Wheel Barrows * 100

Total Solid Waste Loaded for Transportation 1

UNIT OF MEASUREMENT: percentage

OBSERVATION: Manual loading of solid waste results in health hazards for sweepers, consequently more and more mechanised handling of waste is recommended and adopted. The simple equipment for mechanised handling of solid waste is wheel barrows

INFERENCE: It will help to measure degree of mechanisation and its impact on efficiency.

Higher ratio indicates better standards for sweepers working in SW service but at the same time it indicates lower requirement of employees for SW service.

- Ratio of Mechanised Loading of Solid Waste

INDICATOR FORMULA: Solid Waste loaded through mechanised operations * 100

Total Solid Waste Loaded for Transportation 1

UNIT OF MEASUREMENT: percentage

OBSERVATION: Manual loading of solid waste results in health hazards for sweepers, consequently more and more mechanised handling of waste is recommended and adopted internationally. It indicates progressiveness of an urban local body. Mechanisation involves high cost and may reduce requirement of sweepers.

INFERENCE: It will help to measure degree of mechanisation and its impact on efficiency.

Higher ratio indicates better standards for sweepers working in SW service but at the same time it indicates lower requirement of employees for SW service.

- Adequacy of Vehicle Capacity to Transport Solid Waste

INDICATOR FORMULA: $\frac{\text{Capacity of vehicles' (all categories)}^{82} \text{ to transport SW}}{\text{Total tons of solid waste for transportation}}$

SIGNIFICANCE: Transportation of solid waste now fully depends on mechanised vehicles. It is necessary to have adequate vehicular capacity to transport solid waste. Excess capacity results in cost and resource inefficiency while shortage results in non-transportation of solid waste from bins to depots to treatment plant and thereafter to disposal.

INFERENCE: It measures the ULB's capacity to transport solid waste efficiently. This helps to focus on ULBs that need more transportation capacity for solid waste. Disaggregated over various categories of vehicles, this indicator can reveal accurately, the specific kind and extent of vehicle capacity required.

The nature and composition of solid waste generated varies across ULBs according to socio-cultural composition and economic strata and activity of the residents, and the way the solid waste is disposed. Accordingly, the need for transport capacity is also likely to vary. Comparisons should therefore be made with caution.

- Age Analysis of Vehicles

INDICATOR FORMULA: $\frac{\text{Number of vehicles more than 8 years old}}{\text{Total number of vehicles}} * \frac{100}{1}$

[82] Capacity of each vehicle to transport Solid waste * No. Of shifts per day = Total Capacity to Transport

INDICATOR FORMULA: percent

SIGNIFICANCE: Ageing of vehicles always involves mounting and unpredictable expenses on maintenance and repair. Purchase of new vehicles, though more expensive in the immediate time frame, is always a more cost effective, economical option in the long run.

INFERENCE: This measure indicates the extent to which the transporting capacity is outdated, so inefficient. ULBs showing higher figure of this indicator can be singled out for the up gradation of their vehicles for transport of solid waste.

This is a useful indicator but cannot be taken as final statement on efficiency of vehicles. Old vehicles may be working efficiently if they are maintained properly, compared to newer vehicles that are badly maintained.

Treatment and Disposal of Solid Waste

- ### Solid Waste Disposal by Composting

INDICATOR FORMULA: $\frac{\text{Solid Waste Disposed by Composting}}{\text{Total Solid Waste Generated or Collected}}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This indicator measures the ability of the ULB to safely treat and dispose solid waste in an environment – friendly manner, and turn waste into a valuable, soil enriching resource, namely, manure that can be used for horticulture, filling material in landfill sites and constructional needs.

INFERENCE: This helps to focus on ULBs that are not doing as well as their counterparts by way of composting their solid waste, so that they may be encouraged to do better by providing incentives, information / education, and facilities for composting

The composition of waste varies from one ULB to another and so does the computability. The cost of composting depends on the scale of composting that is suitable for the ULB. The incentive for composting depends on the market for compost as a manure (often there is subsidy on chemical fertilizers).

- Solid Waste Disposal by Incineration

INDICATOR FORMULA: Percentage of Solid Waste Disposed by Incineration

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Incineration is not a method for mass application due to environmental implications associated with it. But certain types of waste require incineration method of disposal.

INFERENCE: This indicator measures the extent to which the solid waste collected by the ULB, that has not been recycled or composted, is disposed by incineration. This indicator would help to focus on ULBs that incinerate less solid waste than others do. This can help planners to arrange for more incineration facilities.

Disposal of a high percentage of solid waste by incineration is not always desirable. It may harm the environment because of gasses emitted into the atmosphere. In this respect, the nature of solid waste may not even warrant incineration, given the impending threat to the environment. High figures on this indicator, may even speak of poor performance in the area of waste reduction, recycling and reuse, and composting.

- Solid Waste Disposal by Land Filling

INDICATOR FORMULA: Percentage of Solid Waste Disposed by Land Disposal

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: The waste that has not been disposed of in any other way has to accumulate in a land-fill site. The pressing problem is that of land availability, and the eventual pollution of the subsoil by seepage.

INFERENCE: In one way, this is a measure of the ULB's failure in reducing waste, through recycling, composting and incineration of the remainder. This helps us to locate ULBs where too much waste is disposed by land filling. These ULBs have to be given education, incentives and facilities for waste reduction through recycling, composting and incineration.

There may be a problem, not only with the extent, but also with the way Solid waste is land disposed. Even where the extent of disposal by land fill is low, it may be done in an unhygienic manner (e.g., in open dumps), that may cause greater risk to health and environment, than places where a lot of garbage is land disposed in conformity with health and environmental standards.

- Adequacy of Solid Waste Treatment Capacity

INDICATOR FORMULA: $\frac{\text{Solid Waste Treatment capacity available}}{\text{Solid Waste Treatment Capacity required}}$

UNIT OF MEASUREMENT: Ratio; no unit

SIGNIFICANCE: Compost treatment not only converts solid waste in a resource but also reduces quantum of waste

INFERENCE: This helps to draw attention to the ULBs that need more capacity to treat its collected solid waste and makes it non-harmful for land filling. Adequate treatment capacity is therefore the most crucial component of any SWM.

Comparisons among ULBs based on this indicator should be made, keeping in mind that different kinds of solid waste that is generated and collected, have to be treated in different ways and therefore require different capacities. Only those ULBs that generate similar kinds of solid waste should be compared by this indicator.

- Adequacy of Disposal by Incineration Capacity

INDICATOR FORMULA: $\frac{\text{Capacity of Incineration Plant Available}}{\text{Incineration Capacity Required.}}$

UNIT OF MEASUREMENT: Ratio; no unit

SIGNIFICANCE: Certain type of waste (bio-medical, hazardous) need incineration and should not be disposed through other disposal methods. If adequate capacity does not exists then such waste will get disposed in an environmentally unsuitable manner.

INFERENCE: This indicator is a measure of the ULB's capacity for incinerating the garbage that requires incineration, at an efficient rate. This helps to locate ULBs that need more incineration capacity.

The capacity required for incineration is determined by the limits of garbage disposal by composting and land filling. It also depends on whether the garbage can be incinerated within the safety limits of the environment. Incineration is a minor aspect of SWM. Keeping this in mind importance should be given to this indicator.

- Adequacy of Land for Solid Waste Disposal

INDICATOR FORMULA: $\frac{\text{Land available for Disposal of Waste}}{\text{Land required for Disposal of Solid Waste}}$

UNIT OF MEASUREMENT: Ratio; no unit

SIGNIFICANCE: The land capacity required for disposal of waste is determined by the limits of other methods of garbage disposal like waste reduction, composting, recycling incineration etc. Thus, there always is a need for adequate quantity of land to dispose waste because it cannot be left undisposed. But at the same time, land is a precious commodity and involves high cost.

INFERENCE: This indicator is a measure of the ULB's need for land. This helps ULBs to plan for procurement of additional land.

It does not take into account the fact that need for land to dispose waste depends on efficiency of other methods of waste disposal.

QUALITY INDICATORS

- Quality of Soil around Landfill Site

INDICATOR FORMULA: Percentage of hazardous chemicals in soil sample

SIGNIFICANCE: Hazardous chemicals (e.g., radioactive and biomedical wastes, chemicals like lead, arsenic, etc.) are likely to seep into the soil in the long run. It is possible to measure erosion in the quality of soil to determine quality of disposal process. Similar way water quality should also be monitored using for formulae.

- Water Quality around Landfill

INDICATOR FORMULA: $\frac{\text{Number of surface and groundwater samples taken within specified distance that pass the benchmark for WQI}}{\text{Number of samples taken}} * 100$

INFERENCE: This indicator can help to focus on analysis and monitoring of the composition of solid waste and giving proper treatment before disposal in the landfill.

Analysis of soil or water around landfill site will provide much delayed and end point information. Best way is to analyse composition of solid waste continuously and to remove hazardous, toxic elements from it before disposal.

- Air quality around landfill

INDICATOR FORMULA: Number of air samples taken within the specified distance of

$$\frac{\text{landfill that pass the air quality index benchmark}}{\text{Number of samples tested}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Gasses generated in a landfill site in many places deteriorates the air quality. As a result, residents suffer from foul odours and health hazards (ranging from dizziness, nausea, chronic headaches to major lung disorders and childhood cancers). Methane gasses generated in a landfill, unless effectively used or burnt, can harm the environment by depleting ozone layer. ULBs can deal with this problem by effective Landfill Gas Management Systems that contain and remove the gasses and use them as a source of energy, or burn them in flares (gas incineration). But these processes require technologies that may be too expensive for ULBs in a developing country.

INFERENCE: This can help to locate ULBs where residents are under stress from air pollution because of a nearby landfill site so that higher authorities can mobilize and streamline resources to tackle the problem.

- Air quality around incinerating plant

INDICATOR FORMULA: Number of air samples taken within the specified distance of

$$\frac{\text{incinerating plant that pass the air quality index benchmark}}{\text{Number of samples tested}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Incineration is a process by which solid waste is bunt in an incinerator under controlled condition. The process of burning pollutes the air around the incinerating plant with fine ash particles and other harmful air pollutants. This inevitable problem can be tackled through pollution control measure. The success of such measures needs constant, skilful monitoring of air quality around incineration plant.

INFERENCE: This helps to locate ULBs where the extent of air-pollution caused by solid waste incineration is higher than acceptable to take corrective measures.

Air pollution also depends on geo-climatic conditions type of dominant economic activity (industrial or other) and so comparisons need to be made with caution. Equipment for air pollution control may be prohibitively expensive.

- Quality of the Compost produced

INDICATOR FORMULA: Percentage of potentially hazardous material in random sample of compost produced.

SIGNIFICANCE: When garbage is put through composting, it produces manure which is eventually used for agriculture and gardening. If it contains hazardous material, radioactive substances and arsenic like lead then it can harm ground soil, water and agricultural products produced. There is need for strict quality control for compost produced from solid waste by ULB or any other agency.

INFERENCE: This indicator would help ULB to focus on quality of compost produced by it which if overlooked can cause substantial environmental damage and health hazards.

- Aesthetics

INDICATOR FORMULA:

$$\frac{\text{Length (kms) of roads that are well swept and free from visible open garbage}}{\text{Total road length (km))}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Aesthetics is important not only from the point of view of visual comfort, but also for the convenience of ULB in maintaining better public health and cleaner environment.

INFERENCE: This can help to bring to focus those ULBs that need to improve the cleanliness of its streets and aesthetics of its neighbourhoods.

.EFFICIENCY/EFFECTIVENESS INDICATORS

Using various benchmarks ULB may create adequate system in terms of manpower and equipment to collect, transport and dispose of solid waste generated but system may still not be efficient. Every aspect of SWM should be evaluated by using efficiency indicators

- ### Collection Efficiency[83]

INDICATOR FORMULA: $\frac{\text{Solid Waste Collected by the System}}{\text{Installed capacity of system to collect waste}}$

UNIT OF MEASUREMENT: Ratio, so no unit.

OBSEVATIONS: Collection of solid waste from households, workplaces and streets is first aspect of SWM having a great visibility impact. In Indian ULBs collection is still highly labour intensive, so efficiency depends on efficiency of manpower involved and habits of people.

INFERENCE: It helps ULB to know overall efficiency and if calculated on disaggregate level (for various localities) it help ULB to know in which area collection is not up to mark and to what extent capacity is under-utilised. It may also help to reallocate resources between different areas or collection zones. This indicator can also be used to measure collection efficiency in terms of origin of waste – residential, commercial, industrial etc.

- ### Percentage of residential solid waste diverted (transported)[84]

INDICATOR FORMULA: $\frac{\text{Residential Solid Waste Diverted (Transported)}}{\text{Residential Solid Waste Collected}}$

[83] Recommended by Second State Finance Commission of Tamil Nadu
[84] As recommended in Canadian Municipal Performance Measurement Programme

OBSEVATIONS: This helps to determine the extent of pile-up of collected waste, conversely, the efficiency of the Authority to empty the collection bins/depots for new collections and to deal with the collected garbage.

INFERENCE: Tabulated across residential locations this helps to focus on places where there is need for greater efficiency in transporting away the collected refuse for treatment and disposal

- Transportation Efficiency

INDICATOR FORMULA: $\frac{\text{Solid Waste Transported by the System}}{\text{Installed capacity of system to transport waste}}$

UNIT OF MEASUREMENT: Ratio, so no unit.

OBSEVATIONS: Second most important operation of SWM. Transportation takes place at three stages in SWM – 1. From dustbins, community bins to collection depots (transfer stations), 2. Transfer Stations to various places of disposal and 3. From disposal to final land fill disposal. Different types of vehicles are used under each stage. It is useful to measure efficiency for each stage.

- Efficiency in Transportation of Solid Waste-Household to Community Bins
- Efficiency in Transportation of Solid Waste - Community Bins to Depots
- Efficiency in Transportation of Solid Waste from Depots (Transfer Stations) to Disposal sites

INFERENCE: It helps ULB to know overall efficiency as well as disaggregate level efficiency in transporting solid waste from one place to another. It helps ULB to know in which stage transport efficiency is not up to mark and to what extent capacity is under-utilised.

- Aesthetics of Transportation

INDICATOR FORMULA: $\frac{\text{Number of vehicles that transport waste with cover}}{\text{Total number of vehicles}}$

UNIT OF MEASUREMENT: Ratio, so no unit.

OBSEVATIONS: This is a measure of the cleanliness of transportation of solid waste such that it doesn't cause nuisance of foul odours or overall slovenliness, to the rest of the thoroughfare on the roads.

INFERENCE: This would help to identify ULBs where the solid waste is transported mostly in open vehicles causing nuisance to traffic.

The necessity for investing in covered vehicles depends on the nature and composition of solid waste.

- Regularity of solid waste transport (Vehicles) operations

INDICATOR FORMULA: $\frac{\text{Average Number of vehicles not working per Day}}{\text{Total Number of Vehicles of SW service}}$

UNIT OF MEASUREMENT: number

SIGNIFICANCE: This measure the number of vehicles, which are not in use resulting in to disruption of transportation of waste.

- Average Working Hours of Compost Plant/Incineration Plant or Mechanisation Plan per Day

INDICATOR FORMULA: $\frac{\text{Total number of working hours of the incineration plant in a year}}{\text{365 Or number of days plant remained out of order during the month/year}}$

UNIT OF MEASUREMENT: Hours per day/Number of days

SIGNIFICANCE: Different types of processing plants are used for appropriate disposal of waste. Efficiency in disposal of solid waste now entirely depends on efficiency of these plants. This is a very broad macro indicator. Specific indicators should be used to examine various aspects of these plants.

INFERENCE: These measures the efficiency of the plants installed for disposal of solid waste. It will provide broad indication about inefficiency, which can and should be followed by detailed analysis.

This is a very broad indicator. Sub optimal operation of plants may be result of several things.

- Effectiveness of Treatment

INDICATOR FORMULA: $\frac{\text{Quality of solid waste}^{85} \text{ before treatment}}{\text{Quality of Solid Waste after treatment}}$

UNIT OF MEASUREMENT Ratio, so no unit

SIGNIFICANCE: Sometimes as an intermediate process, a treatment is given to solid waste before its final usage. Such treatment is meant to change quality of solid waste to desirable level.

INFERENCE: It indicates whether treatment is attaining the desired level and quality. It helps in quality control.

EXPANSION/DEVELOPMENT INDICATORS

- Growth in Population served by formal solid waste management service

INDICATOR FORMULA: {(Yi –Yo) / Yo} * 100

Where Yo is Population served in the initial year, Yi is that in the final year

UNIT OF MEASUREMENT: Percent.

SIGNIFICANCE: This indicator is a measure of the Service Provider's, ability/competence to meet the growing demand for solid waste management service. Disaggregated values should also be recorded for different seasons and different localities

INFERENCE: Disaggregated values for different localities help to pinpoint places where the demand for Solid Waste management service has increased the most and whether proportionate resources and efforts have been deployed or not. This can be a starting point of understanding and recording the causes for this increase in demand (e.g., growth in industrial activity generating in-migration; spurt of commercial activity and subsequent tertiary sector activity, formal or informal; rural poverty driven in- migration, etc., all leading to a sudden population growth).

- Decrease in uncollected garbage

[85] based on parameters like Land required for disposal criteria, calorific values, composition of waste for composting, nutrient value of waste after composting Checklist

INDICATOR FORMULA: ((Yo-Yi) / Yo) *100

Where Yo is the initial year, Yi is the final year.

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: If the solid waste service has improved, it should be visible in better cleanliness of the streets and lessening of uncollected garbage.

INFERENCE: Wherever the value is larger than the average (or benchmark) the solid waste management service should be upgraded

Why should one bother to measure the amount of uncollected garbage, instead of making the same effort to have it collected?

- Expansion of Solid Waste Management Service against desired or planned development

This indicator has been explained later on under Road and Storm Water Service. Following that explanation it should be calculated for water supply service also.

- Upgrading human resources

INDICATOR FORMULA: Total amount spent on staff training and HRD Activities

Total Expenditure on Solid waste Management by an agency

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Improvement and sustainability of Solid Waste Management Service depends to large extent on quality of staff. Upgrading staff quality is the final frontier and involves sizeable cost.

INFERENCE: This is a measure of the attention paid to upgrade the quality of the staff in order to deliver better quality of service.

Comparisons should be restricted to those with approximately similar initial level staff quality. It is a quantitative indicator; expenditure may not result in improvement in staff quality. Quality and effectiveness indicators should also be considered to judge agencies' efforts.

- Increase in the Area Served by the Solid Waste Management Service

INDICATOR FORMULA: Total area under SWM service at the end of year * 100

Total area under SWM service at the beginning of year 1

UNIT OF MEASUREMENT: Percent and Sq. kms.

SIGNIFICANCE: Third dimension in measurement of expansion or improvement in the service. City grows and newer areas get added and need SWM service. SWM coverage may have increase in terms of number of people covered, quantity of garbage lifted but it must increase in terms of area served.

INFERENCE: It helps to measure expansion of SWM service in geographical terms and helps to determine

CUSTOMER SATISFACTION INDICATORS

The final acid test of any service is customer satisfaction. ULB should carry out customer satisfaction survey at regular intervals from credible independent agency. Such survey also can be carried out by ULB through its own machinery. Beside overall satisfaction, the survey should include specific aspects of complaint redressal and may use following indicators.

- Number of Complaints per Year /Day or Per Household[86]

INDICATOR FORMULA: Number of complaints per year / day or Per Household

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Complaints are very valuable feedback about the efficiency of service provided and must be analysed to know what is wrong with the management of service.

INFERENCE: This indicator would help to locate ULBs where complaints about solid waste management service are more frequent than others thereby helping to locate ULBs in which the maintenance of solid waste management department needs to be upgraded. Similarly, ULB can use it to know area-wise efficiency of its SWM service.

The number of complaints depends on the different expectations of different customers. Comparisons should be made accordingly.

86 Canadian MPMP recommended similar indicator as follows

Number of complaints received in a year concerning the collection of solid waste and recycled materials per 1,000 households.

- Customer Satisfaction about overall SWM Services

INDICATOR FORMULA: Number of customers satisfied with SWM service * 100

Total number of customers 1

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: overall satisfaction includes various aspects ranging from service delivery to complain redressal.

INFERENCE: This indicator would help to locate ULBs where customers are satisfied with the solid waste management service and those where customers are not satisfied, thereby facilitating a process of learning through the sharing of experience and expertise.

- Customer Satisfaction about Response and Review by SWM Agency

INDICATOR FORMULA: Number of customers satisfied with

the response & review of their complaints * 100

Total number of customers 1

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Customers of the service register their complaints and ULBs may be efficient in complaint redressal, but if it is not good in giving response to customers when they inquire about their complaints, further complaints may ensue.

INFERENCE: This indicator would help to locate ULBs where customers are satisfied with the response to complaints about solid waste management service and those where customers are not satisfied, thereby helping to locate ULBs in which public relations department needs to be upgraded.

- Customer Satisfaction about Redressal of Complaints by SWM Agency

INDICATOR FORMULA: Number of customers satisfied with

the redressal of their complaints * 100

Total number of customers 1

UNIT OF MEASUREMENT: percent

INFERENCE: This indicator would help to locate ULBs where customers are satisfied with the prompt redressal of complaints about solid waste management service and those where customers are not satisfied, thereby helping to locate ULBs in which the maintenance of solid waste management department, needs to be upgraded.

The common limitation associated with all the above customer satisfaction related indicators is that the degree of satisfaction depends on the different expectations of different customers. Comparisons should be made accordingly.

ADMINISTRATIVE /GENERAL INDICATORS

- Percentage of total Solid Waste Management workforce covered by personnel costs

INDICATOR FORMULA: $\frac{\text{WSS Workforce Covered by Personnel Systems}}{\text{Total Workforce Employed for Solid waste management}} * 100$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: At many places Solid Waste management employees work on temporary or daily-wage basis. Such workforce is not covered personnel system and does not get various benefits or job security. This leads to motivational and work quality problems.

INFERENCE: If this measure indicates very high proportion of workforce outside personnel system than that ULB or Authority is likely to face motivational and quality problem.

Cases where this figure is too high should be approached with caution. Bringing maximum workforce under personnel system depends on legal, administrative and political aspects

- Expenditure on SWM staff

INDICATOR FORMULA: $\frac{\text{Expenditure on Solid Waste Management Staff} * 100}{\text{Total Expenditure or Establishment Expenditure of ULB}} \quad 1$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCE: This is a measure of the proportion of resources spent on staff for the running Solid Waste Management department. This ratio should be worked against total expenditure of ULB and total establishment expenditure of ULB.

INFERENCE: This gives a clear idea of the resources spent on staff in comparison with other expenditures on operation, maintenance and investment (in new or updated equipment) of the Solid Waste Management service. When it is compared to total expenditure, it shows share of solid waste management service in total establishment expenditure

- Weightage of Administration

INDICATOR FORMULA: $\frac{\text{Number of Administrative personnel}}{\text{Number of Operations and maintenance personnel}}$

UNIT OF MEASUREMENT: Ratio, so pure number

SIGNIFICANCE: This measures the extent to which human resources are diverted to administration compared to operations and maintenance that actually makes a difference to the quality of solid waste management service. The lower this figures the more efficient and effective the use of the manpower employed.

FINANCIAL INDICATORS

- Total Cost per Ton of Waste Collected[87] or per household

INDICATOR FORMULA: $\frac{\text{Total Cost of Solid Waste Service}}{\text{Total tons of Waste Collected}}$

Or,

$\frac{\text{Total Cost of Solid Waste Service}}{\text{Total number of households in the city}}$

UNIT OF MEASUREMENT: Rupees per ton or per household

[87] Recommended in CMA – G Urban Indicators and Performance Measurement Programme

SIGNIFICANCE: It is an aggregate indicator but can be used to calculate disaggregated values of each component of cost. –

- Operating costs for solid waste collection, transfer and disposal per tonne or per household.[88]
- Operating costs for solid waste diversion per tonne or per household.[89]
- Average operating costs for solid waste management per tonne or per household.[90]
- Cost of Transportation per tonne waste collected
- Cost of Disposal per tonne waste collected

INFERENCE: This gives the overall level of expenditure and cost efficiency

This is dependent on precisely calculated city specific benchmarks, for example, a city may have rainy weather for most of the part of year thus will have the problem of wet garbage on sustained basis, while another city may have desert like situation and will have dry garbage but high degree of inert material in the form of dust.

- Cost Recovery[91]

INDICATOR FORMULA: $\frac{\text{Revenue earned from Solid Waste Service Charge}}{\text{Cost incurred on Solid Waste Service}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

OBSEVATION: Ideally, each service should be run on full cost recovery basis at least at aggregate level. Most of the ULBs in India do not charge for solid waste service. Recently there is trend to introduce solid waste removal charge after solid waste management rules have been made applicable to ULBs. Government of Karnataka has taken lead and has introduced solid waste charge. Another way to do cost recovery is sale of products produced (compost, fuel pallets or coal, electricity) by recycling waste.

[88] Recommended in Canadian Municipal Performance Measurement Programme
[89] Recommended in Canadian Municipal Performance Measurement Programme
[90] Recommended in Canadian Municipal Performance Measurement Programme
[91] Recommended in CMA – G Urban Indicators and Performance Measurement Programme

- Revenue generated from recycling of waste materials

INDICATOR FORMULA: $\frac{\text{Revenue earned from recycling of waste}}{\text{Cost incurred on Solid Waste Service}} * \frac{100}{1}$

INFERENCE: This indicator will help to know whether solid waste service is able to recover its cost on aggregate level if not on individual user basis. If not, the ULB will be able to determine how much cross subsidy, it is required to provide from its general revenue to run its solid waste service.

It does not factor in cost efficiency of solid waste service operations. An ULB may not be able to recover cost of its solid waste service because the service by itself may not be cost efficient and the ULB may be incurring high expenditure.

Beside these financial ratios, rest of financial ratios for solid waste service should be calculated as they have been explained in earlier parts on water and sewerage indicators and in the separate chapter on financial indicators.

ENVIRONMENTAL CONSERVATION INDICATORS

The issue of environmental conservation is very important with reference to Solid Waste service because various studies have clearly demonstrated that improper management of solid waste leads to multi-dimensional environmental degradation to the city and its surrounding areas. Periodic environmental impact assessment (EIA) of solid waste service should be conducted on a regular basis. The following check list can be useful to ULB to carry out informal EIA. The list is minimal and EIA should not be restricted to these points only.

- Regulatory Framework

QUESTIONS:

1 What are the Laws Governing the collection of solid waste?
2 What are the Laws Governing the Transportation of Solid Waste?
3 What are the Laws Governing the Disposal of Solid waste?

INFERENCE: such scrutiny would help to focus on ULBs where the governance is yet to frame laws to protect the environment from the possible harmful effect of solid waste management. Availability of the tabulated information on this indicator would help ULBs to identify and understand the issues on which regulations need to be enacted.

- Land Disposal – Site Identification

QUESTIONS: (a) Is the identified site causing any nuisance to residential area?

(b) If so, what? (Overt unseemliness, foul odour, nuisance of household pests like flies or rodents).

(c) Has EIA been done prior to identification?

(d) If yes, then

Extent of porosity of subsoil

Gradient or slope of the site

Proximity to natural sources of water

Proximity to flood prone area

What are the hydro geological characteristics?

What is the distance between the bottom of the landfill and the top of the water table?

INFERENCE: This helps to locate ULBs that can use better judgment in identifying land for solid waste disposal on the basis of the given specific parameters

Since the measure is largely qualitative, it is subject to variation caused by individual perception. Factors like hydro geological characteristics, composition of solid waste, etc. is likely to vary over ULBs. So comparisons have to be made with appropriate caution. The list of factors given in this indicator is not exhaustive.

- Leachate Collection System

QUESTIONS: (a) Is there a leachate collection system? - Yes, or No

(b) If yes, are there facilities to treat and dispose leachate? Yes, or No

Incidence of leaching, and quality and quantity of leach-ate varies widely across ULBs, because of factors out of the ULB's control. Comparisons should be made accordingly.

- Recovery of Resources/Energy

QUESTIONS: (a) Are there facilities to recover Energy (e.g., Methane recovery) from landfill sites? - Yes, or No

(b) If yes, then name and describe facility.

© Negative environmental impact of such processes

SIGNIFICANCE: This helps to focus on ULBs that have made an effort to produce precious fuel (energy) from solid waste and would help to share their experience with other ULBs that have not done well in this field, and need more assistance to invest in those facilities.

INFERENCE: Comparisons may not be just, because not all kinds of wastes have the same potential for generation of energy. Once the energy is generated, it has to be stored and distributed for use.

This in turn depends on socio economic factors, fuel-use alternatives and public awareness and motivation to conserve fossil fuels.

- Monitoring of Air and Water

QUESTION: (1) Are there facilities for monitoring the air around the landfill site and other waste disposal processes like composting, incineration etc.? - Yes or No.

: (2) How frequently does the air quality meet the prescribed standards? (Number per month), what actions are taken if they do not meet prescribed standards?

: (3) Are there facilities to monitor the quality of groundwater in and around the landfill site or other waste disposal plants? - Yes or No

(4) How frequently does the ground-water quality meet the prescribed standards? - Number per month

SIGNIFICANCE: On a comparative scale, this helps to focus on ULBs that could do better in maintaining air quality around the landfill site and other disposal plants according to prescribed norms.

INFERENCE: Comparisons should be made with care because the different compositions of solid waste in landfill sites cause different degrees and nature of air pollution. Similarly, the groundwater polluting

potential of solid waste is likely to depend on its composition, geo-climatic factors, like rainfall, soil porosity etc. Comparisons across the board should be made with caution.

- Use of Landfill site

QUESTION: How is the landfill site finally used? - Either of the following: Horticulture, Gardens/parks and Construction sites

SIGNIFICANCE: the information gathered by this indicator gives clues about the nature of demand for land in the ULB and the corresponding soil demand. For example if the landfill sites are used as gardens and horticulture, they are likely to need less volume of soil (which has only to be loosely packed) but rich in nutrients (e.g., compost), but if they are used in construction sites they are likely to need more quantity (to be tightly packed) of soil with less nutrients. This kind of information would help to streamline soil use/procurement.

INFERENCE: The final use of a landfill is likely to depend on exogenous factors relating to the land market.

Chapter 5 – D Roads, Storm Water Drains, Bridges, Footpaths

Index

ROADS, STORM WATER DRAINAGE AND BRIDGES _____ 211

COVERAGE/EXPLANATOY INDICATORS _____ 211

- Percentage of Roads Surfaced _____ 211
- Area under Roads to Total Area (Road Density) _____ 212
- Availability of Footpath Facility _____ 212
- Storm Water Drain Coverage (Road Length with SWD) _____ 213
- Population or City Area Served (Covered) by Storm Water Drains _____ 213
- Slum Area Coverage by Storm Water Drainage Service _____ 214

QUANTITY OR STATUS OR RESOURCES COMMITTED INDICATORS _____ 214

- Type of Surfaced Roads _____ 214
- Per Capita Resource Commitment for Roads, Storm Water and other Road Related Services _____ 215
- Total Expenditure (all roads) per Kms of Roads _____ 215
- Total Expenditure per kms of Asphalt Paved roads _____ 215
- Total Expenditure per kms of unpaved roads _____ 215
- Total Expenditure per kms Cement Concrete Roads _____ 215
- Total Expenditure on per kms of Storm Water Drains _____ 216
- Total Expenditure on per kms Footpaths during the year _____ 216
- Total Expenditure on per kms Bridges during the year _____ 216
- Road kilometres Maintained by type during the year _____ 216
- Semi carpeted Road kilometres maintained during the year _____ 216
- Carpeted Road kilometres maintained during the year _____ 216
- Cement Concrete Road kilometres maintained during the year _____ 216
- Storm Water Drains kilometres maintained by type during the year _____ 217
- Footpaths kilometres maintained during the year _____ 217
- Bridges kilometres maintained during the year _____ 217
- Number of miles resurfaced (by contractor or by ULB Staff) _____ 217

QUALITY INDICATORS _____ 218

- Number of Road Samples Failing Quality Test _____ 218

- Percentage of Roads, Footpaths, Storm Water Drains Deteriorating before estimated life 218
- Road Condition _____ 219
- Storm Water Drainage Condition _____ 219
- Footpaths Condition _____ 219
- Average Number of Potholes (per road or per kms of road) _____ 220

EFFICIENCY INDICATORS _____ **Error! Bookmark not defined.**

- Efficiency of Operation and Maintenance Expenditure _____ 220
- Efficiency of Operation and Maintenance Expenditure on SWD _____ 220
- Efficiency of Operation and Maintenance Expenditure on Footpaths _____ 221
- Percentage of Paved Road kilometres rated as good to very good _____ 221
- Percentage of Rainy season responses that met or exceeded municipal road maintenance standards_____ 222
- Roads maintained as per Resurfacing Cycle _____ 222
- Number of Potholes Repaired in 24 hours _____ 223

EXPANSION/DEVELOPMENT INDICATORS _____ 223

- Investment and Development in Roads Service _____ 223
- Investment and Development on Storm Water Drainage_____ 224
- Investment and Development on Footpaths _____ 224
- Expansion of Road Service against Desired or Planned Expansion _____ 224
- Expansion of Storm Water Service against Desired or Planned Expansion_____ 225
- Expansion of Footpaths against Desired or Planned Expansion _____ 225

CUSTOMER/CONSUMER SATISFACTION INDICATORS _____ 225

- Number of Consumers Satisfied with Overall Road Service _____ 225
- Response to Consumers _____ 226
- Promptness in Response _____ 226
- Review and monitoring of Complaints Redressal Mechanism _____ 226

ADMINISTRATIVE/GENERAL INDICATORS_____ 226

- Staff per 10 KM of Road Length_____ 226
- Staff per 10 KM of Storm Water Drains Length_____ 226
- Non-technical Staff per kms of Road_____ 227

FINANCIAL INDICATORS _____ 227

- Operation and Maintenance Cost per KM of Surfaced Road Length _____ 227
- Operating costs for paved (hard top) roads per lane kilometres._____ 227
- Operating costs for unpaved (loose top) roads per lane kilometres. _____ 228

- Costs for Rainy Season Maintenance of Roadways per lane kilometres _____ 228
- Total operating and maintenance expenditure of Road Service per capita _____ 228

ENVIRONMENTAL CONSERVATION INDICATORS _____ 229

- Number of Trees Cut for Expansion/Development of Roads _____ 229
- Number of Trees Planted and Nurtured against Trees Cut _____ 229

ROADS, STORM WATER DRAINAGE AND BRIDGES

INTRODUCTION:

It is the duty of the ULB to provide conditions for easy connectivity of areas within its jurisdiction and ensure conditions for smooth movement of various means of transport. So it has to provide for adequate network of roads and streets. It has to maintain the surface of the road so that traffic bottlenecks and vehicular damage is minimum. To ensure smooth flow of traffic and safety of pedestrians, and to avoid water logging, roads and streets have to be lined with well-maintained footpaths and storm water drains.

Proper proactive planning is very important. Road surfaces should be upgraded so that need for perennial maintenance is minimized. Maintenance staff quality should be upgraded.

The whole gamut of multidimensional tasks involving the roads-footpath and storm water drainage service of the ULB, should be accomplished within stringent resource constraints. So, at every stage ranging from planning to O&M, cost effectiveness and efficiency should be ensured.

COVERAGE/EXPLANATOY INDICATORS

- Percentage of Roads Surfaced[92]

INDICATOR CATEGORY: Outcome Indicators / Status Indicator

INDICATOR FORMULA: $\frac{\text{Road length Surfaced}}{\text{Total road length}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: The quality of roads is gauged in terms of its surfacing. By surfaced road we usually mean road surfaced with Asphalt (Bitumen). Low value of the indicator implies high travel time, higher expenditure on fuel and air pollution.

[92] Second State Finance Commission of Tamil Nadu Report and CMAG - UIPMP

INFERENCE: This gives an idea of the extent to which roads within the jurisdiction of a ULB are surfaced. This indicator enables to quantify and compare the extent of road surfacing that exists in different ULBs or in different areas of a ULB and highlight those ULBs or areas, that need more roads surfaced.

The quality of surfacing is likely to vary across ULBs and that is an important determinant of road condition and maintenance

- Area under Roads to Total Area (Road Density)[93]

INDICATOR CATEGORY: Outcome Indicators / Status Indicator

INDICATOR FORMULA: $\frac{\text{Area occupied by Road}}{\text{Total Area of the City}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent, sq. kms.

SIGNIFICANCE: Science of Town Planning provides certain benchmarks regarding area under road to total area. It is also known as Road Density Standards. Roads should acquire adequate share of the total area to take care traffic needs of people.[94]

INFERENCE: This gives an idea of the area under roads within the jurisdiction of ULB and thus highlights those ULBs or areas where roads occupy inadequate area.

The density of population that is an important determinant of need for road space or coverage varies across ULBs and within their areas. It depends on the basis of modal split and per capita trip rate.

- Availability of Footpath Facility[95]

INDICATOR FORMULA: $\frac{\text{Length of Road Covered with Footpath}}{\text{Total length of Road requiring Footpaths}} * \frac{100}{1}$

SIGNIFICANCE: Footpaths are key component of road infrastructure, with respect to safety of pedestrians. Non-provision of footpaths leads to spill over of pedestrians on roads leading to

[93] City Managers' Association Gujarat - Urban Indicators and Performance Measurement Programme
[94] The planning norm in use is 12 – 15 % of city area for circulation or a single lane road length of 0.034 – 0.042 km. per sq. km of city area.
[95] TNUDP II – Institutional Development Project – Development and Implementation of Urban Indicators for ULBs of Tamil Nadu – Society for Development Studies – New Delhi

increase in road congestions and travel time. The indicator should be worked out on disaggregate level in terms of area and different types of roads

INFERENCE: The indicator indirectly measures the road and traffic management efficiency. Directly it indicates how much percentage of roads lack footpath. It helps ULB to plan efficiently for expansion of footpath coverage

This is a relative indicator, and it does not suffer from serious shortcoming

- Storm Water Drain Coverage[96] (Road Length with SWD)

INDICATOR CATEGORY: Outcome Indicators

INDICATOR FORMULA: $\frac{\text{Road length having Storm Water drains}}{\text{Total road length}} * 100$

UNIT OF MESUREMENT: percent

SIGNIFICANCE: Need for storm water drainage is purely a result of modern urban growth. With houses, roads, footpaths etc. coming up, permeable area gets reduced and rain water starts gathering up. Storm water drainage service is necessary to avoid water logging and resultant breakage of roads.

INFERENCE: This is a measure of the extent of protection from water-logging. Comparing across ULBs, this measure helps to focus on ULBs and their areas where roads have less coverage of storm-water drains.

The necessity of storm water drains depends on the climatic conditions, i.e., incidence of rainfall and natural drainage (watershed and topography).

- Population or City Area Served (Covered) by Storm Water Drains[97]

INDICATOR FORMULA: $\frac{\text{Population/city area served by Storm Water drains}}{\text{Total Population or Total Area of the City}} * \frac{100}{1}$

UNIT OF MESUREMENT: percent

[96] SFC –Tamil Nadu Report – Percentage of Roads Covered with Pucca Drains
[97] City Managers' Association Gujarat - Urban Indicators and Performance Measurement Programme

SIGNIFICANCE: Another way to calculate coverage of storm water drainage service. It should be calculated in both terms – Population and Area. On a disaggregate level coverage of slum population or areas by formal SWD should also be calculated using following formulae

- Slum Area Coverage by Storm Water Drainage Service

INDICATOR FORMULA: Slum Population/area served by Storm Water drains * 100

Total Population or Total Area of the City 1

INFERENCE: Comparing across ULBs, this measure helps to focus on ULBs or their areas where there is inadequate coverage of storm-water drains.

The necessity of storm water drains depends on the climatic conditions, i.e., incidence of rainfall and natural drainage (watershed and topography). Also an area may have storm water drainage but of inadequate size.

QUANTITY OR STATUS OR RESOURCES COMMITTED INDICATORS

- Type of Surfaced Roads[98]

INDICATOR CATEGORY: Outcome Indicator/ Status Indicator

INDICATOR FORMULA: Type of Surfaced Roads (CC, Bitumen, WBM etc.) * 100

Total Surfaced Roads 1

SIGNIFICANCE: In a city there exist different types of roads – cement concrete, bitumen (tar), Water Bound Macadam, or kutcha road etc. It is necessary to know share or percentage of each type of roads in total roads, so that appropriate planning can be done.

INFERENCE: it reveals existing status of different roads in total roads network of city.

It does not reveal sufficiency of roads or quality of these roads

[98] TNUDP II – Institutional Development Project – Development and Implementation of Urban Indicators for ULBs of Tamil Nadu – Society for Development Studies – New Delhi

- Per Capita Resource Commitment for Roads, Storm Water and other Road Related Services

Please refer to Streetlight Section of the Chapter for working out this Indicator

- Total Expenditure (all roads) per Kms of Roads

INDICATOR CATEGORY: Input Indicator

INDICATOR FORMULA: Total Expenditure on Roads

Lane kms maintained by ULB.

UNIT OF MESUREMENT: Rs (lacs)/ kms

SIGNIFICANCE: Availability of adequate financial resources is an important component of good upkeep of the roads service. This should be calculated on disaggregate level using following type of indicators

- Total Expenditure per kms of Asphalt Paved roads

INDICATOR FORMULA: Total Expenditure on Paved Lanes

Paved Lane kms maintained by ULB

- Total Expenditure per kms of unpaved roads

INDICATOR FORMULA: Total Expenditure on unpaved Lanes

Total Unpaved Lane kms maintained by ULB

- Total Expenditure per kms Cement Concrete Roads

INDICATOR FORMULA: Total Expenditure on Paved Lanes

Cement Concrete Roads kms maintained by ULB.

INFERENCE: These indicators indicate resources made available for O & M of Roads Service and different types of roads. This helps to focus on ULBs that are spending either more or less than standard upon the maintenance of their roads

Maintenance of roads within a ULB's jurisdiction has a lot to do with skill of maintenance personnel and the kind, efficiency and organization of road maintenance and not only on the money spent. Also, this does not reveal the breakup of total expenditure into actual O& M, and administration.

In similar way total resource committed to other services Footpaths, Storm Water Drains, and Bridges should be measured using following indicators -

- Total Expenditure on per kms of Storm Water Drains
- Total Expenditure on per kms Footpaths during the year
- Total Expenditure on per kms Bridges during the year

- Road kilometres Maintained by type during the year

INDICATOR FORMULA: WBM Roads kms. Maintained during the year * 100

Total WBM Roads kms in the City 1

UNIT OF MESUREMENT: Percentage

SIGNIFICANCE: Different types of road exist in the city and all of them need maintenance. Percentage of roads maintained during the year gives idea about the resurfacing or maintenance cycle followed by ULB to maintain its roads. This is necessary because in the absence of this some roads get maintained frequently while some remain without maintenance for long period of time. This indicator and its formulae should be utilised for measuring maintenance efforts undertaken for other types of roads

- Semi carpeted Road kilometres maintained during the year

INDICATOR FORMULA: Semi carpeted Roads kms Maintained during the year * 100

Total Semi carpeted Roads kms in the City 1

- Carpeted Road kilometres maintained during the year

INDICATOR FORMULA: Carpeted Roads kms Maintained during the year * 100

Total Semi carpeted Roads kms in the City 1

- Cement Concrete Road kilometres maintained during the year

INDICATOR FORMULA:

Cement Concrete Roads kms Maintained during the year * 100

Total Semi carpeted Roads kms in the City 1

INFERECCE: It measures efforts in physical terms going into maintenance of different types of roads thus helps ULB to plan future maintenance operations. When used in conjunction with expenditure indicators discussed earlier, it provides a comprehensive picture.

It measures effort in physical terms but does not indicate quality of work.

In similar way maintenance efforts should be measured for other services like bridges, storm water drains, footpaths etc.

- Storm Water Drains kilometres maintained by type during the year

Choked drains are emerging as a major urban management problem. O&M is essential to keep the drains in good working conditions. The indicator brings out the management efficiency of the drainage system. While a high indicator value may suggest that adequate attention is being paid to maintenance, it might also suggest the need for awareness creation among the people to maintain clean drains.

- Footpaths kilometres maintained during the year
- Bridges kilometres maintained during the year

- Number of miles resurfaced (by contractor or by ULB Staff)

INDICATOR FORMULA: $\frac{\text{Kilometres Resurfaced by ULB Staff}}{\text{Total Kilometres resurfaced}} * \frac{100}{1}$

UNIT OF MESUREMENT: Percentage

SIGNIFICANCE: In many ULBs maintenance is carried out thorough its own staff as well as through private contractors. It is necessary to know work carried out by both the set of people so that efficiency comparisons can be made between them.

INFERENCE: It measures work carried out by ULB staff and by the contractor's labour. It paves way for comparative analysis which helps ULB to decide whether more staff should be recruited or more contracting should be resorted to.

It only provides percentage share or basic data for comparison, which will necessitate use of some more indicators.

QUALITY INDICATORS

- ### Number of Road Samples Failing Quality Test

INDICATOR FORMULA: $\frac{\text{Number of Road Samples failing quality test}}{\text{Total Number of Road Samples Tested}} * \frac{100}{1}$

UNIT OF MESUREMENT: Percentage

SIGNIFICANCE: It is necessary to know quality of the roads constructed by own employees or private contractors so that efficiency comparisons can be made between them. It has now become possible to analyse quality of road by removing block from it and testing it in the laboratory

INFERENCE: It measures quality of the work carried out by ULB staff and by the contractor's labour. It paves way for quality monitoring and also comparative analysis which helps ULB to decide whether more staff should be recruited or more contracting should be resorted to.

Testing quality in laboratory is time consuming and expensive. It warrants finalizing quality indicators in advance and stipulating them before beginning of work.

- ### Percentage of Roads, Footpaths, Storm Water Drains Deteriorating before estimated life

INDICATOR FORMULA: $\frac{\text{Number of Roads deteriorating before life span}}{\text{Total Number of Roads constructed recently}} * \frac{100}{1}$

UNIT OF MESUREMENT: Percentage

SIGNIFICANCE: It is necessary to know quality of the roads constructed by finding roads and other infrastructure deteriorating before its estimated technical life so that proper analysis and effective correcting actions can be taken to ensure quality.

