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JNNURM: An Opportunity for Sustainable Urbanisation

Secondary Review Analysis

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November 2012

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Abbreviations Used

AUWSP	Accelerated Urban Water Supply Scheme
BSUP	Basic Services for Urban Poor
CBO	Community Based Organisation
CDP	City Development Plan
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CPHEEO	Centre of Public Health and Engineering Organisation
CSE	Centre for Science and Environment
DPR	Detailed Project Report
EIUSP	Environmental Improvements of Urban Slums Programme
FOP	Financial Operating Plan
GoI	Government of India
HPEC	High Powered Expert Committee
IDSMT	Integrated Development of Small and Medium Towns
IHP	International Hydrological Programme
IHSDP	Integrated Housing and Slum Development Programme
ILCS	Integrated Low Cost Sanitation
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LPCD	Litres Per Capita Per Day
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MGI	McKinsey Global Institute
MLD	Million Litres Daily
MNP	Minimum Needs Programme
MoF	Ministry of Finance
MoHUPA	Ministry of Housing and Urban Poverty Alleviation
MoUD	Ministry of Urban Development
MoUEPA	Ministry of Urban Employment and Poverty Alleviation
MSW	Municipal Solid Waste
NCU	National Commission on Urbanisation
NGO	Non-Governmental Organisation
NIJNNURM	New and Improved Jawaharlal Nehru National Urban Renewal Mission
NIUA	National Institute of Urban Affairs
NSDP	National Slum Development Programme
NUSP	National Urban Sanitation Policy
NUTP	National Urban Transport Policy
O&M	Operations and Maintenance

PPP	Public Private Partnership
RAY	Rajiv Awas Yojana
RWH	Rain Water Harvesting
SLBs	Service Level Benchmarks
SLNA	State Level Nodal Agency
SPV	Special Purpose Vehicle
SWOT	Strengths Weaknesses Opportunities Threats
UBSP	Urban Basic Services Programme
UFW	Unaccounted for Water
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
UIG	Urban Infrastructure and Governance
ULB	Urban Local Body
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UN-HABITAT	United Nations Habitat Programme
UNICEF	United Nations Children's Fund
VAMBAY	Valmiki Ambedkar Awas Yojana
WSP	Water and Sanitation Programme
WTE	Waste to Energy
WWF	World Wildlife Fund

1 Background and Objectives

1.1 Introduction

As the world rapidly urbanises, it is imperative to move cities towards greater sustainability if we are to meet the environmental challenge. Urban infrastructures: their design, planning, construction and maintenance are the key to achieving urban sustainability, and in India, these are fundamentally shaped through public programmes. This current study seeks to analyse the sustainability of JNNURM, one of the largest flagship urban programmes of Independent India.

1.2 Rationale of the Study

1.2.1 Why is Urban Important to the Sustainability?

Urban population has been increasing; more than half of world's population lives in urban areas. It is estimated to reach 72% of the total population in the world by 2050, from 3.6 billion in 2011 to 6.3 billion in 2050 (United Nations, 2012).

People move to cities in order to seek a better life and economic opportunities. However, global consumption of resources is also concentrated in cities with 75% of global energy and material flows consumed by cities in the year 2005 (UN-HABITAT, 2006). This rapid urbanization is also often at the expense of the loss of valuable ecosystems and lands for satisfying the urban demands. Serious environmental, social and economic problems are expected if current and future urban areas continue with the same resource consumption practices without taking into consideration future needs (Daily, 1997; Millennium Ecosystem Assessment, 2005).

The criticality of cities in achieving the sustainability agenda has been highlighted in the past few years. The issue has been explored by a range of international agencies in their studies and reports that have attempted to synthesise current thinking about the relationships between urbanisation and ecological change. These include: UN-Habitat's 2009 report on Human Settlements entitled 'Planning Sustainable Cities'; World Bank's 2010 'Eco^2 Cities' report; UNEP's 2011 'Green Economy Report'; WWF's report on 'Reinventing the City: Three Prerequisites for Greening Urban Infrastructures'; etc. All these studies and reports particularly emphasize the need for interventions that achieve a balance between urban economic development, long-term ecological sustainability, and social justice.

Asian cities, including those in India, are and will be undergoing major transitions during the first half of the 21st century. According to the 2012 United Nations report on World Urbanization Prospects, it is expected that half of Asia's population will live in urban areas

by 2020. By 2030, India will become 40% urbanised with about 590 million people living in urban areas (MGI, 2010). This poses a concern as well as an opportunity to plan for sustainable development.

1.2.2 Why is Infrastructure Important to Urban Sustainability?

Until now, inadequate attention has been paid to reconfiguring urban infrastructures in the urban sustainability discourse, even though construction and maintenance of infrastructures are typically the largest public sector investments in urban areas. While various reports on urban sustainability include different, and often disparate aspects of infrastructure like waste, pollution, energy consumption, it is not clear whether it is realised how fundamental infrastructure is to urban dynamics. If resource flows are concentrated in urban areas, then it is mostly through infrastructure that these resources are directed and flow (Swilling et al. 2012). Moreover, lifestyle choices of urban residents are limited and constrained through infrastructure. The conventional infrastructure consists of mostly centrally planned, city scale structures that lock behaviour of residents in certain paths (Swilling et al. 2012).

Thus, it is evident that infrastructure is a key component of urban sustainability. The prevalent infrastructure systems are derivatives of the industrial age, which are based upon specific technical paradigms that may not necessarily taken environmental factors into consideration. Most conventional infrastructure systems are “end of pipe” solutions. It will thus be necessary to re-think, re-design and reconfigure urban infrastructure if cities are to transition and transform into more sustainable form of settlements.