INFERENCE: It indicates work deteriorating before their technical life. This helps to analyse underlying reasons for the same.

The deterioration of road or other road related infrastructure depends on server exogenous factors like sudden flood, seepage of water in road bed due to breakage of water or drainage line etc.

- Road Condition

INDICATOR CATEGORY: Outcome Indicators

INDICATOR FORMULA: $\frac{\text{Lane miles assessed as being in satisfactory condition} * 100}{\text{Lane miles assessed} \quad 1}$

UNIT OF MESUREMENT: percent,

Same formula to be used for measuring general condition of storm water drains/footpaths

- Storm Water Drainage Condition

INDICATOR FORMULA: $\frac{\text{SWD miles assessed as being in satisfactory condition} * 100}{\text{Storm Water Drains miles assessed} \quad 1}$

- Footpaths Condition

INDICATOR FORMULA:

$$\frac{\text{Footpaths miles assessed as being in satisfactory condition} * 100}{\text{Lane miles assessed} \quad 1}$$

SIGNIFICANCE: ULBs must have an idea of the general road or storm water drainage or footpath condition within their jurisdiction for undertaking appropriate maintenance.

INFERENCE: This indicator enables to quantify and compare the road conditions of different ULBs and highlight those that that have good road conditions and also those that need more attention.

This measure is dependent on the perception of what is defined as “satisfactory”, i.e., the benchmark. For inter- ULB comparisons to be meaningful, all ULBs should be covered by similar extent and quality of assessment. There are likely to be differences in the judgments of individual assessors.

- Average Number of Potholes (per road or per kms of road)

INDICATOR FORMULA: $\frac{\text{Total Numbers of Potholes}}{\text{Total Number of Roads or kms of Roads}}$

UNIT OF MESUREMENT: Number per road or per kms of road

SIGNIFICANCE: Potholes on the road cause great hindrance to flow of traffic and sometime result in to serious accidents. Road with potholes means no road at all.

INFERENCE: High number clearly speaks about poor maintenance efforts of ULB. Recurring potholes on particular road or part of road indicates larger problem. Either the construction of road in first place was of poor quality or there is water logging.

Difficult to calculate, it is will be easier to repair potholes than to count them for analysis.

EFFICIENCY INDICATORS

- Efficiency of Operation and Maintenance Expenditure

INDICATOR FORMULA: $\frac{\text{Total O and M Expenditure on Road Service}}{\text{Road miles assessed as being in satisfactory condition}}$

UNIT OF MESUREMENT: Rs (lacs)/ Road miles in satisfactory condition

SIGNIFICANCE: Maintenance expenditure is carried out to keep roads or storms water drains or footpaths in satisfactory condition. It is necessary to verify whether expenditure has resulted in improvement or in maintaining service in satisfactory condition. Same formulae to be used to measure efficiency of O&M of other services as follows

- Efficiency of Operation and Maintenance Expenditure on SWD

INDICATOR FORMULA: $\frac{\text{Total O and M Expenditure on Storm Water Drains}}{\text{Storm Water Drains miles assessed as being in satisfactory condition}}$

- Efficiency of Operation and Maintenance Expenditure on Footpaths

INDICATOR FORMULA: Total O and M Expenditure on Footpaths

Footpaths miles assessed as being in satisfactory condition

INFERENCE: This is a measure of the efficiency of maintenance expenditure carried out on roads or storm water drains or footpaths. On a comparative scale this would help to focus on those ULBs that need to economize on expenditure and obtain better results from their maintenance expenditure.

Maintenance needs may vary across ULBs according to local conditions. Assessors may vary in their judgments on what each of them would regard as "satisfactory".

- Percentage of Paved Road kilometres rated as good to very good[99]

INDICATOR FORMULA: Paved lane kilometres rated as good to very good * 100

Paved Lane kilometres assessed 1

SIGNIFICANCE: ULBs must have an idea of the roads considered good to very good within their jurisdiction for undertaking appropriate maintenance.

INFERENCE: This indicator enables to quantify and compare the road conditions of different ULBs and highlight those that that have good road conditions and also those that need more attention.

This measure is dependent on the perception of what is defined as good or very good i.e., the benchmark. For inter- ULB comparisons to be meaningful, all ULBs should be covered by similar extent and quality of assessment. There are likely to be differences in the judgments of individual assessors.

[99] Canadian Municipal Measurement Programme – Appendix 3

- Percentage of Rainy season responses that met or exceeded municipal road maintenance standards

INDICATOR FORMULA:

$$\frac{\text{Rainy Season Responses that met or exceeded road maintenance standards}}{\text{Paved Lane kilometres assessed}} * \frac{100}{1}$$

SIGNIFICANCE: In India during rainy season road maintenance becomes very important. ULBs must have an idea of the works carried during the rainy season which exceeded road maintenance standards.

INFERENCE: This indicator enables to quantify and compare the effectiveness of the road maintenance works undertaken in response to rainy season.

The intensity of rain differs from city to city. Road maintenance standards should be clearly defined in advance.

- Roads maintained as per Resurfacing Cycle

INDICATOR FORMULA: $\frac{\text{Roads (kms) maintained as per Resurfacing Cycle}}{\text{Total Roads (kms.) maintained during the year}} * \frac{100}{1}$

UNIT OF MEASUREMENT – percentage

SIGNIFICANCE: Roads should be maintained as per the resurfacing schedule, so that deserving roads get maintained as per their turn. But 100 per cent adherence to resurfacing cycle or standard norms is not possible because ULBs are political institution and decision making is in the hands of elected representatives.

INFERENCE: It indicates ULB's ability to follow standards and resurfacing cycle in spite of it being a political agency. It will also help to know roads due for maintenance as per schedule but were not undertaken due to paucity of funds or political decision-making.

- Number of Potholes Repaired in 24 hours

INDICATOR FORMULA: Number of Potholes Repaired in 24 hours

SIGNIFICANCE: Potholes many times lead to serious accidents besides slowing down flow of traffic and damage to vehicles. They need to be repaired as early as possible as soon as they occur. Usually 24 hours response time is considered ideal for mending potholes. ULB should continuously monitor its pothole repairing operation.

INFERENCE: It helps ULB to monitor its efficiency in attending potholes.

High value indicates firefighting or reactive efficiency of ULB but it is also an indicator of lack of proactiveness and poor quality of road development.

EXPANSION/DEVELOPMENT INDICATORS

- Investment and Development in Roads Service

INDICATOR FORMULA: $\frac{\text{Total Capital/Development expenditure on Roads}}{\text{Roads (kilometres) created or substantially improved}} * \frac{100}{1}$

UNIT OF MESUREMENT: Rs (lacs)/ lane kilometre

SIGNIFICANCE: Expansion and development of road service is a perennial need of any city and therefore perennial responsibility of any ULB. One needs to know extent to which investment or development was carried out with respect to road service.

INFERENCE: This is a measure of the ULB's efforts to upgrade and to develop the roads within its jurisdiction. This also helps ULBs to know at what cost it developed their roads.

In the absence of appropriately worked out benchmarks, it will not be very useful.

On the similar line indicators should be worked out for storm-water drains, foot paths etc. using following indicators and their formulae. The benefits and limitations described above will also be similar for these indicators.

- Investment and Development on Storm Water Drainage

INDICATOR FORMULA: Total Capital/Development expenditure on SWD * 100

Storm Water Drains (kilometres) created or substantially improved 1

- Investment and Development on Footpaths

INDICATOR FORMULA: Total Capital/Development expenditure on footpaths * 100

Footpaths (kilometres) created or substantially improved 1

- Expansion of Road Service against Desired or Planned Expansion

INDICATOR FORMULA: Actual Capital/Development expenditure on Roads * 100

Desired or Planned Expenditure on Road Service 1

Along with it should be measured in physical terms using following formulae

Actual Development of Roads achieved in Physical Terms (kms) * 100

Desired or Planned Development of Roads in Physical Terms (kms) 1

UNIT OF MESUREMENT: Rs (lacs)/ lane kilometre

SIGNIFICANCE: The data or value regarding Expansion and development of road service will have no meaning if it not calculated in the context of desired or planned development.

INFERENCE: This is a measure of the ULB's efforts to upgrade and to develop the roads according to desired or planned efforts. This also helps ULBs to know at what cost efficiency (expense incurred) they developed their roads.

This gives quantitative results, and does not reveal the quality with which development was carried out.

Similarly, indicators should be worked out for storm-water drains, foot paths etc. using following indicators and their formulae. The benefits and limitations described above will also be similar for these indicators.

- Expansion of Storm Water Service against Desired or Planned Expansion

INDICATOR FORMULA: Actual Capital/Development expenditure on SWD * 100

Desired or Planned Expenditure on Storm Water Service 1

Along with it should be measured in physical terms using following formulae

Actual Development of SWD achieved in Physical Terms (kms) * 100

Desired or Planned Development of SWD in Physical Terms[100] (kms) 1

- Expansion of Footpaths against Desired or Planned Expansion

INDICATOR FORMULA: Actual Capital/Development expenditure on Footpaths * 100

Desired or Planned Expenditure on Footpath Service 1

Along with it should be measured in physical terms using following formulae

Actual Development of Footpaths achieved in Physical Terms (kms) * 100

Desired or Planned Development of Footpaths in Physical Terms (kms) 1

CUSTOMER/CONSUMER SATISFACTION INDICATORS

- Number of Consumers Satisfied with Overall Road Service

INDICATOR FORMULA: Number of consumers satisfied with service * 100

Total number of consumers 1

This indicator has been explained under water supply service indicators.

Following indicators should also be applied for judging consumer satisfaction about road and road related other services. The indicators have been explained earlier under section on water supply service indicators.

[100] Physical Terms means development planed in running kms length, along with width and depth (if applicable) details.

- Response to Consumers
- Promptness in Response
- Review and monitoring of Complaints Redressal Mechanism

ADMINISTRATIVE/GENERAL INDICATORS

- Staff per 10 KM of Road Length[101]

INDICATOR FORMULA: $\frac{\text{Total No of Staff for Road Service} * 10}{\text{Total Road Length in kms} \quad 1}$

UNIT OF MESUREMENT: Number per 10 kilometres

SIGNIFICANCE: This is a measure of the manpower backing for operating, upgrading and maintaining the roads within the ULB's jurisdiction. The optimum amount of staffing for resource efficient road maintenance (neither overstaffing nor understaffing) is given by appropriate benchmarks depending upon the various needs of each kind of ULB and its local conditions. Using same formula adequacy of staff can be calculated at disaggregate level e.g.

INDICATOR FORMULA: $\frac{\text{Number of maintenance/repairs workers} * 10}{\text{Total Road Length in kms} \quad 1}$

INFERENCE: If comparisons are made across different ULBs (against benchmarks) then the ones with overstaffing and understaffing can easily be identified.

This measure says nothing about the composition of staff (whether or not there is more administrative staff than technical and operational staff). It should be worked out in disaggregate manner.

- Staff per 10 KM of Storm Water Drains Length

INDICATOR FORMULA: $\frac{\text{Total No of Staff for SWD Service} * 10}{\text{Total SWD Length in kms} \quad 1}$

[101] City Managers' Association Gujarat - Urban Indicators and Performance Measurement Programme

- Non-technical Staff per kms of Road

INDICATOR FORMULA: Total Number of Non-technical Staff for Road Service

Total Road Length in kms

UNIT OF MESUREMENT: number of staff per lane kilometre

SIGNIFICANCE: Non-technical staff should not burden road and for that matter any engineering service. The situation should be monitored in this respect.

INFERENCE: Brings out the manpower deployment in maintenance activities.

A high indicator may suggest poor quality road infrastructure that requires regular repairs and maintenance.

FINANCIAL INDICATORS

- Operation and Maintenance Cost per KM of Surfaced Road Length[102]

INDICATOR FORMULA: O & M Expenditure of Road Service

Total Length of Surfaced Roads (kms)

SIGNIFICANCE: Maintenance of roads is critical for an efficient transport system. Maintenance is essential, yet it involves sizeable cost burden to ULB. On one hand ULB needs to keep its expenditure down but at same time has to ensure proper maintenance of roads. Different types of roads require different levels of expenditure, accordingly the measure should be worked out for different types of roads using following indicators.

- Operating costs for paved (hard top) roads per lane kilometres.[103]

INDICATOR FORMULA: O & M Expenditure for Paved Roads

Total Length of Paved Roads (kms)

[102] Canadian Municipal Measurement Programme – Appendix 3
[103] Canadian Municipal Measurement Programme – Appendix 3

- Operating costs for unpaved (loose top) roads per lane kilometres.[104]

INDICATOR FORMULA: O & M Expenditure for Unpaved Roads

Total Length of Unpaved Roads (kms)

INFERENCE: It measures cost of maintenance per kms of surfaced road and thus helps ULB to control cost and thereby leads to expenditure efficiency.

While a high value of the indicator is suggestive of importance given to O&M, it may also point out to poor quality road construction activity.

- Costs for Rainy Season Maintenance of Roadways per lane kilometres

INDICATOR FORMULA: Special Expenditure on Rainy Season Road Maintenance

Total Length of Road Network (kms)

SIGNIFICANCE: In India roads require special maintenance during rainy season. It is more appropriate to separate such expenditure to have better monitoring.

INFERENCE: It helps ULB to identify rainy season expenditure separately and thereby makes it possible measurement of adequacy, efficiency etc.

High value indicates adequate importance given to maintenance aspect by ULB but also indicates lack of efforts to reduce need for rainy season maintenance through proactive measures like creating system to clear water logging or converting bitumen roads in to cement concrete etc. Different cities are subject to different intensities of rainfall. So comparisons should be made accordingly.

- Total operating and maintenance expenditure of Road Service per capita

INDICATOR FORMULA: Total O & M Expenditure on Roads

Total Population of City

SIGNIFICANCE: Another way of measuring adequacy of money spent on road service.

INFERENCE: Helps to know level of expenditure on roads per capita. This may be useful for inter-ULBs comparison.

[104] Canadian Municipal Measurement Programme – Appendix 3

Higher per capita expenditure does not mean better road service in the city.

Beside these financial ratios, rest of financial ratios for roads, storm water drainage and other related services should be calculated as they have been explained in earlier parts on water and sewerage indicators and in the separate chapter on financial indicators.

ENVIRONMENTAL CONSERVATION INDICATORS

- ### Number of Trees Cut for Expansion/Development of Roads

INDICATOR FORMULA: Number of Trees cut

SIGNIFICANCE: Expansion of existing roads and development of new roads many times involves environmental cost in the form of cutting of trees. Sometime it is inevitable to cut trees to improve road network but then enough trees must be planted and grown to mitigate environmental damage.

INFERENCE: This helps to know how many trees were cut due to expansion of roads. This information is useful to plan tree plantation programme.

Numbers do not adequately indicate the real level of environmental damage that depends on the context and present status of ecology in the area.

- ### Number of Trees Planted and Nurtured against Trees Cut

INDICATOR FORMULA: $\frac{\text{Number of Trees Planted and Survived}}{\text{Number of Tree Cut due to Expansion of Roads}}$

SIGNIFICANCE: Expansion of existing roads and development of new roads many times involves inevitable cutting of trees. In such circumstances new trees need to be planted and sufficiently nurtured to mitigate environmental damage. One needs to measures such environment conservation efforts.

INFERENCE: Helps to know how many new trees were planted and survived against the number of trees cut to develop roads. Thus it measure efficiency of tree plantation programme.

Higher or low number is not indicative of real level of environmental damage that depends on the context and present status of ecology in the area.

Chapter 5 E - Indicators for Streetlight Service

Index

STREET-LIGHTING SERVICE ***232***

INTRODUCTION 232

COVERAGE/EXPLANATORY INDICATORS 232

- Population Coverage by Streetlight Service 232
- Area Coverage by Streetlight Service 232
- Street Coverage by Streetlight Service 233
- Spacing between Streetlights 233
- Number of Streetlights in Dense Population Areas 234
- Number of Streetlights in Sparse Population Areas 234
- Number of Streetlights with Automatic Switch On/Off System 234

QUANTITY/STATUS/RESOURCES COMMITED INDICATORS 235

- Number of Streetlights per kilometre of Road Length 235
- Per Capita Resource Commitment for Streetlight Service 235
- Streetlights by Types (% of Sodium Lamps) 236
- Share of Mercury Lamp Streetlights 236
- Share of Tube lights based Streetlights 237
- Share of Streetlight Service in Resources of ULB 237
- Adequacy of Power Supply 237
- Adequacy of Manpower (of different types – technical, maintenance, quality control) 237
- Adequacy of Stock 237

QUALITY INDICATORS 237

- Streetlight Defects per 1000 streetlights 237
- Replacement / Repairs 238
- Average Life of Lamps (by type) 238
- Replacement Ratio of Lamps 239

EFFICIENCY INDICATORS 239

- Promptness of Maintenance 239
- Streetlight Complaints Redressed within two hours 240
- Share of departmentally detected streetlight defects 240
- Luminous Intensity in Crime Prone Areas 241

- Luminous Intensity in Densely Populated Areas _____ 241
- Cost effectiveness of service _____ 242

EXPANSION/DEVELOPMENT INDICATORS _____ 242

- Increase in streetlights by type (sodium, mercury, tube fittings, lamps) _____ 242
- Increase in Population Coverage _____ 243
- Increase in Area Coverage _____ 243
- Increase in Street length Coverage _____ 243
- Change in character/composition of streetlights (by type) _____ 243
- Per Capita Streetlight Service Development Expenditure _____ 244
- Expansion of Streetlight Service against desired or planned development ____ 244
- Upgrading Staff (HR) Quality _____ 244

CUSTOMER/CONSUMER SATISFACTION INDICATORS _____ 245

- Complaints per 1000 people _____ 245
- Complaints per 1000 streetlight points _____ 245
- Complaints per technical staff of Streetlight Service _____ 245
- Number of Customers Satisfied with Streetlight Service _____ 246
- Response to Consumers _____ 246
- Promptness in Response _____ 246
- Review and monitoring of Complaints Redressal Mechanism _____ 246

ADMINISTRATIVE/GENERAL INDICATORS _____ 246

- Staff per 1000 Streetlight _____ 246

FINANCIAL INDICATORS _____ 246

- Operations and Maintenance Cost per Streetlight _____ 246
- Annual Power Consumption or Expenditure per Streetlight _____ 247

ENVIRONMENTAL CONSERVATION INDICATORS _____ 248

- Energy Efficiency _____ 248
- Energy Saving _____ 248

STREET-LIGHTING SERVICE

INTRODUCTION

The socio-economic activities of urban life continue even after sundown, and in some cases, well into the night. Therefore, an important responsibility of the ULBs is to ensure that roads and streets in their jurisdiction are adequately lit, for the safety and convenience of traffic and pedestrians. It has to run a good streetlight service where all streets are well lit, each according to the thoroughfare it carries and at the same time keeping electricity consumption within budgetary and environmental limits. The ULB has to space streetlights and put the lights at an appropriate height so that, (for different types and width of road, and different volume of thoroughfare and population density,) the luminous intensity is adequate, given its resource constraints.

It has to choose correctly between various kinds of light-bulbs of various prices having various energy requirements and giving various intensity of illumination. During various weather conditions, it has to ensure that each streetlight is properly maintained. They also have to upgrade periodically the service by proactive measures, such as replacing existing streetlights, investing in better bulbs and upgrading operation and maintenance staff.

COVERAGE/EXPLANATORY INDICATORS

- Population Coverage by Streetlight Service[105]

INDICATOR FORMULA: $\frac{\text{Population Covered under Streetlight Service}}{\text{Total Population}} * \frac{100}{1}$

- Area Coverage by Streetlight Service

INDICATOR FORMULA: $\frac{\text{Area Covered under Streetlight Service}}{\text{Total Area of City}} * \frac{100}{1}$

[105] City Managers' Association – Gujarat – Performance Measurement and Urban Indicators Programme

- Street Coverage by Streetlight Service

INDICATOR FORMULA: Kilometres of street length covered by streetlight * 100

Total km length of streets to be covered under streetlight 1

UNIT OF MEASUREMENT: % of people, % of area and % of street's length.

SIGNIFICANCE: These are the general measures of coverage and adequacy of streetlight service in the city.

INFERENCE: Comparing different areas of city under ULB by using these indicators help to draw attention of the ULB to the areas where on an average street light coverage is low. These indicators are useful for macro level comparison between different municipal bodies of the region or state.

These indicators indicate coverage aspect only and do not reveal any quality aspects of the service.

- Spacing between Streetlights[106]

INDICATOR FORMULA: Total length of roads covered by streetlights (metres)

Total number of streetlight

UNIT OF MEASUREMENT: metres; distance between two streetlight poles

SIGNIFICANCE: The space between two streetlight poles is a very important design parameter of streetlight service. There are proven technical standards (benchmarks) regarding spacing of streetlights. Illumination level depends greatly on distance between two streetlight poles. Different types of lamps have different illumination level; also, height of poles (lamp) and width of road affects spacing decision. Accordingly this indicator should be calculated in a disaggregate way on basis of types of lamp, width of road and height of poles (lamp).

INFERENCE: it provides information regarding existing distance between two streetlight poles and thus helps ULB to correct present anomalies and to plan future development systematically.

[106] Second State Finance Commission – Tamil Nadu Report

Aggregate level indicator is not of very useful except for very broad comparison across various ULBs or areas within ULB. Disaggregate level (between different areas of different requirements) measurement can be useful if compared with appropriate benchmarks.

- Number of Streetlights in Dense Population Areas

INDICATOR FORMULA: $\frac{\text{Number of Streetlights in densely populated areas}}{\text{Km of road length in densely populated areas}}$

UNIT OF MEASUREMENT: Number per Km in crowded or densely populated areas

SIGNIFICANCE: population density is different in different parts of city. Streetlight needs differ as per density of population. Along with this, one should measure streetlights in sparsely populated areas using following indicator.

- Number of Streetlights in Sparse Population Areas

INDICATOR FORMULA: $\frac{\text{Number of Streetlights in sparsely populated Areas}}{\text{Km of road length in sparsely populated areas}}$

INFERENCE: This is the measure of post-daylight visibility in crowded areas of the ULB. Comparing different areas of city it helps to draw attention of the ULB to the densely populated areas where on the average, street light coverage is low.

Areas registered as densely populated may, (in some sporadic cases) not be the same ones as those where traffic, of pedestrian movement is high. That depends largely on local conditions. The same is true for sparsely populated areas

- Number of Streetlights with Automatic Switch On/Off System

INDICATOR FORMULA:

$$\frac{\text{Number of Streetlights with Automatic On/Off Mechanism}}{\text{Total Number of Streetlights in the City}} * \frac{100}{1}$$

SIGNIFICANCE: Streetlights should be switched on at dusk and switched off promptly at daybreak. Sometimes due to callousness, streetlights are left on well into the day, which results in, to wasteful energy consumption.

INFERENCE: This helps to focus on the ULBs where this number is too low and therefore needs more promptness and vigilance to reduce illumination time.

Daylight hours vary over the year, so desegregations are necessary for various seasons. Secondly, the time of switching on and off depends on the local needs and levels of activity around the times of sunrise and sunset. Comparisons should be made accordingly.

QUANTITY/STATUS/RESOURCES COMMITED INDICATORS

- ### Number of Streetlights per kilometre of Road Length[107]

INDICATOR FORMULA: $\frac{\text{Number of Streetlights in the city}}{\text{Km of road length in the city}}$

UNIT OF MEASUREMENT: Number per Km of Road

SIGNIFICANCE: it is a broad status indicator. It becomes meaningful when worked in disaggregate terms.

INFERENCE: helps to know overall provision of streetlight service in the city

Does not take in to account quality of streetlight service.

- ### Per Capita Resource Commitment for Streetlight Service

INDICATOR TYPE: Input Indicator

INDICATOR FORMULA: $\frac{\text{Total annual/monthly expenditure on streetlight service}}{\text{Population}}$

UNIT OF MEASUREMENT: Rs. Per capita

[107] TNUDP II – Institution Development Project –Development and Implementation of Urban Indicators for ULBs of Tamil Nadu – Society for Development Studies – New Delhi

SIGNIFICANCE: Another way to measure overall resource commitment to streetlight service is per capita streetlight service expenditure.

INFERENCE: This is a measure of the expense incurred per capita by the ULB for providing streetlights and can be a proxy for resources allocation sufficiency, when compared with other services provided by the ULB or with the other ULBs. If per capita provision is exceptionally high, then it can be inferred that too much resource has been provisioned for streetlight service. . Comparing across ULBs, this helps to focus on ULBs where resource provisioning for streetlight service is relatively high and can be examined in the context of level of service in that service.

On its own, this indicator does not clarify whether the per capita cost incurred is proportionate to the coverage or quality of the service.

- Streetlights by Types (% of Sodium Lamps)[108]

INDICATOR FORMULA: $\frac{\text{Sodium Lamp Streetlights}}{\text{Total Number of Streetlights}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: There are different types of lamps available and they serve different purposes. ULBs need to know their composition/status of streetlight service.

INFERENCE: This helps ULBs to know and keep record of the composition of different types of lamps in its streetlight network and thereby helps them to achieve a composition for optimal illumination.

This status indicator provides basic information, not useful beyond that.

In similar way percentage share of other types of lamps should be calculated using following indicators.

- Share of Mercury Lamp Streetlights

INDICATOR FORMULA: $\frac{\text{Mercury Lamp Streetlights}}{\text{Total Number of Streetlights}} * \frac{100}{1}$

[108] Second State Finance Commission - Tamil Nadu Report

- Share of Tube lights based Streetlights

INDICATOR FORMULA: Tube lights Based Streetlights * 100

Total Number of Streetlights 1

- Share of Streetlight Service in Resources of ULB

INDICATOR FORMULA: Resources allotted or spent on streetlight service * 100

Total resource allotted or spent by ULB 1

SIGNIFICANCE: Another very useful status indicator. There are many factors, which affect the quality of streetlight service, but first and foremost among them is financial resource spent.

INFERENCE: It measures resources allotted or spent on streetlight in comparison with other services. It indicates relative importance given to streetlight service.

Provides broad indication, the percentage share of streetlight service is not proportionate to perceived or actual needs of streetlight service but depends on urgency of other services.

Following indicators regarding adequacy of various aspects of streetlight service should be calculated using various formulae and explanation given under similar indicators of water supply service.

- Adequacy of Power Supply
- Adequacy of Manpower (of different types – technical, maintenance, quality control)
- Adequacy of Stock

QUALITY INDICATORS

- Streetlight Defects per 1000 streetlights

INDICATOR TYPE: Outcome Indicator

INDICATOR FORMULA: Number of Street-light defects * 1000

Total number of Streetlights 1

UNIT OF MEASUREMENT: number per 1000.

SIGNIFICANCE: The number of streetlights and other related infrastructure provided is important but what is more important is the default ratio associated with it

INFERENCE: This is a measure of the degree of maintenance, effectiveness and power efficiency of the streetlight service provided by the ULB. This indicator helps a ULB to know in which part of the city or with which quality of material there are more defaults or defect. This helps to focus on those ULBs that have more defective streetlights than others do and therefore calls for attention.

It indicates only consolidated value, the defects may be result of poor quality of material, installations or inadequate maintenance or poor quality work by maintenance staff etc.

- Replacement / Repairs

INDICATOR TYPE: Outcome Indicator

INDICATOR FORMULA: $\frac{\text{Number of defective streetlights repaired / replaced}}{\text{Number of defective streetlights}}$

UNIT OF MEASUREMENT: Ratio, so pure number, therefore, no unit.

SIGNIFICANCE: /INFERENCE: This is a measure of the ULB's commitment towards maintenance of service and effectiveness of its maintenance staff to mend defects at earliest. Thus, it helps to draw attention where this commitment is less than average and needs improvement

It only indicates that adequate repair and replacement is not taking place but one will have to back it by further analysis regarding factors such as availability of adequate funds, manpower, spare parts and quality of supervision

- Average Life of Lamps (by type)

INDICATOR TYPE: Outcome Indicator

INDICATOR FORMULA: $\frac{\text{Summation of life span of all fused lamps (by type)}}{\text{Number of fused out Lamps}}$

UNIT OF MEASUREMENT: time hours

SIGNIFICANCE: Lamps have standard life expectancy and that represents their one of the most important quality. It becomes at most necessary to know whether lamps are burning for expected time period, if not then there is seriously wrong with their quality.

INFERENCE: It measures an average burning period (life span) of the lamps purchased by the ULB's streetlight department. This indicator thus measures important quality aspect of lamps. It should be calculated for each type of lamps as they have different burning period expectancy.

The technical life expectancy of lamps can get severely damaged by the fluctuating power supply or low quality of other components like starter, capacitor etc.

- ### Replacement Ratio of Lamps

INDICATOR TYPE: Outcome Indicator

INDICATOR FORMULA: $\frac{\text{Number of Lamps (by type) replaced during the year}}{\text{Total number of Lamps (by type) installed in the city}}$

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: technical burning period (life expectancy) of lamps determines standard replacement ratio. It is necessary to compare actual replacement ratio with standard to determine quality of lamps used and to control cost of replacement.

INFERENCE: replacement ratio measures actual burning time efficiency of lamps. It helps in examining quality of lamps and finally replacement cost of streetlight service

Lamp's replacement depends on various other factors than its production quality.

EFFICIENCY INDICATORS

- ### Promptness of Maintenance

INDICATOR TYPE: Outcome Indicator

INDICATOR FORMULA: Average number of days to replace a defective streetlight.

UNIT OF MEASUREMENT: number

SIGNIFICANCE: This is a measure of the ULB's efficiency and promptness towards maintenance of service and helps to draw attention to ULBs that need improvement in this regard.

INFERENCE: The need for uninterrupted service and the proneness to light failure depends upon exogenous factors like climatic conditions, socio-economic milieu (determining crime proneness). These should be considered before comparing among ULBs.

- Streetlight Complaints Redressed within two hours

INDICATOR FORMULA: Streetlight Complaints Redressed within two hours * 100

Total streetlight complaints received

UNIT OF MEASUREMENT: number of streetlight complaints redressed

SIGNIFICANCE: Streetlight is a peculiar service in which defect is detected just before prime use time of the service. As a result, redressal of streetlight defects has to be immediate to be meaningful. There is no meaning of redressing a street light complaint after hours of its recording.

INFERENCE: It measures promptness of complaint redressal at highest level. Higher number definitely indicates efficiency of ULB.

It measures performance against complaints received. Streetlights may not be working but nobody complaints.

- Share of departmentally detected streetlight defects

INDICATOR FORMULA: No. of departmentally detected/redressed defects * 100

Total number of defects detected/redressed 1

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: The efficiency of streetlight service lies in proactiveness. ULB should not wait for complaints regarding non-performing streetlights. It must have its own surveillance when streetlights are switched on to know how many streetlights are not functioning.

INFERENCE: It measures non-functioning streetlights detected and redressed by streetlight department thus, it measures proactiveness of streetlight maintenance.

Not limited by any serious weakness but high number also indicates poor quality of streetlights.

- ## Luminous Intensity in Crime Prone Areas

INDICATOR CATEGORY: Outcome Indicators

INDICATOR FORMULA: average power of streetlights in crime prone areas

UNIT OF MEASUREMENT: Watts

SIGNIFICANCE: high crime prone areas are generally underdeveloped and poor areas where by natural consequences streetlight service get poorly developed.

INFERENCE: This is a measure of the commitment of the ULB in controlling crime within its jurisdiction by providing ensuring better visibility in crime prone areas.

Darkness after evening is obviously not the only factor that generates and nurtures crime in a particular neighbourhood. If the focus is on crime control, a deeper understanding of the complex interplay of all the relevant factors is necessary.

- ## Luminous Intensity in Densely Populated Areas

INDICATOR CATEGORY: Outcome Indicators

INDICATOR FORMULA: average power of streetlights in crowded areas

UNIT OF MEASUREMENT: Watts

SIGNIFICANCE: In crowded areas, density of traffic is more. Proper illumination helps in smooth flow of traffic.

INFERENCE: This is a measure of the commitment of the ULB in the smooth flow of traffic and safety and comfort of pedestrians in crowded places

Darkness after evening is obviously not the only factor that causes inconvenience to traffic and pedestrians. Other factors, for example road conditions, width of road, cleanliness of streets, location of civic amenities, light emitting from shops and market places on roads, presence (or absence) of stray animals, etc., are at play.

- Cost effectiveness of service

INDICATOR TYPE: Efficiency Indicator

INDICATOR FORMULA: Total monthly expenditure on streetlight service

Kilowatt hours provided per month in streetlights

UNIT OF MEASUREMENT: Rs Lakhs per kilowatt hour

SIGNIFICANCE:

INFERENCE: This is a measure of the expense incurred by the ULB for the electric energy used in streetlights and can be a proxy for technical and economic efficiency (strictly speaking, inefficiency, by this indicator). Comparing across ULBs, this helps to focus on ULBs where cost of service provision is relatively high and therefore economizing measures are called for.

On its own, this indicator does not clarify composition of the cost incurred (administrative, technical. Also, purchase cost of electricity and living differs from state to state so while comparing ULBs of two different states enough care should be taken to neutralize such differences pertaining to purchase cost.

EXPANSION/DEVELOPMENT INDICATORS

- Increase in streetlights by type (sodium, mercury, tube fittings, lamps)

INDICATOR FORMULA: Number of streetlights at the end of year

Less – Number of streetlights at the beginning of year

UNIT OF MEASUREMENT: numbers

SIGNIFICANCE: At first, instance one likes to know developmental efforts in simple numbers and physical terms.

INFERENCE: very simple and gives extent of development in physical number

just a status information, may turn out non-meaningful, which it will be if it is used as an absolute measure and not converted into a relative one (relative to area, population, etc.)

- Increase in Population Coverage

INDICATOR FORMULA:

$$\frac{\text{Population covered under Streetlights at the end of year}}{\text{Population covered under streetlights at the beginning of year}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Expansion or development is better understood in the context. Population of the city increases and streetlight service should keep pace with it even if it has no backlog. If there is, backlog then it needs to increase its coverage at a higher rate than population growth. Increase in coverage should be measured in terms of area served and street length by using following indicators.

- Increase in Area Coverage

INDICATOR FORMULA:

$$\frac{\text{Area (sq. kms) covered under Streetlights at the end of year}}{\text{Area (sq. kms) covered under streetlights at the beginning of year}} * \frac{100}{1}$$

- Increase in Street length Coverage

INDICATOR FORMULA:

$$\frac{\text{Street Length (kms) covered under Streetlights at the end of year}}{\text{Street Length (kms) covered under streetlights at the beginning of year}} * \frac{100}{1}$$

INFERENCE: these indicators measures expansion or developmental efforts of ULBs and thus provide information about level of efforts still required to be put in.

Not limited by serious weakness.

- Change in character/composition of streetlights (by type)

INDICATOR FORMULA: Change in the share of each type of streetlights – sodium, mercury, tube light fittings, lamps etc. compared to last year or over the years. For this, share of each type of streetlight in total streetlights for the past and present should be calculated and should be compared holistically.

UNIT OF MEASUREMENT: percent share

SIGNIFICANCE: Over the years because of different growth rates in the expansion of different types of streetlights, the character or composition of streetlight service undergoes a change, sometime for better or sometime even for worse.

INFERENCE: it helps to know share of different types of streetlights and when compared over the years helps to know growth trend and changing character.

A meaningful pattern may emerge or may not emerge from such analysis.

- Per Capita Streetlight Service Development Expenditure

INDICATOR FORMULA: $\frac{\text{Total streetlight service development expenditure}}{\text{Total Population of the city}}$

UNIT OF MEASUREMENT: Rs. Per capita

SIGNIFICANCE: Another simple but effective way to indicate extent of development efforts carried out by ULB. Increase in financial resources has to move ahead keeping pace with the increase in population. Per capita figures can immediately expose any signs of lagging behind,

INFERENCE: It helps to know whether development expenditure is keeping pace at per capita level or not. If yes by what margin and if not then it is failing to what extent.

This is quantitative in character and does not take into account expenditure efficiency or needs.

- Expansion of Streetlight Service against desired or planned development

This indicator has been explained earlier on under Road and Storm Water Service. Following that explanation, it should be calculated for streetlight service also.

- Upgrading Staff (HR) Quality

Refer similar indicator explained under water supply service for explanation

CUSTOMER/CONSUMER SATISFACTION INDICATORS

- Complaints per 1000 people

INDICATOR TYPE: Outcome Indicator

INDICATOR FORMULA: $\frac{\text{Number of Complaints in a year}}{\text{Total population}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: Number per 1000 people

SIGNIFICANCE: The number of complaints is one of the concrete indicators of quality of any service. This number should be examined in various terms – number people, number of streetlights, number of staff working in streetlight department etc. Following variations should also be worked to get holistic picture of complaints.

- Complaints per 1000 streetlight points

INDICATOR FORMULA: $\frac{\text{Number of Complaints in a year}}{\text{Total Numbers of Streetlights}} * \frac{1000}{1}$

- Complaints per technical staff of Streetlight Service

INDICATOR FORMULA: $\frac{\text{Number of Complaints in a year}}{\text{Total population}} * \frac{1000}{1}$

INFERENCE: This is a measure of the quality, condition and effectiveness of the street-lighting service. Comparing across ULBs this helps to draw attention to areas that have registered more complaints and therefore need more attention.

The comparison is meaningful only if all the ULBs concerned have similar coverage of streetlight service to start with. The number of complaints also depends on exogenous factors like promptness and willingness of the residents to register a complaint and their expectations of service coverage and quality, level of awareness, social/civic consciousness, exposure and education.

Following indicators should also be applied for judging consumer satisfaction about road and road related other services. The indicators have been explained earlier under section on water supply service indicators.

- Number of Customers Satisfied with Streetlight Service
- Response to Consumers
- Promptness in Response
- Review and monitoring of Complaints Redressal Mechanism

ADMINISTRATIVE/GENERAL INDICATORS

- Staff per 1000 Streetlight[109]

INDICATOR TYPE: Input Indicator

INDICATOR FORMULA: $\frac{\text{Total number of Staff}}{\text{Number of streetlights}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: number per thousand

SIGNIFICANCE: /INFERENCE: This is a measure of the ULB's commitment in employing staff for the upkeep of streetlights. Measurements should be referred to an appropriate benchmark of optimum staff per 1000 streetlights such that figures below such a benchmark would indicate understaffing, and those above would indicate overstaffing. Figures for this indicator, along with the appropriate benchmark would help to draw attention to ULBs where streetlight service is understaffed or overstaffed.

This indicator does not give any information about the composition of staff (administrative or technical). Disaggregation by category of staff is essential.

FINANCIAL INDICATORS

- Operations and Maintenance Cost per Streetlight[110]

INDICATOR TYPE: Input Indicator

INDICATOR FORMULA: $\frac{\text{Total operations and maintenance expenditure}}{\text{Number of street lights maintained}}$

UNIT OF MEASUREMENT: Rs per street light

[109] City Managers' Association – Gujarat – Performance Measurement and Urban Indicators Programme
[110] Second State Finance Commission – Tamil Nadu Report

SIGNIFICANCE: /INFERENCE: This measures the resources committed by the ULB to the upkeep of streetlights. Comparing across ULBs this draws attention to those ULBs that are spending less on the upkeep of streetlights

The need for maintenance may vary across ULBs according to exogenous factors like weather, road conditions, socio-economic composition of the resident population, proneness to crime etc. Comparisons and recommendations have to be made accordingly.

- Annual Power Consumption or Expenditure per Streetlight[111]

INDICATOR FORMULA: $\frac{\text{Annual power consumption of streetlight}}{\text{Total number of Streetlights}}$

$\frac{\text{Annual power consumption expenditure of streetlight}}{\text{Total number of streetlights}}$

UNIT OF MEASUREMENT: units per streetlights or Rs. Per streetlight

SIGNIFICANCE: Major component of streetlight service expenditure (more than 90 per cent) is power consumption. It is possible to calculate standard value of power consumption per streetlight point and on basis of it standard power expenditure per streetlight. Comparison of actual values with standard paves way for efficiency measurement.

INFERENCE: It measures power consumption and in turn financial cost per streetlight. It helps ULB to measure technical and expenditure efficiency per streetlight point and thus finally helps to improve technical and cost efficiency.

This is not so useful at the aggregate level. It must be calculated at disaggregate level in as much detail as possible e.g. as per types of lamps, as per usage (total day less non-functioning days) etc.

Beside these financial ratios, rest of financial ratios for streetlight service should be calculated as they have been explained in earlier parts on water and sewerage indicators and in the separate chapter on financial indicators.

[111] TNUDP II – Institution Development Project –Development and Implementation of Urban Indicators for ULBs of Tamil Nadu – Society for Development Studies – New Delhi

ENVIRONMENTAL CONSERVATION INDICATORS

- ### Energy Efficiency

INDICATOR FORMULA: Number of the most energy efficient lamps * 100

Total number of Streetlights} 1

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Some types of bulbs give more illumination for less electricity. ULBs should convert the maximum number of its streetlights to such category.

INFERENCE: This helps to focus ULBs that should change more of its bulbs to the energy efficient type

Energy efficiency is not only dependent on type of lamps; it depends on the components, which make one streetlight point.

- ### Energy Saving

INDICATOR FORMULA: Number of hours for which streetlights are lit

SIGNIFICANCE: Streetlights should be switched on at dusk and switched off promptly at daybreak. Sometimes due to callousness, streetlights are left on well into the day.

INFERENCE: This helps to focus on the ULBs where this number is too high and therefore needs more promptness and vigilance to reduce illumination time.

Daylight hours vary over the year, so desegregations are necessary for various seasons. Secondly, the time of switching on and off depends on the local needs and levels of activity around the times of sunrise and sunset. Comparisons should be made accordingly.

Chapter 5 F - Indicators for Traffic and Public Transport

Index

TRAFFIC & PUBLIC TRANSPORT ***252***

INTRODUCTION 252

TRAFFIC ***252***

COVERAGE INDICATORS 252

- Crossings under Traffic Management 252
- Crossings with traffic police 253
- Crossings with traffic signals 253
- Crossings with rotary arrangement 253
- Crossings with Fly-over or Sub-way arrangement 253

QUANITY/STATUS/RESOURCES COMMITTED INDICATORS 254

- Accident frequency 254
- Injuries 254
- Deaths 254
- Number of vehicles per 1000 people 254
- Intersections per Sq. Kms 255
- Adequacy of traffic signals 255
- Volume on the roads 256
- Peak Traffic 256
- Parking Space 257
- Adequacy of Traffic Control Personnel 257

QUALITY AND EXPANSION/DEVELOPMENT INDICATORS 258

- Number of Crossings and Critical Points brought under Traffic Management 258
- Creation or Addition in Public Parking Space 258

EFFICIENCY INDICATORS 259

- Apprehending errant drivers 259
- Number of Cases booked for Parking Rules Violations 259

CUSTOMER /CONSUMER SATISFACTION INDICATORS 260

- People satisfied with overall traffic management 260
- People satisfied with parking infrastructure 260
- People satisfied with behaviour of Traffic Police 260
- People satisfied with workings of traffic signals 260

ADMINISTRATIVE/GENERAL INDICATORS 260

- Number of Traffic Rules Violation cases per traffic control person 260

- Number of Parking Rules Violation Cases per traffic control person ____ 261
- Recovery of fines/penalties per traffic control person _____ 261
- Number of Traffic Control Persons caught for neglecting duties or for taking bribes 261

PUBLIC (City) TRANSPORT SERVICE _____ 261

COVERAGE INDICATORS _____ 261

- Population Coverage _____ 261
- Area Coverage _____ 262
- Route's Coverage by MTS _____ 262
- Passengers Catered as percentage of population _____ 263
- Passengers Catered as percentage of potential passengers _____ 263
- Distance covered _____ 263

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS _____ 264

- Public (municipal) Transport Vehicles (Busses) to Population of City ___ 264
- Adequacy of Municipal Transport Vehicles (Busses) _____ 264
- Frequency of service _____ 264
- Bus – Stops _____ 265
- Appropriateness of space between bus stops _____ 265

QUALITY INDICATORS _____ 265

- Proportion of busses which are clean and aesthetically maintained ____ 266
- Proportion of bus stops/terminus which are clean and aesthetically maintained 266
- Actual trips against expected or planned trips per bus _____ 266
- Actual average number of passengers against capacity _____ 266

EFFICIENCY _____ 267

- Daily trips per Bus _____ 267
- Average Passengers per Bus _____ 267
- Average Earnings per Bus _____ 267
- Punctuality of Bus Service _____ 267
- Distance Travelled By a Bus in a Day or Per Trip _____ 268
- Fuel Utilisation Efficiency _____ 269
- Bus breakdown or Off-the-route ratio _____ 269
- Manpower Efficiency _____ 269
- Number of Without Ticket passengers caught by MTS inspectors _____ 270
- Proportion of without ticket passengers caught to total passengers ____ 270
- Without Ticket Passengers Caught per MTS Inspector _____ 270

EXPANSION/DEVELOPMENT INDICATORS _____271
- Net addition to the fleet _____271
- Addition to area under Bus Stop/Bus Terminus and suitable infrastructure271

CUSTOMER/CONSUMER SATISFACTION INDICATORS _____272
- Percentage of commuters satisfied with the frequency of busses _____272
- Percentage of commuters satisfied with the frequency of busses _____272
- Percentage of commuters satisfied with frequency of bus stops _____272
- Percentage of commuters satisfied with condition of busses _____272
- Percentage of population unhappy with overcrowding _____272
- Percentage of commuters satisfied with quality of personnel (driver, conductor, etc) 272
- Percentage population who feel bus fares are affordable _____272

ADMINISTRATIVE/GENERAL INDICATORS_____272
- Number of MTS employees caught for neglecting their duties or taking bribes from without ticket passengers _____272

FINANCIAL INDICATORS _____273
- Cost per Kilometre _____273
- Cost per Passenger _____273
- Cost per Route _____273
- Salary cost per kilometre or passenger or route or per bus_____273
- Maintenance cost per kilometre or passenger or route or per bus _____273
- Administrative cost per kilometre or passenger or route or per bus _____273
- Earning per kilometre _____273
- Earning per Passenger _____274
- Earning per route _____274

ENVIRONMENTAL CONSERVATION INDICATORS _____274
- Number of Polluting Busses _____274

TRAFFIC & PUBLIC TRANSPORT

INTRODUCTION

The ULB has to ensure the smooth and safe flow of traffic on its roads by providing traffic support that is multidimensional i.e., providing adequate traffic services (e.g., traffic signalling, traffic police, parking space, etc.). It should also help to minimize vehicular pollution. This burden becomes lighter if there is a satisfactory and useful public transport system. That is the reason for expounding the issues of traffic and transport together in the same chapter. A practicable Public Transport System can have a multitude of beneficial effects like reduction of slum and squatter settlements, reducing the need for owning private vehicles, which in turn would reduce atmospheric pollution.

The indicators given may be unconventional because they have not been constructed for technicians but from the citizen's i.e., the consumer's/customer's point of view. They are only suggestive, not exhaustive.

TRAFFIC

COVERAGE INDICATORS

- ### Crossings under Traffic Management

INDICATOR FORMULA:

$$\frac{\text{Number of crossings under one or other traffic management system}}{\text{Total number of crossings/junctions}}$$

SIGNIFICANCE: There cannot be a road network without intersections or crossing of roads. Crossings are accident-prone places and need to be manned either by traffic police or by signals or by rotary system or by construction of flyovers etc. First indicator above gives aggregate picture of the crossings under one or other sort of traffic management. Along with this disaggregate level indicators should be worked out on all these counts to have a complete picture regarding traffic management using following indicators.

- Crossings with traffic police

INDICATOR FORMULA: $\frac{\text{Number of crossings with traffic police}}{\text{Total number of crossings/junctions}}$

- Crossings with traffic signals

INDICATOR FORMULA: $\frac{\text{Number of crossings with traffic signals}}{\text{Total number of crossings}}$

- Crossings with rotary arrangement

INDICATOR FORMULA: $\frac{\text{Number of crossings with rotary arrangement}}{\text{Total number of crossings}}$

- Crossings with Fly-over or Sub-way arrangement

INDICATOR FORMULA: $\frac{\text{Number of crossings with Flyover/Subway arrangement}}{\text{Total number of crossings}}$

INFERENCE: This is a measure of the ULB or traffic police department's commitment towards ensuring smooth flow of traffic at crossings and greater road safety. First indicator helps to know how many crossings yet to be brought under traffic management while other disaggregate indicators give information about crossings under different traffic management systems.

Traffic police may not be effective or may not attend their designated points. Sometimes there may be a large number of signalled crossings but they might not have been placed at strategically important places may remain out of order or cause more than necessary stoppages to the flow of traffic. Similarly, rotary arrangement or fly-overs have certain advantages and disadvantages.

QUANITY/STATUS/RESOURCES COMMITTED INDICATORS

Road Safety

- Accident frequency

INDICATOR FORMULA: total number of accidents per year and per route or per crossing

SIGNIFICANCE: Accidents occur due to a variety of causes. Most of the causes are related to bad traffic management. Accidents result in injuries and deaths. So along with total accident frequency, it is desirable to calculate frequency of injuries and deaths. It is also necessary to analyse accidents per route or per crossing to know accident prone areas so that specific remedial measures can be taken.

- Injuries

INDICATOR FORMULA: Number of people injured by vehicles per year.

- Deaths

INDICATOR FORMULA: Number of Deaths occurred owing to traffic accidents per year

INFERENCE: These are measures of the extent and efficacy of traffic regulation of the traffic policy department (ULB) within its jurisdiction. Tabulating the figures and comparing them across cities helps to focus on those that need to improve the road safety by better regulation and management of traffic. Similarly intra-city (between the various areas of the city) analysis and comparison will indicate accident-prone areas and roads.

Comparisons are valid only if they are made among ULBs that have the same volume of traffic, road length and population density, capability of drivers.

Traffic Magnitude

- Number of vehicles per 1000 people

INDICATOR FORMULA: $\frac{\text{Number of vehicles of each type owned and used}}{\text{Total population}} * 1000$

SIGNIFICANCE: Traffic depends not only on population but it get manifested through the number vehicles owned and used by people. It is necessary to know the density of population.

INFERENCE: This measure gives an idea of the volume of traffic that the ULB or traffic police department has to control and regulate and its resultant workload. This helps to gauge the need for road space and plan the optimum use of existing roads (footpaths, bicycle lanes, road dividers, subways, flyovers, etc.) and the construction of new roads. The composition of vehicle ownership also indicates the socio economic condition of the ULB's population.

The planning and optimum use of road space should also heed through traffic.

Traffic Signals

- ### Intersections per Sq. Kms

INDICATOR FORMULA: $\frac{\text{Number of major intersections}}{\text{Area under municipal jurisdiction}}$

UNIT OF MEASUREMENT: no. per sq. km

SIGNIFICANCE: This gives a measure of the complexity of traffic flow in the cities and projects a case for supplementary road construction or building of flyovers or subways. It is also necessary to know adequacy of traffic signals arrangements by applying following indicator –

- ### Adequacy of traffic signals

$$\frac{\text{Number of crossings/intersections with traffic signals}}{\text{Number of crossings/intersections requiring traffic signals}}$$

In similar way adequacy of other traffic management arrangements like flyovers, rotary or manning by traffic policy should be worked out to access sufficiency of traffic management efforts

INFERENCE: Complexity and interference with its smooth flow depends more on efficient management in which case a high value for this may not cause any problem. In other words, numerous intersections better managed may be better than fewer intersections that are mismanaged.

Traffic Volume

- ## Volume on the roads

INDICATOR FORMULA: $\frac{\text{Total number of vehicles passing through all the roads per day}}{\text{Total road length.}}$

UNIT OF MEASUREMENT: no. per km

SIGNIFICANCE: After population and then number of vehicles, the traffic volume results from the number of vehicles actually used and pass on the road every day.

INFERENCE: This is a measure of the ULB or traffic police department's burden of responsibility to manage and maintain smooth and safe flow of traffic, the pressure on its existing roads, and its effect on the environment. Comparing across ULBs it helps to draw attention to ULBs that need more support (financial or other) for traffic control, regulation and maintenance.

On its own, this indicator does not say much about the kind of vehicles that ply on the road. For example, trucks and busses obviously create more pressure on existing road space than small cars and bicycles. So, meaningful comparisons by this indicator can be made only after disaggregating it (traffic volume) by type of vehicle

- ## Peak Traffic

INDICATOR FORMULA: $\frac{\text{Average number of vehicles passing through each road per minute during rush hour traffic}}{\text{Total road length.}}$

UNIT OF MEASUREMENT: no. per km

SIGNIFICANCE: Volume of the traffic differs during the day. It gets very high during certain period, which is known as peak hours. The road network needs to be designed to take care of peak hour's traffic.

INFERENCE: This is a measure of the ULB or traffic police department's burden of responsibility to manage and maintain smooth and safe flow of rush hour traffic, the pressure on its existing roads, and its effect on the environment. This also helps to gauge the relative necessity for a public transport service

On its own, this indicator does not say much about the kind of vehicles that ply on the road during rush hour. For example, trucks and busses obviously create more pressure on existing road space than small cars and bicycles. So, meaningful comparisons by this indicator can be made only after disaggregating it (traffic volume) by type of vehicle

- ## Parking Space

INDICATOR FORMULA: $\frac{\text{Total area of parking space available (sq. mts.)}}{\text{Number of vehicles plying on the roads per day}}$

UNIT OF MEASUREMENT: sq. mts. per vehicle

SIGNIFICANCE: No width of road will be sufficient if properly earmarked parking space is not created and parking is not enforced in such designated parking spaces.

INFERENCE: This is a measure of the ULB or traffic police department's competence to provide safe and clean parking space so that traffic flow on roads remains smooth. This indicator should be disaggregated by different areas and type of vehicle because that is a determinant of the amount and kind of parking space required.

This indicator does not throw much light on the relevant issues like safety, optimum location etc.

- ## Adequacy of Traffic Control Personnel

INDICATOR FORMULA: Number of traffic personnel per 10 km road length or per 1000 vehicles

UNIT OF MEASUREMENT: no. per km or 1000 vehicles

SIGNIFICANCE: In Indian cities traffic management is not automated and it is still highly labour intensive. Without adequate staff it is not possible to regulate and manage traffic in Indian cities as maturity of Indian traffic is also not up to mark.

INFERENCE: This is a measure of the adequacy of traffic control personnel.

Sometimes inefficient personnel cause more confusion and harassment to public than automated traffic control systems.

QUALITY AND EXPANSION/DEVELOPMENT INDICATORS

- ### Number of Crossings and Critical Points brought under Traffic Management

INDICATOR FORMULA: Number of Crossings and Critical Points brought under Traffic Management. Another variation of this indicator could be

Number of Crossings and Critical Points brought under Traffic Management.

Number of Crossings & Critical Points need to be brought under Traffic Management

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: it is necessary to monitor achievements against requirement to fine tune development planned for Traffic service.

INFERENCE: Helps to measure achievements in the context of requirements.

- ### Creation or Addition in Public Parking Space

INDICATOR FORMULA: Area (sq. mts.) added to public parking space during the year. This number can be compared with planned addition or addition needed –

Area (Sq. mts.) added to public parking space during the year

Area (sq. mts.) addition planned or need to be added to existing parking space

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: Increasing population and vehicular density make it necessary that every year additional parking area get created and utilised to keep traffic flow smooth. Today it has become possible to develop and parking service with some profit. Thus, it can earn some return to ULB along with regularisation of traffic.

INFERENCE: development of parking area should be evenly spread across the city otherwise, it may create spatial imbalance.

EFFICIENCY INDICATORS

- ### Apprehending errant drivers

INDICATOR FORMULA: number of drivers booked for violating traffic rules

The more specific calculation could be about accidents caused by drivers

$$\frac{\text{Number of drivers booked for causing accidents in a year}}{\text{Number of drivers caused traffic accidents in the same year}}$$

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: If violators of rules are not nabbed and punished there will not be a meaning to rules itself. Rules require efficient enforcement and monitoring of enforcement processes.

INFERENCE: This is a measure of the efficiency and promptness with which traffic regulations are enforced and therefore, the extent to which drivers are deterred from flouting traffic rules. Tabulating values and comparing across cities can draw attention to those cities that need to improve effectiveness of traffic control and vigilance as an urgent priority. That will depend on the quality of the enforcing authority (police force)

There may be cases where the driver was innocent and was wrongly booked, (e.g., where it might have been a pedestrian's fault, or the police misusing its authority)

- ### Number of Cases booked for Parking Rules Violations

INDICATOR FORMULA: Number of Cases booked for Parking Rules Violations

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: it is necessary to monitor frequency or number of parking violations to know efficiency of traffic personnel and enforcement of no parking regulations. Similarly, it is necessary to analyse causes of high or low number of parking rules violations Reasons for a high rate of violation may be due to non-availability of parking space or over strictness of staff placed in a particular area.

INFERENCE: High rate may indicate efficiency of traffic control staff and result in to earnings from fine, but high rate is at the same time causes of concern as it may indicate highhandedness of the staff on duty or people being forced to pay fine notwithstanding lack of adequate facility etc. or people's lack knowledge about parking rules etc.

CUSTOMER /CONSUMER SATISFACTION INDICATORS

- People satisfied with overall traffic management

INDICATOR FORMULA: Number of People satisfied with traffic conditions * 100

Population 1

SIGNIFICANCE: The residing population who is on the receiving end of the traffic conditions and service should have the final say on whether or not the service is good enough. While collecting information on this, the interviewer has to ask the respondents about their opinion of existing road safety, smooth flow of traffic, and other related issues. People's satisfaction should be measure in disaggregate terms –

- People satisfied with parking infrastructure
- People satisfied with behaviour of Traffic Police
- People satisfied with workings of traffic signals

INFERENCE: Attention can be drawn to ULBs where more people are more dissatisfied with traffic conditions and thus traffic conditions need to be improved.

This indicator relies on information gathered by the method of primary sample survey, (where the skill of the surveyor has an important role to play). The degree of satisfaction is a qualitative entity, varying with the perception and expectation of the individual.

ADMINISTRATIVE/GENERAL INDICATORS

Please refer to Chapter 7 for generic administrative indicators and apply necessary indicators to this service

- Number of Traffic Rules Violation cases per traffic control person

INDICATOR FORMULA: Number of Cases booked for Traffic Rules Violations

Number of Traffic Control Personnel

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Traffic function is labour intensive in India as a result lot of staff is employed whose performance needs to be monitored as efficient delivery of traffic service depends to large extent on

the efficiency of staff employed for it. Similarly, parking rule violation cases and fine recovered by each traffic control person should be calculated by using following indicators -

- Number of Parking Rules Violation Cases per traffic control person
- Recovery of fines/penalties per traffic control person

INFERENCE: High rate of these indicators may indicate efficiency of traffic control staff but high rate is at the same time cause of concern as it may indicate highhandedness of the staff on duty or lack of traffic facility still people being forced to pay fine or people lack knowledge about traffic rules, which indicate failure of traffic education component.

- Number of Traffic Control Persons caught for neglecting duties or for taking bribes

INDICATOR FORMULA: Number of traffic control persons caught for neglecting duties or taking bribes

UNIT OF MEASUREMENT: number

SIGNIFICANCE: There should be vigilance team carrying out continuous review of traffic control staff to ensure quality of the service. Another way to examine the efficiency and quality of traffic control staff is the review of complaints received from people about behaviour of traffic control staff.

INFERENCE: these indicators will be useful when used over the years to know improvement or decline in the quality of service.

PUBLIC (City) TRANSPORT SERVICE[112]

COVERAGE INDICATORS

- Population Coverage

INDICATOR FORMULA: $\frac{\text{Population covered by MTS}}{\text{Total Population}} * \frac{100}{1}$

[112] The more adequate the public transport service in the city less is the need for private vehicles, slum and squatter settlements and therefore greater the relief on existing road space and environment. This is a common benefit almost applicable to all indicators relating to public transport.

SIGNIFICANCE: Population is the first and foremost important determinant of need for number of busses and size of public transport service. This is a very broad indicator useful for inter ULBs comparison and intra ULB comparison. Population coverage depends on area so along with this indicator area coverage indicator should also be calculated using following formulae.

- Area Coverage

INDICATOR FORMULA: $\frac{\text{Area covered/served by MTS}}{\text{Total Area of the City}} * \frac{100}{1}$

Area coverage should also be measured in terms of route coverage by PTS

INFERENCE: These are measures of the coverage of population and area by the municipal transport service. It helps to focus on those ULBs where the transport service is overcrowded and inadequate.

The necessity of public transport (number of busses) depends certainly on combination of size of population and area but also on a lot of exogenous factors like the socio economic character of the ULB, the area under its jurisdiction and the relative location of its amenities (like schools offices, health centers, etc.) and how many people are willing to use public transport service.

- Route's Coverage by MTS

INDICATOR FORMULA: $\frac{\text{Number of routes covered by MTS service.}}{\text{Total Number of possible routes}}$

SIGNIFICANCE: population and area coverage are macro indicators. It is the routes which connect different areas and on which busses ply. Coverage of routes is a specific coverage indicator, which helps ULB to focus on service delivery.

INFERENCE: This is a measure of the connectivity and coverage of the MTS. A higher number directly implies less need for privately owned vehicles

The need for MTS is likely to vary according to the extent and nature of economic activity, area of the ULB and location of amenities (schools, offices, markets and health centers).

- Passengers Catered as percentage of population

INDICATOR FORMULA: $\frac{\text{Average number of passengers carried daily}}{\text{Population}}$

SIGNIFICANCE: Not every member of population is a passenger of MTS. The specific coverage indicator in terms of population coverage would be passengers catered with reference to total population and potential passengers of MTS. Thus, passenger's coverage should also be calculated by using following indicator.

- Passengers Catered as percentage of potential passengers

INDICATOR FORMULA: $\frac{\text{Average number of passengers carried daily}}{\text{Potential passengers of MTS}}$

INFERENCE: These are measures of the extent to which the residents avail the municipal transport service, which, in turn, is a reflection of the safety and quality of the service, and affordability of fare. On a comparative scale, this helps to focus on those ULBs that need to improve the service quality of the MTS or revise the fare.

The value of this indicator depends on other exogenous factors like spatial distribution of amenities (shops, markets, offices, schools, health centers), and also the area under the ULB's jurisdiction.

- Distance covered

INDICATOR FORMULA: $\frac{\text{Total length of routes (kms) covered by MTS}}{\text{Total Pliable Road Length}}$

SIGNIFICANCE: Coverage of routes by MTS may be high but busses may not be covering entire distance of routes. Thus, another aspect associated with MTS Coverage measurement is distance covered by it.

INFERENCE: This is a measure of the coverage of the MTS. Longer bus route enables a passenger to travel greater distances on the same bus.

The need depends on the area of the ULB's jurisdiction, the spatial distribution of population and the location and spatial distribution of amenities (schools, offices, markets health centers).

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS

- ### Public (municipal) Transport Vehicles (Busses) to Population of City

INDICATOR FORMULA: $\frac{\text{Number of MTS busses}}{\text{Population}}$

SIGNIFICANCE: There has to be sufficient number of busses with MTS to provide reliable and sufficient service to people. Fleet is the basic component is fundamental component of any MTS and ULB must of sufficient number of busses with it. The more specific indicator regarding adequacy of busses would be –

- ### Adequacy of Municipal Transport Vehicles (Busses)

INDICATOR FORMULA: $\frac{\text{Number of MTS busses}}{\text{Number of MTS busses required}}$

INFERENCE: These are measures of the adequacy of the municipal transport service and population burden per bus. Second variant helps to know shortfall in number busses required. It helps to focus on those ULBs where the transport service is overcrowded and inadequate.

The first one is very broad indicator, need for the number of busses depends on potential passengers, efficiency with which busses utilised and willingness of people to use public transport. For second one, there is need of arriving at potential number of passenger and then ideal number of busses required.

- ### Frequency of service

INDICATOR FORMULA: $\frac{\text{Average number of trips made by all busses daily}}{\text{Number of routes}}$

SIGNIFICANCE: After adequacy of busses, what really matters is number of trips made by them on the route during the day. Convenience in using municipal transport system depends on frequency of service.

INFERENCE: This is a measure of the convenience of the residents due to greater frequency of busses and therefore less overcrowding and the efficiency of use of existing busses. Tabulated across ULBs, this would help to locate the ULBs that require greater frequency of service.

The need is likely to vary according to the extent and nature of economic activity, area of the ULB and location of amenities (schools, offices, markets, health centers etc.). A greater number of busses plying daily is not necessarily a good indicator of service frequency unless properly monitored and managed. Often several busses come together followed by long delays.

- Bus – Stops

INDICATOR FORMULA: $\frac{\text{Number of bus stops}}{\text{Total road length.}}$

UNIT OF MEASUREMENT: Number / km

SIGNIFICANCE: Number of bus stops should be just adequate, fewer bus stops leads to inaccessibility while higher frequency results into slowing of busses or delay. Only adequacy of number of bus stop is not sufficient, the bus stops should be spaced adequately. To measure adequacy of space (distance) between two bus stops, following indicators should also be used along with this indicator.

- Appropriateness of space between bus stops

INDICATOR FORMULA: $\frac{\text{Average space between bus stops}}{\text{Ideal Space required between two bus stops}}$

INFERENCE: Both the indicators help to measure easy accessibility of bus stops to the residents.

But this indicator must have carefully worked out benchmarks for comparison.

QUALITY INDICATORS

Following are some of the quality related indicators for MTS on these line appropriate indicators should be constructed to assess quality of MTS by ULB or civil society or any other agency carrying out PM of MTS.

- Proportion of busses which are clean and aesthetically maintained

INDICATOR FORMULA:

$$\frac{\text{Number of busses found clean and aesthetically maintained}}{\text{Total number of busses}} * \frac{100}{1}$$

- Proportion of bus stops/terminus which are clean and aesthetically maintained

INDICATOR FORMULA:

$$\frac{\text{Number of bus stops/terminus found clean and aesthetically maintained}}{\text{Total number of bus stops/terminus}} * \frac{100}{1}$$

- Actual trips against expected or planned trips per bus

INDICATOR FORMULA: $\frac{\text{Number of trips in actual practice do the busses cover}}{\text{Number of busses expected to cover}}$

- Actual average number of passengers against capacity

INDICATOR FORMULA: $\frac{\text{Number (average) of passengers on each bus}}{\text{Average seats on each bus}}$

UNIT OF MEASUREMENT: Number and ratio

SIGNIFICANCE: Quality is a composite entity and may involve many other issues as well. The enlisted questions are only representative, not exhaustive. Benchmarks have to be worked out for each component.

INFERENCE: Information to be collected is qualitative and judgemental. Therefore, it will be handicapped by biases of individual perception.

EFFICIENCY

- ### Daily trips per Bus

INDICATOR FORMULA: $\frac{\text{Daily trips by all the busses}}{\text{Total Numbers of busses in operation}}$

SIGNIFICANCE: Simple efficiency measurement indicator. Available fleet of busses should be put to maximum use as passengers and earnings per bus depend on average trips made by a bus. It should be used along with other indicators like average passengers per bus or distance covered per litter fuel or earnings per bus because higher trips need not necessarily result in higher passengers or earnings or distance per litter fuel. The formulae for other related efficiency indicators could be as follows

- ### Average Passengers per Bus

INDICATOR FORMULA: $\frac{\text{Total Passengers Travelled by all the busses}}{\text{Total Numbers of busses in operation}}$

- ### Average Earnings per Bus

INDICATOR FORMULA: $\frac{\text{Daily earnings by all the busses}}{\text{Total Numbers of busses in operation}}$

INFERENCE: These indicators measure efficiency in utilisation of public transport vehicles and earnings or passengers per bus. Higher the number on these counts better is the utilisation.

The first two indicators, daily trips and passengers per bus, are ambiguous. On the one hand, they measure the efficiency of service and on the other, hand it is a measure of the degree to which each bus is overworked or overcrowded. Earnings per bus may be low because of low fares. Indicators will be meaningful only if carefully worked out benchmarks are available for comparison.

- ### Punctuality of Bus Service

INDICATOR FORMULA: $\frac{\text{Total Number of trips running in time in a day}}{\text{Number of trips of all Buses in a day}}$

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Punctuality is one of the most important efficiency criteria for any public transport service. If buses are not running on time and their arrival and departure is not predictable then people will not like to use them.

INFERENCE: It measures operational efficiency of busses in terms of punctuality. It indicates inherent discipline in running the service. But we need to remember that timely operation of bus service depends on numerous exogenous factors

- Distance Travelled By a Bus in a Day or Per Trip

INDICATOR FORMULA: $\frac{\text{Average total distance travelled daily by bus}}{\text{Area of ULB}}$

Or

$$\frac{\text{Average distance travelled by bus per trip}}{\text{Area of ULB}}$$

Or

$$\frac{\text{Average Distance travelled by bus per trip or daily}}{\text{Average distance bus expected to travel per trip or daily}}$$

UNIT OF MEASUREMENT: Kms / Sq. Km

SIGNIFICANCE: It is necessary to know how much each bus is travelling every day to compare it to standard value. If bus is travelling much less than standard then it is not put to efficient use, very high value indicate overuse of a vehicle. Secondly, it is also necessary to know distance travelled per trip by a bus as convenience of passenger depends on it. The third variation of indicator assesses actual performance against expected performance, which indicates efficiency.

INFERENCE: This is a measure of the connectivity of the MTS. Longer the distance, easier it is for the passenger to travel greater distances without the inconvenience of changing busses, paying more bus fare and waiting longer at bus-stops. Comparing across ULBs, this would help to draw attention to those that need to have longer bus routes.

The value of this indicator depends on other exogenous factors like spatial distribution of amenities (shops, markets, offices, schools, health centers), and also the area under the ULB's jurisdiction.

- ## Fuel Utilisation Efficiency

INDICATOR FORMULA: $\frac{\text{Total fuel in litres consumed by all Buses}}{\text{Number of kilometres travelled by all Buses}}$

UNIT OF MEASUREMENT: Litres / km

SIGNIFICANCE: Fuel is the main component of operational cost of any transport and therefore need to be measured and controlled.

INFERENCE: It measures operational efficiency of busses. If the distance travelled per litres of fuel is low than standard then it indicates technical and maintenance status of buses. It indicates need for better maintenance and operations of vehicles.

Not constrained by serious limitation but fuel utilisation efficiency also depends on road condition, traffic and congestion on roads etc.

- ## Bus breakdown or Off-the-route ratio

INDICATOR FORMULA: $\frac{\text{Number of busses off-the-route or under breakdown}}{\text{Total Number of Busses with MTS}}$

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: The number busses actually in working condition is more important than number of busses with MTS.

INFERENCE: It measures number of busses remaining out of order and thereby it reflects the quality and efficiency of busses, day-to-day maintenance or even of operating staff.

This is a broad indicator. The breakdown of busses results from various reasons, accordingly it should be calculated on disaggregate level in all possible terms to local real point of inefficiency.

- ## Manpower Efficiency

INDICATOR FORMULA: $\frac{\text{Total Number of Employees of MTS}}{\text{Total Number of Busses with MTS}}$

UNIT OF MEASUREMENT: number/per bus

SIGNIFICANCE: Adequate and good-quality staff is essential for efficient working of MTS. Human element constitutes another side of coin besides technical aspects.

INFERENCE: it measures staff per bus, if the number is too high then not only cost of operation goes up but also utilisation of human resources goes down and thereby efficiency.

It is a very broad indicator. Different types of staff are involved. Should be calculated in disaggregate terms to find out which type of staff is in excess. Even disaggregate level indicators will remain broad and indirect. Staff efficiency needs to be calculated in terms of their direct output e.g. number of passengers handled by reservation clerk in a day, or number of busses cleaned by the cleaner in a day etc.

- ## Number of Without Ticket passengers caught by MTS inspectors

INDICATOR FORMULA: Number of Without Ticket passengers caught by MTS inspectors.

UNIT OF MEASUREMENT: number

This number can be then compared with total number of passengers to know the proportion of without ticket passengers to total passengers. Second relationship, which can be explored, is without ticket passengers caught per MTS inspector

- ## Proportion of without ticket passengers caught to total passengers

INDICATOR FORMULA: $\frac{\text{Number of Without Ticket passengers caught by MTS}}{\text{Total Number of Passengers of MTS}}$.

- ## Without Ticket Passengers Caught per MTS Inspector

INDICATOR FORMULA: $\frac{\text{Number of Without Ticket passengers caught by MTS}}{\text{Total Number of MTS Inspectors/Ticket Checkers}}$.

SIGNIFICANCE: Finding and catching without ticket passengers is very essential and it must be done with at most efficiency. Without ticket passengers not only cause financial loss to MTS but they cause damage at the very roots of equal treatment and justice by MTS to passengers. If it is allowed to perpetuate law abiding passenger feel injustice. It is necessary to monitor efficiency of ticket checkers because many a times they misuse their powers.

INFERENCE: Useful for preventing financial loss to MTS and helps in maintaining other objectives like equal treatment and controlling financial irregularities.

EXPANSION/DEVELOPMENT INDICATORS

- ### Net addition to the fleet

INDICATOR FORMULA: Number of busses purchased during the year

Less – Number of busses scrapped during the year

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Growth in the fleet is a must to cope with increasing passengers load and to improve frequency of the service.

INFERENCE: It measures expansion efforts undertaken by MTS. The resulting figures can be compared with other indices like growth in the population, passengers, area of the city etc. to determine their adequacy.

Adding busses to the fleet is one of the measures to cope with increasing demand and to improve existing level of service but not the only measure.

- ### Addition to area under Bus Stop/Bus Terminus and suitable infrastructure

INDICATOR FORMULA: Area (sq. mts.) added in the form of bus stops/terminus

Area (sq. mts.) under bus stops/terminus in the beginning of year

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: Growth in the bus stops and bus terminals is a must to cope with increasing passengers load. It can be measured in terms of area.

INFERENCE: It measures expansion efforts undertaken by MTS. The resulting figures can be compared with other indices like growth in the population, passengers, area of the city etc. to determine their adequacy.

Adding bus stops or adding area to bus terminals is an important aspect but this indicator measures it in quantitative terms. It is also necessary that such expansion should be qualitative and should be measured in quality terms.

CUSTOMER/CONSUMER SATISFACTION INDICATORS

- Percentage of commuters satisfied with the frequency of busses

INDICATOR FORMULA: Number of commuters satisfied with overall MTS * 100

Total Number of Commuters 1

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: Commuters satisfaction is the real acid test for any public transport service. This indicator should be calculated at both aggregate and disaggregate level.

- Percentage of commuters satisfied with the frequency of busses
- Percentage of commuters satisfied with frequency of bus stops
- Percentage of commuters satisfied with condition of busses
- Percentage of population unhappy with overcrowding
- Percentage of commuters satisfied with quality of personnel (driver, conductor, etc.)
- Percentage population who feel bus fares are affordable

INFERENCE: These indicators help the ULB to determine where improvement is necessary. These figures may be biased by individual perception and expectation but if a sufficiently skilful interviewer selects a truly representative sample these biases may be evened out.

ADMINISTRATIVE/GENERAL INDICATORS

Kindly refer Chapter 5 for generic administrative indicators and apply necessary indicators to this service

- Number of MTS employees caught for neglecting their duties or taking bribes from without ticket passengers

INDICATOR FORMULA: Number of MTS employees caught for neglecting duties or taking bribes

UNIT OF MEASUREMENT: number

SIGNIFICANCE: There should be vigilance team carrying out continuous review of MTS staff to ensure quality of the service. Another way to examine the efficiency and quality of traffic control staff is the review of complaints received from people about behaviour of MTS employees.

INFERENCE: these indicators will be useful when used over the years to know improvement or decline in the quality of service.

FINANCIAL INDICATORS

- Cost per Kilometre

INDICATOR FORMULA: $\frac{\text{Total Cost of Municipal Transport Service}}{\text{Total Kilometre travelled by all buses.}}$

UNIT OF MEASUREMENT: Rs. / km

SIGNIFICANCE: in order to know financial efficiency of MTS we need to know cost incurred by it and income earned by it. Cost efficiency can be and should be calculated on various grounds like – per passengers, per bus or per route beside per kilometre (distance) and then should be compared with income earned under these heads. Also cost can be broken down in to various components like salary, fuel, maintenance, administrative, interest payment etc. multiple combinations are possible to measure cost. Disaggregate level measurement can be done by using following indicators

- Cost per Passenger
- Cost per Route
- Salary cost per kilometre or passenger or route or per bus
- Maintenance cost per kilometre or passenger or route or per bus
- Administrative cost per kilometre or passenger or route or per bus

INFERENCE: all these indicators help to measure cost from different dimensions, which then facilitates probe in to cost inefficiency.

The various definitions defining various cost categories must be very clear and for evaluation, suitable benchmarks should be available.

- Earning per kilometre

INDICATOR FORMULA: $\frac{\text{Total Earnings of Municipal Transport Service}}{\text{Total Kilometres travelled by all buses}}$

UNIT OF MEASUREMENT: Rs. / km

SIGNIFICANCE: Another equally important facet of financial efficiency measurement. Like cost, earnings should also be measured on disaggregate levels to facilitate comparison cost incurred. There can be several indicators as follows –

- Earning per Passenger

INDICATOR FORMULA: $\frac{\text{Total Earnings of Municipal Transport Service}}{\text{Total Passengers travelled by all buses}}$

- Earning per route

INDICATOR FORMULA: $\frac{\text{Total Earnings of Municipal Transport Service}}{\text{Total number of routes travelled by all buses}}$

INFERENCE: These indicators measure earnings of MTS from different angles to facilitate its comparison with different types of costs.

ENVIRONMENTAL CONSERVATION INDICATORS

- Number of Polluting Busses

INDICATOR FORMULA: $\frac{\text{Number of Busses not meeting emission standards}}{\text{Total Number of Busses with MTS}}$

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Public transport vehicles (busses) are a major source of air pollution. These busses will stop polluting atmosphere only if they are continuously monitored. This and other several indicators should be used for the purpose.

INFERENCE: It indicates number of busses failing emission standards and acts as a pointer to the gravity of the situation.

For determining number of busses failing emission standards, busses will have to be checked preferably by an independent agency and MTS must comply with checking norms. Otherwise, information will not be available.

Chapter 5 G - Indicators for Public Health Service

Index

PUBLIC HEALTH SERVICE ***278***

INTRODUCTION 278

COVERAGE/EXPLANATORY INDICATORS 278

- Birth Registration 278
- Deaths Registration 279
- Under-five mortality 279
- Percentage of People Using Public Health Service 280
- Total Demand – Supply Gap of Public Health Service 281
- Health Centers per 1000 people or per Sq. Km. 282
- Hospital Beds per 1000 population 282
- Health professionals per 1000 population 283

Family Planning 283

- Family Planning Coverage (Couple Protection Rate) 283
- Immunization Coverage 284

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS 285

- Per Capita Resource Commitment for Public Health Service 285

Infectious Diseases 286

- Prevalence of Infectious Diseases 286
- Prevalence of Typhoid 286
- Prevalence of Cholera 286
- Prevalence of Gastroenteritis 286
- Prevalence of Infective Hepatitis 286
- Prevalence of Tuberculosis 287
- Prevalence of Leprosy 287
- Mortality due to Infectious Disease 287
- Certainty of mortality in Infectious Disease Affected Patients 287
- Share of Infectious Disease Death in Total Deaths 287
- Malaria Incidence 288
- Spread of Malaria 288
- Extent of Blood Sample's testing to Determine Malaria 289
- Extent of Malaria Positive Samples 289
- Extent of Plasmodium Falciperum Disease 289

Family Planning 290
- Use Permanent Family Planning Methods 290
- Modern Contraception Use 291

Reproductive, maternal, and child health 291
- Antenatal Care 291
- Tetanus Immunity 292
- Anaemia Control 292
- Institutional Deliveries 292
- Post-Partum Care 293
- Reproductive Health problems 293

QUALITY/EFFICIENCY INDICATORS 294
- Mortality Ratio in Public Hospitals 294
- Failure Ratio of Immunisation 294
- Reduction in Number of Malnourished Children 295

Prevention of Infectious (food and beverages borne) Diseases 296
- Health Licenses issued to Food joints and vendors 296
- Coverage of food joints by health license system 296
- Regular Renewal of Licenses 296
- Health Licenses Pending / Overdue 297

Inspection of Food Joints/Eatable Places 297
- Inspection of Health Licenses Denied Cases 297
- Frequency of Inspection 297
- Extent of Inspection 297
- Hygiene Notices 298
- Hygiene Notice to Unlicensed Food joints 298
- Fine recovered 298
- Closure of Food Joints 299

EXPANSION/DEVELOPMENT INDICATORS 299
- Increase in Population Coverage of Public Health Service 299
- Number of Hospital Beds Added during the year 300

CUSTOMER/CONSUMER SATISFACTION INDICATORS 301
- Number of people satisfied with health service coverage 301
- Number of people satisfied with cleanliness and hygiene of health facilities 301
- Number of people satisfied with availability of medicine 301
- Number of people satisfied with pathological facilities 301

- Number of Customers Satisfied with Streetlight Service _____ 302
- Response to Consumers _____ 302
- Promptness in Response _____ 302
- Review and monitoring of Complaints Redressal Mechanism for Health Service 302

ADMINISTRATIVE/GENERAL INDICATORS _____ 302

- Expenditure on administration _____ 302
- Weightage of Administration _____ 302

FINANCIAL INDICATORS _____ 303

- Financial Viability _____ 303
- Cost Effectiveness _____ 303

ENVIRONMENTAL CONSERVATION _____ 304

- Disposal of bio-medical waste _____ 304

PUBLIC HEALTH SERVICE

INTRODUCTION

The role and responsibility of the municipal government in providing health-care to its residents vary very widely across ULBs. Also, the health hazards and problems vary widely across ULBs according to geo-climatic conditions, local, socio-economic character of the residents. This makes this chapter intricately complex and very wide in scope. To maintain generality, only key issues and problems have been discussed , that are common to most ULBs (registration of birth &death, family planning, and prevention of disease and epidemics) The indicators given are only key ones (by no means exhaustive), around which other relevant indicators can easily be constructed and used.

The problems confronting almost every ULB are shortage of funds on the one hand and multitude of acute problems on the other hand, causing authorities to make very difficult choices. It is well known that for any tier of government in India, public health is granted a very small share of financial resources.

A major problem that confronts performance measurement in this sphere is availability of appropriate data.

COVERAGE/EXPLANATORY INDICATORS

- *Birth Registration*

INDICATOR FORMULA: Number of live births registered by ULB during the year * 100

Number of infants (age group 0-1) in the same year 1

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: In India, all births are not registered even today.

INFERENCE: This is a measure of the coverage and efficiency of ULB's system of birth registration. Compared across ULBs it helps to draw attention to those where greater effort is required, to improve the municipal system of registering births.

This measure has to depend on data gathering by the method of door to door household survey (in order to count the number of births that have taken place in a certain year). This is cost and resource-intensive, depends on the quality of survey and is subject to all the usual difficulties of primary data collection. Registration of Births depends on the level of awareness and incentive of its residents, which in turn depends on their socio-cultural and educational level. Comparisons should be made accordingly and appropriate Public awareness programs should be recommended.

- *Deaths Registration*

INDICATOR FORMULA:

$$\frac{\text{Number of deaths registered by ULB during the year}}{\text{Number of deaths in the same year}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Like births, deaths also do not get registered cent percent. This is a more serious issue. Public awareness programmes should be worked out and launched.

INFERENCE: This is a measure of the coverage and efficiency of ULB's system of birth registration. Compared across ULBs it helps to draw attention to those where greater effort is required, to improve the municipal system of registering births.

This measure has to depend on data gathering by the method of door to door household survey (in order to count the number of deaths that have taken place in a certain year). This is cost and resource-intensive depends on the quality of survey and is subject to all the usual difficulties of primary data collection.

- *Under-five mortality*

INDICATOR FORMULA: Percentage of female children and male children who die before reaching their fifth birthday.

$$\frac{\text{Number of death for children less than five years during the year}}{\text{Average number of live births during the last five years}}$$

UNIT OF MEASUREMENT: ratio

SIGNIFICANCE: In the context of the goal of providing equal opportunities for a safe and healthy life, Under-five mortality is a powerful indicator of quality of life in cities. High child mortality is directly correlated to low environmental conditions and quality of basic services such as the level of wastewater treatment and sewerage and sanitation facilities.

INFERENCE: Mistakes are common for this indicator. Child mortality is different from infant mortality, which account for mortality of under-one year old infants. Information for this indicator is generally extracted from Census data or originates from the registration offices. Many deaths are caused by malnutrition, poor life conditions, i.e. poor shelter, polluted water and inadequate sanitation. Child mortality may be due to other social factors and may affect boys and girls differently.

- *Percentage of People Using Public Health Service*

INDICATOR FORMULA: Number of people using public Health Service * 100

Population of the City 1

UNIT OF MEASUREMENT: Percentage

SIGNIFICANCE: It is important to know how many people are using PH service and depend on it to plan provision of public health infrastructure.

INFERENCE: This is a measure of the people's preference for public health service facilities. This helps to plan future expansion of public health service.

People's use of public health service cannot be taken as positive preference. They may be using it because they do not have any recourse; similarly, people's non-use of public health service cannot be inferred as lack of demand or need for public health service It may be of such a low quality that they are forced to opt for non-affordable private service, instead of public health service. Also, people from far regions come to city to avail public health facility; as a result, denominator (population of city) figure is not static.

- Health-care Coverage

Percentage of adults having healthcare coverage of some kind

INDICATOR FORMULA: Number of adults having healthcare coverage * 100

Population of the City 1

Percentage of children (0-17) having healthcare coverage of some kind

INDICATOR FORMULA: Number of children having healthcare coverage * 100

Population of the City 1

INFERENCE: These outcome indicators reveal the effectiveness, and accessibility of healthcare that the residents are availing over the years. But this is only quantitative

- *Total Demand – Supply Gap of Public Health Service*

INDICATOR FORMULA:

Actual supply of the Public Health Service (by components–doctors, nurses, beds) * 100

Demand for the Public Health Service (by components – doctors, nurses, beds etc.) 1

Individually indicator should be calculated using formulae like

Number of doctors available * 100

Number of doctors required 1

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: This is a basic indicator to know sufficiency of public health service or individual component of it.

INFERENCE: It helps to know present level of service in the context of demand and resulting gap, which paves way for corrective actions to overcome deficiency.

Demand for public health service and its various components depend on socio-economic factors of the city so standard value may not be adequate. Suitable benchmarks will have to be worked out and demand should be calculated properly

- *Health Centers per 1000 people or per Sq. Km.*

INDICATOR FORMULA: $\frac{\text{Number of health centers}}{\text{Population}} * \frac{1000}{1}$

Another variant, which measures health, centres per sq. kms. could be

$$\frac{\text{Number of health centers}}{\text{Area of City (sq. kms)}}$$

UNIT OF MEASUREMENT: Number per 1000 or number per sq. kms.

SIGNIFICANCE: It is necessary to work out this indicator to know adequacy of public health infrastructure and accessibility in terms of distance.

INFERENCE: This is a measure of the residents' access to primary healthcare facilities. This can help to sharpen focus on those ULBs that have less health centers than others do have and therefore need to have more.

Effective access to healthcare depends not only on the presence of a health center but on its quality of service delivery by way of medical/paramedical staff, availability of equipment, medicine, etc.

- *Hospital Beds per 1000 population*

INDICATOR FORMULA: $\frac{\text{Number of public hospital beds}}{\text{Population}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: Number per thousand

SIGNIFICANCE /INFERENCE: This is a measure of the availability of hospital facility for people. Comparing across ULBs it can help to draw attention to those ULBs where this figure is relatively low and need more medical infrastructure.

Availability of infrastructure, on its own, is not sufficient. There must be adequate health professionals to provide service to people.

- *Health professionals per 1000 population*

.

INDICATOR FORMULA: $\frac{\text{Number of health professionals}}{\text{Population}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: Number per thousand

SIGNIFICANCE: This is a measure of the residents' access to medical attention. Comparing across ULBs it can help to draw attention to those ULBs where this figure is relatively low and more medical professionals are required.

Here, health professionals include doctors, nurses and other paramedical staff. The needs may vary with different situations and across different ULBs. This indicator should be appropriately disaggregated. Competence of health professionals and quality of service they provide, which are important determinants of public access to medical attention, are not addressed by this indicator.

Family Planning

- *Family Planning Coverage (Couple Protection Rate)*

INDICATOR FORMULA:

$$\frac{\text{Number of couples opting for family planning methods}}{\text{Number of Couples in productive age (Population) within municipal area}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This measure reflects on the ULB's role (past and projected) in population control within its jurisdiction.

INFERENCE: This indicator can help to locate areas where the incidence of family planning is low and attention should be paid to improve family planning services by way of spreading awareness and information, and providing inexpensive supply of family planning devices and services, and economic incentives.

Since household sample survey and sales records collect information for this indicator, there may be under-reporting. Under reporting can also occur because the nature of the information itself is personal and socio-culturally sensitive.

- *Immunization Coverage*

INDICATOR FORMULA: $\frac{\text{Immunization Coverage}}{\text{Number of five year old children}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This indicator is a measure of the health and well-being of the children and their protection from diseases that cause death and disability. There are several diseases having different vaccines and vaccination schedules according to the age of the infants. At the two ends of the spectrum, we have cases where immunization cover is complete, and, where there has been no immunization at all. The grey area in between comprises a great number of cases each with a different permutation of immunization coverage, usually reflecting different levels of awareness, availability (of vaccine) and affordability .For example some five year olds might have had full immunization against DPT (Diphtheria, Pertussis and Tetanus), but not against Polio. There may be cases where a child has received immunization from a disease but not completely, if one or more doses of a vaccine (each to be given at a different age) have been missed .Any meaningful Performance Measurement exercise should try as far as possible to capture all such possible cases. Thus, for this indicator, desegregation is a must. It can be done along the lines of the following example

$$\frac{\text{Number of 5 yr. old fully immunized against DPT}}{\text{Number of 5yrolds}} * \frac{100}{1}$$

$$\frac{\text{Number of 5yrolds partially immunized against DPT}}{\text{Number of 5yr olds}} * \frac{100}{1}$$

(3months, 6months, 12months, booster dose18months, second booster5yrs)

$$\frac{\text{Number of 5yr olds immunized against DPT but not polio}}{\text{Number of yr. olds}} * \frac{100}{1}$$

$$\frac{\text{Number of 5yr olds immunized against DPT, Polio but not MMR}}{\text{Number of 5yr olds}} * \frac{100}{1}$$

….so on and so forth. These can be further disaggregated into “girls” and “boys”

INFERENCE: This indicator primarily helps to locate areas where immunization coverage is low. If appropriately disaggregated indicator values are properly recorded and systematically tabulated, a

goldmine of information is generated on the awareness (including gender bias), availability and affordability of the various vaccines. Thereby appropriate steps may be taken to generate more resources where necessary, ensure the availability of the required vaccine at the right place and time, and create public awareness about the urgency of immunization.

This indicator calls for good skills of data gathering, and data reading and interpreting. This could be expensive and biased by individual perception.

Secondly, the figure in the numerator – the number of immunized 5yr olds is obtained from municipal records furnished regularly by all medical establishments (dispensaries, clinics, hospitals, private or government-run); whereas the figure in the denominator-the number of 5yrolds is given by the latest Census which is conducted only once every 10 years. It is very likely that they do not match exactly, i.e., in the numerator and denominator we may not be talking about the same children, also the numbers of children are likely to have changed through death or migration. One may use the Census figure as an approximation for the recent figure, or update the former by an appropriate method of projection.

REMARK For this indicator the complexities are daunting and the controversies baffling. . Notwithstanding these formidable obstacles, some headway should be made to generate and use this vital information. We offer only a broad guideline.

QUANTITY/STATUS/RESOURCES COMMITTED INDICATORS

- *Per Capita Resource Commitment for Public Health Service*

INDICATOR FORMULA: $\frac{\text{Total annual/monthly expenditure on healthcare}}{\text{Population}}$

UNIT OF MEASUREMENT: Rs. Per capita

SIGNIFICANCE: This is a measure of the ULB's commitment to provide good healthcare coverage to the residents and prevent epidemics. But this measure should not be viewed in isolation. Commitment depends on a number of non-financial factors. One should also remember that the allocation of funds for public health in higher tiers of government is low and when that is devolved to the ULBs, the amount is not much.

Infectious Diseases

- ### *Prevalence of Infectious Diseases*

INDICATOR FORMULA: $\frac{\text{Number of people infected by infectious disease}}{\text{Population}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: Number per 1000

SIGNIFICANCE: Prevalence of infectious diseases indicates vulnerability of people and inability of the authorities to prevent infectious diseases. Along with this overall indicator, disaggregate indicator for each infectious disease (typhoid, cholera, or malaria, etc.) should also be worked out, as infectious diseases are several and are caused by distinct factors. The formulae for such working would be as follows[113]

- ### *Prevalence of Typhoid*

INDICATOR FORMULA: $\frac{\text{Number of cases suffering from Typhoid}}{\text{Population}} * \frac{1000}{1}$

- ### *Prevalence of Cholera*

INDICATOR FORMULA: $\frac{\text{Number of cases suffering from Cholera}}{\text{Population}} * \frac{1000}{1}$

- ### *Prevalence of Gastroenteritis*

INDICATOR FORMULA: $\frac{\text{Number of cases suffering from Gastroenteritis}}{\text{Population}} * \frac{1000}{1}$

- ### *Prevalence of Infective Hepatitis*

INDICATOR FORMULA: $\frac{\text{Number of cases suffering from Infective Hepatitis}}{\text{Population}} * 1000$

[113] Each individual indicator for infectious disease should be disaggregated by seasons

- *Prevalence of Tuberculosis*

INDICATOR FORMULA: $\frac{\text{Number of cases suffering from Tuberculosis}}{\text{Population}} * \frac{1000}{1}$

- *Prevalence of Leprosy*

INDICATOR FORMULA: $\frac{\text{Number of cases suffering from Leprosy}}{\text{Population}} * \frac{1000}{1}$

INFERENCE: These indicators measure overall prevalence of infectious diseases and also prevalence of each of infectious disease. Tabulated across ULBs these indicators can help to locate ULBs that are most vulnerable to infectious diseases as a whole and to a particular infectious disease. This would be of immense help to ULBs to undertake appropriate preventive actions.

Factors that cause vulnerability to infectious disease may be out of the ULB's control (in-migrant bringing infections, infections caused by natural calamities or seasons' change, socio-economic character of the population determining habits of personal hygiene).

- *Mortality due to Infectious Disease*

INDICATOR FORMULA: $\frac{\text{Number of deaths from infectious disease}}{\text{Population}} * \frac{1000}{1}$

The supporting indicator to this indicator could be

- *Certainty of mortality in Infectious Disease Affected Patients*

INDICATOR FORMULA: $\frac{\text{Number of deaths from infectious disease}}{\text{Number of people suffering from infectious disease}} * \frac{1000}{1}$

- *Share of Infectious Disease Death in Total Deaths*

INDICATOR FORMULA: $\frac{\text{Number of deaths from infectious disease}}{\text{Total number of deaths}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: Number per 1000

SIGNIFICANCE: Infectious disease if not controlled properly invariably results in loss of life, which must be prevented. .

INFERENCE: These indicators measure inability of ULBs or the responsible agency to provide adequate care and treatment to infectious -disease-affected people. Comparison across ULBs this indicator can help to locate ULBs that are most vulnerable to infectious disease.

- *Malaria Incidence*

INDICATOR FORMULA: $\frac{\text{Number of malaria cases}}{\text{Population}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: Number per 1000

OBSERVATION: This is a measure of the residents' risk of contracting malaria.

INFERENCE: Comparing across ULBs, this indicator helps to focus on ULBs or their areas where malaria is more prevalent. This will enable Authorities to mobilize resources for malaria control and direct them to the most affected areas.

Malaria cases may go unreported. This indicator may help to create a bias and draw resources and attention away from areas, which are affected by malaria but to a lesser extent. Authorities in such areas may become complacent and that may have dangerous consequences for the residents.

- *Spread of Malaria*

INDICATOR FORMULA:

$\frac{\text{Number of wards where Malaria is endemic by the given indicators}}{\text{Number of wards in the ULB}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This measures the spread of malaria across the jurisdictional area of the ULB.

INFERENCE: This measure helps to focus resources for malaria control towards ULBs where residents are more vulnerable to the disease.

Even areas where the vulnerability is low, malaria control is important so that the threat does not increase in the long run. This indicator may draw necessary resources away from some ULBs where need is less, yet pressing.

- *Extent of Blood Sample's testing to Determine Malaria*

INDICATOR FORMULA:

$$\frac{\text{Number of blood samples taken (and tested for malaria) of fever patients}}{\text{Number of fever patients reported}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: Number

SIGNIFICANCE: This is a measure of the alertness and commitment of the municipal authorities in monitoring the incidence of malaria among its residents. This helps to locate ULBs where more fever patients should be tested for malaria, and where appropriate resources for pathological testing facilities are necessary.

- *Extent of Malaria Positive Samples*

INDICATOR FORMULA: $\frac{\text{Number of Malaria Positive blood samples}}{\text{Number of total blood samples tested}} * \frac{100}{1}$

For this purpose, data base should cover not only municipal health centre but also state government, private or trust health centres.

INFERENCE: This shows the extent to which extent blood samples are turning out malaria positive, as that indicates the gravity of the incidence of malaria.

Information for this indicator is at the level of the municipal health centers only. Patients availing private medical facilities are likely to go largely unreported.

- *Extent of Plasmodium Falciparum Disease*

INDICATOR FORMULA: $\frac{\text{Number of Falciparum (malignant malaria) cases}}{\text{Total number of malaria cases}} * \frac{100}{1}$

UNIT OF MEASUREMENT: percent

SIGNIFICANCE: This is a measure of the extent of fatal danger (falciparum tends to be fatal) from malaria.

INFERENCE: This helps to locate areas in greater danger of Plasmodium Falciparum (mosquito borne malignant malaria parasite), where there is urgency of undertaking malaria (mosquito) control measures on an emergency footing.

Because of this indicator, resources may be drawn away from lesser mosquito- ridden areas. Those areas may become more vulnerable to malaria and other mosquito borne dangerous diseases (e.g., Haemorrhagic Dengue) in the long run.

Family Planning

- *Use Permanent Family Planning Methods*

INDICATOR FORMULA:

$$\frac{\text{Number of Surgical Sterilizations performed and IUDs inserted}}{\text{Population of child bearing age}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: Permanent family planning methods are not only superior to temporary family planning methods but also ensure control of population growth. This measures the competence of the ULB in the area of population control.

INFERENCE: This may help to locate areas where there is shortage of permanent family planning services, so that resources, incentives and other support can be mobilized. This indicator can be used more effectively if it is disaggregated into ‘male’ and ‘female’ to understand the relative responsibility of family planning borne by each gender, so that the need for appropriate awareness programmes can be assessed.

By itself, this indicator says little about actual population problem. Even if this figure is high, the ULB may not have a population problem if temporary methods of family planning are more popular and effective.

- *Modern Contraception Use*

INDICATOR FORMULA: Users of modern Contraceptive methods * 100

Population of child bearing age 1

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This is the measure of the predictability and reliability of the particular community's effort to control population.

INFERENCE: This figure will help to locate areas where the ULB needs to improve its availability of supply of modern contraceptive devices, and encourage its residents to adopt modern contraception.

Use of so-called modern contraception does not always guarantee population control because in some cases they may fail, whereas natural, traditional/religious family planning methods, if used properly may be effective.

Reproductive, maternal, and child health

- *Antenatal Care*

INDICATOR FORMULA: Numbers of antenatal check-ups performed in a year * 100

Number of full term pregnancies in that year 1

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This is a measure of the goodness of maternal and child health of the population of a ULB.

INFERENCE: This helps to locate areas where the level of antenatal healthcare is low and greater effort should be made to improve the antenatal healthcare facilities of the ULB and its access. Public-awareness programs should be conducted on the importance of antenatal care.

Use of this indicator should be backed by some knowledge of the quality of medical personnel who give antenatal care. Incompetent personnel can cause more harm than good.

- *Tetanus Immunity*

INDICATOR FORMULA: Number of Tetanus vaccines given in a year * 100

Number of pregnancies in that year 1

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This indicator measures the immunity of its women and infants from the infectious and fatal disease of tetanus to which all women and new born infants are at high risk during the process of childbirth.

INFERENCE: This locates ULBs where the level of tetanus immunization is low and urgent effort should be made by the ULB to immunize its expectant mothers.

- *Anaemia Control*

INDICATOR FORMULA:

Number of pregnant women taking Iron and folic acid supplements * 100

Number of pregnancies

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This reflects the extent to which expectant mothers are free from Anaemia that is very common and cause debility and weakness in mothers and infants and, in severe cases may cause death art childbirth. .

INFERENCE: Wherever this figure is too low, iron/folic acid tablets should be made available by ULBs to its expectant mothers

There is a difference of medical opinion on the desirability of artificial iron supplements. In some cases, they may cause minor and major undesirable side effects and the more effective and cheaper method to combat anaemia is to monitor regularly the diet of a pregnant mother.

- *Institutional Deliveries*

INDICATOR FORMULA: Number of deliveries in hospital or nursing home *100

Number of births 1

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This measures the protection of mothers in childbirth from mortality and the extent to which medical help is available to them and her infants.

INFERENCE: This measure helps to locate ULBs where this figure is too low so that efforts can be made to improve institutional help to expectant mothers (by building more hospitals and nursing homes, improving the existing ones, subsidizing them to make them more accessible and spreading public awareness on the necessity and importance of institutional delivery)

The extent of benefit from institutional delivery will depend largely on the condition of these institutions (availability of equipment, standard of hygiene, quality of medical personnel, etc.). Often their condition is so deplorable that non-institutional delivery may be a safer option.

- *Post-Partum Care*

INDICATOR FORMULA: $\frac{\text{Number of post-partum check-ups}}{\text{Number of births}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This is a measure of the goodness of maternal and child health of the population of a ULB.

INFERENCE: This helps to locate areas where the level of post-natal healthcare is low and greater effort should be made to improve the postnatal healthcare facilities of the ULB and its access. Public-awareness programs should be conducted on the importance of antenatal care.

Use of this indicator should be backed by knowledge of the quality of medical personnel who give post-natal care.

- *Reproductive Health problems*

INDICATOR FORMULA: $\frac{\text{Number of cases of reproductive health problems}}{\text{Female population of child bearing age}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: This measures the extent to which the ULB needs to mobilize resources and health professionals to deliver better reproductive health to its population.

INFERENCE: With the help of this indicator, we can locate ULBs (where this figure is too high) that need more medical personnel in the field of reproductive health and make them more accessible to all sections of its population.

This indicator may be subject to the bias of underreporting. Traditional societal conventions inhibit persons from disclosing reproductive health problems and seeking medical help.

QUALITY/EFFICIENCY INDICATORS

- *Mortality Ratio in Public Hospitals*

INDICATOR FORMULA: $\frac{\text{Number of Death in Public Hospitals}}{\text{Number of Patients Admitted in Public Hospitals}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: one of the ways to judge quality of medical services in public hospitals is the mortality rate of the admitted and treated in the public hospitals.

INFERENCE: This measures the extent to which patients admitted in the public hospitals meet with the death

This indicator should be used with caution because patients who get admitted in public hospitals are those who have not received good medical care in early stage of disease because they could not afford it and finally get admitted in public hospitals. But high rate definitely indicate that the quality and efficiency of hospital infrastructure, facilities and medical personnel need to be reviewed.

- *Failure Ratio of Immunisation*

INDICATOR FORMULA:

$$\frac{\text{Number of children contracting disease in spite of immunisation}}{\text{Number of children immunised}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: In many cases immunisation fails and it is necessary to know about it

INFERENCE: This measures the quality of immunisation programme and helps to take corrective actions

This indicator should be used with caution and such failed immunisation cases and the cause of their failure should be examined thoroughly before drawing any conclusion.

- *Reduction in Number of Malnourished Children*

INDICATOR FORMULA:

$$\frac{\text{Number of children brought out from malnutrition}}{\text{Number of children treated under nutrition programme}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: Percent

SIGNIFICANCE: public health authorities carry out nutrition programme to treat malnourished children of poor families.

INFERENCE: This measures the quality of nutrition programme and helps to take corrective actions

This indicator does not suffer from serious limitations but should be used with caution because malnutrition status of a child results from various other factors besides intake of nutritional food. Also the focus should be wider than nutrition programs and lay stress on long term permanent solutions (like employment generation, female literacy etc.)

- General health

INDICATOR FORMULA: Percentage of adults reporting general health to be "good"

SIGNIFICANCE: This is an indirect measure of the gap between demand and supply of healthcare and the ULB's burden of responsibility to provide adequate healthcare services. But is suffers from biases caused by individual perception of "good health"

- Infection

INDICATOR FORMULA:

Number of infection outbreaks in the last 5 years caused by food/water borne bacteria

Percentage of population receiving safe potable water

INDICATOR FORMULA: Population receiving safe potable water * 100

Total Population 1

SIGNIFICANCE: These indicator measures the vulnerability of the residents to food/water bourn infections and their responsibility to provide safe potable water and to monitor the sale of food.

Prevention of Infectious (food and beverages borne) Diseases

- *Health Licenses issued to Food joints and vendors*

INDICATOR FORMULA: Number of Licenses Issued

Number of Applications received

UNIT OF MEASUREMENT: Number

SIGNIFICANCE: infectious diseases spread to infected food sold at food joints and by food vendors. In order to avoid this laws make it mandatory to have health license for all who deal with food and beverages. Issue of health license after proper scrutiny and then regular inspection is the best preventive measure regarding food and water related diseases. The other related indicators regarding issue of health licenses could be

- *Coverage of food joints by health license system*

INDICATOR FORMULA: Number of Licenses Issued * 100

Total Number of Food joints 1

- *Regular Renewal of Licenses*

INDICATOR FORMULA: Number of Licenses Renewed * 100

Total Number of Licenses Issued 1

INFERENCE: These indicators measure of the ULBs' readiness to allow food selling units to function and proliferate easily. Tabulated across ULBs one can focus on those where this figure is much higher than in most others to take a closer look at the reason for this readiness….efficiency of functioning and eagerness to foster easy food sale and purchase, or carelessness and corruption.

- *Health Licenses Pending / Overdue*

INDICATOR FORMULA: $\frac{\text{Number of Licenses pending and overdue}}{\text{Number of Applications received}}$

UNIT OF MEASUREMENT: Number

SIGNIFICANCE: This is the measure of the ULBs' administrative inefficiency. This may foster the proliferation of illegal food-vending units who hope to get a license but are not ready to wait.

Inspection of Food Joints/Eatable Places

- *Inspection of Health Licenses Denied Cases*

INDICATOR FORMULA: $\frac{\text{Number of Licenses Denied Cases Inspected}}{\text{Number of Licenses Denied}}$

UNIT OF MEASUREMENT: Number

SIGNIFICANCE: Denial of license is not sufficient to prevent people from carrying out food related activities in unhealthy manner. There is need for constant inspection of all the food joints and places (licenses issued or denied or even those who have not applied. The other indicators related to inspection of food places could be as follows –

- *Frequency of Inspection*

INDICATOR FORMULA: Number of time each food joint/place inspected during the year.

- *Extent of Inspection*

INDICATOR FORMULA: $\frac{\text{Number of food joints inspected}}{\text{Total number of food joints}}$

INFERENCE: These indicators are measure of the Municipal Authority's commitment, promptness, and meticulousness in keeping its food-vending units safe and free of health hazards. If this number is low

in comparison to benchmarks and / or to other ULBs, more attention should be given to better and more effective inspection of food-vending units.

Quality of inspection is critical and not the frequency. These indicators are not designed to calculate quality of inspection. Further, the quality and effectiveness of inspection would depend on the skill and integrity of the individual inspector.

- *Hygiene Notices*

INDICATOR FORMULA: $\frac{\text{Number of notices issued for unhygienic conditions}}{\text{Total number of food joints}}$

UNIT OF MEASUREMENT: number

OBSERVATION: This is a measure of the follow up action to inspection. Hygiene notices to be issued to all food joints (licensed or unlicensed) if they fail inspection. After hygiene notice, a food joint can be regularised after payment of fine for default and if he complies with hygiene norms. Failure to pay fine and to comply with hygiene norms can lead to closure of food joint. All the related indicators should be worked out in tandem to get a comprehensive picture.

- *Hygiene Notice to Unlicensed Food joints*

INDICATOR FORMULA: $\frac{\text{Notices issued to unlicensed food joints}}{\text{Total number of food joints}}$

INFERENCE: If this number is too low then a second look needs to be taken at the hygiene of the food-vending units and inspections need to be more effective and thorough.

This would depend on the skill and integrity of the inspector. Low values may also generate the positive message that the food units were clean and hygienic to begin with.

- *Fine recovered*

INDICATOR FORMULA: $\frac{\text{Number of Fine recovered Cases}}{\text{Number of food joint issued with hygiene notice}}$

UNIT OF MEASUREMENT: Number

OBSERVATION: Number of cases in which fine recovered and amount recovered indicates how far ULB is able to enforce its inspection process carried out and hygiene notices issued.

INFERENCE: This helps to locate ULBs where this figure is unacceptably low and it is not able to enforce fine on the defaulters. This will help ULB to mobilise resources to assert its authority more effectively.

Inordinately high figures of this indicator mean that the ULB has no effective control over the proliferation of food joints, which are popular enough to remain in profitable business and hence do not mind paying fine to ULB.

- *Closure of Food Joints*

INDICATOR FORMULA: $\frac{\text{Number of Illegal Food joints closed}}{\text{Total number of food joints.}}$

UNIT OF MEASUREMENT

OBSERVATION: This is a measure of the ULB's authority over its food joints and its commitment to monitor their health status by keeping them within its control.

INFERENCE: In ULBs where this figure is too high, steps must be taken by the relevant authorities to check the mushrooming of illegal food joints.

When this figure is low, the picture is confusing. It may mean that plenty of illegal joints exist and the Authorities were unable to close them down, or it may mean that there were not many illegal joints to start with.

EXPANSION/DEVELOPMENT INDICATORS

- *Increase in Population Coverage of Public Health Service*

INDICATOR FORMULA: $\{cov1 / pop1 - cov0/pop0\} * 1000 / cov0/pop0$

Where cov - is coverage

pop - is population

0 - is the initial year

1 - is the final year

This is a measure of how much the coverage of healthcare has increased keeping pace with the growth in population. It should be applied to each component of the coverage like health centers [(health centres in year1/population in year1) - (health centres in year0/population in year0)]*1000 / health centres in year0/population in year 0 hospital beds, health professionals, pathological facilities etc.

UNIT OF MEASUREMENT: Number per thousand

OBSERVATION: Over time, population may increase and render the existing health service coverage insufficient. In such a case, coverage of health care has to grow, keeping pace with the increasing demand of a growing population. In some other cases, where the health service coverage may be insufficient improves over time even if the population does not increase. This indicator measures the extent to which the coverage of healthcare has grown to meet the needs of the resident population.

INFERENCE: this can help to locate ULBs where the coverage of healthcare has not grown enough over time to fulfil the demand of its population.

Age and socio economic characteristics of the population may demand different priorities and urgency of coverage. Comparisons should, as far as possible, made of like with like. Secondly, in an unlikely case if there is a population decrease, then this figure may come out high, even though coverage may not have expanded.

- *Number of Hospital Beds Added during the year*

INDICATOR FORMULA: $\frac{\text{Number of Beds added during the year}}{\text{Number of Existing Beds at the beginning}} * \frac{100}{1}$

UNIT OF MEASUREMENT: number of beds and percentage

SIGNIFICANCE: It is necessary that increase in hospital beds keep pace with increase in population and demand for health service. It should also be calculated for public hospitals and private hospital separately.

INFERENCE: It measures developmental efforts to increase health infrastructure compared with the population growth and increase demand it is possible to judge adequacy of present developmental efforts.

CUSTOMER/CONSUMER SATISFACTION INDICATORS

The following indicators can be used to measure the extent of customer/consumer satisfaction

- *Number of people satisfied with health service coverage*

$$\frac{\text{Number of people satisfied with the accessibility of healthcare (logistically and financially}}{\text{Adult population}} * \frac{100}{1}$$

- *Number of people satisfied with cleanliness and hygiene of health facilities*

$$\frac{\text{Number of people satisfied with cleanliness and hygiene of health facilities}}{\text{Adult population}} * 100$$

- *Number of people satisfied with availability of medicine*

$$\frac{\text{Number of people satisfied with availability of medicine}}{\text{Adult population}} * \frac{100}{1}$$

- *Number of people satisfied with pathological facilities*

$$\frac{\text{Number of people satisfied with pathological facilities}}{\text{Adult population}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percent

OBSERVATION: The above indicators can measure the extent of satisfaction of the residents with the various components of health-care provided by ULB.

INFERENCE: As usual, the satisfaction or dissatisfaction of each individual depends upon his perception, socio-economic background and awareness that lead to his /her own specific expectation. The people who have never needed healthcare have been included in this indicator, though they are not in a position to have a consistent and reliable opinion.

Following indicators should also be applied for judging consumer satisfaction about road and road related other services. The indicators have been explained earlier under section on water supply service indicators.

- *Number of Customers Satisfied with Streetlight Service*
- *Response to Consumers*
- *Promptness in Response*
- *Review and monitoring of Complaints Redressal Mechanism for Health Service*

ADMINISTRATIVE/GENERAL INDICATORS

- *Expenditure on administration*

INDICATOR FORMULA: $\frac{\text{Expenditure on administrative costs}}{\text{Total expenditure of the ULB on health}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Ratio, so pure number

SIGNIFICANCE: It measures the extent to which financial resources are diverted to administration compared to delivery of healthcare (health workers, medicines, equipment and infrastructure) that actually makes a difference to the quality of health service. The lower this figure the more efficient and effective the use of the resources earmarked for health.

INFERENCE: This helps to locate ULBs where administrative costs need to be cut down as far as possible.

- *Weightage of Administration*

INDICATOR FORMULA: $\frac{\text{Number of employees in administration}}{\text{Total number of employees in the health department}}$

UNIT OF MEASUREMENT: Ratio, so pure number

SIGNIFICANCE: This is a measure of the extent to which human resources are diverted away to administration. Higher this figure, greater is the inefficiency of administration in running the health service.

INFERENCE: This helps to locate areas burdened with administrative overstaffing.

It is difficult to have benchmark for this, and so it will be difficult to know how many people are in excess

FINANCIAL INDICATORS

- ### *Financial Viability*

INDICATOR FORMULA: $\frac{\text{Earnings of ULB from health facilities}}{\text{Expenditure on health}}$

UNIT OF MEASUREMENT: Ratio, so pure number

SIGNIFICANCE: The municipal health centers charge a nominal fee to patients, and also have some earnings from the subsidized sale of medicines. It is unrealistic to expect that to cover costs. But higher this number, lesser is the financial burden on the health service.

INFERENCE: this helps to locate places where this figure is too low (comparatively).These places have to explore some economic options like price discrimination (variable charges according to abilities to pay), and better targeting of subsidies. Location specific options need to be worked out.

In a quest for performing well on this indicator, attention may be diverted away from the municipal government's prime objective to provide affordable healthcare.

- ### *Cost Effectiveness*

INDICATOR FORMULA: $\frac{\text{Expenditure incurred on health service}}{\text{Number of people benefited}}$

UNIT OF MEASUREMENT: Rupees per Person

SIGNIFICANCE: It is an aggregate indicator but can be used to calculate disaggregated values of each component of cost. –

- Expenditure on immunization/ number immunized
- Expenditure on family planning / number that availed of family planning services
- Expenditure on licensing procedure /number of licenses granted and denied

- Expenditure on inspections/number of inspections carried out.

INFERENCE: It gives a clear picture of overall level of expenditure and cost efficiency

In an attempt to look financially efficient there may be pressure on the staff to perform well on these figures, leading to compromises on quality of service and social responsibility.

Beside these financial ratios, rest of financial ratios for public health service should be calculated as they have been explained in earlier parts on water and sewerage indicators and in the separate chapter on financial indicators.

ENVIRONMENTAL CONSERVATION

- ### *Disposal of bio-medical waste*

INDICATOR FORMULA: $\frac{\text{Tons of biomedical wastes appropriately disposed}}{\text{Tons of biomedical waste generated from all health delivery facilities}}$

UNIT OF MEASUREMENT: Ratio, no unit.

SIGNIFICANCE: If biomedical wastes are dumped along with other garbage, the soil, air and water may be infected with disease causing germs. They should be treated and disposed in a special place (away from water sources, and residential areas)

INFERENCE: Can help to locate ULBs where the problem is more acute than in others.

Chapter 5 H - Indicators for Public Housing Service

Index

PUBLIC HOUSING INDICATORS ***306***

INTRODUCTION 306

COVERAGE/EXPLANATORY INDICATORS 306

- Housing – Demand Supply Gap 306
- Tenure types 307
- Evictions 307
- Housing rights 308
- Housing price and rent-to-income ratios (housing affordability) 309
- Land price-to-income ratio 309
- Mortgage and non-mortgage 310
- Number of new low-moderate income housing units completed 311
- Amount of public financial assistance provided per new low-moderate income owner occupied unit completed. 312
- Amount of public financial assistance provided per new low-moderate income rental housing unit completed 312
- Amount of public financial assistance provided per new housing unit for homeless households 312
- Number of low-moderate income housing units that had rehabilitation completed during the reporting period 313
- Number of rehabilitated low-moderate income housing units completed with public financial assistance during the most recent program year per Rs. 10,000. 313
- Number of low-moderate income owner occupied housing units rehabilitated per Rs.10, 000 of public financial assistance. 313
- Number of low-moderate income rental housing units rehabilitated per Rs.10, 000 of public financial assistance. 313
- Number of below poverty line (BPL) households that received public financial assistance and purchased homes per 1,000 BPL households 314
- Percent of total housing assistance funds leveraged from private sources. 314

GENERAL DEFINITIONS 315

PUBLIC HOUSING[114] INDICATORS

INTRODUCTION

In India, Public Housing is not intrinsically under the municipal government (unless, under special circumstances it acts on behalf of the State government).

From the point of view of any ULB, it is easier to deliver, regulate and charge for basic civic services to a population that is housed in a regular dwelling of any category, than to a floating population in slums and squatters. This is why the ULB has a stake in public housing.

The issue of Public Housing relates directly to the basic and fundamental human right to adequate shelter and can address related social issues like equity and gender equality.

The issue of Public Housing is also a reflection of the development potential of the municipality because it directly relates to prices, availability and affordability of land.

COVERAGE/EXPLANATORY INDICATORS

Housing – Demand Supply Gap

INDICATOR FORMULA: Percentage of woman and man-headed households facing shortage or lack of housing units in the following tenure categories[115]:

(a) owned; (b) purchasing; (c) private rental: (d) social housing; (e) sub-tenancy; (f) rent free; (g) squatter no rent; (h) squatter rent paid; (I) homelessness; (j) other.

$$\frac{\text{Availability of Housing Units in owned house Category}}{\text{Need for Housing Units in owned house category in the city}} * \frac{100}{1}$$

This formula to be used to measure demand-supply gap for each tenure category mentioned above

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: It is necessary to know housing shortage (gap between demand and supply of housing units) in overall terms and disaggregate terms because until and unless housing shortage of higher groups is also addressed along with homeless and low income groups no public housing programme can succeed. If there persist housing shortage in higher groups and if not addressed properly

[114] Public housing is not a primary responsibility of ULBs in India. It is a state function but in bigger cities ULBs also take up this function to some extent. Some time State Government's public housing programme gets implemented through ULB.

[115] For the definition of various terms please refer to section on General Definitions at the end of this chapter.

then they encroach upon the housing unit supply created for the lower groups by applying inappropriate means and finally lower groups remain without housing.

INFERENCE: This indicator provides an overview of the housing shortage of different tenure status among urban dwellers. Housing shortage by Tenure type by sex of household-head is an essential part of the basic information on the status of men and women in human settlements.

Tenure types

INDICATOR FORMULA: percentage of woman and man-headed households living in the following tenure categories:

(a) owned; (b) purchasing; (c) private rental: (d) social housing; (e) sub-tenancy; (f) rent free; (g) squatter no rent; (h) squatter rent paid; (i) Substandard houses (j) homelessness; (j) other.

$$\frac{\text{Households living in owned house}}{\text{Total number households (families) in the city}} * \frac{100}{1}$$

This formula to be used to measure percentage of each tenure category mentioned above

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: This indicator provides an overview of the share of different tenure status among urban dwellers. Among the safest tenure are ownership, purchasing and tenants in social housing and when rental regulations are protective enough, private tenancy can offer a fairly safe tenure to households. The most common precarious tenure statuses are homelessness and squatter, which can also be used as distinct indicators.

INFERENCE: Tenure type by sex of household is an essential part of the basic information on the status of men and women in human settlements.

Evictions

INDICATOR FORMULA: Average annual number of men-headed and women-headed households evicted from their dwellings during the past five years.

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Whether is it legal or illegal, eviction has generally negative social impacts on the concerned population. This indicator measures the degree to which this practice is still in force. Because eviction is usually irregular and intermittent, the value for this indicator is an average over the last five-

year Period. In developed countries the indicator will refer to evictions during large public works projects but mostly to evictions for non-payment of rent, and will measure affordability conditions and the availability of legal recourse by landlords. In developing countries the major component of this indicator will be squatter evictions. In many countries, Governments have chosen to allow long-term squatter settlements to remain in place, improved infrastructure, and secured land tenure thereby allowing the residents to invest more in improving their housing. In other countries, however, eviction continues unabated.

INFERENCE: It is quantitative; it certainly indicates number of evictions but not the story behind it or quality of rehabilitation.

Housing rights

INDICATOR FORMULA: Yes/no answers should be replied to the following questions:

1. Does the Constitution or national law promote the full and progressive realisation of the right to adequate housing? (Yes/no) Does it include protections against eviction? (Yes/no)

2. Are there impediments to women owning land (considerable, some, and none)? Are there impediments to particular groups owning land (considerable, some, and none)? Which particular groups?

3. Are there impediments to women inheriting land and housing (considerable, some, none)? Are there impediments116 to particular groups inheriting land and housing (considerable, some, none)? Which particular groups?

4. Are there impediments to women taking mortgages in their own name (considerable, some, and none)? Are there impediments117 to particular groups taking mortgages in their own name (considerable, some, and none)? Which particular groups?

SIGNIFICANCE: Since the adoption of the Universal Declaration of Human Rights in 1948, the right to adequate housing has been recognized as an important component of the right to an adequate standard of living. Part of the actions that Governments are committed to providing, in the matter of housing, that the law shall prohibit any discrimination and guarantee to all persons equal and effective protection against them. Also, Governments are committed to providing legal security of tenure and equal access to land for all, including women and those living in poverty (Habitat Agenda, para 61).

116 Impediments include both legal and traditional barriers to inheritance, which affect a significant proportion of the land area (e.g., in excess of 5%). Discriminations, which are faced by other particular groups, can be on the basis of race, colour, language, religion or other.

117 Impediments include both legal and institutional impediments, including requirements for guarantors, higher interest rates, down payment or deposit requirements, or loan limits which are different from those applying to men of similar incomes and wealth.

Housing price and rent-to-income ratios (housing affordability)

INDICATOR FORMULA: Ratio of the median free-market price of a dwelling unit and the median annual household income and ratio of the median annual rent of a dwelling unit and the median annual household income of renters.

$$\frac{\text{Median Free Market Price of a Dwelling Unit}}{\text{Median Annual Household Income}}$$

And

$$\frac{\text{Median Annual Rent of a Dwelling Unit}}{\text{Median Annual Household Income of Renters}}$$

UNIT OF MEASUREMENT: ratio, pure number

SIGNIFICANCE: In a responsive and efficient housing market, the ranges of housing prices and rents have to be such that they respond to all sections of the population and reach the lowest segments. This indicator is based on the assumption that, for households, access to adequate housing means that housing expenditures do not take up an undue portion of their income. Housing price and rent to income ratio provide a good measure of housing affordability at the city level. They also convey the greatest amount of information on the overall performance of housing markets.

Land price-to-income ratio

INDICATOR FORMULA: Ratios between the median price of 1 square metre of highly-developed, developed and raw land and the median household income per month.

$$\frac{\text{The Median Price of 1 sq. mts. of highly developed land}}{\text{The Median Household Income per Month/Annum}}$$

UNIT OF MEASUREMENT: ratio, pure number

Methodology: The median price of 1 m2 of land can be calculated using the following options:

1. Where the informal sector is small and data are reliable, median house price can be determined directly from published (formal) sales figures or from recent surveys.

2. If no direct data are available, then prices need to be estimated for each type of land, using the method suggested for the estimation of the housing price.

3. The ultimate solution is to use averages prices when median prices are not available.

Please indicate in the 'Note' page which method was used for this indicator.

SIGNIFICANCE: Land price is one major key to revealing land availability and development in cities. A responsive urban environment should be able to have land accessible and available at a reasonable range of prices in order to respond to the demand of individual households and the private sector. The ratio of the price of land to household income not only indicates if affordable land is available to cater the needs of the different segments of the population. It also shows if the local government is is able to respond to the growing needs by developing infrastructure in undeveloped parts of the city or providing incentives for new developments.

Mortgage and non-mortgage

INDICATOR FORMULA: Percentage of dwellings purchased during the last past year that are covered by mortgage loans and percentage of dwellings that are covered by non-mortgage loans.

$$\frac{\text{Dwellings purchased through mortgage loans during the year}}{\text{Total Dwellings purchased through mortgage and non-mortgage loans}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percentage

Methodology: If the percentage is not available, one might simply get the annual number of mortgage loans as well and the total annual number of non-mortgage loans attributed to households.

Information on mortgage loans might be easier to collect than non-mortgage loans. Information on the number of dwelling purchased during the last year with mortgage can be obtained from the major banks and housing finance institutions, and if it exists, the national housing bank.

SIGNIFICANCE: Because housing is an expensive purchase beyond the reach of the majority of households, the availability of mortgage facilities is a necessary part of ensuring access to owner-occupancy, and where such credit is not adequately available to particular groups; housing ownership will be severely restricted. In countries, which have no mortgage available, households, can either go for commercial loans, which are generally too expensive for the majority of the population, or, when available, can obtain other loans from the non-formal financial sector, generally in the form of micro-credits.

EFFICIENCY INDICATORS

Number of new low-moderate income housing units completed

INDICATOR FORMULA: Total number of new low-moderate income housing units completed with public financial assistance during the most recent program year

UNIT OF MEASUREMENT: number

SIGNIFICANCE: Clearing of shortage of housing units specifically for low and moderate income household is the most important objective of any public housing programme. The progress towards this objective needs constant monitoring.

INFERENCE: Knowing number is important but it should be compared with the planned output and also with the estimated need otherwise, it will not serve the purpose of efficiency monitoring. Along with above simple indicator following variations should be utilised for in-depth analysis.

$$\frac{\text{Total number of new low-moderate income housing units completed}}{\text{Estimated need for new low-moderate income housing units}} * \frac{100}{1}$$

$$\frac{\text{Total number of new low-moderate income housing units completed}}{\text{Total number of new low-moderate income housing units planned}} * \frac{100}{1}$$

It also has component of financial assistance but low and moderate income housing units do get constructed without assistance of public financial assistance. It is necessary to know units, which got constructed during the same period without public financial assistance and its ratio with those, which were constructed with financial assistance. This indicator is useful to know effectiveness of public housing programme.

$$\frac{\text{Total number of new low-moderate income housing units completed without assistance}}{\text{Total number of new low-moderate income housing units completed with assistance}}$$

Amount of public financial assistance provided per new low-moderate income owner occupied unit completed.

INDICATOR FORMULA:

$$\frac{\text{Total amount of public financial assistance provided for new low-moderate housing units}}{\text{Number of new low-moderate income owner housing units completed}}$$

UNIT OF MEASUREMENT: amount per unit

SIGNIFICANCE: it is necessary to know average amount being provided to low and moderate income owner for getting house. This will help to know sufficiency of such amount and to plan for future outlay. In a similar way, this indicator can be used for other types of housing units e.g. rental or housing units constructed for homeless units.

INFERENCE: It is more important to know whether the right kind (needy) of people benefited from public financial assistance programme than the average amount provided.

Amount of public financial assistance provided per new low-moderate income rental housing unit completed

INDICATOR FORMULA: $\frac{\text{Total amount of public financial assistance provided for new low-moderate income rental housing units}}{\text{Number of new low-moderate income rental housing units completed}}$

Amount of public financial assistance provided per new housing unit for homeless households

INDICATOR FORMULA: $\frac{\text{Total amount of public financial assistance provided for new housing units for homeless households}}{\text{Number of new housing units completed for homeless households}}$

INFERENCE: it is more important to know number of people benefited from public financial assistance programme than average amount.

Number of low-moderate income housing units that had rehabilitation completed during the reporting period

INDICATOR FORMULA:

$$\frac{\text{Number of Housing Units rehabilited in owned house Category}}{\text{Need for Housing Units in owned house category in the city}} * \frac{100}{1}$$

This indicator to be used for calculating rehabilitation efforts under various categories

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: Hosing programme is not only confined to construction of new units but it also includes rehabilitation of the existing housing stock. One should measure rehabilitation of houses efforts in both aggregate and disaggregate manner so future allocations for public housing can be fine-tuned. For this it needs to be used in terms of benchmark cost by using following indicators -

Number of rehabilitated low-moderate income housing units completed with public financial assistance during the most recent program year per Rs. 10,000.

INDICATOR FORMULA:

$$\frac{\text{Number of Housing Units rehabilited within Rs. 10000 assistance}}{\text{Total number of low-moderate income Housing Units rehabilitated}} * \frac{100}{1}$$

Number of low-moderate income owner occupied housing units rehabilitated per Rs.10, 000 of public financial assistance.

INDICATOR FORMULA:

$$\frac{\text{Housing Units Owner occupied rehabilited within Rs. 10000 assistance}}{\text{Total of low-moderate income owner occupied Housing Units rehabilitated}} * \frac{100}{1}$$

Number of low-moderate income rental housing units rehabilitated per Rs.10, 000 of public financial assistance.

INDICATOR FORMULA:

$$\frac{\text{Housing Units (rental) rehabilited within Rs. 10000 assistance}}{\text{Total of low-moderate income (rental) Housing Units rehabilitated}} * \frac{100}{1}$$

INFERENCE: it helps to measure and monitor rehabilitation of houses efforts which is equally important to construction of new housing units. Through rehabilitation programme government can address housing problem at much lesser cost and energy.

Rehabilitation of houses, at the best, is useful for halting depletion of existing housing stock but it does not lead to increase in housing stock. Recurring rehabilitation can result into increased cost and missing opportunity to use space efficiently.

Number of below poverty line (BPL) households that received public financial assistance and purchased homes per 1,000 BPL households

INDICATOR FORMULA:

$$\frac{\text{Number of BPL households recipient of public financial assistance}}{\text{Total Number of households below poverty line}} * \frac{1000}{1}$$

UNIT OF MEASUREMENT: number per 1000 households

SIGNIFICANCE: it is necessary to put performance of government in providing public financial assistance to BPL households to acquire their own house in the perspective of total BPL households. This will help to know sufficiency of programme and to plan for future course of action and financial outlay. Same indicator can be used for other categories of households covered by public financial assistance programme.

INFERENCE: it is more important to know whether right kind (needy) of people benefited from public financial assistance programme than the average amount provided.

Percent of total housing assistance funds leveraged from private sources.

INDICATOR FORMULA:

$$\frac{\text{Total amount of housing assistance funds leveraged from Private Sources}}{\text{Total amount of housing assistance funds leveraged}} * \frac{100}{1}$$

UNIT OF MEASUREMENT: percentage

SIGNIFICANCE: Resources–particularly public resources are limited. No housing assistance fund can accomplish its objective unless it succeeds in leveraging private resources. This can be achieved in various ways – from formal partnership with private sector to contribution from the beneficiary in cash and kind form.

INFERENCE: It helps to measure success of housing assistance fund's efforts to leverage private resources. It also indicates acceptability and sustainability of programme through this indicator.

GENERAL DEFINITIONS

Owned: refers to households with a clear title or ownership (formal housing) of the house and land they occupy, possibly through a company structure or as condominiums or strata title, or long leasehold of land. Purchasing refer to owner-occupiers in formal housing with a formal mortgage over the property.

Private Rental: is a household in (formal) housing for which rents are paid to a private landlord who is the legal owner. Social housing includes all households in public, parastatal, NGO owned, or operated housing, including government employee housing and housing owned or operated by co-operatives. Sub-tenancy refers to households who are renting from another household who is renting the premises.

Squatter: without rent refers to households in squatter housing, or housing, which has no title to the land on, which it stands, and who pays no rent. Squatter - with rent refers to households in squatter housing who pay rent.

Other: includes homeless, nomads, persons living in institutions or hotels, and any other tenure.

Homeless: refers to persons without shelter. These persons usually carry their few possessions with them, sleeping in streets, in doorways, on piers or in some open areas, such as park.

Median housing price: Housing price is defined as the price at which a house would sell if placed on the market for a reasonable length of time by a seller who is not under pressure to sell. The median-priced house in the urban area is that house which has 50% of the houses priced below it, and 50% of the houses priced above it. The calculation of the price of the median-priced house should, therefore include all housing, both new and old, and both formal and informal. If, for example, the majority of the housing stock is informal, and the informal housing stock is generally cheaper than the formal housing stock, then the median priced house will probably be an informal unit. For blocks of apartments or multiple-family dwellings, which are usually sold as a single building, the value of one dwelling unit should be estimated as a pro rata share of the total sale price. This is relevant for countries in Africa where the majority of housing is of this type.

Median rent: Rent should be contract rent or the amount paid for the property alone and not for utilities such as electricity, heating etc. If median rent data cannot be located, then an estimation procedure has to be used, with ranges of rents estimated separately for different categories such as public housing, controlled rents, one bedroom and two bedroom furnished and unfurnished apartments, and single

family houses of different types. The median price will be part way up the price ranges of the median dwelling types.

Median household income: Household income is defined as the gross income from all sources, which include wages, salaries, incomes from businesses or informal sector activities, investment income, and where information is available, income in-kind such as consumption of agricultural produce, which might have been sold. For the calculation of the rent to income ratio, incomes should be median gross income of private and public renter households. Where renter household income data do not exist, median income of all households can be used.

- **Highly developed land** refers to plots serviced with at least roads, water and electricity and possibly drainage and sewerage.

- **Developed land** refers to plots serviced with roads only.

- **Raw land** refers to unserviced plots with or without planning permission.

Mortgage loans refer specifically to loans from the formal financial sector to households, with mortgage (i.e. conveyance of property by debtor to creditor as security for debt incurred by the purchase of property). Mortgage loans include those loans which originate from the formal financial intermediary and which have, as final recipient, a household or individual which uses it for housing occupancy whether it is secured by the property or not. They should include loans to cooperatives to be used for housing for cooperative members and block loans to developers, which are passed on to purchasers.

Non-mortgage loans refer to all other types of loans from the formal or informal financial sector to households conveyed without mortgage for purchasing houses. Non-mortgage loans include those with non-financial intermediaries such as employers who provide credit for housing, loans provided by non-formal financial intermediaries through a NGO project, etc.

Dwellings purchased also include houses, which are built by individuals, with or without loans. The loans, in these particular cases, can be to cover the price of the plot and/or for the labour and/or for construction materials.

CHAPTER 6 - Financial Indicators

Index

INTRODUCTION _____ 321

- Goals of Urban Local Bodies _____ 321
- Financial Indicators for Urban Local Bodies _____ 322

REVENUE – EARNINGS RELATED INDICATORS _____ 324

- Net Take-down Ratio (Net Revenue to Total Revenue) _____ 324
- Operating Revenue to Total Revenue _____ 325

Growth Related Indicators _____ 325

- Annual Growth in Total Revenue _____ 325
- Annual Growth in Revenue Income _____ 326
- Annual Growth in Capital Income _____ 326
- Annual Growth of Own Resources in Revenue Income _____ 326
- Annual Growth in Revenue from Government Grants _____ 326

Percentage Share Based Indicators _____ 327

- Share of Revenue Income in Total Income _____ 327
- Share of Revenue from Own Sources in Revenue /Total Income _____ 327
- Share of Own Sources Revenue in Capital Income _____ 328
- Share of Tax Revenue in Revenue /Total Income _____ 328
- Share of Non-tax Revenue in Revenue /Total Income _____ 328
- Share of Property Tax in Revenue Income _____ 328

Revenue – Earnings (Per Capita Basis) Indicators _____ 328

- Per Capita Total Income _____ 328
- Per Capita Tax Income _____ 329
- Per Capita Non-Tax Revenue _____ 329
- Per Capita Government Grants Income _____ 329
- Per Capita Property Tax: _____ 329
- Growth in Per Capita Total Income _____ 329
- Growth in Per Capita Tax Income _____ 329
- Growth in Per Capita Non-tax Income _____ 329
- Growth in Per Capita Property Tax Income _____ 330
- One-Time Operating Revenue Ratio: _____ 330

RESOURCE MOBILISATION AND COLLECTION EFFICIENCY INDICATORS _____ 330

Resource Mobilisation Indicators – Tax Assessment Related Indicators _____ 331
- Increase in Property Tax Assessments _____ 331
- Assessment Efficiency _____ 331
- No. of Assessments per Assessment Staff _____ 332

Resource Mobilisation Indicators – Demand Related Indicators _____ 333
- Increase in Tax Demand _____ 333
- Average Tax Demand per property _____ 333
- % Properties Issued Demand Notice within 30 days of due date _____ 333
- Share of Past Arrears in Total Demand _____ 334

Collection Performance Related Indicators _____ 334
- Tax Collection Performance of ULB _____ 334
- Current Tax Demand Collection Performance of ULB _____ 334
- Past Tax Arrears Collection Performance of ULB _____ 334
- Uncollected Property Tax: _____ 335
- Property Tax Collection per Staff _____ 335
- Salary Expenditure to collect Rs. 1000 of property Tax _____ 336
- % Arrears Pending for 3 or 5 Years _____ 336

OPERATING (EXPENDITURE) EFFICIENCY INDICATORS _____ 336

Percentage share based Indicators _____ 337
- Maintenance Expenditures to Operating (Revenue) or Total Expenditures _____ 337
- Establishment Expenditure as % of Operating (Revenue) or Total Expenditure _____ 337
- Interest Payment Expenditure as % of Operating (Revenue) or Total Expenditure ____ 337
- Capital (Developmental) Expenditure as % of Total Expenditure _____ 337
- Loan Repayment as % of Total Expenditure _____ 337
- Administrative Expenditures to Total Revenue or Expenditures _____ 338

Growth Related Indicators _____ 338
- Growth in Total Expenditure _____ 338
- Growth in Revenue Expenditure _____ 339
- Growth in Capital Expenditure _____ 339
- Growth in Establishment (Salary Expenditure) _____ 339
- Growth in Maintenance Expenditure _____ 339
- Growth in Interest Payment and other Financial Charges Expenses _____ 339

Per Capita Base Indicators _____ 340
- Per Capita Total Expenditure: _____ 340
- Per Capita Operating (Revenue) Expenditure _____ 340

- Per Capita Expenditure on Capital Works _____ 341
- Per Capita Establishment (Salary) Expenditure _____ 341
- Per Capita Operation and Maintenance Expenditure: _____ 341
- Growth in Per Capita Total Expenditure _____ 341
- Growth in Per Capita Operating (Revenue) Expenditure _____ 341
- Growth in Per Capita Capital (Development) Expenditure _____ 341
- Growth in Per Capita Establishment Expenditure _____ 341
- Growth in Per Capita O & M Expenditure _____ 341

Some Special Relational Indicators _____ 342

- Maintenance Expenditure to Total Fixed Assets _____ 342
- Interest Payment Expenditure to total loans and borrowings _____ 342
- Capital Outlay Ratio: _____ 343
- Capital Utilization Ratio _____ 343
- Expenditure on Discretionary Services _____ 344
- One-Time Operating Expenditure Ratio: _____ 344

REVENUE – EXPENDITURE RELATIONAL INDICATORS _____ 345

- Operating Ratio _____ 345
- Total operating revenue as a percentage of costs _____ 345
- Capital expenditure/ capital income _____ 345
- Revenue expenditure/ revenue income _____ 345
- Financing of Capital Expenditure through Revenue Surplus _____ 345
- Financing of Capital Expenditure through Debt _____ 345
- Financing of Capital Expenditure through Grants _____ 345

BUDGET RELATED INDICATORS _____ 346

- Actual Receipts against Budgeted Receipts _____ 346
- Actual Property Tax Revenue to Budgeted Property Tax Revenue _____ 346
- Actual Water Service Revenue to Budgeted Water Service Revenue _____ 346
- Actual capital Revenue to Budgeted Capital Revenue _____ 346
- Actual Grant Revenue to Budgeted Grant Revenue _____ 346
- Excess expenditure incurred against budgetary allocation _____ 346
- Actual Salary Expenditure to Budgeted Salary Expenditure _____ 347
- Actual Maintenance Expenditure to Budgeted Maintenance Expenditure _____ 347
- Actual Capital Expenditure to Budgeted Capital Expenditure _____ 347

LIQUIDITY RELATED INDICATORS _____ 347

- Current Ratio (Current Assets to Current Liabilities) _____ 347

- Cash to Debt Service _____ 348
- Cash to Debt Service plus Operating Expenditures _____ 348

DEBT AND DEBT COVERAGE INDICATORS _____ 349

- Net Revenue Surplus (Deficit) to Current Liabilities _____ 349
- Debt Ratio _____ 350
- Total Long-Term Debt to Total Fund Equity _____ 350
- Debt Outstanding to Total Liability _____ 351
- Long term Debt to Total Outstanding Liability _____ 351
- Debt Outstanding to Total Revenue _____ 351
- Long-Term Debt to Total Assessed Valuation Ratio: _____ 351
- Net Fixed Assets to Funded Debt _____ 352
- Percentage Capital Investment on Creation of Fixed Assets to Total Debt _____ 352
- Net Revenue to Debt Service _____ 353
- Debt Service Coverage Ratio: _____ 353
- Debt Service to Total Expenditure _____ 353
- Operating Revenue to Operating Expenditures plus Debt Service _____ 354
- Per Capita Outstanding Debt _____ 354
- Per Capita Long Term Debt _____ 355
- Overdue loans as percentage of Outstanding Loans _____ 355

RETRUN ON INVESTMENT/ASSETS INDICATORS _____ 355

- Per Capita Assets _____ 355
- Fixed Assets to Total Assets _____ 136
- Liquid Assets to Total Assets _____ 136
- Capital Investment (on creation of new assets) to Total Fixed Assets _____ 137
- Value of Work in Progress to Total Assets _____ 137
- Return on Assets (Net Revenue to Total Assets) _____ 138
- Return on Equity (Net Revenue to Total Fund Equity) _____ 138
- Depreciation to Total Assets _____ 139
- Operating Deficit Ratio: _____ 139
- Operating Surplus Ratio: _____ 140

CHAPTER 6 – Financial Indicators

INTRODUCTION

Finance is a common thread running through all the aspects of an individual and organised life. Effective financial management is always important for every organisation and urban local bodies cannot be exception to this. It has becomes even more critical in times of high population growth, inflation and tight fiscal position. In such times, intergovernmental funds are usually harder to obtain, as are sources of credit; additionally, citizens are more sceptical about payment for services.

Money is constantly moving in and out of ULB, and the mix of the various sources and destinations of these funds is constantly changing. Controlling the mix of these sources and uses in accordance with a pre-determined plan is the essence of financial management.

Financial management for a ULB includes the following five basic components:

1. Establishing the goals and objectives of the government.
2. Defining how success in meeting these goals and objectives will be measured.
3. Creating a plan for obtaining the funds needed to meet these goals and objectives.
4. Allocating the money to the various assets and programs of the government while keeping the goals and objectives in mind.
5. Tracking results based on the defined success criteria and making necessary decisions based on these measurements.

Any performance Indicator system for ULBs must be built around these five aspects.

- Goals of Urban Local Bodies

For the most part, urban local bodies are not profit-oriented entities. They should, however, seek the highest return on their investments and the greatest possible impact from their expenditures. Although not exactly the same as ‘maximization of profit’, these are certainly closely related goals. The objectives of urban local bodies include:

1. Effectively meeting the needs of its citizens.
2. Maximizing return on assets.

3. Maximizing impact of expenditures
4. Minimizing cost of services
5. Following equitable hiring and personnel practices
6. Having concern for social and environmental factors

High quality financial management is essential in order for urban local bodies to meet regularly these goals effectively.

- Financial Indicators for Urban Local Bodies[118]

In general, the indicators used in the analysis of corporate financial statements can be applied to the financial statements of ULBs. Computing and studying these indicators can be a useful means of understanding ULB's financial condition. Some of the profitability ratios do not directly apply to local governments since they do not seek a profit. They do, however, apply to certain urban services run by ULBs on enterprise basis, which are often revenue generating centres. In addition to standard indicators used for analysis of corporate sector, there are various financial indicators developed and used to measure peculiar aspects of urban public finance (finances of ULBs).

Financial ratio analysis assumes the use of accurate accounting methods and the production of financial statements. However, in Indian ULBs, the quality of accounting system and resultant data is not up to mark. In Recent years, sincere efforts have been made to introduce accrual based double entry accounting system in ULBs. Till date, around 150 ULBs have introduced accrual based double entry accounting system. As this has been taken up as a national programme and state governments supporting it, it hoped that in coming five years' time most of the ULBs would have improved accounting system and data base.

The ratios identified are very basic; yet cover a broad spectrum of important financial characteristics. They are arranged into the following categories: revenue analysis, operating (expenditure) efficiencies, liquidity, debt and debt coverage, return and investments, the calculation and a discussion of the significance of the ratios follow. The analysis of the trends exhibited over the three years of the financial statements is a very important part of this discussion since benchmark of median figures are not well established for local government finance.

[118] As most of the financial indicators are in the form of ratio there is no 'unit of measurements' hence this heading is not repeated under every financial indicator.

Figure 6.1 - Generic Revenue and Expenditure Structure of Urban Local Bodies

Generic Resource / Revenue Structure of ULBs

- Tax Resources/Revenue
  - Octroi (in handful of ULBs)
  - Property Tax
  - Water Tax
  - Sewerage Tax
  - Conservancy Tax
  - Solid Waste Removal Tax
  - Fire Tax
  - Tax on Advertisements
  - Tax on Vehicles
- Non Tax Resources/Revenue
  - Income from Rents
  - Income from Investments
  - Income from user charges

Total Revenue from Own Resources

- Government Revenue Grants

Total Revenue Income

- Capital Income (Own Sources)
- Capital Income (New Loans)
- Capital Income (Grants)

Total Capital Income

- Deposits Receipts
- Return on Advances
- Fund Receipts

Total Extra-ordinary Income

Generic Expenditure Structure of ULBs

- Establishment or Salary Related Expenditure
- Administrative/Contingency Expenditure
- Operation & Maintenance Expenditure
- Programme Related Revenue Expenditure
- Interest Payment Expenditure
- Depreciation Expenditure

Total Revenue Expenditure

- Capital Expenditure from own sources
- Capital Expenditure from Loans & Borrowings
- Capital Expenditure from Grants

Total Capital Expenditure

- Deposits Refund
- New Advances Given
- Funds Related Expenditure

Total Extra-ordinary Expenditure

Total Expenditure of ULB = Revenue Expenditure + Capital Expenditure + Extra-ordinary Expenditure

This analysis is by no means exhaustive. It simply identifies some of the key ratios that can be used to evaluate the fiscal health of ULBs and their enterprises. Before proceeding to financial indicators, it will be appropriate to look at the generic revenue and expenditure of ULBs.

REVENUE – EARNINGS RELATED INDICATORS

Revenue Analysis Indicators help a financial manager track the sources and composition of annual revenues. For comprehensive analysis, one needs to analyse revenue of ULB from average and annual growth, per capita and from share of each source perspective. This information is extremely important when planning future expenditures and investments.

- Net Take-down Ratio (Net Revenue to Total Revenue)

INDICATOR FORMULA: $\frac{\text{Net Revenue}^{119}}{\text{Total Revenue}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCES: Moody's investors services (one of the largest bond rating agencies in the U.S.) use this ratio when evaluating revenue bonds associated with new municipal enterprise projects. According to moody'' for newly proposed U.S. water and sewer projects the median value for this ratio is approximately 0.40 or 40%. When applying this ratio to the financial statements of urban local bodies, a much lower ratio of 10% to 20% would be appropriate.

INFERENCE: This ratio is a measure of profitability. The value of the ratio represents the proportion of the total revenue that is in excess of expenditure and is able to be "reinvested" in the entity or used to meet obligations. It should be noted that this ratio is more useful and commonly applied to new capital projects, which are treated as separate fiscal activities. It is also useful, however, when analyzing the profitability of a public enterprise as whole.

Arriving at the figure of net revenue is a very dicey and subjective issue. For example as noted earlier urban local bodies' sources of revenue, comprise tax sources, non-tax sources and government grants. Out of these revenue from tax and non-tax resources can be termed as real own revenue of ULBs. But the issue here will be to include government grants in the revenue or not? If yes then government grants are of various natures – compensatory grants against loss of revenue due to State Government's action, compensatory grants against expenditure incurred on the implementation of state government's

[119] Net Revenue here means revenue income less revenue expenditure that is revenue surplus.

schemes/programmes, adhoc or ex-gratia grants or grants in the form of share in State's resources to correct vertical imbalance. For example, octroi levying municipal body will have higher net revenue if we adopt narrow definition of it, but then a ULB, which is barred from levying octroi by State Government and is receiving octroi compensatory grant will register very low net revenue to total revenue ratio.

- Operating Revenue to Total Revenue

INDICATOR FORMULA: $\frac{\text{Operating Revenue}}{\text{Total Revenue}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCES: It is a one sort of 'self-reliance index'. ULBs deliver various types services (carry out various operations) some remunerative, most of non-remunerative or part remunerative. It is necessary to know operation (activity or service-wise) revenue performance.

INFERENCE: This ratio gives an indication of the proportion of revenue that is generated solely by operations. It is important for a ULB to track carefully how much of its revenue is coming from non-operating sources, such as governmental grants and subsidies.

Various operations/activities are carried out for social welfare purpose by ULBs. Income from such activities/operations is sometimes minimal and most of the time less than cost incurred on the operations as a result operating revenue remains at much lower level in ULBs in case ULBs in India ratio of 0.70 or 70 % can be considered adequate.

Growth Related Indicators

- Annual Growth in Total Revenue

INDICATOR FORMULA: $\frac{\text{Y1 (Total Revenue of ULB in Y1)}}{\text{Y0 (Total Revenue of ULB in Y0)}} * \frac{100}{1}$

Where Y1 is total revenue of the year and Y0 total revenue of the earlier year

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCES: Growth is the first and foremost important aspect of measuring performance. Revenue growth is must for sustainability and progress of any organisation. This indicator shows aggregate growth but revenue of any organisation comprises various types of revenues, accordingly to track the sources and composition of annual revenues disaggregate or individual revenue source-wise following indicators should be calculated and having done this, inference should be drawn about the revenue growth of an urban local body.

- Annual Growth in Revenue Income

$$= \frac{\text{Y1 (Revenue income of ULB in the year 1)}}{\text{y0 (Revenue income of ULB in the year o)}} * 100 - 1$$

- Annual Growth in Capital Income

$$= \frac{\text{Y1 (Capital income of ULB in the year 1)}}{\text{y0 (Capital income of ULB in the year o)}} * 100 - 1$$

- Annual Growth of Own Resources in Revenue Income

$$= \frac{\text{Y1 (Own Sources (tax + non-tax) income of ULB in the year 1)}}{\text{y0 (Own Sources (tax + non-tax) income of ULB in the year o)}} * 100 - 1$$

- Annual Growth in Revenue from Government Grants

$$= \frac{\text{Y1 (Income from Government Grants of ULB in the year 1)}}{\text{y0 (Income from Government Grants income of ULB in the year o)}} * 100 - 1$$

In this way, growth indicators can be calculated for each category and for each source of income of ULB.

INFERENCE: The most important benefit of growth related indicators (aggregate and disaggregate level) is they indicate vitality of an organisation and its various sources of revenue. Revenue growth is fundamental to sustainability and progress of any organisation. All other aspects of financial management in an organisation - financing expansion to increase service level, raising funds from market or reducing indebtness etc. rest on actual growth, which has taken place in the revenues of ULB. It is widely accepted primary indicator of inter ULB comparison. Annual growth may show high ups and down to overcome this problem average growth rate should be calculated over the period of three to five years using following formulae for each source and category of revenue of ULB

Growth measuring indicators suffer from certain weaknesses – the product of the indicator depends heavily on the base year value. If value in the base year is very high then growth rate will look low than what it is in real terms, similarly if the value in the base year is low then growth rate will appear much higher than what it is. Any growth rate has meaning only if it is viewed in context and benchmarks. It is very difficult to frame benchmarks for growth rate indicator. It is also unfair to compare ULBs on basis of growth rate indicators because the potential (increase in trade/economy) and the challenges (increase in population and inflation in price) faced by an ULB differ from ULB to ULB. Still growth related indicators are primary indicators and their quality and utility improves when –

1. They are averaged out to remove annual fluctuation
2. They are adjusted to remove effects of inflation, which has taken place.
3. They are adjusted to effects of growing population (see per capita indicators)

Percentage Share Based Indicators

- Share of Revenue[120] Income in Total Income

INDICATOR FORMULA: $\frac{\text{Revenue Income of ULB}}{\text{Total Income of ULB}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCES: differential growth date of different sources of revenue results in to change in the composition and shares of individual source in the total revenue of ULB. The trend analysis of shares of different sources of revenue provides additional dimension to the financial analysis. These indicators by definition are of disaggregate nature. Using the similar formulae share of each source of ULB in the revenue income or in the total revenue of ULB should be worked out –

- Share of Revenue from Own Sources in Revenue /Total Income

INDICATOR FORMULA: $\frac{\text{Revenue from Own Sources of ULB}}{\text{Revenue or Total Income of ULB}} * \frac{100}{1}$

[120] Revenue Income of ULB comprises Tax Revenue, Non-tax Revenue and Revenue Grants including devolutions, transfers etc but not capital grants.

- Share of Own Sources Revenue in Capital Income

$$= \frac{\text{Revenue from Own Sources in Capital Income of ULB}}{\text{Total Capital Income of ULB}} * \frac{100}{1}$$

- Share of Tax Revenue in Revenue /Total Income

$$= \frac{\text{Revenue from Tax Sources of ULB}}{\text{Revenue or Total Income of ULB}} * \frac{100}{1}$$

- Share of Non-tax Revenue in Revenue /Total Income

$$= \frac{\text{Revenue from Non-tax Sources of ULB}}{\text{Revenue or Total Income of ULB}} * \frac{100}{1}$$

- Share of Property Tax in Revenue Income

$$= \frac{\text{Revenue from Property Tax of ULB}}{\text{Revenue or Total Income of ULB}} * \frac{100}{1}$$

The above list is illustrative and not exhaustive. Depending upon time, energy and usefulness of the exercise ULB should work out these ratios.

INFERENCE: it indicates how each and every source of revenue is fairing in comparison with other sources of revenue and growth in total revenue. It helps decision makers to know which source is not growing or growing at a low rate and thus can help them to initial deeper analysis and then appropriate corrective actions.

Share of any resource or component of revenue depends on the growth rate taking place with respect to other resources or components of revenue. A particular source may show declining trend even if in absolute terms and in percentage term it is registering normal growth. Sometimes one time exceptional revenue flow may vitiate share structure of different resources. Keeping these limitations in mind about share related indicators analysis should be carried out.

Revenue – Earnings (Per Capita Basis) Indicators

- Per Capita Total Income

INDICATOR FORMULA: $\frac{\text{Total Income}}{\text{Population}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: The third dimension through which revenue and resources of ULBs should be analysed is 'Per Capita' Basis. Such an analysis is necessary because population keeps on growing but 'growth' or 'share' indicators fail to capture its effect on revenue trends or resources of ULB. The revenue from a resource of ULB may be growing but if rate of growth is less than the growth of population then in per capita terms revenue may be declining. In order to assess such situation per capita analysis is important. It should be done at both aggregate and disaggregate terms for an individual year and also for more than one years to know growth rate. Following is the illustrative list of per capita base indicators.

- Per Capita Tax Income

$$= \frac{\text{Total Tax Income}}{\text{Population}} * \frac{100}{1}$$

- Per Capita Non-Tax Revenue

$$= \frac{\text{Total Non Tax Income}}{\text{Population}} * \frac{100}{1}$$

- Per Capita Government Grants Income

$$= \frac{\text{Total Income from Government Grants}}{\text{Population}} * \frac{100}{1}$$

- Per Capita Property Tax:

$$= \frac{\text{Total Property Tax Income}}{\text{Population}} * \frac{100}{1}$$

- Growth in Per Capita Total Income

$$= \frac{Y1}{Y0} * 100$$

Where Y1 = Per Capita Total Income in Year 1

Where Y0 = Per Capita Total Income in Year 0

- Growth in Per Capita Tax Income

$$= \frac{Y1}{Y0} * 100$$

Where Y1 = Per Capita Tax Income in Year 1

Where Y0 = Per Capita Tax Income in Year 0

- Growth in Per Capita Non-tax Income

$$= \frac{Y1}{Y0} * 100$$

Where Y1 = Per Capita Non Tax Income in Year 1

Where Y0 = Per Capita Non Tax Income in Year 0

- Growth in Per Capita Property Tax Income

= Y1* 100 Where Y1 = Per Capita Property Tax Income in Year 1

Y0 Where Y0 = Per Capita Property Tax Income in Year 0

INFERENCE: Per capita base indicators provide more realistic picture about growth of total as well as source wise income. If revenue is not growing at per capita level then it indicates that either rates have remained stagnant for more than necessary period or ULB has failed to capture increase in population to improve coverage of tax and non-tax sources. Thus, it indicates that ULB should take necessary steps to increase rates of tax and user charges and to increase coverage of its tax and non-tax sources.

Though per capita base growth indicators are more refined than simple growth indicators but these indicators do not explain or takes in to account changing composition of population of the city. It may be possible that growth in population of the city may taking place because of rural unskilled migrants or displaced people due to big project who may not have tax or charge paying potential.

- One-Time Operating Revenue Ratio:

INDICATOR FORMULA: One-Time Operating Revenue * 100

Net Operating Revenues 1

UNIT OF MEASUREMENT:

SIGNIFICANCES: One time unusual revenue distorts revenue growth and share of different sources of revenue in total revenue. It is important to know and to segregate such unusual receipts to know real position of regular sources of revenue.

INFERENCE: This ratio is designed to identify any unusual one-time sources of revenue that would not occur yearly. Examples include a large amount of revenue received in the form of a donation or from the sale of municipal land.

RESOURCE MOBILISATION AND COLLECTION EFFICIENCY INDICATORS

This group of indicators include indicators pertaining to resource mobilisation and collection performance, which help a decision maker to know how well sources have been mobilised and collected. These indicators have been further sub-grouped according to various sub-tasks of resource mobilisation and collection.

Resource Mobilisation Indicators – Tax Assessment Related Indicators

First stage of any resource mobilisation effort in government is identification and assessment. For levying and collecting tax, one needs to first assess it as per rules. In case of ULBs in order to mobilise Property Tax and other property related takes properties liable to the tax needs to be identified and then assessed properly. To evaluate efficiency of assessment work/process in ULB following indicators should be utilised.

- Increase in Property Tax Assessments

INDICATOR FORMULA: $\frac{\text{Assessments in Numbers at the end of year}}{\text{Assessments in Number at the beginning of the year}} * \frac{100}{1}$

Another variant could be $\frac{\text{Assessments in Value at the end of year}}{\text{Assessment in Value at the end of year}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: Property Tax income is product of Property tax rate * Assessment Value, hence increase in assessment acquires immense importance. Similarly increase in number of assessments when compared with growth in properties shows how far the coverage of tax is increasing. Tax revenue also depends on coverage or increase in number of assessments.

INFERENCE: Both indicators are very useful to know whether number of assessed properties and assessed value of the properties is increasing healthily or not. If number of assessed properties is not increasing adequately even if number of properties and population in the cities is increasing then it clearly indicates inefficiency of assessment staff /machinery of ULB. On other hand if value of assessed properties is not increasing adequately then it warrants further analysis of the properties assessed during the year.

It has no serious pitfalls. At the same time, it does not take into account sufficiency of assessment staff or machinery. Also, like other growth indicator it suffers from low and high value in the base year.

- Assessment Efficiency

INDICATOR FORMULA: $= \frac{\text{Assessments Accepted by People (not challenged)}}{\text{Total number of Assessments Carried out}} * \frac{100}{1}$

Another variant could be $= \frac{\text{Actual Increase in the Assessment Value /Numbers}}{\text{Potential increase possible in Assessment Value/Numbers}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: Efficiency assessment is must because on it depends growth in number of assessments and assessed value. Assessment of properties is a very sensitive issue and if property owner is not satisfied with it, then assessment gets challenged and revenue gets blocked for a substantial period. So customer satisfaction is another dimension of assessment efficiency and ULB must take care of it.

INFERENCE: First variant helps ULB to know assessment efficiency from tax payer's perspective. If very high or very low numbers of assessments are getting challenged then it can presume that there is something wrong with the quality and efficiency of assessments. Second variant indicates assessment efficiency from the perspective of realising potential. If ratio is less than one then assessment staff/machinery is not exploiting potential adequately. Potential revenue not realised is lost, thus this variant also gives very valuable information to ULB to take necessary measures to achieve full utilisation of tax potential.

It is difficult to set benchmark for first variant of assessment efficiency. High or low value are not definite indicator of assessment inefficiency Less number of assessments may get challenged because staff may have grossly under assessed value of properties or a large scale rigging may have taken place. Large number of rejections of assessments may be due to hostile attitude of people towards payment of tax or other non-transparency factors. With regard to second variant availability information and calculation of potential is a problem. Such data does not exist in ULBs. If quality and availability of such data is good then this indicator can provide good insight in assessment efficiency.

- No. of Assessments per Assessment Staff

INDICATOR FORMULA: Total Number of New Assessments made

Number of Assessment Staff

SIGNIFICANCES: it is necessary to assess workload per person engaged on an assignment.

INFERENCE: it indicates workload per staff or output per staff, which can help ULB to know sufficiency and efficiency of human resources employed for assessment work.

Just a quantitative indicator, not meaningful if appropriate benchmark not evolved. Not possible to know quality with which assessments have been carried out.

Resource Mobilisation Indicators – Demand Related Indicators

Second stage in resource mobilisation is to know what is happening to tax demand – is it increasing or not, it's changing composition, time taken for issuing demand notices to tax payers etc.

- Increase in Tax Demand

INDICATOR FORMULA: $\frac{\text{New year Tax Demand}}{\text{Earlier year Tax Demand}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: Growth in revenue needs to be measured at every stage to know grey area or where there is an inadequate growth.

INFERENCE: it indicate rate of growth in tax demand. By comparing this growth rate with growth rate in assessed value, one can find appropriateness of rate of tax. For example, if increase in tax demand is not commensurate with increase in assessed value then one needs to examine rate structure of tax.

- Average Tax Demand per property

INDICATOR FORMULA: $\frac{\text{Total Property Tax Demand}}{\text{Number of Properties}}$

SIGNIFICANCES: it is necessary to know quickly average yield at aggregate level

INFERENCE: indicates average yield from properties in the city. Comparison or trend analysis over the years gives quick and broad indication about increase in tax demand.

Widely utilised for quick, broad level assessment but not very meaningful

- % Properties Issued Demand Notice within 30 days of due date

INDICATOR FORMULA: $\frac{\text{Properties issued demand notice within 30 days of due date}}{\text{Total number of properties}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCES: Issue of demand notice is important legal step before recovering tax. It is also important that demand notices get issued in time to speed up tax recovery.

INFERENCE: indicates efficiency of tax recovery department in issuing demand notices

- Share of Past Arrears in Total Demand

INDICATOR FORMULA: $\frac{\text{Amount of Past Tax Arrears}}{\text{Total Tax Demand}}$

SIGNIFICANCES: Any tax demand is made up of arrears and current demand. If amount of arrears crosses current demand mark then it can inferred that non-payment of tax has been chronic habit of people.

INFERENCE: it indicates efficiency of tax collection effort in the context of tax demand. If share of past arrears is growing in tax demand then it indicates that collection is continuously declining and more and more tax payers are becoming chronic defaulters.

Collection Performance Related Indicators

- Tax Collection Performance of ULB

INDICATOR FORMULA: $\frac{\text{Total Tax Recovered /Collected}}{\text{Total Tax Demand}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: Actual recovery of any tax depends mainly on the efficiency of collection staff / machinery; as a result, it acquires great significance. The collection performance of Indian ULBs is quite low, on an average it stands at less than 60 per cent. It should be calculated at all possible levels and for each significant resource of ULBs and in current and past arrears terms. Some of such indicators are as follow -

- Current Tax Demand Collection Performance of ULB

$= \frac{\text{Total Tax Recovered or Collected against current demand}}{\text{Total Current Tax Demand}} * \frac{100}{1}$

- Past Tax Arrears Collection Performance of ULB

$= \frac{\text{Total Tax Recovered or Collected against Pat Arrears}}{\text{Total Past Arrears Tax Demand}} * \frac{100}{1}$

INFERENCE: basic indicators to assess performance of collection machinery. These indicators are must for analysing collection efficiency of an organisation. Disaggregate level indicators together improve usefulness of this analysis.

These are quantitative indicators; tax payers may not be paying because they were not satisfied with assessment or tax rates may be unfair or frustration about performance of ULB. In spite of these limitations, these are only indicators to measure collection efficiency.

- Uncollected Property Tax:

INDICATOR FORMULA: $\frac{\text{Uncollected Property Tax}}{\text{Net Property Tax Levy}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: Examination of collection performance at disaggregate level (tax source-wise) is very important to know source-wise efficiency and constraints

INFERENCE: This ratio indicates the inefficiency of the ULB's property tax collection operations.

Quantitative indicator, tax payers may not be paying because they were not satisfied with assessment or tax rates may be unfair or frustration about performance of ULB.

- Property Tax Collection per Staff

INDICATOR FORMULA: $\frac{\text{Total Property Tax Collection (Rs. In lacs)}}{\text{Collection Staff Employed}}$

UNIT OF MEASUREMENT: In Rupees

SIGNIFICANCES: Collection performance depends to large extent on efficiency of staff. It therefore becomes imperative to know collection per staff. Same formulae can be used for assessing collection per staff in case of other tax resources of ULBs.

INFERENCE: It indicates collection achieved per staff in turn it indicates collection efficiency.

May be useful for internal assessment if ULB has worked out in advance target or benchmark for per staff collection performance. It cannot be used for inter-ULB comparisons, as collection amount is result of assessment, tax rate and various other factors.

- Salary Expenditure to collect Rs. 1000 of property Tax

INDICATOR FORMULA: $\frac{\text{Total Salary Expenditure for Property Tax Recovery} * 1000}{\text{Total Property Tax Collected}} \quad 1$

UNIT OF MEASUREMENT: Rupees

SIGNIFICANCES: This is another way of measuring staff efficiency. Salary cost at 2 to 3 per cent can be considered as acceptable.

INFERENCE: it clearly indicates cost incurred on staff to collect property tax. It is also useful for inter-ULB comparison.

- % Arrears Pending for 3 or 5 Years

INDICATOR FORMULA: $\frac{\text{Amount of Arrears pending for more than 3 or 5 years}}{\text{Total Amount of Arrears}} * 100 \quad 1$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: As arrears become older, they become more difficult to recover. Also, accounting standards[121] and legal provisions require such age old arrears to be classified as doubtful or bad debts

INFERENCE: It helps ULB to know which of its arrears have now entered into doubtful category. Arrears pending more than 3 years should be around 10 per cent and more than 5 should be around 5 per cent of total arrears. It also indirectly reflects on collection efficiency.

OPERATING (EXPENDITURE) EFFICIENCY INDICATORS

Operating (expenditure) Efficiency Ratios provide insight into the productivity of day-to-day operations and administration. Expenditure efficiency is the most neglected area even in the urban local bodies, which are efficient in other aspects – revenue mobilisation-collection, investment, debt management, liquidity management etc.

[121] ULBs were up till now not subject to such standards but recently C&AG has recommended that the tax arrears amount which is in arrears for more than three years, 50 % of such amount should be treated as doubtful receivables and due provisioning should be done.

Percentage share based Indicators

- Maintenance Expenditures to Operating (Revenue[122]) or Total Expenditures

INDICATOR FORMULA: $\frac{\text{Maintenance Expenses}}{\text{Operating (Revenue) Expenses}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: This is a relationship indicator. It is important to analyse major components of operating expenditure to know exactly where lays the problem. Using similar formulae movements in the other components of operating expenditure like salary cost, administrative cost, interest payment cost etc. should be analysed. In similar manner, all these expenditures should be calculated as % of total expenditure to get comprehensive picture.

Following range could be considered as ideal[123] values with regard to various expenditures to revenue expenditure of ULBs

Establishment (Salary) Expenditure to Revenue Expenditure – 35 to 40 %

Administrative/Contingency Nature Expenditure to Revenue Expenditure – 1 to 3%

Operation & Maintenance Expenditure to Revenue Expenditure – 20 to 25 %

Interest Payment and Finance Charges Expenditure to Revenue Expenditure – 8 to 12 %

Depreciation Expenditure to Revenue Expenditure – 5 to 10 per cent

Thus, maximum value of all these heads of revenue expenditure will add up to 90 % of the revenue expenditure and revenue surplus will be available at modest 10 % for development.

- Establishment Expenditure as % of Operating (Revenue) or Total Expenditure
- Interest Payment Expenditure as % of Operating (Revenue) or Total Expenditure
- Capital (Developmental) Expenditure as % of Total Expenditure
- Loan Repayment as % of Total Expenditure

[122] In corporate parlance all types of expenditures are compared with revenue to know their interrelationship.
[123] These are ideal because barring handful of ULBs most of the ULBs in India do possess these values.

INFERENCE: This ratio provides management another means of detecting increasing maintenance costs. If the percentage of operating costs due to maintenance expenditures is increasing, it may indicate problems with the fixed assets. Similarly

Share of any expenditure or component of expenditure depends on the growth rate taking place with respect to other components of expenditure. A particular expenditure may show declining trend even if in absolute terms and in percentage term it is registering normal growth. Sometimes one-time exceptional expenditure may vitiate share structure of different expenses. Keeping these limitations in mind about share related indicators analysis should be carried out.

- Administrative Expenditures to Total Revenue[124] or Expenditures

INDICATOR FORMULA: $\frac{\text{Administrative Expenditures}}{\text{Total Revenue or Expenditures}} * \frac{100}{1}$

UNIT OF MEASUREMENT:

SIGNIFICANCES: As a general rule of thumb, any operation should be concerned if their administrative costs exceed 2% of their total costs. Rising administrative costs can take funds away from operations and the provision of services to the residents. For example, a government may set aside funds for salary increases in order to ensure the employment of key administrative staff, even if this represents an increasing share of total expenditures. These funds are then no longer available for day-to-day operations or services.

INFERENCE: As mentioned above it indicates money spent on this item in comparison with others items of expenditure.

Share of a particular expenditure in total expenditure is a relative thing depends on growth trends in other expenditure items. This indicator should be interpreted cautiously.

Growth Related Indicators

- Growth in Total Expenditure

INDICATOR FORMULA: $\frac{\text{Y1 (Where Y1 = expenditure in year 1)}}{\text{Y0 (Where Y0 = Expenditure in year 0)}} * \frac{100}{1}$

[124] In corporate parlance all types of expenditures are compared with revenue to know their interrelationship.

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: Growth is one of the important aspects of measuring performance. Expenditure growth needs to be monitored continuously otherwise; it can harm progress of any organisation. This indicator shows aggregate growth but expenditure of any organisation comprises various types of expenditures, accordingly to track the different types of expenditures disaggregate or individual expenditure-wise following indicators should be calculated and having done this, inference should be drawn about the structure of expenditure in an urban local body.

- Growth in Revenue Expenditure

$$= \frac{\text{Y1 (Where Y1 = Revenue Expenditure in year 1)}}{\text{Y0 (Where Y0 = Revenue Expenditure in year 0)}} * \frac{100}{1}$$

- Growth in Capital Expenditure

$$= \frac{\text{Y1 (Where Y1 = Capital Expenditure in year 1)}}{\text{Y0 (Where Y0 = Capital Expenditure in year 0)}} * \frac{100}{1}$$

- Growth in Establishment (Salary Expenditure)

$$= \frac{\text{Y1 (Where Y1 = Establishment Expenditure in year 1)}}{\text{Y0 (Where Y0 = Establishment Expenditure in year 0)}} * \frac{100}{1}$$

- Growth in Maintenance Expenditure

$$= \frac{\text{Y1 (Where Y1 = Maintenance Expenditure in year 1)}}{\text{Y0 (Where Y0 = Maintenance Expenditure in year 0)}} * \frac{100}{1}$$

- Growth in Interest Payment and other Financial Charges Expenses

$$= \frac{\text{Y1 (Where Y1 = Establishment Expenditure in year 1)}}{\text{Y0 (Where Y0 = Establishment Expenditure in year 0)}} * \frac{100}{1}$$

In this way, growth indicators can be calculated for each category and for each type of expenditure of ULB.

INFERENCE: The most important benefit of growth related indicators (aggregate and disaggregate level) is they indicate expenditure (cost efficiency) of an organisation and its various expenses. Growth based indicators are widely accepted primary indicator of inter ULB comparison. Annual growth may show high ups and down to overcome this problem average growth rate should be calculated over the period of three to five years using following formulae for each source and category of revenue of ULB

Growth measuring indicators suffer from certain weaknesses – the product of the indicator depends heavily on the base year value. If value in the base year is very high then growth rate will look low than what it is in real terms, similarly if the value in the base year is low then growth rate will appear much higher than what it is. Any growth rate has meaning only if it is viewed in context and benchmarks. It is very difficult to frame benchmarks for growth rate indicator. It is also unfair to compare ULBs on basis of growth rate indicators because the increase in inflation and the challenges (increase in population and inflation in price) faced by an ULB differ from ULB to ULB. Still growth related indicators are primary indicators and their quality and utility improves when –

1. They are averaged out to remove annual fluctuation
2. They are adjusted to remove effects of inflation, which has taken place in
3. They are adjusted to effects of growing population (see per capita indicators)

Per Capita Base Indicators

- Per Capita Total Expenditure:

INDICATOR FORMULA: $\frac{\text{Total Expenditures of ULB}}{\text{Population}} * \frac{100}{1}$

SIGNIFICANCES: Yet another important dimension through which expenditure of ULBs should be analysed is 'Per Capita' Basis. Such an analysis is necessary because population keeps on growing but 'growth' or 'share' indicators fail to capture its effect on expenditure of ULB. For example, ULB may take satisfaction that its development expenditure is growing in absolute, percentage and share terms but if the rate of growth of development expenditure is less than the growth of population then in per capita terms it may be declining. In order to assess such a situation per capita analysis is important. It should be done at both aggregate and disaggregate terms for an individual year and also for more than one years to know growth rate (trend). Following is the illustrative list of per capita base indicators.

- Per Capita Operating (Revenue) Expenditure

This measure the average cost of operations, which ULB incurs per citizen. An increasing trend would indicate either increasing expenditures on average or declining population. For trend analysis over succeeding years, the constant value of the currency should be used (inflation adjusted currency)

$= \frac{\text{Net Operating Expenditures}}{\text{Population}} * \frac{100}{1}$

- Per Capita Expenditure on Capital Works

$$= \frac{\text{Total Expenditures}}{\text{Population}} * \frac{100}{1}$$

- Per Capita Establishment (Salary) Expenditure

$$= \frac{\text{Total Expenditure on Establishment}}{\text{Population}} * \frac{100}{1}$$

- Per Capita Operation and Maintenance Expenditure:

$$= \frac{\text{Total O \& M Expenditure of ULB}}{\text{Population}} * \frac{100}{1}$$

- Growth in Per Capita Total Expenditure

$$= \frac{Y1}{Y0} * \frac{100}{1}$$

Where Y1 = Per Capita Total Expenditure in Year 1

Where Y0 = Per Capita Total Expenditure in Year 0

- Growth in Per Capita Operating (Revenue) Expenditure

$$= \frac{Y1}{Y0} * \frac{100}{1}$$

Where Y1 = Per Capita Operating Expenditure in Year 1

Where Y0 = Per Capita Operating Expenditure in Year 0

- Growth in Per Capita Capital (Development) Expenditure

$$= \frac{Y1}{Y0} * \frac{100}{1}$$

Where Y1 = Per Capita Capital Expenditure in Year 1

Where Y0 = Per Capita Capital Expenditure in Year 0

- Growth in Per Capita Establishment Expenditure

$$= \frac{Y1}{Y0} * \frac{100}{1}$$

Where Y1 = Per Capita Establishment Expenditure in Year 1

Where Y0 = Per Capita Establishment Expenditure in Year 0

- Growth in Per Capita O & M Expenditure

$$= \frac{Y1}{Y0} * \frac{100}{1}$$

Where Y1 = Per Capita O & M Expenditure in Year 1

Where Y0 = Per Capita O & M Expenditure in Year 0

INFERENCE: Per capita base indicators provide more realistic picture about growth of total as well as source wise income. For example if development expenditure is, not growing at per capita level then it indicates that present level of development expenditure is not sufficient. Against this if other expenditures like salary, interest payment have shown increase in per capita terms then situation can be considered serious.

Though per capita base growth indicators are more refined than simple growth indicators, these indicators do not explain or take in to account changing composition of population of the city. It may be possible that growth in population of the city may taking place because of rural unskilled migrants or displaced people due to big project who will require more infrastructure or development than usual.

Some Special Relational Indicators

- Maintenance Expenditure to Total Fixed Assets

INDICATOR FORMULA: $\frac{\text{Maintenance Expenditures}}{\text{Total Fixed Assets}}$

SIGNIFICANCES: The money spent on the maintenance of any fixed asset is important to its owner (ULBs). For example, a car owner pays very close attention to the maintenance and repair costs he is putting into his automobile. When the maintenance costs become too high, he makes the decision to purchase a new one. Businesses and Organisations make similar decisions regarding their fixed assets. Management of ULBs should track the proportion of maintenance costs to fixed assets.

INFERENCE: This is specific relational indicator. Observing the magnitude and trends of this ratio provides valuable information on the condition of these assets and helps managers make appropriate capital investment decisions.

- Interest Payment Expenditure to total loans and borrowings

INDICATOR FORMULA: $\frac{\text{Total Interest Payments}}{\text{Total Loans and Borrowings}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: The average cost at which loans have been taken is important information for making decisions regarding debt management. If average cost of borrowing is much higher than that prevailing in market then ULB should go for debt restructuring.

INFERENCE: This is special relational indicator. Observing the magnitude and trends of this ratio provides valuable information about interest payment cost Vis a vie loans and borrowings. If there is a

growing trend in the cost than market average then ULB is borrowing funds at much higher cost and need to select appropriate borrowing options.

- Capital Outlay Ratio:

INDICATOR FORMULA: $\frac{\text{Capital Outlay Form Operating Revenue}}{\text{Gross Operating Expenditure}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: The real strength of an organisation and sustainability of capital formation depends on how much an organisation is capable of funding its capital outlay from its operating revenue or operating surplus. Capital outlay ratio of 1.1 or 10 % can be accepted as minimum. Unfortunately, in India most of the municipal bodies do not have operating surplus and are not able to finance any capital outlay from their operating revenue.

INFERENCE: This ratio suggests how well the ULB is maintaining its capital assets as well as meeting its financing needs from its operating funds. Higher the ratio, better is the financial position of ULB.

- Capital Utilization Ratio

INDICATOR FORMULA: $\frac{\text{Capital Utilised During the period}}{\text{Capital Available for Utilisation}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: Availability of capital is not only the issue, its timely and judicious utilisation is equally important. Any organisation including ULBs should avoid a situation where capital was available for utilisation but not utilised in time[125] as a result cost overrun and delayed development. But most of the ULBs suffer from this avoidable and unfortunate syndrome, still worse nobody bothers about it because nobody tries to know about it.

[125] Two classical examples of this, in 1998-99 Ahmedabad and Bangalore Municipal Corporations raised huge capital by issuing 'Municipal Bond', but failed to utilised raised capital for a period of more than one year.

INFERENCE: it is a very good indicator of ULBs efficiency in utilising capital available for city development. It should be worked out by each and every ULB to improve performance.

It is a quantitative indicator and will not indicate the quality with which capital was utilised or whether it achieved desired improvement in service delivery or infrastructure.

- Expenditure on Discretionary Services

INDICATOR FORMULA: $\frac{\text{Expenditure on Discretionary Services}}{\text{Total Expenditure of ULB}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: This is an indicator specific to ULBs. Municipal Act in India invariably bifurcate functions to be performed or services to be provided by ULBs in to two categories – Obligatory and Discretionary. Such a classification exists to guide ULBs about the criticality of certain functions/services than others.[126]

INFERENCE: It indicates how much amount is being spent on non-core or discretionary services. This information helps ULB to verify that expenditure on discretionary items is not carried out at the expense of core or obligatory functions/services.

Not limited by specific weaknesses, only ULB will have work out sufficiency level of expenditure on core services in advance as a benchmark. Also, distinction between obligatory and discretionary is getting blurred day by day.

- One-Time Operating Expenditure Ratio:

INDICATOR FORMULA: $\frac{\text{One-Time Operating Expenditure}}{\text{Net Operating Expenditure}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: One time unusual expenditure distorts share of different types of expenditures in total expenditure. It is important to know and to segregate such unusual expenditure to know real position of regular heads of expenditures.

[126] Prior to its budgetary reforms in 1992-93, Vadodara Municipal Corporation of Gujarat was spending more amounts on Gardens, Zoo and other recreational items than on Roads and Storm Water Drain.

INFERENCE: This ratio is designed to identify any unusual one-time expenditure that would not occur yearly. Examples include a large amount of arrears paid to employees or expenditure to repair damages after natural disaster.

REVENUE – EXPENDITURE RELATIONAL INDICATORS

- Operating Ratio

INDICATOR FORMULA: $\frac{\text{Operating}[127]\ \text{Expenditures}[128]}{\text{Operating Revenues}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: Moody's calculates the U.S. median figure for water and wastewater enterprise projects to be approximately 60%. In other words, operating expenses amount to 60% of operating revenue. If this ratio is, greater than 1.0 it means that operating expenses are greater than operating revenues, or the operation itself is losing money, even before debt service obligations are taken into account. In most of the ULBs in India, operating ratio is greater than 1.0 as they do not charge adequate user charge and there is expenditure inefficiency of great order.

INFERENCE: This ratio indicates the general efficiency of the daily operations of the facility.

Operating ratio may be favourable but ULB may be highly leveraged in capital account. This may lead to loan repayment may be affecting new capital formation (development of the city).

- Total operating revenue as a percentage of costs
- Capital expenditure/ capital income
- Revenue expenditure/ revenue income
- Financing of Capital Expenditure through Revenue Surplus
- Financing of Capital Expenditure through Debt
- Financing of Capital Expenditure through Grants

[127] Word 'operating' used in corporate sector financial terminology is equivalent to word 'Revenue Receipts or Revenue Expenditure'

128 Operating Expenditures (including maintenance) to Operating Revenue

BUDGET RELATED INDICATORS

- Actual Receipts against Budgeted Receipts

INDICATOR FORMULA: $\frac{\text{Actual Total Revenue of ULB}}{\text{Budgeted Total Revenue of ULB}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: Budget is not a financial tool in ULBs but it is a legal authorisation and core of ULB's administration. Budget serves as a performance standard or benchmark against which resource mobilisation and expenditure control efforts of ULB under different heads can be and should be compared. Budgets are made in advance and therefore it becomes necessary to verify their reliability. Using the formulae given above following indicators should be worked out. Following list is indicative and not exhaustive.

- Actual Property Tax Revenue to Budgeted Property Tax Revenue
- Actual Water Service Revenue to Budgeted Water Service Revenue
- Actual capital Revenue to Budgeted Capital Revenue
- Actual Grant Revenue to Budgeted Grant Revenue

INFERENCE: These indicators measure quality of budget making (estimate forecasting) and actual efforts to achieve budgeted targets.

Wide disparity between actual figures and budgeted does indicate problems with estimate forecasting but every time inadequate or inefficient efforts may not be responsible for such disparity. Budgeted estimates may be unrealistic.

- Excess expenditure incurred against budgetary allocation

INDICATOR FORMULA: $\frac{\text{Actual Expenditure Incurred}}{\text{Budgeted Expenditure}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: Like receipts side, actual against budgeted comparison should be done regarding expenditure outlays. Expenditure control is more important because if actual receipts fall short of budgeted receipts then it indicates inefficiency but there remains a chance to recovered unrecovered receipts; but in case of expenditure, there is no second chance as a result it becomes important that actual expenditure remain within the confines of budgeted amount. Actual expenditure against budgeted expenditure should be worked out at disaggregate level using following indicators and many more -

- Actual Salary Expenditure to Budgeted Salary Expenditure
- Actual Maintenance Expenditure to Budgeted Maintenance Expenditure
- Actual Capital Expenditure to Budgeted Capital Expenditure

INFERENCE: These indicators measure quality of budget making (estimate forecasting) and actual efforts to achieve budgeted targets.

Wide disparity between actual figures and budgeted does indicate problems with estimate forecasting but every time inadequate or inefficient efforts may not be responsible for such disparity. Budgeted estimates may be unrealistic.

LIQUIDITY RELATED INDICATORS

Liquidity is a measure of the availability of assets that can be readily converted into cash in order to meet short-term obligation. Sufficient liquidity is sufficient to any operation. Poor liquidity indicates that short-term obligations associated with day-to-day operations cannot be met. It also indicates that the ability to cover debt service could be limited.

- Current Ratio (Current Assets to Current Liabilities)

INDICATOR FORMULA: $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

SIGNIFICANCES: The Current Ratio is the relationship between current assets and current liabilities, and it roughly indicates the ability to meet short-term financial obligations. A ratio of 2.0 or better is generally accepted as a good level of liquidity. In other words, for every Rupee of short-term liability

there are two dollars of cash or convertible assets to cover them. For a public enterprise, a ratio of 1.5 may be adequate due to its predictable cash inflows from self-established user fees.

INFERENCE: it is well accepted indicator of organisation's ability to meet its short-term financial liabilities. Higher the ratio better is the liquidity position of an organisation.

It only indicates ability to meet short-term financial obligation and not the overall ability of an organisation to meet its entire financial obligation. Very high ratio indicates that an organisation is maintaining unnecessary liquidity and therefore ignoring return on investment perspective of financial management.

- Cash to Debt Service

INDICATOR FORMULA: $\frac{\text{Cash}}{\text{Debt Service}}$ [129]

SIGNIFICANCES: It compares service on debt to the readily available, liquid cash assets. The ratio indicates how many times cash assets could cover the service due on the enterprise's debt. A ratio of at least 2.0 is recommended in corporate sector by financial experts; however, due to the fact that ULBs, Government Agencies and public enterprises generally do not seek as large profit margins as private enterprises, a ratio greater than 1.0 can be a good indication for government.

INFERENCE: The ratio of Cash to Debt Service gives a general indication of how able an entity is to handle the obligations of its indebtedness.

It is not indicator of overall solvency of an organisation. Very high ratio does not mean very good financial management. Very high ratio robs away profitability or an opportunity to earn decent rate of return on assets.

- Cash to Debt Service plus Operating Expenditures

INDICATOR FORMULA: $\frac{\text{Cash}}{\text{Debt Service + Operating Expenses}}$

[129] In all ratios involving Debt Service, Debt Service is defined as interest expenditure plus principal paid.

SIGNIFICANCES: Ratio of same genre with added dimension of operating expenditure. A ratio of 1.0 or higher would be sought in corporate sector; again, however, given the nature of public enterprises, a somewhat lower ratio may be expected.

INFERENCE: The Cash to Debt Service plus Operating Expenditures ratio indicates not only the ability to meet short-term debt service obligations, but day-to-day operating costs as well.

Again an indicator addressing only liquidity aspect of any organisation's finances. Like all other liquidity ratios fails to reflect holistic position but if interpreted properly certainly helps to know what is wrong with the liquidity management.

DEBT AND DEBT COVERAGE INDICATORS

Debt and Debt Coverage indicators indicate the level of indebtedness and the ability to meet the service or interest on this debt. These measures relate debt or debt service to assets and to inflows of revenue as well as give an indication of the proportion of expenditures that go towards debt coverage.

- Net Revenue Surplus (Deficit) to Current Liabilities

INDICATOR FORMULA: $\frac{\text{Net Revenue}}{\text{Current Liabilities}}$

SIGNIFICANCES: In a strictly private, for profit venture a ratio of at least 1.0 would be recommended. In a public enterprise, with its limited ability to seek large profits, the expected ratio may be lower and more emphasis focussed on ensuring a positive or increasing trend.

INFERENCE: This ratio indicates what level of the current liabilities or obligations of the enterprise are covered by net revenues. It is one of the very good indicators of soundness of financial position of an organisation.

Except little bias to words current liabilities, not limited by any serious limitation. When interpreted along with total liability to total assets it can provide comprehensive picture.

- Debt Ratio[130]

INDICATOR FORMULA: $\frac{\text{Total Liabilities}}{\text{Total Assets}}$

UNIT OF MEASUREMENT: ratio

SIGNIFICANCES: In general, creditors like to see a lower ratio because this indicates that the enterprise is in a good position to meet its obligations to them in the case of liquidation. A ratio of 0.50 means that 50% of the enterprises financing is supplied by creditors. This is viewed as a very safe financing situation. A decreasing trend in the ratio indicates that the enterprise owns more and more of its assets outright. A Debt Ratio value of 75% is still considered a comfortable position, but a ratio at this level does raise the need for solid capital investment planning in order to prevent a more highly indebted or leveraged position. As the ratio approaches the 0.75 figures, it will become more difficult for an enterprise to borrow money. If the ratio increases higher to the 0.80 levels, management is risking subjecting the enterprise to dangerously high leveraged position.

INFERENCE: This is perhaps the most common ratio used to measure the level of indebtedness in private and governmental financial analysis. Lower ratio clearly indicates very sound financial position of an organisation but at the same time, it indicates low leveraging of resources. For ULB very low debt ratio is also not good because it indicates that particular ULB is not leveraging resources and thus not bringing adequate development to the city.

It does not indicate liquidity or return on investment or quality of assets. A debt ratio may be in comfort zone (less than 0.5), but liquidity management in an organisation may be bad or profitability may be declining or quality of assets may be poor. This ratio fails to indicate such trends.

- Total Long-Term Debt to Total Fund Equity

INDICATOR FORMULA: $\frac{\text{Total Long-Term Debt}}{\text{Total Fund Equity}}$

SIGNIFICANCES: Equity represents the funds the urban local body or government has invested in their own enterprise or infrastructure. Comparing this internal long-term investment to financing obtained from outside creditors is another measure of the extent to which an urban local body is

130 (Total Liabilities [Current Liabilities plus Long-Term Debt] to Total Assets)

leveraged. An increasing trend indicates that a greater proportion of the long-term financing is coming from outside creditors. Anytime the ratio exceeds 1.0, long-term debt financing exceeds equity.

INFERENCE: It indicates liability structure of an organisation and relationship between long term debt and equity. A ratio over 1.0 can be justified if long-term funds are available at cheaper cost than equity or if an organisation does not want to dilute its equity holding. This indicator helps decision makers to take such important financial decisions.

In the public realm, benchmark figures are not well established, and therefore, the trend analysis of the ratio is very important.

- Debt Outstanding to Total Liability

INDICATOR FORMULA: $\frac{\text{Debt Outstanding}}{\text{Total Liability}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: Another way to calculate debt related ratio is relationship of outstanding debt to various components of balance sheet. This ratio compares the outstanding Debt of a ULB to its Total liability. Liability includes various types debt is one of them. It becomes important to know composition of liability and various relationships within it. Similarly, other relationships of outstanding liability could be as follows

- Long term Debt to Total Outstanding Liability
- Debt Outstanding to Total Revenue

INFERENCE: These indicators help to understand relationship between various types of liabilities especially outstanding liability. Debt outstanding to total revenue help ULB to know its financial viability.

- Long-Term Debt to Total Assessed Valuation Ratio:

INDICATOR FORMULA: $\frac{\text{Long-Term Debt}}{\text{Total Assessed Valuation}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: This ratio compares the Long-Term Debt of a ULB to its Total Assessed Valuation (the value of all the ULB's equipment and property).

INFERENCE: Should be interpreted cautiously. In corporate sector if this ratio is very low, it is considered very well. For developing and growing ULBs this ratio can be as high as 5.0% to 10.0 % and still be considered a good indication. This is because the investment in development will lead to increased real estate values, which, in turn, leads to a rise in property tax revenue.

- Net Fixed Assets to Funded Debt

INDICATOR FORMULA: $\frac{\text{Net Fixed Assets}}{\text{Total Funded Debt}}$

SIGNIFICANCES: This ratio compares net fixed assets of ULB to total funded debt of ULB. It acts as a supplementary measure to determine security for the lenders. A ratio of 2:1 would mean that for every rupee of long-term indebtedness, there is a book value of two rupees of net fixed assets.

INFERENCE: indicates financial strength of ULB hence useful to convince lenders of ULB.

Book value and actual liquidating value may be greatly at variance and in interpreting this indicator this fact must be borne in mind.

- Percentage Capital Investment on Creation of Fixed Assets to Total Debt

INDICATOR FORMULA: $\frac{\text{Capital Investment on Creation of Fixed Assets}}{\text{Total Debt}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: Debt should be incurred to create additional earning capacity so that its interest and repayment burden can be mitigated. It is necessary to know how debt raised has been utilised. How much it has gone into creation of capital assets. In ULBs, there is tendency to utilise debt proceeds for the purposes other than creation of fixed assets and the ULBs, which suffer from revenue deficit debt and other capital account proceeds get utilised for meeting revenue expenses. This makes this ratio very important.

INFERENCE: This indicator help to know how much portion of the debt raised has been utilised for creation of fixed assets and how much has been utilised for other purposes.

Ratio of creation of fixed from debt is important but not sufficient because debt may get utilised primarily for non-remunerative or non-productive fixed assets. Ratio of Investment in productive assets is much better indicator for assessing efficiency in utilisation of debt proceeds

- Net Revenue to Debt Service

INDICATOR FORMULA: $\frac{\text{Net Revenue}}{\text{Debt Service}}$

SIGNIFICANCES: Creditors and potential creditors will look to this ratio to help them determine the risk inherent in investing in the enterprise. A ratio of 2.0 is desired in private business. For urban local bodies, a ratio in excess of 1.0 (net revenue greater than debt service) is a more realistic benchmark. And once again, the analysis of trends in the ratio is very useful.

INFERENCE: This ratio indicates the ability of the enterprise to raise revenues to pay off the service on its debt. It is a much better indicator of financial positions that earlier indicator net revenue to current liabilities.

- Debt Service Coverage Ratio:

INDICATOR FORMULA: $\frac{\text{Debt Service}}{\text{Gross Operating Revenue}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per cent

SIGNIFICANCES: as high as 10% are considered acceptable. In developing ULBs, the Debt Service Ratio will often exceed this 10% benchmark.

INFERENCE: This ratio is a measure of the ULB's ability to meet its debt service obligations. It compares Debt Service to Gross Operating Revenues.

- Debt Service to Total Expenditure

INDICATOR FORMULA: $\frac{\text{Debt Service (Interest + Principle Repayment)}}{\text{Total Expenditure of ULB}} * \frac{100}{1}$

UNIT OF MEASUREMENT: per cent

SIGNIFICANCES: as high as 20% can be considered acceptable. In developing ULBs, the Debt Service Ratio will often exceed this 20% benchmark.

INFERENCE: It indicates how much ULB is paying toward total debt service and how much share it constitutes of its total expenditure. This is a composite ratio as it takes in to account interest payment and loan repayment together and therefore it is useful for inter-ULB comparison. Simple interest payment to operating/total expenditure or loan repayment to capital/total expenditure fail to overcome situations where in one ULB may have high interest payment but low loan repayment while another ULB may have low interest payments but high loan repayments.

- Operating Revenue to Operating Expenditures plus Debt Service

INDICATOR FORMULA: $\frac{\text{Operating Revenue}}{\text{Operating Expenses + Debt Service}}$

SIGNIFICANCES: A ratio of 1.0 indicates that revenue from operations exactly equals the sum of the costs of the operation and the obligations on debt. Any value below 1.0 indicates a shortfall in revenue to cover these expenditures. Again, lenders of money would be wary of investing in an enterprise that cannot generate the revenue need to cover these costs because of fear that the debt service obligations of the entity will not be consistently met. In fact, in credit analysis for revenue bond issuance in the U.S., a ratio of 1.3 or better for the projected cash flows of a proposed project of bond issue is considered an indication of financial strength.

INFERENCE: This ratio measures the ability of the enterprise to cover its operational costs and debt service solely with operating revenue.

A ratio of 1.0 or just over 1.0 indicates the ability to meet - but only to meet anticipated expenses including debt service with anticipated operating revenues. Such a ratio permits little accumulation of reserves or coverage in the event of financial difficulty of even a minor nature.

- Per Capita Outstanding Debt

INDICATOR FORMULA: $\frac{\text{Total Outstanding Debt of ULB}}{\text{Population}}$

UNIT OF MEASUREMENT: Rupees per capita

SIGNIFICANCES: one need to know outstanding debt on per capita basis just as an additional dimension.

- Per Capita Long Term Debt

INFERENCE: Gives average position. Useful for inter ULB comparison on very broad basis.

This indicator is very simplistic, not useful for qualitative analysis.

- Overdue loans as percentage of Outstanding Loans

INDICATOR FORMULA: $\frac{\text{Amount of Overdue Loans}}{\text{Total Outstanding Loans}} * \frac{100}{1}$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: Outstanding loans are not issue, every organisation has it but the real issue is overdue loans. As a rule, there should not be any overdue loan and therefore no need for this indicator but majority of ULBs in India have overdue loans of varying degrees and amount. As many ULBs have this feature, this ratio becomes relevant for Indian ULBs.

INFERENCE: it will indicate severity of overdue loans and poor financial position of ULB

Not limited by specific limitations

RETRUN ON INVESTMENT/ASSETS INDICATORS

Return and Investment Ratios measure how efficiently physical and cash assets are being used or invested. The expected return on assets or equity is often the most critical factor in a capital investment decision. These ratios are also an excellent means for evaluating the financial decision-making and management of an urban local government.

- Per Capita Assets

INDICATOR FORMULA: $\frac{\text{Value of Total Assets of ULB (in Rs.)}}{\text{Population under ULB}}$

UNIT OF MEASUREMENT: Rupees Per Capita

SIGNIFICANCES: One needs simple snap shot value for inter-ULB comparisons. Also useful for comparison with per capita liability thus having balance sheet of ULB per capita basis.

INFERENCE: It is simple and useful for inter-ULB comparison but highly quantitative in nature and in reality not useful for determining real financial strength of ULB.

- Fixed Assets to Total Assets

INDICATOR FORMULA: $\frac{\text{Fixed Assets}}{\text{Total Assets}}$

SIGNIFICANCES: When it comes to evaluating and monitoring of assets, it is necessary to know composition of assets and relationships between different constituents of assets of ULB. There is no fixed benchmark about how much should be the share of fixed assets to total assets. It should not very low or very high. If it is very low then it indicates that ULB is keeping high amount in liquid form and either not earning enough returns on them or it is not going for development of city. If the share of fixed assets to total assets is very high then it indicates ULB may face working capital (liquidity) problem.

INFERENCE: The ratio is certainly important as it measures share of fixed assets to total assets and with the help of it, one can analyse other components and appropriateness of composition of total assets of ULB. But what is more important to know is how far assets are liquid or productive. This can be known by using next two indicators.

- Liquid Assets to Total Assets

INDICATOR FORMULA: $\frac{\text{Liquid Assets}}{\text{Total Assets}}$

SIGNIFICANCES: It is not that the fixed assets are non-liquid and current assets are liquid. Current assets can also be non-liquid. Thus high current assets to total assets ratio non-necessarily indicate high degree of liquid assets to total assets. From financial strength point of view liquid assets to total assets is a better indicator than fixed or current assets to total assets. ULB may have assets (current or fixed) which are not-liquid. From generating immediate stream of resources, liquid assets matter more.

INFERENCE: It measures proportion of liquid assets to total assets. Higher the proportion of liquid assets to total assets higher is the financial strength of ULB.

Assets may be liquid but may not be productive or earning sufficient rate of return and liquidity may be at the cost of productivity.

- Capital Investment (on creation of new assets) to Total Fixed Assets

INDICATOR FORMULA: $\frac{\text{Capital Investment Expenditures}}{\text{Total Fixed Assets}}$

SIGNIFICANCES: Beside liquidity and return on investment third important aspect of finance is sustained growth of an organisation. Growth of an organisation depends on level of capital investment carried. It is also important that such a new investment should be in productive assets so that future rate of return remains at adequate level. Generally, a corporate enterprise would seek a ratio value of 0.75. In other words, for every four Rupees invested in fixed assets, three would be spent on productive capital assets. For urban local bodies such a high ratio is not possible, as they have to undertake various social welfare infrastructures. A ratio having value of 0.5 or 0.4 could be ideal for ULBs.

- Value of Work in Progress to Total Assets

INDICATOR FORMULA: $\frac{\text{Value of Work in Progress}}{\text{Total Assets}}$

SIGNIFICANCES: This ratio is an indication of how much the enterprise is investing in its future. It represents the proportion of the fixed assets, which offer long-term view in the form of buildings, infrastructure, equipment, and other productive capital equipment.

INFERENCE: The trends of this ratio should be tracked. A rising ratio indicates an increased acquisition of productive capital assets relative to other fixed assets such as vehicles and office equipment. This suggests a likelihood of improved returns on assets.

May inculcate bias towards productive assets but urban local bodies need to create social welfare assets, which are not productive. It will fail to note that productiveness of assets in case of ULBs is dependant more on political rather than financial decision making.

- Return on Assets (Net Revenue to Total Assets)

INDICATOR FORMULA: Return on Assets (ROA) = $\frac{\text{Net Revenue}}{\text{Total Assets}}$

SIGNIFICANCES: When faced with numerous options for investing their money, organisations, individuals, institutions must evaluate the earning or interest generating capacity of these options. It is often advisable to compare the return on assets for an enterprise with the current lending rate or the interest rates being offered by financial institutions, since these will be competing for the same investment dollars.

INFERENCE: The ratio of Net Revenue to Total Assets indicates how much every Rupee of assets earns for an organisation (ULB). This is very important indicator from the point of view of a potential investor but it also indicates quality of capital investment decisions made in the past and helps in taking current and future capital investment decisions.

Does not take in to account quality of assets. Urban local bodies are 'not for profit' institutions, so they charge for recovering cost rather than for making profit as a result return on assets can be very low in case of ULBs. Also, there may not be anything wrong with the growth rate of Net Revenue but because of non-performing or non-yielding dead assets ROA may be very low.

- Return on Equity (Net Revenue to Total Fund Equity)

INDICATOR FORMULA: Return on Equity (ROE) = $\frac{\text{Net Revenue}}{\text{Total Fund Equity}}$

SIGNIFICANCES: ROE is another ratio that indicates the "earning power" of an entity. As described above, equity is the internal investment made by the government in its own programs and enterprises. Government, too, is looking for a good return on its investment. This is especially important for enterprises or revenue generating activities of government.

INFERENCE: The ROE indicates 'earning power' with reference to equity. Such a comparison facilitates certain important financing decisions. This is so because it indicates whether the financial position of the enterprise may be improved by borrowing or issuing debt in comparison with self-financing, which depletes equity. If credit can be obtained at a rate lower than the annual ROE, more is to be gained by borrowing than by using equity reserves. The reserve of this is also true. If the rate at which credit can be obtained is higher than the annual ROE, the enterprise has more to gain by using its equity reserves for making the investment.

The return on equity may appear very high if organisation is having very small equity base and high leveraged position, which is a potentially dangerous situation in a volatile financial market.

- Depreciation to Total Assets

INDICATOR FORMULA: $\frac{\text{Total Depreciation Amount}}{\text{Total value of Fixed Assets}} * \frac{100}{1}$

SIGNIFICANCES: ULB possesses different types of fixed assets and is required to charge different types of depreciation rates. It's good to know overall or average position regarding depreciation and its rate.

INFERENCE: It calculates average rate of depreciation on total assets of ULB. Useful for Macro level comparisons and inter-ULB comparisons.

- Operating Deficit Ratio:

INDICATOR FORMULA: $\frac{\text{General Fund Operating Deficit}}{\text{Net Operating Revenue}}$

UNIT OF MEASUREMENT: Ratio hence no unit

SIGNIFICANCES: This ratio compares the General Fund Operating Deficit (if a deficit exists) to Net Operating Revenue. An increase in this ratio reflects increasing inability of ULB to cover its operating expenditures.

INFERENCE: It measures extent of operating deficit to operating revenue. Ideally there should not be operating deficit at all, if for any reason it is there, it should be as low as possible and having decreasing trend rather than increasing one.

- Operating Surplus Ratio:

INDICATOR FORMULA: $\frac{\text{General Fund Operating Surplus}}{\text{Net Operating Revenue}} * 100$

UNIT OF MEASUREMENT: Per Cent

SIGNIFICANCES: The opposite of the above ratio, this ratio compares the General Fund Operating Surplus to Net Operating Revenue. Here an increasing ratio indicates improved financial health and solvency. A ratio of 10% like this is considered very healthy.

INFERENCE: It measures relationship between operating surplus and operating revenue. Higher the ratio better is the financial health of ULB. But high operating surplus ratio is not indicator of good governance or increasing quality and quantity of service delivery. It simply indicates that operative (revenue) expenditure is less than operative income. But higher operative surplus may be due to monopolistic situation or inadequate expenditure on upkeepment of infrastructure or low level of services.

CHAPTER 7 - Administration and Governance Related Indicators

Index

Introduction _____ ***363***

Administration Related Indicators _____ ***363***

INPUT INDICATORS: _____ 363

- Population per elected officials/representative _____ 363
- Employees per 1000 Population:_____ 363
- Number of employee hours per capita or per identified area _____ 364
- Office space _____ 364
- Administration or Governance Related Salary Costs to expenditure _____ 364
- Administration or Governance Related Salary to Total Salary of ULB_____ 365
- Fringe Benefits Costs pertaining to General Administration to Total Administrative Costs 365

OUTPUT INDICATORS _____ 365

- Number of reports generated _____ 366
- Number of pamphlets distributed_____ 366
- Number of complaints answered _____ 366
- Number of public outreach events held _____ 366
- Number of educational programs initiated_____ 366
- Number of errors/delays in debt service payment _____ 366

OUTCOME INDICATORS _____ 366

- Number of people educated _____ 366
- Number of people attending meetings _____ 366
- Number of financial errors made per month _____ 366
- Percent of quarterly reports completed _____ 366
- Percent of budgets submitted by deadline _____ 366
- Collection Rate - accounts receivable _____ 366
- Percent of delinquent payment _____ 366
- Percent of invoices, vouchers paid _____ 366

EFFICIENCY INDICATORS _____ 367

Workforce _____ 367

- Number of employees per capita _____ 367
- Percentage administration cost to total costs_____ 367

Outreach Programme _____ 367

- Number of people educated per outreach employee 367
- Cost per outreach program 367

Responsiveness 368

- Average number of employee hours per complaint 368

Information Compiling and Dissemination 368

- Average number of working days to compile monthly financial statements 368
- Average number of working days to compile quarterly reports 368
- Average number of working days to compile annual budget 368

EXPLANATORY INDICATORS 368

- Population served 368
- Nature of work force (union, non-union) 368
- Community economic condition 368

Governance Related Indicators 368

- Decentralisation 369
- People's Participation 369
- Transparency and Accountability 370
- Equity 370
- Strategic Vision 370

CHAPTER 7 - Administration and Governance Related Indicators

Introduction

Though the functions of Administration and Governance do not directly deliver basic civic services, they are necessary at every step and at all times to steer the operations of service provision through leadership, coordination, running, and supervision. Good administration can ensure that service provision is satisfactory, economical, efficient and adequate. Good governance can ensure justice, equity and create a conducive political and legal environment for human progress and efficient delivery of service.

Administration Related Indicators

INPUT INDICATORS:

- *Population per elected officials/representative*

INDICATOR FORMULA: $\frac{\text{Population}}{\text{Number of Elected Officials}}$

UNIT OF MEASUREMENT: number of people per elected officials

SIGNIFICANCE: Elected representative should be required to represent manageable size of population. If the number is very large then distance between them increases.

INFERENCE: helps to identify need to increase number of elected officials

- *Employees per 1000 Population:*

INDICATOR FORMULA: $\frac{\text{Number of Employees}}{\text{Population}} * \frac{1000}{1}$

UNIT OF MEASUREMENT: per 1000 population

SIGNIFICANCE: population constitutes workload while employees constitute workforce there has to be adequate relationship between workload and workforce. This makes it an important indicator. There

is no fixed formula regarding ideal number of employees per 1000 people, it will have to be worked carefully taking into account services delivered, people's needs, use of machines etc.

INFERENCE: This ratio is a measure of employee productivity and effectiveness. If employees are, highly productive and effective then ULB can manage same work with less number of employees per 1000 people. It is especially meaningful when compared to other ULBs and tracked over time.

It is highly subjective and requires careful working of benchmark

- *Number of employee hours per capita or per identified area*

INDICATOR FORMULA: $\frac{\text{Number of man-hours per week (for each category of work)}}{\text{Population}}$

Or $\frac{\text{Number of man-hours per week (for each category of work)}}{\text{Area of ULB}}$

UNIT OF MEASUREMENT: man-hours per capita, or man-hours per unit area

SIGNIFICANCE: This is a measure of the potential municipal service that can be delivered per capita or per unit area with the ULB's existing workforce. Comparing across ULBs this helps to identify those that are overstaffed or understaffed, according to stipulated benchmarks. This measure is only quantitative and says nothing about quality of service.

- *Office space*

INDICATOR FORMULA: Square meters of office space per ULB employee

SIGNIFICANCE: This is a proxy for the quality of working conditions of the ULB employees by way of comfort and space. Comparing across ULBs focus can be brought to those where ULB employees work in overcrowded conditions and so may not be able to deliver the best at their job. This measure has certain limitations. Not all kinds of ULB jobs require the same quantity and quality of space. Productivity on a host of other factors like leadership, commitment, motivation, pays, etc.

- *Administration or Governance Related Salary Costs to expenditure*

INDICATOR FORMULA: $\frac{\text{Salary expenditure on Administration and governance}}{\text{Total revenue expenditure}}$

SIGNIFICANCE: This is a measure of the financial burden on the ULB to pay employees who do not directly deliver urban service, but are necessary only to organise the service delivery- in other words, a necessary nuisance. If the figure is too low, (compared to appropriate benchmarks) the administration employees will not find motivation to work and that can hold up or slow down the entire service delivery system. On the other hand figure that are too high indicate inefficiency or overstaffing (on administration) and unproductive financial burden to ULB. The limitation that this indicator suffers is that all administrative salaries are clubbed together. Administrative jobs vary widely in importance and skill requirement. Disaggregation is necessary.

- *Administration or Governance Related Salary to Total Salary of ULB*

INDICATOR FORMULA: $\frac{\text{Administration or Governance Related Salary}}{\text{Total Salary of Urban Local Body}} * 100$

SIGNIFICANCE: This gives a clue to the relative salary burden that the ULB has to shoulder for administration. This should not be too high if the ULB is to maximise its service delivery to the residents. In the same way one can calculate, if necessary, share of various components of administration cost by using indicators like -

- *Fringe Benefits Costs pertaining to General Administration to Total Administrative Costs*

INDICATOR FORMULA: $\frac{\text{Fringe Benefits costs of general administration section}}{\text{Total Administrative Cost Urban Local Body}} * \frac{100}{1}$

OUTPUT INDICATORS

The output of administration cannot be spectacular like that of service departments. Also, it is very difficult to measure output of administration function of any organisation. Some illustrative indicators have been listed below; as they are very simple and self-explanatory, they have not been described. It will be up to concerned ULB to work out suitable output indicators on the lines of these illustrations to measure its administration function. It should be remembered that it cost should not outweigh benefits.

- *Number of reports generated*
- *Number of pamphlets distributed*
- *Number of complaints answered*
- *Number of public outreach events held*

- *Number of educational programs initiated*
- *Number of errors/delays in debt service payment*

SIGNIFICANCE: The above set of indicators relates to the productivity, efficiency and the job commitment of the administration employees of the ULB. It must be remembered that all these are only quantitative. They don't give any clue to the necessity, quality or effect of the output.

OUTCOME INDICATORS

- *Number of people educated*
- *Number of people attending meetings*
- *Number of financial errors made per month*
- *Percent of quarterly reports completed*
- *Percent of budgets submitted by deadline*
- *Collection Rate - accounts receivable*
- *Percent of delinquent payment*
- *Percent of invoices, vouchers paid*

SIGNIFICANCE: The above set of indicators reveal the effectiveness of the jobs performed by administrative staff in terms of real benefits accruing to the public, and how far the citizens and other stakeholders (contractors, lending agencies, higher tier governments, etc.) are able to participate and relate to them. These measures are only quantitative pointers and warrant more research. They should be backed by qualitative information for example, about the nature of financial errors, importance of the 'public meetings', etc.

EFFICIENCY INDICATORS

Workforce

- *Number of employees per capita*

SIGNIFICANCE: This is a measure of the efficiency of the workforce in delivering services to the residents. This should be viewed against accepted benchmarks. A figure that is too low may indicate that service delivery is inadequate. An optimum figure (given by the benchmark) should be maintained.

- *Percentage administration cost to total costs*

SIGNIFICANCE: This gives us a measure of the efficiency with which administration performs its duties, i.e., the relative financial burden that administration imposes on the ULB

Outreach Programme

- *Number of people educated per outreach employee*

INDICATOR FORMULA: $\frac{\text{Number of People educated under outreach programme}}{\text{Number of employees working on outreach programme}}$

SIGNIFICANCE: this measures the efficiency of employees responsible for delivering outreach programs to enhance the education and awareness of the public on relevant issues. This is only quantitative. There may be many people who attended that program but it is not known for certain the extent to which they are effectively educated. This should be disaggregated by various kinds of employees associated with an outreach program.

- *Cost per outreach program*

INDICATOR FORMULA: $\frac{\text{Total Expenditure on outreach programmes}}{\text{Number of outreach programmes}}$

SIGNIFICANCE: This helps to point out the financial burden caused by outreach programs on ULB. The limitation of this indicator is that it tends to view all outreach programs similarly. Outreach programs should be grouped by their importance, effectiveness and quality, and disaggregating must be done accordingly.

Responsiveness

- *Average number of employee hours per complaint*

SIGNIFICANCE: This is an indication of the importance given to customer (citizen) satisfaction and the commitment to participatory governance. But this is a quantitative indicator that should be backed by qualitative information about the nature of the complaints.

Information Compiling and Dissemination

- *Average number of working days to compile monthly financial statements*
- *Average number of working days to compile quarterly reports*
- *Average number of working days to compile annual budget*

SIGNIFICANCE: This is a measure of the efficiency with which the most important function of the administration is performed, namely compilation of information, presenting it in a meaningful way and making the information available. This indicator measures the timeliness of these operations and can be useful to improve efficiency where required when tabulated across ULBs and compared with accepted benchmarks. But this says nothing about the quality of the statements/reports/budgets.

EXPLANATORY INDICATORS

The following indicators have been listed here only for illustration purpose; they have been described in detail in the other parts of book.

- *Population served*
- *Nature of work force (union, non-union)*
- *Community economic condition*

Governance Related Indicators

For assessing quality of urban governance the above format of using indicators is not suitable. The information to be gathered is not quantitative. Qualitative information is to be gathered and compiled by the Report Card methodology. A report card should be prepared at regular interval by awarding

grades or points on the issues that are to be discussed. Performance measurement information should be gathered and grouped under the following heads. This format can be used for the entire ULB and also for each individual department providing each service131. Besides following questions another set of question have been given in the format of Report Card at the end of this chapter, which also should be used to assess quality of urban governance.

- *Decentralisation*

1. Can higher levels of Government (national or state) supersede the local Government (appoint a new council, call for re-election, etc.)? (Yes/No)
2. Remove councillors from office? (Yes/no)
3. Can the local government, without permission from higher tier government,
    - Set taxes?
    - Set user charges?
    - Borrow funds?
    - Choose contractors for services?
4. Is the amount of funds from higher tier governments made known to the ULB before its budgeting process? If so, to what extent?

SIGNIFICANCE: The goal of institutional development is seldom reached if all tiers of government do not act together in a coordinated manner through partnership. To make this possible decentralization is necessary so that local governments are strengthened. The local government will never do its job effectively or identify itself with its responsibilities unless it has some freedom of action. It is of utmost importance for them to know what recourses will be devolved to them from higher governments (either as a formula or as a long term goal) before framing their budget since their functioning will be seriously affected if after the budget higher government change their funding plans.

- *People's Participation*

Is the city government involving the citizens prior to undertaking any major project? (Yes/No)

SIGNIFICANCE: Citizen Participation in the local government is a very important part of democracy and self-determination. A local government with a strong popular support base is better able to fulfil its citizens' needs according to their wishes. There should be a legal and institutional framework to facilitate broad-based people's participation in decision making, implementation and operations. Every voice should be heard in identification of problems and setting of priorities. But participation is not so

[131] "Urban Indicators Toolkit" A guide for ISTANBUL +5

meaningful if citizens are not articulate or well informed. Education and free flow of information are the essential elements of effective and meaningful people's participation.

- *Transparency and Accountability*

  Is their independent and regular auditing of municipal accounts?

  Are there public contracts and tenders for municipal services?

  Are there laws against municipal officers guilty of corruption?

  Are there laws of disclosure of income and sources of wealth?

SIGNIFICANCE: Transparency and accountability are not only key elements of effective democracy and people's participation; they also foster efficiency by reducing corruption and bureaucratic red tape.

- *Equity*

  Does the delivery of every municipal policy follow the principle of "equality of status and of opportunity"?

  Are municipal services made available to all irrespective of economic status, financial means, caste, creed, and religious orientation?

SIGNIFICANCE: The framework of our Constitution is built on the sacred principle of equality of status and of opportunity. So every tier of our government has to respect the basic tenor of a Welfare State, which guarantees to every individual the right to live with dignity. For the ULB this means that basic civic services are essential and should be made accessible to all citizens irrespective of their ability to pay for them.

- *Strategic Vision*

  Are long term plans well detailed and documented?

  Do projects have a specific goal-statement?

  Are targets set well ahead of time?

  Do plans and strategies corroborate the long-term development goals of the Nation?

SIGNIFICANE: All stakeholders of the city government (planners, officials-elected and executive, citizens, etc.) are more involved with the process of service delivery if they can comprehend clearly the goals that lie ahead. This makes actions and resource utilization more streamlined and efficient. Any path is much easier to follow if one knows where exactly one wants to go.

Figure 7.1 - Good Urban Governance – An ULB Report Card

	POINTS	2 HIGH	1 MED.	0 LOW
A.	**Participation**			
1.	Women's representation in the City Council			
2.	Quality of participation of Council Members in municipal debates			
3	Municipal incentives for private sector Participation in city economy			
4.	Private sector participation in the provision of basic services and in environmental programmes			
5.	Private sector support for municipal Human Resources Development activities			
6.	Attitude of municipal leadership to civil society participation			
7.	NGO participation in implementing municipal programmes			
8.	Participation of academic institutions in Municipal strategy search, research & evaluation			
9.	Degree of municipal decentralization			
B	**Strategic Vision**			
10.	presence of strategic vision for the city			
11.	Presence of a strategy for poverty reduction			
12.	Presence of strategies for each priority action area			
13.	Regularity of future-search & strategy-search efforts in the City Office			
C.	**Rule of Law**			
14.	Public respect for city codes and standards			
15.	Enforcement of municipal safety standards in public buildings and schools			
16.	Effectiveness of anti-corruption measures in city administration			
17.	Vigilance and action against crime and violence in the city			
18.	Legislative quality of environment care			

D.	**Transparency**			
19.	Participation of the urban poor in poverty programmes			
20.	Transparency in municipal staff selection and promotion			
21.	Effectiveness of IEC for public education			
E.	**Responsiveness**			
22.	Mechanisms to ascertain residents' needs and aspirations			
23.	Staff training to generate responsiveness and efficiency			
24.	Mechanisms to address public grievances and views			
25.	Adequacy of budgetary allocation for basic services			
26.	Quality of municipal roads, road safety and transport			
27.	Municipal programmes to care for children and youth			
28.	Municipal initiatives for environment care			
F.	**Consensus Orientation**			
29.	Availability of all party consensus on major municipality strategies			
30.	Use of mass media for public consensus building			
31.	Promotion of issue-based discussions among senior officials			
32.	Institutional mechanisms to consult civil society partners			
G.	**Equity**			
33.	Incidence of poverty in the city			
34.	Extent of women's representation in senior municipal positions			
H.	**Effectiveness and Efficiency**			
35.	Use of modern management techniques and tools for city administration			
36.	Degree of municipal administrative and procedural reforms			
37.	Innovations in municipal fiscal management			
38.	Attention to Research and Development			
39.	Access to potable water and safe sanitation			
40.	Extent of coverage of sewerage services			

41.	Universal access to basic education			
42.	Quality of Primary Health Care services			
43.	Privatization of municipal services			
44.	Access to and use of municipal borrowings for city development			
I.	**Accountability**			
45.	Degree of Decentralization & delegation of authority			
46.	Quality of monitoring the implementation of delegated tasks			
47.	Quality of Human Resources Management in the City office			
48.	Consistency between defined hierarchical structure and actual delegation			
49.	Municipal attention on recycling waste			
50.	Participation in major governance networks (national, regional & global)			

CHAPTER 8 - The Way Forward
Index

Introduction ***376***

Applying PM to Urban Local Bodies ***376***

Clarity about the objectives and beneficiaries of PM exercise 376

Clarity about the coverage of PM exercise 376

Clarity about the scope of PM exercise 377

Method of PM measurement 377

Review present status (of data collection and storage) of a ULB 377

Selecting Appropriate Performance Measures 377

Judicious Benchmarking or selecting suitable performance standards 378

Capacity Building at all levels by all players 378

Opinion Building for PM exercise 378

Developing Urban Performance Indicator System (UPIS) for ULBs ***379***

Uses of Performance Measurement and Urban Performance Indicator Systems ***381***

Respond to officials' and public's demand for accountability. 381

Help to articulate and demand for budgetary allocations 381

Allocate resources efficiently and raise funds 381

Examine reasons for failures and successes and suggest remedies 382

Motivate personnel to continue improvement 382

Monitor the role of contractors and other grantees 382

Support strategic and other long term planning (by providing initial information and later tracking the process) 382

Evaluate programs 383

Most importantly help to provide better services. 383

Build public trust and communication 383

Implementing Urban Performance Indicator System (UPIS) for ULBs ***384***

1. Survey: Performance Measurement Needs of Decision-Makers/Citizens 384

2. Opinion Building 385

3. Feasibility Study 385

4. Designing and Developing UPIS 385

5. Implementation Team and Plan 385

6. Professional Support 386

7. Participatory Implementation 386

8. User Education & Capacity Building 386

9. Post-implementation Evaluation 386

CHAPTER 8 - The Way Forward

Introduction[132]

The concept of PM and benchmarking of the quality of service delivered by an urban local body is a new tool that is being introduced in India. Therefore, certain efforts would have to be made to sustain this concept further and replicate the framework in other cities. There are a number of instruments for promoting, developing, and sustaining the concept of PM systems in local governments. One approach is to use legislative and regulatory mechanisms. Alternatively, market-based financial instruments could be used to induce city governments to adopt PM. A third approach involves community-based pressure groups.

Applying PM to Urban Local Bodies

There has not been much precedence of designing a system for Comprehensive Performance Measurement of ULBs except the efforts discussed in Appendix 3, 4 and 5. As a result, the following roadmap is not based on study of real experiments. It is therefore only illustrative and builds up on the foundations of the following attributes

Clarity about the objectives and beneficiaries of PM exercise

There must be clarity about the objectives of the target beneficiaries for which performance measurement of ULB is to be undertaken. The structure and content of performance measurement will change drastically with the change in the objective or group of beneficiaries.

Clarity about the coverage of PM exercise

The coverage of this exercise can range from single ULB to intra-state and interstate ULBs. Clarity about the coverage is important not only from the point of knowing cost and deployment of resources to undertake the proposed PM exercise, but more importantly, from the perspective of the heterogeneity associated with the Indian ULBs.

[132] TERI USERS program- Executive Summary

Clarity about the scope of PM exercise

It is necessary to decide about the scope of PM exercise. An ULB covers such a variety of functions. Though one should go for comprehensive PM exercise, it will be difficult for ULB or civil society or even state government to cover entire gamut of urban governance. PM exercise involves cost and lot of intellectual and human energy. As in the initial period all types of resources for PM will not be adequate, defining precise scope of PM exercise will be an essential task.

Method of PM measurement

One needs to choose the method of carrying performance measurement that is based on accounting system data, or on independent performance data, or on a combination of both. Ideally, the system must have balance of both but as discussed earlier; in Indian ULBs there exist serious problem with accounting data and budgetary process and data. Accordingly, in initial period governance, service access, delivery and satisfaction based PM will have to have more prominence. Here one is most likely to face the problem of non-availability of performance-related data and the standard values for comparison. Based on review of the present status of various systems in an ULB one will have to select a combination of methods of measurement.

Review present status (of data collection and storage) of a ULB

Before designing a system for applying PM to an ULB, or group of ULBs one must look at the five systems – accounting, budgeting, financial reporting, auditing and management information system. It is not possible to improve all these systems in short span of time. Accordingly taking into account actual status of these systems in ULB one will have to devise a procedure to collect performance related data for the areas/indictors selected for performance measurement.

Selecting Appropriate Performance Measures

For comprehensive performance measurement of ULB one will have to select such performance measures which are qualitative or satisfaction based in nature as well as those which deal with rupee productivity or expenditure efficiency of ULBs expenditure (value for money).

Judicious Benchmarking or selecting suitable performance standards

Performance measurement of ULBs will obviously require selection of judicious benchmarks or performance standards in Indian context for evaluating or comparing municipal performance. For example, World Health Organisation (WHO) provides for ideal standard of 270 lpcd (liters per capita per day) for water supply, which is quite unattainable in the Indian context. One will need to select a more applicable and appropriate standard of 170 lpcd or 140-lpcd water supplies to compare performance of Indian ULBs.

Capacity Building at all levels by all players

Performance measurement is not a layman's job, it is a job of specialist who can select appropriate data, apply PM to it and make its results/findings so simple that even laymen can understand it. Whoever (state government, civil society, ULB itself) decides to carry out PM of ULB must have appropriate capacity to do so. As PM of ULB is not common and well developed in India no player at present has adequate capacity and therefore capacity building at all levels by all players is must in India.

Opinion Building for PM exercise

Performance measurement though desirable and crucial will not be welcome by everybody. As a result of absence of comprehensive, objective PMS in ULBs inefficiency has perpetuated over the years and has developed nexus of vested interest. Application PM in ULBs is going attract opposition of vested interest. Also there exists general and natural inertia in the existing system. Nexus of vested interests utilises this inherent inertia as shield to derail any action against it. In a political body like ULB such a union can really derail any good reform. It only through well planned and executed opinion building exercise one can subside or turn around natural status quo tendency and can isolate nexus of vested interest about PM. Opinion building is not the last but the first step for successfully applying PM in ULBs.

This book focuses primarily on the specific tool of urban performance measurement, the urban performance indicator. It should be used for developing a comprehensive system of urban performance indicators that would build up a wide based, interlinked system of performance measurement, where every attribute of urban development is harmoniously phased with each other as a part of a whole. Such an Urban Performance Indicator System is expected to monitor periodically all relevant aspects of urban development.

Developing Urban Performance Indicator System (UPIS)[133] for ULBs

In order that comparative UPIS is useful, it is necessary to follow a participatory process in developing the system and to set it up for regular updating and publishing. For this it is necessary to identify appropriate institutions, which can perform these tasks on an effective basis in an appropriate manner.

At the all India level a national research institute should develop and publish such key indicators on a regular basis. The participation of potential user groups (e.g., financial institutions, Government of India, Planning Commission, credit rating agencies, representatives of investors, civil societies and academic cum training institutes) in the initial stage of indicator development should be ensured. This may be done through a workshop after initial pilot testing. The research institute may need to identify regular sources for updating the indicator and publishing at regular frequency. This may be done by gradually enabling State governments to establish a State level system in the long run. However in the short run it would be necessary to establish other means for regular information flows.

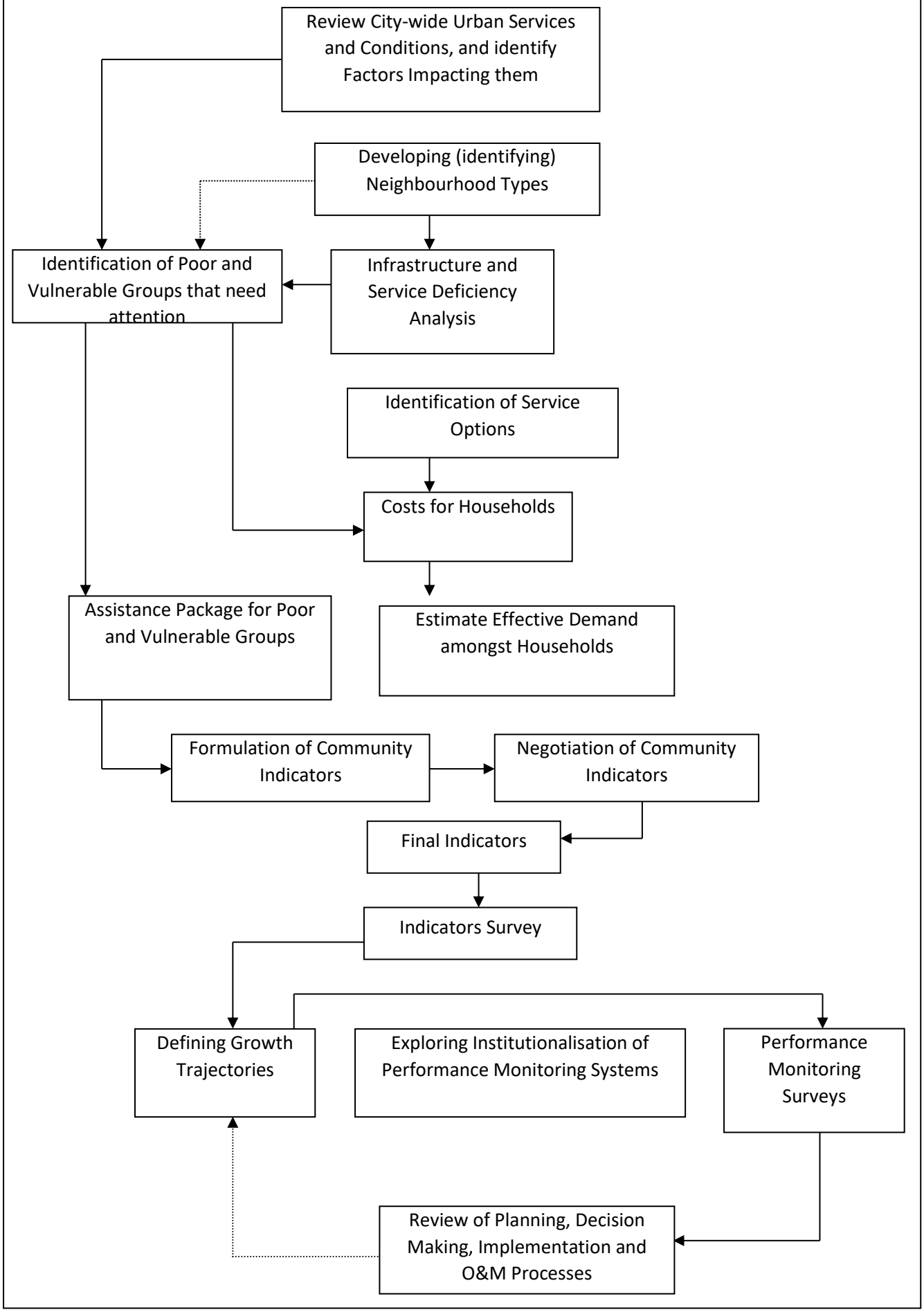
At the State level the State government can take on the responsibility by itself or with the help of a State level research institution. It may be useful to follow Canadian Government's initiative of making performance reporting by ULBs statutorily mandatory using preselected indicators.

The participation of state and municipal level politicians and officers and other State level user groups such as NGOs and research institutions needs to be ensured. The State may establish a reporting system for ULBs and other agencies for regular updating. It is essential that the Indicator report be shared with all participating ULBs to enable them to assess their own performance in a comparative manner.

At the city level the urban government needs to have the prime responsibility of developing and maintaining the performance indicator system. It needs to be integrated with its city planning, urban service monitoring, and financial management systems. Figure 8.1[134] shows flow chart regarding such an integrated process.

[133] Meera Mehta; FIRE D
[134] Material regarding TERI – USERS Programme

Figure 8.1 - INTEGERATING URBAN PERFORMANCE INDICATORS PROCESSES WITH CITY-WIDE PLANNING



Like-wise urban performance indicators system should also be integrated with urban service delivery and financial management systems. That is the final long term goal of Performance Measurement.

An important aspect of the urban performance indicator system is its potential access to citizens and different CBOs and NGOs from the city. This will ensure inbuilt people's participation and feedback.

Broad trends of indicators should reveal macro trends of urban development and are expected to provide feedbacks on the prevailing policies[135].

Uses of Performance Measurement and Urban Performance Indicator Systems136

After a good system of performance indicators has been designed, the prime objective is to derive the maximum use and benefit from the flow of information that it generates.

The main uses of performance indicator system can be enlisted as follows:

Respond to officials' and public's demand for accountability.

When performance information is available, the issue of accountability need not be restricted to legal and financial issues, and can easily encompass performance accountability.

Help to articulate and demand for budgetary allocations

By virtue of available, objective information, funds channeled to a program may be maintained or increased for good performance and may be reduced for bad performance. Here one should be careful about the objectives of the program (socially desirable programs should not be indiscriminately cut even if performance measures are not up to the mark).

Allocate resources efficiently and raise funds

To the extent, disaggregated outcome/output data is available, PM information can help to reallocate resources for better overall performance

[135] "Istanbul +5 UNCHS (Habitat) Conference 2001"
[136] Hatry

Examine reasons for failures and successes and suggest remedies

Performance Measurement information generally states objectively what happened, making it easier for the stakeholders to understand why and how it happened. It is a starting point to find answers to questions like, why did a program or department perform sub-optimally, what are the ways that it can perform better, what are the outcomes of similar programs elsewhere, and so, what are the 'best practices'.

Motivate personnel to continue improvement

Objective performance information can motivate all sections of staff to identify and implement ways to improve services on a continuing basis. Motivation can be given through incentives –monetary or non-monetary. Examples of monetary incentives are, linking pay with performance (e.g., bonuses), granting discretionary funds to units showing better performance, etc. Examples of non-monetary incentives are recognition awards, giving officers more flexibility and authority in case of better performance accountability, etc.

Monitor the role of contractors and other grantees

If the ULB contracts or provides grants to other organizations for services to other customers it can include outcome based performance targets in the agreements and then compare outcomes against those targets. This is called 'outcome based performance targeting' and is drawing attention from researchers and program managers .If targets are included in a contract or grant agreement, they should be developed with care so as to be compatible with the performance indicators of the program. A combination of reward and penalties can be included in these agreements. i.e., rewards for meeting and exceed targets, or reduced fees for failing to meet targets.

Support strategic and other long term planning (by providing initial information and later tracking the process)

Performance indicators can provide baseline values to establish the extent of action necessary, provide historical data by which realistic projections can be made, and provide data on key outcome indicators that can be used in regular reports on progress towards meeting strategic plan objectives.

Evaluate programs

An agency's performance measurement system can provide an excellent starting point for special evaluation efforts. The information is very helpful for performance audits. The utility of the performance measurement system can be enhanced if regular reports are written on it and circulated, giving explanatory information.

Most importantly help to provide better services.

The prime goal of PM is to help to provide better services more efficiently, in order to maintain and improve the quality of life. This may be done in many ways, for example, using PM data to identify organizational units with disappointing outcomes, helping them to develop improvement plans, providing technical assistance, and prevailing upon them to intensify PM and report outcome indicators to monitor improvement.

Build public trust and communication

A PM system opens up a number of ways to communicate with public, and in the long run, foster public faith in the program or unit. Customer surveys are important in providing regular customer feedbacks. Information can be made readily available to the citizens through summarized annual PM reports, which, in order to be credible, should be honest, accurate and complete. Such reports can be circulated through public libraries, press and media.

The usefulness of a PM system depends much on the skill of reporting performance information. How the findings are reported is almost as important as what is reported. Groups of related (linked) indicators should be tracked together side by side, depending on the user. For citizens and officials who operate a unit or program, a relatively large number of indicators are needed for internal assessment. Whereas, for external reporting (intended for planners, budgetary and legislative authorities) a shorter number of composite indicators would be appropriate.

In both cases, skillful presentation of PM data in a tabular format is of utmost importance. Such tables can be charted in many kinds of formats.

Implementing Urban Performance Indicator System (UPIS) for ULBs

As noted earlier designing and implementing UPIS for ULBs can take several forms, it can be pursued by central government, state government or by ULB itself for internal purpose, by civil societies or by all of them independently or jointly. While implementing urban performance indicator system for ULBs all the steps discussed earlier related to applying PM system should be followed along with certain additional steps enumerated below. In order to maintain the flow, all the earlier steps have been repeated but not elaborated. Though steps have been listed in a particular order it not necessary to carry them out in a linear manner or in order presented here. Implementers should undertake various steps simultaneously. This roadmap is drawn from the ULB's perspective (adopting PMS and UPIS for internal assessment) which can be adopted by other players like State Government or Civil Society Groups. This will not be applicable to Rating agencies and financial institutions as they have developed their own models of focused but limited performance measurement. For example rating agencies measure financial performance of ULB from safety of investor's money point of view while financial institutions measure ULB from recovery of their lending.

1. Survey: Performance Measurement Needs of Decision-Makers/Citizens

Performance measurement is a primarily need of management, in so far as they are decision makers. Therefore the starting point of UPIS in ULBs has to be a survey of PM needs of decision makers. It is most likely that such survey will reveal low to moderate need for PMS or UPIS in decision makers (political and administrative) of ULB. Such result should not be taken, not as an end but as a beginning. In such cases the decision makers should receive training on the importance, utility and application of PMS or UPIS. Such an in-house training (opinion building) workshops should be conducted with the help of experts.

Such a pre-implementation survey is also relevant for civil society intending to do performance measurement of ULB using urban performance indicators. It should carry out a survey of people or stakeholders to know what they would like to know about the performance of their ULB. Such survey will help Civil Society to focus and conserve its precious resources. If survey reveals indifference of society to performance measurement and analysis then in this case, also it will be necessary to create demand for performance measurement and through that the demand for accountability, transparency from the citizens.

2. Opinion Building

Opinion building is must any type of reforms. It may have to be conducted several times. As discussed earlier it may have to conducted for creating demand for the reform itself and then about the design and implementation of the reform. It will have to be conducted for all the players and obviously it must be appropriate as per the distinct character and needs of each player.

3. Feasibility Study

The next step will be quick feasibility study regarding implementation of UIPS for ULBs. The objective is to examine quickly the problems, what the proposed UIPS will be able to provide and the expected costs to introduce a UIPS. It will also include review of present status of data collection and storage in ULB, availability of resources and capacities to undertake UIPS.

4. Designing and Developing UPIS

In the context of need, willingness and feasibility surveys UIPS should be designed by observing following steps discussed earlier under PM section

- Clarity about the objectives and beneficiaries of UPIS
- Clarity about the coverage of UPIS
- Clarity about the scope of UPIS
- Methodology and Bases for Selection of Urban Performance Indicators

Entire exercise should be made as participative as possible to benefit from different ideas and perspective but more importantly to create ownership for UPIS.

5. Implementation Team and Plan

The agency pursuing UPIS for ULB will have to create an implementation team which will have responsibility of preparing implementation plan in the light of exploratory and planning steps enumerated above.

6. Professional Support

As PM of ULB and application of UPIS is still in infancy stage, there is lack of experience and capacity among all the prospective movers of this movement. There is a role for professionals in this endeavour. The decision on how much professional support is needed and in which area solely depends on the perception of the situation of implementing agencies.

7. Participatory Implementation

Like participatory designing and development of UPIS, it implementation should be participative to last detail.

8. User Education & Capacity Building

User education and capacity building are key components of any implementation strategy. Opinion building exercise discussed earlier can create demand for introduction of UPIS and support for the UPIS model taken up for implementation. But it is also necessary to educate users regarding how to interpret and utilise results of PMS or UPIS.

9. Post-implementation Evaluation

The last step, a post-implementation evaluation of the resulting system, is an important phase in any change or reform process. As a part of this, it is also important to assess the effectiveness of the particular change or reform process. Some questions to be asked are whether the UPIS development was completed in time and within the estimated costs or whether the maintenance costs were higher than expected or finally has it attained desired results.

In Sum

The PM concept and tool of UPI is becoming increasingly relevant and necessary in the wake of changing relationship between the government and people, which is becoming more and more contractual.

ULBs are the closest organs of the government to the people and they render basic urban services upon which quality of life depends. The concept of PM and application of UPI to assess ULB's performance is relevant from the point of consumer rights protection movement as they provide various services and citizens of the city are its consumers. At present, PM concept and tool of UPI is relatively new in India but very soon, it will become mainstay and ULBs will be under its constant surveillance.

As the performance measurement concept has a multiplicity of purposes or objectives (for what?) and multiplicity of stakeholders (for whom?) there exist several methods and tools. Conventional or traditional performance measurement tools like accounting; budgeting, auditing, costing (cost efficiency, efficacy) and financial reporting, presently exist in Indian ULBs but in highly underdeveloped, archaic and neglected forms. Efforts are on at various levels to reform these systems[137] at ULB level but it will take a minimum period of seven to ten years to modernize these basic systems in Indian ULBs. We will have to look for other methods of performance measurement of ULBs. One way is to apply mathematical models (parametric, non-parametric models of production function/border estimation) of performance measurement[138]. But most of the mathematical techniques of PM are too complex for any ULB in the world (especially for in India) to apply them for its performance measurement. One technique or tool of performance measurement, which can be easily and effectively used for the PM of ULBs, is analysis by Performance Indicators. As a result, across the world municipal performance measurement programmes are getting structured around urban performance indicators. In this book, an attempt has been made to review some of such attempts and to enlist various urban performance indicators.

It will be humanly impossible to apply all the indicators hereby listed or hundreds of indicators not listed in this book, or the indicators which can be developed afresh. PMS or UPIS becomes meaningful only in the context of objectives, purpose, stakeholders, coverage, scope, present status etc. UPIS should be designed keeping these contexts in view.

Let us reiterate that this book relates sample indicators, which are not by any means exhaustive. Other related and relevant indicators can be framed with the help of the indicators that have been discussed

This book is about a tool (indicator) of Performance Measurement, which intrinsically is supposed to provide clues, not solutions.

[137] Please refer books written by Ravikant Joshi on Municipal Budgeting, Municipal Accounting and Municipal Management Information System reforms published by YUVA – Mumbai. www.yuvaindia.org
[138] Please refer appendix 2 of the book.

APPENDIX 1 - Benchmarking

Index

Introduction ***390***

Obtaining Various Types of Benchmarks ***390***

Performance in the previous period 390

Performance of similar organisational units or geographical areas 391

Performance of different customer groups 391

Performance in other jurisdiction or sector 391

Efforts before and after the new procedure 391

Characteristics of a Good Performance Benchmarks ***392***

Validity – 392

Effectiveness and efficiency 392

Grounded in reality 392

Common Pitfalls in Performance Benchmarking ***393***

Inadequate PM in your own organization 393

Poor choice of Benchmarks 393

Focus on "beauty contest" rather than on continuous improvement. 393

Finding Useful Benchmarks ***393***

Municipal Benchmarks 393

Data reports from comparative performance measurement project 393

Professional associations 394

Consultant reports 394

Independent search 394

Choosing Appropriate Type of Benchmarking ***394***

Spotlighting community conditions and focusing efforts—targets as benchmarks 394

Diagnosis of strengths and weaknesses; setting performance expectations; injecting sense of competition—comparison of performance statistics 394

Prescription of improving key process – corporate – style benchmarking. 394

Performance Measurement / Benchmarking Strategies ***395***

Meaningful measurement 395

- High marks on these signify excellent performance of this function 395
- These measures inspire constructive management thought 395
- Provide valuable feedback to operating unit 395

Relevant comparisons 395

- Effectiveness measures offer more useful comparison than workload measures 395

- Be careful when comparing unit costs (e.g., cost accounting procedures differ ,in scope and quality of services) 395

Strong counterparts 395

- Select units with which you truly wish to be associated 395

Reasonable Performance targets 396

- Aggressive but attainable 396

Emphasis on performance improvement 396

- A 'BENCHMARING MENTALITY' 396
- Acknowledge that no organization can be the best at everything it does 396
- Each can draw lessons from models outside the organization. 396
- The objective is continuous improvement; not winning a beauty contest. 396

Distinguishing Alternate Versions of Benchmarking 396

Corporate Style Benchmarking 397

Setting Targets as Benchmarks 397

Comparing performance statistics to establish benchmarks 397

Public Sector Benchmarking 397

In Sum 399

APPENDIX 1 - BENCHMARKING

Introduction

In order to judge whether the performance of an indicator (that measures the output of a program), is good or bad, appropriate comparisons should be made to benchmarks – which are measures of what should be expected[139].

The PM process generates measures (indicators in our case) that are relevant for all services/departments across municipalities. But each municipality has to set its own benchmark/target in the context of its own local conditions. Indicators should measure the progress towards these benchmarks for performance measurement to be meaningful, e.g., Water availability per capita is an indicator that is appropriate for both Rajasthan and Kerala, but the Benchmark value for this indicator is vastly different in these two States.

The technique of benchmarking has its genesis in the private corporate sector. Its development and application as a well-designed technique among public sector units, has yet been s sporadic[140].

Obtaining Various Types of Benchmarks

Various types of benchmarks that are used to assess performance in a certain period are[141],

Performance in the previous period

Comparing the performance of the current period to a benchmark of the previous period is appropriate if a temporal comparison is sought i.e., whether performance has improved or deteriorated over time, or to appraise the impact of a new service, program, or practice. For this

[139] Hatry
[140] D. Ammons ; *Handbook of Human Resources in Government;* Stephen .E. Condrey (ed) (San Francisco, Jossey Bass Publishers, 1998)
[141] Hatry

category of benchmarking data should be gathered as frequently as possible. The length of the reporting periods should be the same. Outcomes may be compared over one year, or once in one quarter of a year. If there is seasonal variation then outcomes of one season should be compared to those of the same season. For programs or investments with long gestational periods, comparisons should be made across several years.

Performance of similar organisational units or geographical areas

Outcome comparisons can be made over organisational units or geographical areas, when the same service is provided to the same type of customers

Performance of different customer groups

(Performance comparisons can be made across categories of customer groups to gauge relative success on relevant indicators, to focus on customers who may need special attention or help. The Government or some professional association may develop a Standard for a certain indicator, which may be used as a benchmark for performance assessment.

Performance in other jurisdiction or sector

For some outcome indicators, similar outcomes may be obtained from other jurisdictions or from the private sector. Comparisons will be relevant if activities are sufficiently similar and compatible data is available in a timely way. For comparisons to be meaningful, data should be appropriately normalized, i.e., adjustments should be made for differences in scale. This is beneficial because it enables authorities to gauge what degree of performance is realistic to target, and to identify and replicate exemplary performance. In the recent past, cognisance has been taken of the private sector's ability (as far as it provides services similar to the government) to provide performance benchmarks, e.g., in the field of public transport, or solid waste management. In US, UK and Germany, formal efforts have been made to compare efforts of local government agencies, with corresponding private sector agencies.

Efforts before and after the new procedure

Outcomes can be used to gauge the effectiveness of a new procedure by providing benchmarks for comparing efforts before and after its application. New procedures can be applied either across the

board or as a part of an operation (the rest of the operation remaining as before). When the change is across the board, the outcomes should be compared before and after the inception of the new procedure. When the change introduced is only partial comparisons of outcome data should be conducted over the same period between the original process and the changed (partially) one. This way, alternatives can be tested before making a full commitment.

At the beginning of a program, it may be useful to set a target, and then to articulate and document how the actual performance compares to the targeted performance. Prolonged experience with an indicator is an essential input into the act of target setting. Targets must be compatible with the long term strategy of a program.

Characteristics of a Good Performance Benchmarks

Validity –

Benchmarks address key dimensions of performance meaningfully. A valid benchmark takes into account all the real, external circumstances under which affect the values performance indicator and sets a range and target that is realistic and attainable.

Effectiveness and efficiency

A good benchmark should emphasize effectiveness and efficiency in a manner that is little affected by external variations like inflation

Grounded in reality

They are reasonable and attainable[142], so as to provide constant encouragement and vision to the officers to improve their productivity and performance toward a goal that is within their reach.

EXAMPLES

- You expect your engineers to give you good estimates of the costs of city projects. But how close is good enough?
- The sanitation director just told you that he received 200 complaints about the residential garbage services last year. Is that good or bad?

[142] Ammons; Presentation---USERS Project_ training programme on "Performance Measurement and benchmarking in urban local bodies"26-26 June 2001, New Delhi

Common Pitfalls in Performance Benchmarking

Inadequate PM in your own organization

If the performance measurement in the organization (in our case, the ULB) is not adequate or meaningful, there will be difficulty in framing rigorous, realistic and meaningful benchmarks.

Poor choice of Benchmarks

A poorly constructed benchmark will impede the progress of the ULB towards achieving realistic and attainable targets. As a result, even if the performance measurement process is good, its aim of improving performance to the greatest possible extent, is likely to remain unfulfilled

Focus on “beauty contest” rather than on continuous improvement.

Benchmarks set with the motive of projection and demonstration are not as good as those set with the motive of continuous and sustained improvement. The former type of benchmark may cause improvement that is not sustainable. Benchmarks based on the “beauty contest” approach is likely to generate impressive urban development that is sporadic, and less balanced than those constructed with the aim of sustained, continuous and balanced urban development.

Finding Useful Benchmarks

Municipal Benchmarks

By studying the results of municipal performance measurements, one can form a fairly good idea of what is attainable and realistic at the municipal level and so can frame benchmarks accordingly.

Data reports from comparative performance measurement project

Comparing performance measurement results across ULBs, one can locate and focus on the best performing ULB, and if its intrinsic conditions can be generalized, can set it as an attainable target/benchmark.

Professional associations

The shared experience of urban local government professionals and experts in the field of urban development can be a rich storehouse of knowledge on attainable performance in the ULBs. Based on this good benchmarks can be constructed, that are likely to foster sustained urban development

Consultant reports

Consultants' reports can throw new light on what is attainable, and what the impediments are, and improve the objectivity and correctness of benchmarks.

Independent search

Choosing Appropriate Type of Benchmarking

Spotlighting community conditions and focusing efforts—targets as benchmarks

Benchmarks can be chosen by studying and analyzing how performance can be maximized by framing and following an appropriate target, given the constraint of conditions particular to a community,

Diagnosis of strengths and weaknesses; setting performance expectations; injecting sense of competition—comparison of performance statistics

Benchmarks can be chosen by setting of targets achieved by others, keeping in mind the strengths and weaknesses of the organization in question.

Prescription of improving key process – corporate – style benchmarking.

Benchmarks can be chosen by a program of improving a chosen key process that chases the target of the achievement attained by the best performer.

Performance Measurement / Benchmarking Strategies

Meaningful measurement

- ### High marks on these signify excellent performance of this function

Attainment of a well framed benchmark should clearly signify excellent performance on the aspect being measured, and at the same time must not in any way cause harm to any other aspect. Ideally, it should foster balanced urban development.

- ### These measures inspire constructive management thought

If a benchmark is good in terms of realistic attainability, it provides encouragement to managers to promote better performance in a constructive way. It should not be discouraging and demoralizing.

- ### Provide valuable feedback to operating unit

A good benchmark should generate objective signals to the operating unit that would help to overcome its obstacles and improve its performance. At every step, following a good benchmark provides useful feedbacks based on direct experience (the advantages and difficulties that it has faced).

Relevant comparisons

- ### Effectiveness measures offer more useful comparison than workload measures

Effectiveness measures usually pertain to those attributes that are desirable to all entities. So performance targets of effectiveness measures are comparable among ULBs (generally). Workload related performance measures are affected by local conditions and so they are less comparable.

- ### Be careful when comparing unit costs

Cost accounting procedures differ, in scope and quality of services

Strong counterparts

- ### Select units with which you truly wish to be associated

If benchmarks are chosen by reference to other units, the organization should be able to relate to that unit and view its performance as desirable, exemplary and attainable.

Reasonable Performance targets

- ### Aggressive but attainable

Targets should be set so that they pose a positive and encouraging challenge. At the same time, they should be attainable (because of intrinsic constraints); otherwise, it would be discouraging and generate apathy.

Emphasis on performance improvement

- ### A 'BENCHMARING MENTALITY'

The officers of ULBs should be enthused to work with an attainable target in view. They should set and periodically review this target with according to what is possible and desirable.

- ### Acknowledge that no organization can be the best at everything it does

At the general level, there should be a realization that performance measurement and benchmark chasing are not absolute but relative. Some ULBs may perform well in some aspects whereas others perform well in other aspects. If an unrealistic and rigid goal of being the best at everything is set, disappointment and demoralizing effects can cause a setback to the rank and file of ULB officers and employees. That may leave the organization worse off by creating new problems.

- ### Each can draw lessons from models outside the organization.

However well an organization may be performing, it can always draw lessons from the experience of others to improve its performance and if appropriate, revising its existing benchmarks.

- ### The objective is continuous improvement; not winning a beauty contest. 143

The focus of performance measurement and benchmarking should be continuous and sustained improvement, and not overt demonstration.

Distinguishing Alternate Versions of Benchmarking[144]

The following section focuses on the 3 types of benchmarking that exist in the public sector.

- Corporate style benchmarking

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[143] do

[144] D. Ammons, "Benchmarking Performance"; *Handbook of Human Resource Management in Government*, (San Fransisco, CA: Jossey –Bass Publishers, 1998)

- Setting targets as benchmarks
- Comparing performance statistics to establish benchmarks

Corporate Style Benchmarking

Corporate style benchmarking narrowly focuses on only a single process and through a careful examination of that process in the best performer's attempts to extract "best practice" lessons. It focuses on operational processes rather than on social or economic conditions, targets of goals, or general comparisons of output or outcome measures. A process is selected for benchmarking because it is considered important to a company's success. Among all the companies, the best performer in this particular process is identified and its achievement (in this process) is regarded and set as a 'benchmark'

Setting Targets as Benchmarks

The second form focuses more broadly on the identification of benchmarks for the purpose of performance targeting or evaluation. It usually relates to projects of lower tier governments and communities. This is oriented to the conditions that are regarded as important (to local leaders) to the long term health and wellbeing of the community. The benchmarking process comprises identification of opportunities, Operationalisation of a vision by breaking it down to tangible targets and building up of a tracking process through specific performance indicators. For ULBs, this is a powerful tool for performance improvement.

Comparing performance statistics to establish benchmarks

The second and the third forms of benchmarking are more popular in the Government sector. This compares selected performance statistics of two organizations. Governments (higher tier governments and public sector units assemble such statistics for their own organization and for other similar organizations, and designate the most favourable numbers as benchmarks. The value of such an approach depends on the choice of counterparts.

Public Sector Benchmarking

Only a few cases in the public sector conform to corporate style benchmarking. The most heralded projects belong to the target setting type of benchmarking possessing much in common with strategic

planning, often focusing on goals tied to social indicators. But there are a few cases in the public sector that do conform to the corporate model.

In some cities, for example municipal sanitation departments have lost out in competition with private contractors on some services, drawn operational lessons from the victors and other competitors, and won back the services by incorporating those lessons to improve their efficiency. Other municipality service departments have drawn useful lessons from their private sector counterparts by using the latter's achievements as benchmarks.

The benefits of corporate-style benchmarking are not reserved for the private sector alone. Governments can derive significant benefits as well.

All three forms of benchmarking have practical value in the public sector. A given form must be matched carefully with the task at hand.

Corporate style benchmarking has a narrow focus, is process oriented, and is rather costly. It requires the gathering of detailed information and emphasizes thorough analysis. If the public sector unit wants to improve a key process or operations within its function, then corporate style benchmarking may be a good option. Benchmarking in the public sector usually has a broader focus. Operational details are less important than indicators of social condition. If the purpose of benchmarking is planning, general review, or assessment, these approaches are better than corporate style benchmarking.

The role or focus of a project is expected to be a key determinant of the form of benchmarking. Corporate style benchmarking is expected to reveal better ways of performance given the process to produce a given service. The expected result will be a prescription for improvement. The other types of benchmarking can be expected to set targets or diagnose problems but are not particularly suited for prescribing specific operational solutions.

Benchmarking in all three different varieties is applicable to both public and private sector. The intended focus and the role of the project will suggest the type of benchmarking that is most appropriate.

In Sum

The process of performance measurement of ULBs becomes meaningful if it is accompanied by efficient and meaningful benchmark setting. The two parallel exercises enhance and expedite improvement in the performance of ULBs and help to take urban development to new heights. PM is about how well an ULB is performing, and benchmarking is about how well it can and should perform. PM is positive (objective), while Benchmarking is normative.

Benchmarking is a process of target setting within the perspective of local conditions, and is based on comparisons of performance over time and across different kind of performance units. It should factor in reasonable expectations of the recipients of urban services. Attainable and realistic targets set by an efficient and sensitive benchmarking process provides stimulating challenge to improve performance in a sustainable manner. Benchmarks set through a process of rigorous empirical study and thorough all round understanding of the service that the ULB seeks to provide, will impart direction and vision to all performing units. Benchmarks should not generate a tendency to perform with the short term objective of demonstration. It should initiate a long term, sustained effort towards constant improvement. A good benchmarking exercise is expected to generate healthy competition among performance units and enable/encourage them to learn from each other.

APPENDIX 2 – Methodological Designs of Performance Measurement

Index

Introduction ____ ***401***

Methodology for Efficiency Evaluation and Control in Public Entities ____ ***401***

Indicators ____ 401

The Budgetary Control ____ 402

Models for Frontier Production Function Estimation ____ 402

- Determinant Parametric Models: ____ 402
- Statistics or probabilistic parametric models ____ 402
- Stochastic parametric models ____ 403

Non-parametric Models for Production Border Estimation – ____ 403

Models not Using the Border Production Function – ____ 404

- Partial Productivity Indexes ____ 404
- Global Productivity Indexes ____ 404
- Econometric Models ____ 404

Methodology for the Evaluation of Public Programs and Policies ____ ***404***

Cost/efficacy, cost effectiveness and cost/profit studies ____ 404

Use of General Models: ____ 404

- Lineal models ____ 404
- Input/output models ____ 404
- Regression analysis: ____ 404
- Simulation studies: ____ 405

Non-parametric models: ____ 405

APPENDIX 2 – Methodological Designs of Performance Measurement[145]

Introduction

The methodological designs of performance measurement differ depending on the type of unit evaluated. Again performance measurement can be of two forms – one, performance measurement of the entity itself and two, performance measurement of the programmes of the entity. The methodological designs will be different for the entity and programme. The various performance measurement tools techniques are as follows

Methodology for Efficiency Evaluation and Control in Public Entities

If the unit evaluated is an entity, then the methodological design followed for the performance measurement and evaluation, is as follows:

- Analysis of trends and time series.
- Variation analysis, which intends to compare the current results with factors related generally to certain standards or objectives.
- Cross-sectional analysis.
- Documentary analysis: Use of information obtained from books, reports, magazines or previous operative auditing statements.
- Opinion polls: This would offer an alternative to circumvent the usual difficulties of data collection and preparation
- Experts committee: Consultation of a group of experts on the information needed on results.

Indicators

A set of indicators is a useful tool to analyse the various facets of an agency or a body. Indicators are defined as a measuring scale derived from various parameters/variables, which gives information about the state of a phenomenon relating to managerial, technical, environmental and financial aspects of an agency. In more formal words indicators are defined as 'systems of quantifiable elements or numerical ratios to measure certain aspects of the input of public entities, their operation and their results.' They constitute the instruments most widely used in this evaluation phase, although

[145] This Appendix is based on the Paper entitled 'Methodology for evaluating the efficiency of public entities', Written by Teresa Garcia Valderrama and Yolanda Calzado Cejas in International Journal of Public Budget – Nove –Dece 1997, Year XXIV.

for their correct application it is necessary that the objectives be previously informed to those directly involved in the evaluation.

The Budgetary Control

Through the budgetary implementation, the manager may identify the compliance degree of the rules established. Such budgetary technique does not constitute a good management control instrument in public entities in view of its binding and legal character, There exist other more rational budgetary techniques which set aside the traditional budget's incremental base, mainly, the Zero Base Budget and the Budget by Programs, which try to solve the disadvantages of the incremental or traditional budget, from the management control viewpoint.[146]

Models for Frontier Production Function Estimation

The production borders estimation models may be of three types[147]: -

- *Determinant Parametric Models:*

These models may be defined, analytically, as follows:

$$Y_i = f(x_i, B)\ B > \text{or} = 0$$

Where Yi represents the output vector of the ith municipal body, Xi the input vector of the ith municipal body and B represents the parameter vector

The model presents the advantage to build the production function in mathematical form and under constant scale performances but it suffers from the high sensitivity before extreme observations.

- *Statistics or probabilistic parametric models*

[146] Bates J.G. (1993): Managing Value for Money in the Public Sector – Chapman and Hall, First Edition London

[147] Vilardelli Riera. I. (1989): As quoted in Teresa Garcia Valderrama and Yolanda Calzado Cejas in International Journal of Public Budget – Nove –Dece 1997, Year XXIV.

Such models present the following formula:

$$\mathbf{Pr\ \{f\ (Xi,\ B)\ >\ or\ =\ Yi\}\ >\ or\ =\ P}$$

Where Xi and Yi are the respective input and output vectors of the ith municipal body, and B is the parameter vector. P = Minimum probability specified in external form

The usefulness of these models lies in the need to decrease the border sensitivity to the extreme observations, by reason of the external effects. In this case the observations selection is carried out in arbitrary form.

- *Stochastic parametric models*

In such models it is presupposed that, both the external and other factors that are out of the managers' control, have limited effects, that is why they are specified in the errors structure, a contingent variation of the efficiency. The following is the formula for these models

$$\mathbf{Yi = f\ (Xi,\ B) + Ui}$$

[Xi and Yi are input and output vectors of the ith municipal body and B is the parameter vector.]

Where f (Xi, B) is the production function

Ui is the random disturbance term (error or stochastic term) for the ith observation (municipal body)

Non-parametric Models for Production Border Estimation –

This includes the Data Envelopment Analysis Model (DEA) by Charnes, Cooper and Rhodes[148] (1978). The technique consists of a mathematical algorithm that includes all the resources and achievements involved in the evaluation. The model compares efficiency values according to Pareto's highest efficiency rate.

[148] Measuring the Efficiency of Decision Making Units, European Journal of Operational Research NO 2 pages 429-444

Models not Using the Border Production Function –

These models may be of three types -

- *Partial Productivity Indexes*
- *Global Productivity Indexes*
- *Econometric Models*

Methodology for the Evaluation of Public Entity's Programs & Policies

At present, the techniques most frequently applied in the performance measurement and evaluation of public programs and policies may be classified into the following groups:

Cost/efficacy, cost effectiveness and cost/profit studies

The instruments most widely used in this type of study are the indicators, of the same nature as those previously analysed. This kind of analysis presents serious inconveniences derived from the lack of agreement at the time of defining the concepts of efficacy, effectiveness and profit and, above all, the difficulty in the calculation of the program costs, caused by the lack, in our country, of a cost accounting procedures that allows for the categorization of the costs charged to each program.

Use of General Models:

- *Lineal models*

Represented by equation systems that express linear ratios among the variables studied.

- *Input/output models*

They are composed of matrix systems that relate the input to the output of a system. At first, they were used in macroeconomic analyses and then they were slowly introduced in social areas and other disciplines, such as education.

- *Regression analysis:*

Both determinant and stochastic

- *Simulation studies:*

Montecarlo is the simulation technique most applied and its advantage is that it allows the examiner to evaluate, in time, the results of a program having different standards, analyzing their sensitivity before material changes in the variables arising in each program.

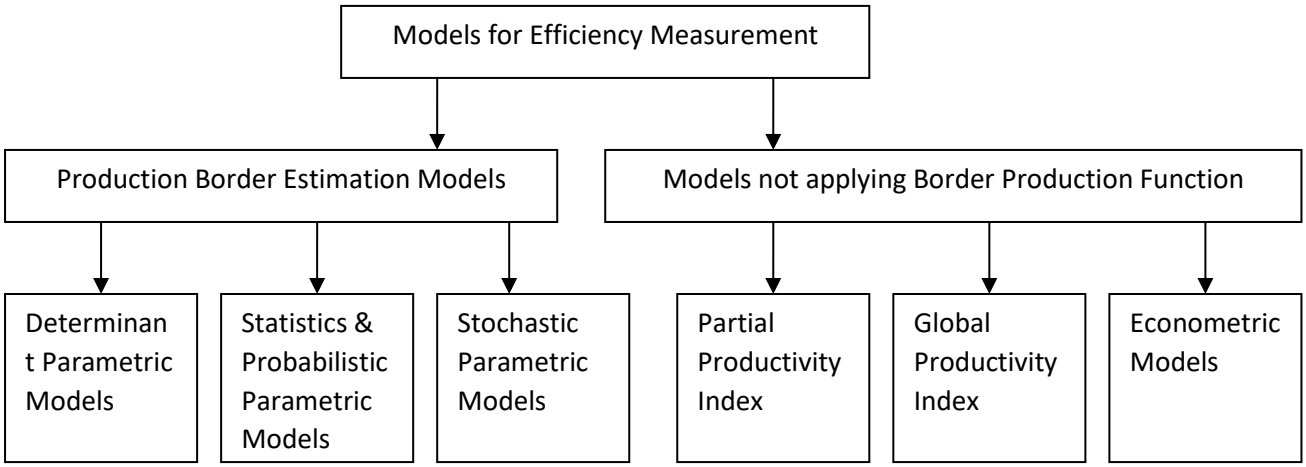
Non-parametric Models

Giving priority to the DEA model. In the United States the measurement of the public programs efficiency through such model is widespread, since it allows us to identify program irregularities, thus permitting us to detect inefficiencies derived both from defects in program design and management.

Among all these performance measurement techniques and tools performance indicators is the most widely utilized, simple and user-friendly technique. Indicators are basically statistics, related to specific programs and policy concerns and are used as pointers to the desirable choices from among policy options. In the context of urban complexities in developing countries and inadequate information and financial resource flow, indicators can be immensely useful for providing quick access to processed information. Indicators are highly cost and time effective multipurpose tools that can be used to detect specific problem areas, monitor and evaluate policy programs and also to examine issues of sustainability.

Indicator analysis is a way to measure, indicate, point out or point with more or less exactness. Indicator is something that is a sign, symptom or index. In other words, an indicator is something used to visualise the condition of the system.

Figure A.2.1 - Models for Efficiency Measurement



Appendix 3 - Municipal Performance Measurement – Case Studies

Index

Introduction ***408***

The Canadian Municipal Performance Measurement Program ***408***

Salient Features 409

The Performance Measurement Indicators of Canadian MPMP 410

- Local Government 410
- Fire 410
- Police 411
- Roads 411
- Transit 411
- West Water (Sewerage) 411
- Water 412
- Solid Waste Management (Garbage) – 412
- Land-Use Planning 412

Observations - 413

Urban Services Environmental Rating System (USERS) Developed by Tata Energy Research Institute ***413***

Salient Features 414

- Framework for PM (Performance Measurement) adopted under USERS Study 414
- Performance Benchmarking 414
- Stakeholder participation 415
- Capacity building 415

The Performance Measurement Indicators of TERI's USERS – 416

Phased implementation of PM indicators 417

Observations 418

Urban Indicators & Performance Measurement Program (UIPMP) of City Managers' Association – Gujarat ***418***

Salient Features 418

Performance Measurement Indicators of CMAG's UIPMP 419

- Infrastructure Indicators 419
- Finance Indicators 421

Observations 422

Summary & Conclusions ***422***

Appendix 3 - Municipal Performance Measurement – Case Studies

Introduction

Development of the appropriate municipal performance measurement model is not an easy job. Therefore, conceptualization, construction, and operation of a comprehensive urban Performance measurement program, at every step, can benefit immensely from past attempts at urban PM, in India or abroad. Positive as well as negative aspects of past attempts can help to improve the prospective program in all aspects.

The main features of the Canadian experience of urban PM have been described at the beginning of this chapter.

Unfortunately there is no existing model of indicator based PMS in India, except the model developed by the credit rating agencies to do credit rating of urban local bodies and limited focus attempts made by the Tata Energy Research Institute (TERI), City Managers' Association Gujarat (CMA-G), Tamil Nadu Urban Development Fund – Chennai and Centre for Good Governance - Hyderabad for evaluating municipal performance.

The Canadian Municipal Performance Measurement Program

Canadian urban local bodies have the double entry accrual based accounting system. Yet, in order to overcome the intrinsic limitations of balance sheet and financial statements, the Canadian Ministry of Municipal Affairs and Housing designed municipal performance measurement system under Section 83.1 of the Municipal Act and introduced it in Canadian urban local bodies with effect from the month of December 2001. The model is backed by detailed operational guidelines about how to conduct performance measurement and the various performance indicators to be utilized for the same. The salient features, the various rules, official procedures etc. regarding the implementation of MPMP (Municipal Performance measurement Program), and the publication of municipal information under this performance measurement are as follows –

Salient Features

1.1 A municipality shall in respect of each municipal fiscal year provide to the Minister of Municipal Affairs and Housing and publish for the taxpayers of the municipality, the performance measurement information designated in the attached chart.

1.2 The information provided and published by a municipality under subsection 1.1 shall include performance measurement information for any planning board, police services board, public utility commission or transit commission of the municipality.

2.1 A municipality shall provide the information required by section 1.1 to the Minister not later than six months after the last day of the fiscal year to which the information relates.

2.2 A municipality shall publish the information required by section 1.1 not later than nine months after the last day of the fiscal year to which the information relates.

3.1 A municipality at a minimum shall include with the information published under section 1.1,

(a) The name of each performance measure in the chart and the fiscal year to which it relates; and, (b) The result generated for the measure by the Ministry of Municipal Affairs and Housing's electronic financial information return software, after the municipality submits the relevant performance measure information to the Minister of Municipal Affairs and Housing.

3.2 A municipality shall publish the information referred to in subsection1.1 through one or more of the following methods,

(a) A direct mailing to taxpayers or households;

(b) An insert with the property tax bill;

(c) One or more notices in local newspapers or advertising periodicals; or

(d) Posting the information on the Internet

4. A municipality shall provide to the Minister the information required by section 1 by reporting that information in those schedules or lines in the municipality's financial information return for the

relevant municipal fiscal year that correspond to the service or function performance measurement categories designated in the chart.

5. A planning board, police services board, public utility commission or transit commission of a municipality shall make available for review by the municipality any performance measurement information designated in the chart related to services or functions supplied in respect of that municipality by the board or commission in a fiscal year.

6. If a municipality does not supply a service or function at any time in a fiscal year, section 1 does not include any requirement for the municipality to provide or publish information related to that service or function designated in the chart for the fiscal year.

7. In this Schedule, "supply" means supply pursuant to a statute, bylaw or resolution or an arrangement or agreement with any person or municipality, and "supplied" has a corresponding meaning.

The Performance Measurement Indicators of Canadian MPMP

The Canadian MPMP has selected following Performance Measurement Indicators (PMIs) for the purpose of performance measurement and evaluation –

- ### Local Government

Indicator 1 is applicable in Indian Urban local bodies (IMB) and useful for VFM measurement.

Operating costs for general government as a percentage of total municipal operating costs.

- ### Fire

In some states, this function is with urban local bodies while in most of the states it is with the state government hence partly applicable.

2. Operating costs for fire services per $1,000 of assessment. (Applicable to – Indian Urban Local Body)

- Police

In India this not a Municipal Function, hence not applicable.

3. Operating costs for police services per household.

4. Total crime rate as defined by Statistics Canada

- Roads

Except indicators, seven and nine other indicators are applicable in India ULBs. In case of seven & nine indicators we need to modify them for rainy season in place of winter. Indicator 5 to 7 can be utilised for Performance Measurement only after constructing performance benchmarks

5. Operating costs for paved (hard top) roads per lane kilometers.

6. Operating costs for unpaved (loose top) roads per lane kilometres.

7. Operating costs for winter control maintenance of roadways per lane kilometers.

8. Percentage of paved lane kilometers rated as good to very good.

9. Percentage of winter event responses that met or exceeded municipal road maintenance standards.

- Transit

Indicator 10 & 11, both are applicable in Indian ULBs having city transport service, but only 10 can be utilised for VFM Measurement.

10. Operating costs for conventional transit per regular service passenger trip

11. Number of conventional transit passenger trips per person in the service area in a year

- West Water (Sewerage)

Indicators 12 to 14 are applicable to Indian ULBs but none of them can be used for VFM measurement.

12. Operating costs for wastewater per kilometer of sewer line

13. Number of sewer-main backups per 100 kilometers of sewer line in the year

14. Percentage of wastewater estimated to have by-passed treatment.

- Water

Indicators 15 to 17 are fully applicable for India ULBs but only indicator 15 can be used for VFM measurement after modification and comparison with benchmark.

15. Operating costs for the treatment and distribution of drinking quality water per mega-litter

16. Number of breaks in water mains per 100 kilometers of water main pipe in a year

17. Weighted number of days when boil water advisory issued by the Medical Officer of Health, applicable to a municipal water supply

- Solid Waste Management (Garbage) –

Indicators 18 to 23 are applicable for IMBs but only indicators 18 to 20 can be used for VFM measurement with certain modifications.

18. Operating costs for solid waste collection, transfer, and disposal per ton or per household
19. Operating costs for solid waste diversion per ton or per household.

20. Average operating costs for solid waste management per ton or per household
21. Number of days per year when a Ministry of Environment compliance order for remediation concerning an air or groundwater standard was in effect for a solid waste management facility, by site and total number of sites in the municipality.

22. Number of complaints received in a year concerning the collection of solid waste and recycled materials per 1,000 households.

23. Percentage of residential solid waste diverted.

- Land-Use Planning

Indicators 24 & 25 are applicable to IMBs but not relevant from point of VFM measurement.)

24. Percentage of new development with final approval, which is located within settlement areas and the number of new lots, blocks, and/or units

25. Percentage of land designated for agricultural purposes, which was preserved, and number of hectares of land originally designated for agricultural purposes, which was re-designated for other uses.

Observations -

It can be observed from the above that Canadian Model of Municipal Performance Measurement cover nine core municipal functions or service areas by using 25 broad-level efficiency and effectiveness performance measures. The model provides for publication and dissemination of the municipal performance information under the 9 core municipal service areas and 25 efficiency and effectiveness performance measures to the people at large within 9 months of the end of fiscal year. This report is to be published over and above the annual financial accounts.

It can further be observed that most of the performance measures of the Canadian Municipal Performance Measurement Programme are applicable to Indian urban local bodies. Of-course we will need a more elaborate list of performance measures/indicators to suit the heterogeneity associated with the Indian municipal system.i Further, we will have to decide about addressing the issue of multiplicity of stakeholders. The Canadian MPMP programme seems to be designed from the perspective of reporting to common citizens and higher-level government. As a result, most of the performance measure areas are not directed towards Value for Money measurement.

As mentioned earlier in India two attempts have been made to structure municipal performance measurement system based on performance indicators in India.

Urban Services Environmental Rating System (USERS) Developed by Tata Energy Research Institute

TERI was engaged by the Ministry of Environment and Forests and United Nations Development Programme to develop a framework called USERS (Urban Services Environmental Rating System). The aim of this project is to measure the performance of a municipal body with respect to its service delivery in urban areas through a set of performance indicators that are benchmarked against set targets. The urban local bodies of Kanpur and Delhi have been identified as pilot case studies. The USERS project is aimed at

- Addressing the problem of environmental degradation in urban areas by empowering urban communities with information, which would foster the emerging trend towards transparency and accountability
- Providing policy–makers/implementation agencies with an analytical tool, which would enable more informed planning/decision making
- Developing and disseminating a rating system for the environmental aspects associated with the operations of urban agencies involved in three service areas—water supply and waste (solid waste and sewerage) management.

Salient Features

• Framework for PM (Performance Measurement) adopted under USERS Study

Performance measurements indicate how much or how well the agency is doing. Ideally, they track the agency's progress towards achieving its objectives. A framework adopted under the USERS study for PM is the inputs-outputs efficiency outcomes framework. Its components are defined as follows:

- **Inputs:** The amount of resources used. Indicate the level of effort but not a measure of performance.
- **Outputs:** Level of services provided or amount of work done. These measure performance in terms of 'how much' not how well or how efficiently.
- **Efficiency:** Relate outputs to inputs. These indicators are central to PM but they do not measure the extent to which the agency's objectives are achieved.
- **Outcomes:** Indicate the degree to which programme objectives are achieved and measure value of service from the perspective of the end-user.

• Performance Benchmarking

PM must necessarily be accompanied with performance benchmarking, otherwise it becomes difficult to judge how well or how poorly the agency is currently performing, and what types of corrective actions are required. Performance benchmarks provide a point of reference for drawing conclusions from a PM exercise.

TERI identified four alternative benchmarking approaches for this framework. One benchmarking approach involves referring to a technical standard (such as for water quality) or a mandatory statutory standard. Another approach for benchmarking of performance indicators is to observe the

trend in the values of the indicator over a period, and assess whether the agency's performance is on a path of improvement or deterioration. The third approach for benchmarking is to compare the agency's performance with that of other comparable agencies and other cities recognized for best practices to judge the current performance level. Benchmarking by comparisons is a practical approach having the benefit of being comparison with peer organizations. The fourth approach for benchmarking that TERI considered for certain indicators is the comparison of actual performance with a pre-established target.

- Stakeholder participation

The officials of the urban local bodies (Delhi & Kanpur) were involved right from the beginning of the project, and their consent and feedback was obtained on the project objectives, deliverables, the framework being adopted, and the indicators being developed. This was accomplished through a series of workshops, brainstorming sessions, and personal discussions held at regular intervals in Delhi and Kanpur.

- Capacity building

A series of workshops and training programmes was organised to obtain feedback from Indian and international experts on the project objectives and framework being adopted. These experts shared their experience on their efforts in similar directions, which helped the project team in fine-tuning and development of the framework. Workshops were organized for the pilot agencies of Delhi and Kanpur for the development of indicators of PM. Training programmes on the concept of PM and benchmarking of urban local bodies were also organized, where the participants were not only from different urban local bodies throughout India, but also included academicians, researchers, policy–makers, NGOs (non-governmental organizations) and representatives from citizens pressure groups. Study tours for the municipal officials of the pilot cities were organized to understand the management of the three basic services of water supply, sewerage, and solid waste in other parts of the country.

The Performance Measurement Indicators of TERI's USERS –

TERI has also adopted the tool of performance measurement indicators for developing the USERS framework. It selected a list of the indicators for the three different services with an integrated approach under three different categories:

- Management indicators
- Technical indicators
- Financial indicators

A set of managerial and technical indicators shows the extent of management capability of the agency and the technical efficiency in the provision of various services that the agency provides. Financial indicators reflect the cost-effectiveness/efficiency in service delivery by the agency.

Table A.3.1 - **Management PMIs for water production**

Sr. No	Indicator	Unit	Type	Level	Frequency	Benchmark
1	Average daily intake of surface raw water	MLD	Output	C	Weekly	Trend
2	Average daily clear water production	MLD	Output	C	Weekly	Trend
3	Average daily withdrawal by tube wells	MLD	Output	C, Z	Weekly	Trend

Note: C- city; Z – zone; MLD – million liters per day

Table A.3.2. - Technical PMIs on water quality surveillance

S. No	Indicator	Unit	Type	Level	Frequency	Benchmark

4	At water treatment plants,					
	a) Residual chlorine tests					Water quality
	Samples tested	No.	-	C	Weekly	standards
	Found not satisfactory	%	Efficiency	"	"	-
	b) Full chemical tests					Water quality
	Samples tested	No.	-	C	Weekly	standards
	Found not satisfactory	%	Efficiency	"	"	-
	c)Bacteriological examination					Water quality
	Samples tested	No.	-	C	Weekly	standards
	Found not satisfactory	%	Efficiency	"	"	-

Note: C-city; Z - zone

Table A.3.3 - Financial PMIs for revenue collection

Sino.	Indicator	Unit	Type	Level	Frequency	Benchmark
5	Average revenue collected per unit of water produced	Rs.	Efficiency	C, Z	Monthly	Comparisons
6	Average revenue collected per unit of water sold	Rs.	Efficiency	C, Z	Monthly	Comparisons
7	Total revenue collected / total revenue demanded	-	Efficiency	C, Z	Monthly	Trend

Note: C- city; Z - zone

Phased implementation of PM indicators

Considering that it would be unrealistic to assume that the agencies responsible for providing these services would be in a position to implement all of these indicators at the outset, TERI has proposed implementation of these indicators in the following phased manner.

- The agency can operate many of the indicators with its existing management information system or by retrieving relevant information from easily available records.
- There are some indicators, which can be operationalised relatively easily, by gathering some more information and by making some minor modifications to the existing management information system.
- Finally, there are some indicators that require substantial effort for data collection and major modification of the existing management information system before these may be operationalised.

Observations

The TERI's USERS programme is quite limited since it focuses mainly on environmental aspect of urban service. Therefore, it has not undertaken comprehensive performance measurement.

Urban Indicators & Performance Measurement Program (UIPMP) of City Managers' Association – Gujarat

City Managers' Association – Gujarat selected 29 finance indicators and 38 infrastructure indicators for its maiden pilot UIPMP and applied it to 10 selected cities of Gujarat for the year 2000 – 01data. The salient features of this programme and the list of the indicators used, are elaborated in this section –

Salient Features

- The UIPM program was undertaken by the CMA-G to provide the urban local bodies with an analytical tool for self-assessment, which would also make them more transparent and accountable.
- The process involved formulation of list of performance indicators by Technical Advisory Committee, which comprised outside expert and practicing municipal officers.
- Having finalized the list placed below, a hierarchy of weightages was formed and weightages were assigned to each performance indicator to facilitate comparison of one municipal body with other and to facilitate ranking of the urban local bodies evaluated.

- The CMA-G team collected data through the questionnaire, followed by the orientation visit and data collection and validation visits to the urban local bodies.
- Being the first experiment, not many urban local bodies participated in it. The data was not available or reliable, so as a result some the indicators could not be worked out.
- The biggest obstacles turned out to be lack of uniform and compatible data and apathy or indifference.
- This entire exercise of performance measurement was based on the comparative measurement among the urban local bodies and did not include comparison against the standards or benchmarks.
- CMA-G could not undertake or replicate UIPM program for years subsequent to 2001 &2002 due to various reasons, but it still plans to extend the programme to 30 cities.
- Though the UIPMP aimed at providing an analytical tool to urban local bodies for self-assessment, no municipal body has utilized UIPM for self-assessment in last two years or so.

Performance Measurement Indicators of CMAG's UIPMP

The list of the performance indicators utilized as part of UIPMP of CMA-G.

- Infrastructure Indicators
    - **Water Supply**
        - **Service Level**
            1. Water Supplied Per Capita Per Day
            2. Average House of Supply Per Day
            3. Number of Supply Days in a Week
            4. Treatment Plant Capacity as % of Water Supply from Surface Water Resources
            5. Storage Capacity Adequacy
        - **Service coverage**
            6. Ratio of Slum Population to Public Stand Post
            7. % HH Covered by Water Supply Connections
            8. % Pipe Length to Total Road Length
        - **Service Cost and Efficiency**
            9. Cost of Supply
            10. Establishment Cost Per Capita
            11. Cost Recovery
            12. Amount of Unaccounted for Water
            13. Staff per MLD Supplied

- **Sewerage and Sanitation**

  - **Service Level**
    14. % Of Waste Water Treated
    15. Slum Population Per Public Convenience
    16. Ratio of Pay and Use Toilets to Total Public Toilets

  - **Service Coverage**
    17. % Of Population covered by Underground Drainage and Individual Septic Tanks System
    18. % HH Covered by Sewerage Connection

  - **Service Cost and Efficiency**
    19. Cost Per Sewerage Connections
    20. Cost Recover
    21. Staff Per 1000 Sewerage Connections

- **Solid Waste Management**

  - **Service Level & Coverage**
    22. % Waste Collection
    23. % Vehicle to Waste Generated
    24. Spacing of Waste Bins
    25. % Capacity of Bins
    26. Road Length Covered Per Sweeper

  - **Service Cost and Efficiency**
    27. Total Cost Per Ton of Waste Collected
    28. Manpower Per Ton of Waste
    29. Cost Recover

- **Roads & Storm Water Drainage**

  - **Service Level**
    30. % Of Roads Surfaced
    31. % Road Length having Storm Water Drains

  - **Service Coverage**
    32. Road Density
    33. % City Area Covered by Storm Water Drains
  - **Service Cost and Efficiency**
    34. Cost Per KM of Road Length
    35. Staff Per 10 KM of Road Length

- **Streetlights**

  - **Service Level & Coverage**
    36. Street Light Service Coverage
  - **Service Cost and Efficiency**
    37. Cost Per Street Light
    38. Staff Per 1000 Streetlights

- Finance Indicators

  - **Resource Mobilization**

    1. Per Capita Revenue Income
    2. Per Capita Tax Income
    3. Per Capita Non-Tax Revenue
    4. % Of Own Resources in Revenue Income
    5. % Of Own Resource in Capital Income
    6. % Growth in Per Capita Tax Income
    7. % Growth in Per Capital Non-tax Income
    8. %Growth of Own Resources in Revenue Income
    9. % Of Octroi in Revenue Income
    10. % Of Total Grants in Total Income
    11. Per Capita Property Tax Income
    12. Property Tax Collection Performance
    13. Number of Properties Assessed Per Staff
    14. Property Tax Collection Per Staff
    15. Properties Assessed per Sq. Km of City Area
    16. % Of Arrears in Total Demand

  - **Expenditure Management**

    17. Per Capita Revenue Expenditure
    18. Per Capital Expenditure on Water Supply and sanitation
    19. Per Capita Expenditure on Public Health
    20. Per Capita Expenditure on Public Safety
    21. Per Capita Expenditure on Public Works
    22. Per Capita Expenditure on General Administration
    23. % Of Establishment Expenditure in Total Revenue Expenditure
    24. Operating Ratio
    25. Per Capita Expenditure on Capital Works
    26. % Of Expenditure on Discretionary Services

  - **Debt Management**

    27. Debt Service Ratio to Income (Loan Repayment / Revenue Income)
    28. Debt Service Ratio to Expenditure (Loan Repayment / Revenue Expenditure)
    29. Outstanding Liabilities Per Capita

Observations

As mentioned earlier the UIPMP of CMA-G was aimed at providing a self-assessment tool to the urban local bodies. It included various types of performance indicators right from the input-output analysis, impact analysis and cost recovery.

Summary & Conclusions

The Canadian case can serve as a useful example. Its positive feature is its built-in interaction with citizens and media. On the other hand, in the Indian context, its language and presentation has to be less legalistic and more layman friendly. It should preferably be translated to all local languages wherever it is applied. The focus of TERI program of performance measurement is limited to environment related issues. So it would not be a good example for all round-comprehensive PM. But it can be used as a guideline to build up the program step by step in the initial stages and launch /operate the program in the face of usual constraints

CMAG program's application is sporadic, not sustained and not compared to benchmarks. It also came across-data problems.

Nonetheless, the program is a goldmine for urban performance indicators that are applicable in the Indian urban scenario. A detailed study of the problems that confronted the program is likely to help in formulating a more evolved and useful system of urban performance measurement.

Any new PM program can benefit from the positive and negative experience of previous PM programs.

Appendix 4 - Performance Indicators Recommended by Tamil Nadu Second Finance Commission

(ANNEXURE 2 (a) of the Second Finance Commission Report)

S. No	Sector	Indicators Proposed to be Developed
A. Municipal Finance		
1.	Property Tax (8)	• Current Collection Performance • Average Tax Demand per property • % arrears pending for 5 years • % Properties Issued Demand Notice within 30 days of due date • No. of Assessments per collection Staff • % Increase in Assessments • Assessment Efficiency • Salary Expenditure to collect Rs. 1000 of property Tax
2.	Resource Mobilization (4)	• Per Capita Income • % Contribution by Own Sources • % Contribution from properties • Growth in Revenue Income
3.	Expenditure, Debt and Liability Management (10)	**1. Expenditure Management** • Per Capita Expenditure • Operating Ratio • Establishment Expenditure as % of Revenue Income • Growth in Revenue Expenditure • Capital Utilization Ratio **2. Debt and Liability Management** • Per Capita Outstanding Debt • Debt Payment to Actual Commitment • Overdue as % of Outstanding Loan • Outstanding Debt to Revenue Income • Outstanding Non Debt Liability as % of Revenue Income

B. Core Services		
1.	Water Supply (9)	• Supply Frequency • Gross lpcd (w.r.t current population) • % of Storage Capacity • % Assessment covered with HSC • Slum Population per Stand Post • Ratio of Distribution Network to Road length (Incl. SH, NH & MDR etc.) • Cost per 1000 liters (Only O & M) • Revenue per 1000 liters • Current Collection Performance of • water charges
2.	Sewerage and Sanitation (4)	• % HHs with Sewer Connections • Ratio of UGD Network length to Road length (Incl. SH, NH & MDR etc.) • % Houses with LCS & Septic Tank Facility • Slum population per seat of Public Convenience
3.	Solid Waste Management (5)	• Per Capita Waste generated (Current Population) • % Capacity of the Fleet of Vehicles to waste generated • Collection Efficiency • Spacing of Dustbins • Road length per conservancy staff
4.	Roads, Storm Water Drains and Street Lighting (5)	• % Roads Surfaced • Percentage Road Covered with pucca Drains • Drain Length per drain cleaner • Spacing between lights • % Sodium & Mercury Lamps • O & M Cost Per light
C. Demography and Social Indicators		
1.	Demography, Slum and Social Indicators	• % Slum Population • % Population Below Poverty Line • Persons per park and Playground

		• % Women Beneficiaries under SJSRY scheme
D. Urban Governance		
1.	Urban Governance (8)	1. Fiscal Discipline • Revenue Realization : Budget vs. Actual • Revenue Expenditure Control : Budget Vs Actual • Capital Works : Budget vs. Actual • No. of audit objections • Receipts of any Incentive Grant 2. Performance and Public Responsiveness • % Water connection given within the stipulated time • % Building permissions issued within • the stipulated time • % Litigation in favour of municipality during the year

Assignment of Scores

In order to assess the performance it is recommended that the values of above indicators be assigned scores to each indicator and weightages to each sector. These performance level scores to each indicator will have to be assigned either uniformly to all local bodies of the state / region for the purposes of comparative assessment or as desired by the local body to evaluate internal performance. An illustrative methodology for formulating Scorecard and assigning weightages is presented in the following sections.

Formulation of Score Card

The score card could be formulated based on the norms (water supply, collection performance etc.) or men value among the categories of local bodies. Depending upon the variation of performance levels of the local body, a five or ten point scale can be adopted for this purpose.

Assignment of Weightages

Further to bring all the indicators and all local bodies on a comparative scale for overall evaluation, weightage needs to be assigned to each sector depending on the relative importance of the particular

sector or the purpose of evaluation. This will minimize discrepancies that occur in relation to certain ground realities. An illustrative weightage for different sectors is presented in Table A.4.1.

Table: A.4.1 Sector Indicators – Weightages

Main Indicators	Weightage - %
For Overall Performance	
Service	40
Finance	60
Total	100
Financial Sector	
Resource Mobilization	
General Resources	35
Property Tax	25
Expenditure Management	25
Debt Management	15
Total – Financial Sector	100
Core Service Sector	
Water Supply	30
Sewerage and Sanitation	20
Roads and Storm Water Drains	20
Street Lighting	10
Solid Waste Management	20
Total – Service Sector	100

While a weightage of 40% and 60% can be assigned for service and financial sectors of the local body, within finances sector a weightage of 35% is assigned for resource mobilization and 25% for expenditure management. In service sector, water supply has been assigned a weightage of 30% and 20% for sewerage and sanitation. This weightages could be altered based on the purpose of evaluation.

Appendix 5 -Performance Measurement in Education – The PROOF Initiative

Index

Challenges of Universalizing Elementary Education ***429***

PROOF – Public Record of Operations and Finance ***430***

Extending the PROOF Model to Education ***432***

The PROOF in Education Model—A Process Guide ***433***

Step One: Acquiring trust and cooperation of the system 435

Step Two: Identifying Relevant Performance Indicators For Schools 435

Step Three—Collecting Data and Embarking Upon Management Discussion and Analysis 436

Step Four: Understanding Current Processes 438

Outcomes of PROOF in Education ***438***

Concluding Observations ***440***

Appendix 5 -Performance Measurement in Education
The PROOF Initiative[149]

Challenges of Universalizing Elementary Education

High drop-out rates, insufficient infrastructure, the absence of cutting-edge teaching methods and high levels of illiteracy among children have severely affected the quality of education in India. It is not surprising to learn that in a vast majority of government and municipal schools, children can barely read their text-books, even after spending as much as five years in school. For a large number of children, opportunity for education is not likely to be available beyond the primary stage and what they learn in the elementary school system must sustain them throughout their lives. It is imperative to ensure that all children, irrespective of their socio-economic background and the conditions of the schools they attend, reach a minimum level of learning before they finish primary education. This level of education equips them with a better understanding of their world and enables them to function in it as literate and productive individuals.

India still has the unfortunate reputation of having the largest number of illiterates and out-of-school children in the world. Approximately 59 million children in the age group of between 6 to 14 years are out of school; of this about 60 percent are girls. These numbers are likely to increase, unless steps are taken to arrest this trend. Keeping in view the developmental needs of children from the disadvantaged and deprived sections of society, such as school drop-outs, working children and especially girls, there is clearly a need for an effort to combine quality concerns with concerns for equity. Given the magnitude and the urgent nature of the problem, the task of strengthening the government school system needs to be viewed as a national priority.

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149 This paper on Performance Measurement in Education – the PROOF Initiative is written by Mr. Ashok Kamath of Akshara Foundation, Bangalore, India with Research, Compilation and Editorial Support of Lalitha Banerjee , Manije Kelkar. Authors are grateful to them for allowing us to include it as Appendix 5 of the book with necessary editing.

PROOF – Public Record of Operations and Finance

Good governance from public institutions, encouraging citizen empowerment and supporting public-private partnerships was the genesis for the Public Record of Operations and Finance (PROOF) model. PROOF was spearheaded by four Bangalore-based non-profit organizations, namely Janaagraha, VOICES, Centre for Budget and Policy Studies and Public Affairs Centre. Since 2003, Bangalore-based Akshara Foundation has been a key partner for the PROOF initiative. PROOF is a Social Accountability model that uses performance indicators, budgets and process analysis as a means to impact change. The fundamental goal of PROOF is to provide citizens with good governance from public institutions much in the vein that shareholders expect and demand from private companies. Citizens as stakeholders in their communities have been taken for granted by local governments and have, over time, assumed a passive role in demanding explanations for and change of resource allocations for essential services. In the private sector, shareholders have the right to scrutinize financial statements.[150] Why shouldn't citizens expect the same rights and level of financial reporting from their local government?

PROOF empowers citizens to impact change through understanding the budget. The cornerstone of the PROOF model is that it measures performance of the government by evaluating financial statements and assessing promised and actual outcomes. While there are different ways of measuring performance, the PROOF model has adapted the methodology developed by the U.S. Governmental Accounting Standards Board (GASB), an indicator-based framework measuring service efforts and accomplishments.

The PROOF process is illustrated below in Figure A.5.1 and A.5.2. Through sharing information between citizens and the urban local body, stakeholders can assess performance by evaluating indicators. Performance levels stimulate discussion as to how to improve current status of public services and programmes. These discussions raise questions pertaining to resource allocations made by the local government to essential services. The government then needs to explain allocation decisions and put in place new allocations for the next year that will have more meaningful impact on the city's services and programmes.

[150] Ramesh Ramanathan (founder of Janaagraha) "PROOF Case Study."

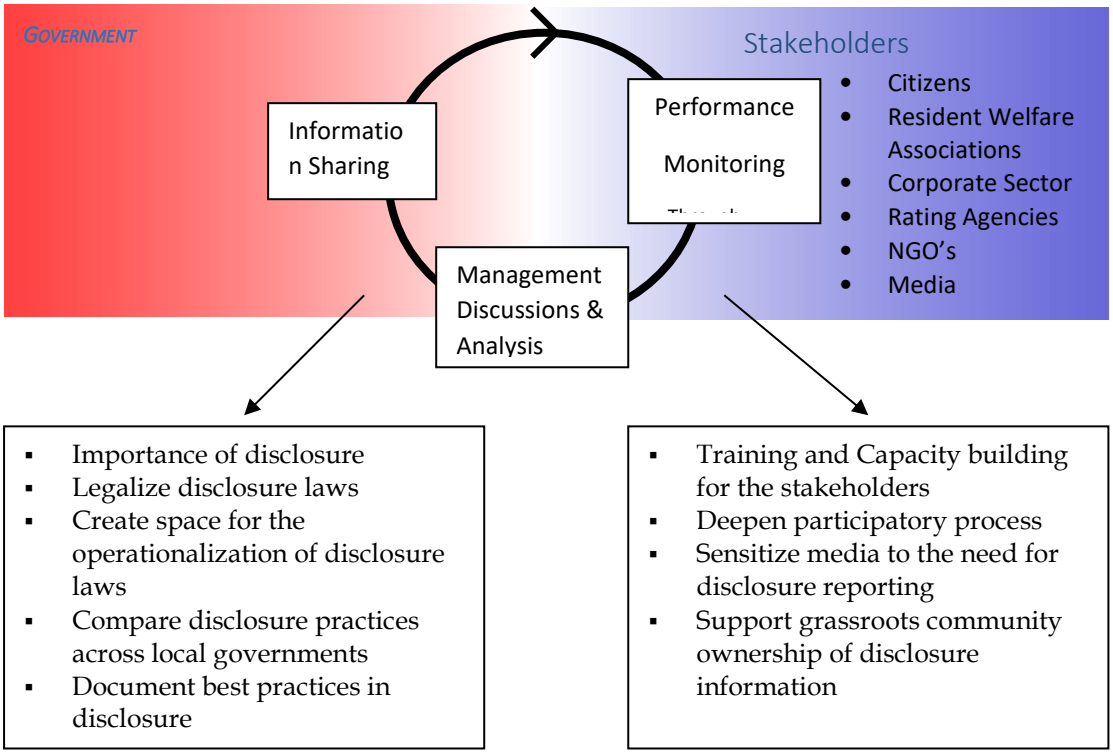
Figure A.5.1: Main Components of PROOF: A Model of Ensuring Fiscal Accountability

Financial Statements provided in a standardized, systematic and transparent format	**Performance Indicators** in selected activities, such as education, water supply, sewage, sanitation, etc.	**Management Discussion and Analysis** in response to salient findings of financial statements
Types of financial statements are listed below— ▪ *Revenue and Expenditure Statement* compared to Original Budget figures ▪ Indicative *Balance Sheet*, with detailed information regarding current and long-term assets and short and long-term liabilities	Types of performance indicators are listed below— ▪ *Inputs*—The amount of resources, financial and/or Non-financial, utilized for services or programmes ▪ *Outputs*—Units produced or services provided ▪ *Efficiency indicators*—Measure cost per unit of	Areas of discussion include— ▪ Overall *performance* ▪ Selected *activities*

The expected outcomes of PROOF are listed below:

- Fundamental change in financial disclosure reporting
- Legislation requiring financial disclosure reporting
- Greater transparency and insight into government's revenues and expenditures
- Ability of citizens to hold government accountable.
- Encouraging forum for open exchange and dialogue
- Providing information to elected representatives who may not be aware of realities.
- Improving status quo of essential services and/or programmes
- Discourage capture of funds, inefficiencies in provision of services/programmes and corruption.
- Extrapolation of PROOF concept to other sectors, such as education, water supply, healthcare, sanitation, etc.

Figure A.5.2 – The PROOF Process



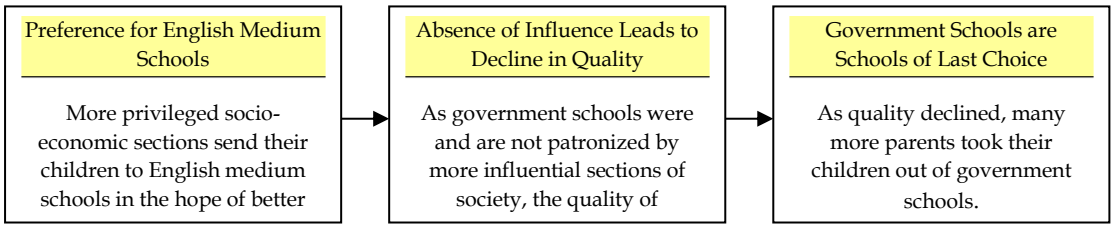
Extending the PROOF Model to Education

The basis of PROOF is good governance; good governance is not only restricted to the realm of providing financial transparency but also extends to most, if not all, public services. One essential public service that the government provides citizens with is education. Education in India has largely been budget-based where efficiency has been rated on the basis of the ability to "consume" a budget and to demand more. Performance at the delivery point has not been an important criterion. To improve service delivery, there is a need for:

- A shift from inputs to performance and outcomes
- Considerations of cost effectiveness across all levels of educational administration
- New methodologies and planning

Figure A.5.3 describes a vicious cycle that has set in education system in India; only the children of the weakest and least influential parents remain in government schools. Even where individuals have formal rights, they find it difficult to exercise them because of their vulnerable status in society. As a result, education became just a talking point of local politics and a secure source of income for most teachers without any accountability.[151,152]

Figure A.5.3 – Vicious Circle set in Public Education System



Most of the teachers themselves do not send their children to the government schools where they teach. Unless the parents who send their children to government schools have real influence and power to manage the schools, there will be no improvement in the status of government schools. Only when interests and the power to change them go together, will public services improve.[153] Good governance, financial transparency, and participatory budgetary processes could bring about accountability to public education.

The PROOF in Education Model—A Process Guide

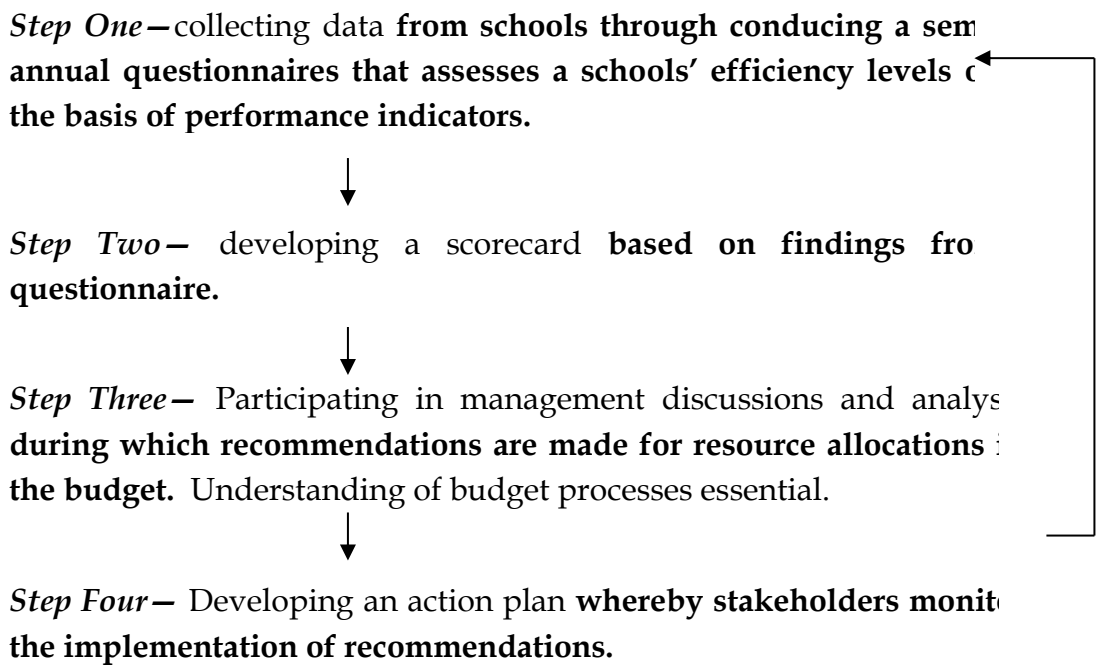
While budgets are one mechanism to influence change, **a complementary tool is developing a performance measurement framework** to improve conditions in the government school system. Akshara Foundation, which focuses on the universalisation of elementary education, developed and applied the PROOF model to schools. Entitled PROOF in Education (PIE), the model utilizes performance measurement, along with budgets and processes, as a tool to enhance learning quality

[151] www.loksatta.org
[152]Overseas Development Institute "World Governance Paper Discussion Four." (July 2003) .http://www.odi.org.uk/wga_governance/Docs/WGS_4_Civil_Society.pdf
[153] www.loksatta.org

and conditions in municipal schools. As with the PROOF model, budgetary analysis is a critical component of PIE.

Initially being implemented on a pilot basis but with the ambitions of being extended to all over India, Akshara applied PIE to primary schools in Bangalore managed by the local urban body– the Bangalore Mahanagara Palike (BMP). The BMP manages seven primary schools, which it offered immediately for a pilot program. At a high level, stakeholders are mobilized to improve the quality of education in public schools. PIE involves stakeholders, such as teachers, headmasters/headmistresses, students, alumni and citizens in impacting change in schools through the four-step process illustrated below in Figure A.5.4.

Figure A.5. 4: Steps involved in PROOF in Education



Akshara worked with the BMP to secure a Memorandum of Understanding and in the third quarter of 2003, Akshara received formal approval from the BMP to initiate PIE on a pilot basis.

The PROOF in Education Model has three distinct phases:

Implementing PROOF in Education—The process of collecting data to compile efficiency scores for schools. Recommendations are prepared which are then shared with BMP officials; once BMP commits to the work plan, school staff monitors implementation of work plan.

Leveraging Budgets—This is a process of understanding the budget, disseminating information to stakeholders and then submitting recommendations for inclusion to the next year's budget.

Understanding Current Processes—The process by which stakeholders, especially school staff, understand the processes in the department of education and the BMP. This enables stakeholders to understand process flows such as what happens when they submit requests to fix/provide infrastructure, who is responsible for sanctioning requests, the presence and roles of committees and staff at the BMP and in the Department of Education.

STEP ONE: ACQUIRING TRUST AND COOPERATION OF THE SYSTEM

Akshara realized that to operationalize PIE in the field, support had to be gained from schools. To gain support from schools, Akshara staff met with HMs, teachers and Department of Education officials to convey that the PIE was to make their daily tasks and job roles easier. Field staff and volunteers spent many hours interacting with teachers and HMs, talking with them, assuaging their fears. In-person meetings with staff at schools were effective in securing buy-ins.

STEP TWO: IDENTIFYING RELEVANT PERFORMANCE INDICATORS FOR SCHOOLS

To identify performance indicators and parameters, Akshara Embarked upon detailed conversations with staff at BMP schools—Common themes emerged from these discussions that framed the performance indicators. Senior staff from Akshara met with field staff and one staff member from Janaagraha to complete flow diagrams to assess the main physical components of schools—playgrounds, teaching aids, toilets, drinking water, etc. Consequently, the flow diagrams revealed the following performance indicator themes:[154]

- Community participation
- Infrastructure
- Scholastic outcomes of students
- Performance of teaching and non-teaching staff

[154] Ramesh Ramanathan (Janaagraha). "Proof Study Two."

Developed the parameters that comprised performance indicators— Staff at Akshara had to "work backwards". For example: In well-managed schools, a library is a part of the school's infrastructure and implies a fixed space, with electricity, tables, benches, shelves, and adequate numbers of relevant books. Contrast that with a BMP schools where a library could be a room or just a cupboard to which children do not have access to on a regular basis. What is a playground? Is it just an open field or is it an enclosed area with balls, bats, etc.?

Assigned benchmarks and weightages to parameters— Akshara staff spoke with teachers and HMs at a cross-section of schools (private, public, and government, BMP) to understand ideal ratios or measurements for parameters; for example, conversations revealed that for every 25 children, a school should maintain one toilet. Benchmarks were selected that were realistic, meaningful and achievable for BMP schools. Akshara staff had these conversations with HMs and teachers at between five to six schools. The process of developing parameters and weightages took between three to five months.

Step Three—Collecting Data and Embarking Upon Management Discussion and Analysis

Once indicators and parameters were decided upon, the following sequence of events occurred:

Obtaining Approval: Once the MoU with the BMP was signed, Akshara staff approached the Education Officer (EO) to obtain approval before visiting schools to collect data.

Data Collection: Data was collected by the Programme Coordinator at Akshara. The Programme Coordinator visited schools and approached teachers with a questionnaire assessing parameters.

Generating Scorecard: Once answers were compiled, staff at Akshara tabulated the efficiency scores (i.e., sum of scores for performance indicators). The Akshara team discussed the results internally; the Program Coordinator then presented the findings to the officials of the Education Department of the BMP.

Meeting with BMP staff: The Programme Coordinator and a senior staff member held meetings with the BMP management to share and discuss findings. BMP management included the Commissioner, Special Commissioner, Additional Commissioner, Deputy Commissioner of Development (DCD), Education Officers, and Subject Inspectors. A senior staff member from Akshara presented findings

on all the indicators; the audience was stunned with the findings since it clearly indicated that infrastructure indicators were poor.

Managing reactions: The Programme Coordinator then visited the schools to speak to the teachers. Teachers, after speaking with HMs about the results of the meeting, were unhappy with the findings, and interpreted the score to mean that they were doing their jobs poorly.

Ensuring easy wins: For several other needs like charts, globes, first aid kits, etc., Akshara involved organizations like the Round Table who assumed expenses in supplying teaching aids, maps, globes, sports material, etc.

In collaboration with Janaagraha, Akshara held public discussions to explain line items in budgets, review budgetary analysis and discuss the state of BMP schools. To enable stakeholders to understand the budget, **PROOF,** addressed the following topics through regular meetings and discussions[155]:

Purpose of the budget

Budgeting cycle—timeframes, who is involved, etc.

Components of the budget

Explanation of how the budget affects citizens

Last year's budget and the present budget year calendar

A simple explanation of how the city budget works

Understanding sources of revenue and items of expenditure

Understanding financial terms

Moderators for these sessions were senior staff from Akshara, using documents already prepared by Janaagraha. Participants included citizens, parents, teachers and HMs. Information was precise, clear and detailed.

[155]Agnes Natkaniec "Participatory Budgeting and Capital Investment Planning". Citizen Participation Handbook.

STEP FOUR: UNDERSTANDING CURRENT PROCESSES

The third component of PIE was understanding internal education-related processes in the BMP. A common theme that emerged from teacher conversations was that often, school staff were unaware of the flow of requests into the BMP. For example, teachers and HMs either had little idea or different interpretations on who and how sign-off for requests was made, how long it would take for requests to be filled, etc.

To provide greater transparency into the process, Akshara staff interviewed the EO and the Deputy Director Public Instruction (DDPI) in an effort to provide teachers with greater knowledge of procedures within the BMP. **The Programme Coordinator and other Akshara personnel are in discussions with the BMP officials to understand aspects relating to a variety of topics including procurement, maintenance, materials, inspection, student welfare, etc. Some examples of questions include:**

- What is the process for repairing cracks in school ceilings and in classroom walls?
- How is material allocated for the maintenance of toilets?
- How are blackboards, chairs, benches and other furniture allocated to schools?
- What is the planning process for when the number of allotted classrooms is insufficient?

Outcomes of PROOF in Education

During the 12-month period ending July 2005, Akshara has taken **three** sets of detailed measurements, one in July 2004, December 2005, and July 2005 and have presented these findings to the citizens of Bangalore via PROOF-organized public discussions. While the measurements revealed deficiencies in the system, it also recommended solutions. As schools are continually assessed, more findings are revealed that are then addressed with BMP officials; the cycle is continuous. These solutions were implemented by a variety of stakeholders, such as the BMP, other NGOs and the community and scores improved over a period of time testifying to the adage that ***"What gets measured, gets done."***

A model like PIE has yielded on a short-term basis, and will yield over the longer term, many significant outcomes. Here are a few examples:

- Better infrastructure for children and for teachers. Since a necessary component of the PIE model is conducting efficiency levels thrice a year, schools will be able to monitor the improvement in the standard of infrastructure over time. In the ideal sense, over time, key physical conditions should improve to the point that they are robust – it is well known that better infrastructure will increase enrolment and attendance.

- Enhanced learning levels and higher literacy rates. By participating in the PIE process, teachers and head teachers will be aware of scholastically weaker children since their results (measured in the scholastic outcomes of student's indicators) have a bearing on the school's efficiency score. In order to raise its efficiency score, the school will have to improve learning levels. Once again, what gets measured gets done.

- More accountability from local government towards implementing education-related initiatives.

- More community involvement. Stakeholders have rallied around improving education for underserved sections of society instead of maintaining an insular view. Ordinary citizens and other stakeholders have been mobilized to partner to improve the standard of BMP schools. For example, community leaders have formed School Support Groups at schools; these groups implement "quick fixes" at schools (such as fixing walls, installing security gates, etc.) to enhance school conditions.
- Improved understanding into BMP processes and planning cycles. Through continual interaction with the BMP, Akshara hopes to develop a process guide that can be disseminated to BMP teachers and head teachers. This process guide is aimed at providing more transparency into BMP processes and also in equipping teachers and head teachers with an understanding of how their requests are managed.
- Training sessions have been organized for the school community. The aim of these sessions is to assist teachers with time management, understanding students and enabling them to remember their motivations for becoming teachers. Held over 12 modules each between half a day to one and a half days and conducted over a period of two months, teachers and head teachers attend these sessions that also encourage teamwork and learning.

Concluding Observations

PROOF in Education is still a work-in-progress; each round of questionnaires and interactions with stakeholders reveal issues and challenges that need to be addressed. For PROOF in Education to be successful, stakeholders will have to own the initiative and follow-through with it in years to come. Initial setbacks, and any future obstacles, should not deter stakeholders from the ultimate goal of enhancing the quality of education in municipal schools. The indicators and benchmarks developed during the process and system of assigning scores is presented in the Table A.5.1

Table A.5.1 – PROOF in Education – Indicators, Benchmarks and score assigned

Public Education - Infrastructural Indicators						
Bangalore Mahanagar Palike - School at Marappanapalaya						
Sr. No.	**Relevant Parameter**	**Desired Benchmark**	**Weightage**	**Desired for the school**	**Actual for the school**	**Score**
I.	***Library***					
1.	Room with electricity	12ft x 15ft	10	1	1	10.00
2.	Books					
	Quality					
2 a	Choice of language	Eng: Hindi: Kan				
2 b	Choice of subject					
2 c.	Subject Books/ General					
	Organised by class / grade					
2 d	Quantity per child	3 per child	20	549	5	0.18
3.	Cupboards					
3 a	Number of books per cupboard	100				
3 b	Number of cupboards	10				
	All books in cupboards and accessible to children					
4.	Benches and Chairs for onsite reading	10 per room	5	10	5	2.50
5.	Number of Library periods held per week	3 per week (1 per class)	20	1	1	20.00

6.	Number of Library teachers per school	1 per school	15	1	1	15.00
	Total		**70**			**47.68**
				Percentage score		**68.12%**
II.	***Playground***					
1.	Playground					
1 a	Private playground	200ft x100ft	15	1	1	15.00
1 b	Public playground					
2.	PT Material					
2 a	Skipping rope	1 in 25 children	7.5	13	12	0.00
2 b	Football	1 in 50 children	7.5	7	7	7.50
2 c.	Tennikoit	1 in 50 children	5	7	9	5.00
3.	Drill material					
3 a	Dumbells	25 sets per school	7.5	25	26	7.50
3 b	Leziums	30 sets per school	5	30	29	0.00
3 c.	Drums	1 per school	7.5	1	1	7.50
4.	Number of PT classes held per week	1 per class	20	1	1.25	20.00
5.	Number of PT masters	1 per school	25	1	1	25.00
	Total		**100**			**87.50**
				Percentage score		**87.50%**
III.	***Toilet***					
1.	Number of Toilets					
1 a	Boys	1 each for boys	7.5	1	1	7.50
1 b	Girls	1 each for girls	7.5	1	1	7.50
1 c.	Staff	1 each for staff	7.5	1	1	7.50
2.	Number of Toilet Seats					
2 a	Boys	1 per 25 boys	7.5	6	8	7.50
2 b	Girls	1 per 25 girls	7.5	7	5	0.00
2 c.	Staff	1 per school	7.5	1	1	7.50
3.	Condition	Quality: All toilets must be cleaned daily	5	Yes	Yes	5.00

4.	Sewerage Connection	All toilets with sewage connection	15	14	1	1.07
5.	Water Supply	All toilets with water connection	15	14	0	0.00
6 a	Maintenance	Per month 5 litres phenyl	3	5	6	3.00
6 b		5 kgs bleaching powder	3	5	2	0.00
6 c.		2 brooms	3	2	25	3.00
6 d		1 Poura Karmika	11	1	1	11.00
	Total		**100**			**60.57**
			Percentage score			**60.57%**
IV.	***Classrooms***					
1.	Classrooms					
1 a	Number of rooms used for classes	40 students in a class of 12ft x 15ft	25	8	7	21.88
1 b	HM Rooms	1 per school				
1 c.	Staff Room	1 per school				
1 d	Library	1 per school				
1 e	Storage Room	1 per school				
1 f.	Rooms for other purposes (Details)	As required by the school				
2.	Classroom Dimensions	12 ft x 15 ft				
3 a	Number of children per classroom	40	15	40	44	11.25
3 b	Condition of classroom	Quality: Should be cleaned by the PK once daily	5	7	#REF!	#REF!
4.	Blackboard	1 per classroom	5	7	#REF!	#REF!
5.	Dusters	1 per classroom	5	7	#REF!	#REF!
6.	Benches and desks	1 per 3 children	10	102	#REF!	#REF!
7.	Chalks	3 boxes per month per class	5	21	#REF!	#REF!
8.	Tables for teacher	1 per classroom	2.5	7	#REF!	#REF!
9.	Chairs for teacher	1 per classroom	2.5	7	#REF!	#REF!
10.	Cupboards	1 per room	5	7	#REF!	#REF!

11.	Teaching aids used	8 types per class	5	56	10	0.89
A	Science charts- 4th std onwards	1 per classroom				
b.	Science Models	1 per classroom				
c.	Math's charts	1 per classroom				
d.	Math's Kits	1 per classroom				
e.	Social Science charts	1 per classroom				
f.	Language charts	1 per classroom				
g.	General Knowledge charts	1 per classroom				
h.	Maps and Globes	1 per classroom				
	Total		**85**			#REF!
			Percentage score			**#REF!**
V.	***Water and electricity***					
1.	Electricity Connection	All rooms must be electrified	50	20		0.00
2.	Drinking Water Facility	Number of drinking water taps with regular water supply: 1 per 50 children	50	7	1	7.14
	Total		**100**			7.14
			Percentage score			**7.14%**
	INFRASTRUCTURE TOTAL		**455**			**#REF!**
			Percentage score			**#REF!**
VI.	***Midday Meal***					
1.	No. of children availing of meal	All children in the school	50	304	300	49.34
2.	Quantity of meal	Sufficient for each child	25	Sufficient	Sufficient	25.00
3.	Quality of meal	Includes vegetable, lentil and rice				
			75			74.34

			Percentage score			**99.12%**
VII.	***Materials and Facilities***					
1.	No. of months without uniforms	0	20	0	2	14.29
2.	No. of months without books	0	20	0	1	17.14
3.	No. of months without shoes	0	10	0	2	7.14
			50			38.57
			Percentage score			**77.14%**

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[i] In India, municipal body or local self-government system is a State Subject by the Constitution. Accordingly, the State Governments has enacted independent legislation for the municipal system in the State. These legislations are common or similar broader/macro aspects but differ widely at micro level or actual municipal governance system level. Again, within State between various urban local bodies, there exists diversity in terms of functional sphere, financial powers, resources etc. accordingly we will need municipal performance measurement system, which is broad based and can take any heterogeneity in its fold.