Therefore, the role of urban infrastructures, their design, construction and operation, becomes critical while aiming for sustainable cities and urbanisation. These infrastructures, in turn, provide an opportunity to transform the lifestyle of the people and target a city’s investment towards sustainable development.

However, there is also an opportunity. The cities in the developing world, which hold a large majority of the urban population, are grossly underserved. The quality of service provided is low and varies substantially between high income to low income areas. While this is a serious concern, and often recognised as such, it also presents a possible opportunity to put more sustainable infrastructures in place, and leapfrog to more sustainable modes of urban development.

1.2.3 Urban Sustainability and Infrastructure

Though sustainability as a term has been in prevalence for last couple of decades, there is no consensus on a universal definition (Sahely, Kennedy and Adams, 2005). In general, all definitions or frameworks of sustainability include a reference to three overlapping components: environmental/ ecological, social/ cultural, and economic. It is often understood that sustainability needs to address all the three (Sahely, Kennedy and

Adams, 2005; Zavrl and Zeren, 2010; Jeon and Amekudzi, 2005). Increasingly, there is an understanding of embeddedness of projects/ systems within a particular political frame, and hence a fourth political/ institutional component is often added.

But this all-encompassing definition many a time leaves it open to wide range of interpretation. Often, either the environmental aspect is emphasised, neglecting the other two. Sometimes, sustainability is conflated with economic sustainability, neglecting the environmental aspects.

Visions of urban sustainability differ equally. While definitions of urban sustainability might differ, there is general agreement on areas of actions. These include:

- Emphasis of public transport and non-motorised modes over personal cars
- Compact, polycentric , mixed used urban form
- A symbiotic relationship with the hinterland
- Recycling of reuse of water
- Minimisation of waste
- High quality accessible public realm
- Democratic, participatory planning and governance
- Just and equitable cities
- Adequate and fulfilling employment

(Kenworthy, 2006; Rogers, 1997; Costa, Marchettini and Facchini, 2004)

As is evident from the areas identified above, a number of those areas are concerned with physical infrastructure. These infrastructural networks provide the setting for the location of and define and control the movement of energy, material and people through the cities. It is important to understand this movement of energy and material through these infrastructures to move cities towards becoming more sustainable. While specific criteria and issues of urban sustainability with each of the infrastructure sectors can be delineated separately, there are some common concerns across these.

In order to transition to more sustainable infrastructure, one needs to understand and assess its impact. While there have been quite a few sustainability assessment criteria, there is general agreement that these methods fail to recognise the interlinkages between the environmental, social and economic aspects of sustainability (Adinyira, Oteng-Seifah and Adjei-Kumi, 2007).

The most generic and broad based tool to understand impact of urban areas (or urban infrastructure in particular) is ecological footprints. ‘Ecological footprint is a measure of the “load” imposed by a given population on nature. It represents the land area necessary to sustain current levels of resource consumption and waste discharge by that population’ (Wackernagel and Rees, 1996: 5). Though it is a single indicator, it is often preferred as it is a single more comprehensive measure of sustainability (Yigitcanlar and Dur, 2001).

Another common approach to understand sustainability of an urban region is to view it as a complex system, and understanding flows of resources through it. Studying this complex flow of resources is study of urban metabolism. Urban metabolism might be defined as "the sum total of the technical and socioeconomic processes that occur in cities, resulting in growth, production of energy, and elimination of waste" (Kennedy, Cuddihy and Engel-Yan, 2007). Generally four broad types of flows are considered: water, energy, materials and nutrients. Understanding urban metabolism does not only help us understand the overall impacts of the urban area, but also understand critical processes that fundamentally undermine sustainability.

It is understood that cities generally disrupt the natural cyclical flow of resources through linear activity (Ravetz, 2000; Rogers, 1997). They require huge inputs of food, energy, water and materials and they spew out emissions, waste water, and organic and inorganic waste. The first principle of moving towards sustainability in urban areas is transition from linear flows to cyclical flows. As cities are concentrations of human activity, it is not possible to close the loop within city or even regional limits. Even a global cycle is preferable to a linear loop, as long as the loop is closed (Ravetz, 2000). Typically, most urban infrastructures in place today are "end of pipe "solutions (Timmeren, Kristinsson and Roling, 2004).

A handful of detailed urban metabolism studies have been carried out in cities (mostly in the developed world) (Newcombe, Kalma and Aston, 1978; Hendriks et al. 2000). These are typically multi-year studies, including detained analysis of stocks and flows. These studies typically require extensive data collection, and research. It is thus difficult to carry out these kinds of detailed studies for most cities, and it is not clear how far the results of one city can be extrapolated for purposes of urban policy. Thus, while urban metabolism is a useful method for understanding processes in an urban area, it is often not possible to understand completely urban metabolism in a city.

The issue of scale is important. Sustainability, in principle means looking at urban areas as embedded into larger regional and global ecosystems. However, in reality, urban infrastructures are the responsibility of city authorities, who may or may not have jurisdiction and decision making power outside of city are. Hence the issue of drawing appropriate boundaries when dealing with sustainability is critical.

While examining sustainability, one needs to look at expanded time horizons. It is often not understood that there are conflicting goals and priorities faced by managers and engineers. These conflicts can be divided as: (i) financial versus technical factors, (ii) short-term versus long-term planning horizons, and (iii) network versus project factors Vanier (2001). Also, these infrastructures are often path dependent, often controlled by limited number of stakeholders (Timmeren, Kristinsson and Roling, 2004).

1.2.4 Why JNNURM?

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM), launched in December 2005, is a flagship project of Government of India. The objective of the project was to lead "a reforms driven, accelerated development of Indian cities, with a particular focus on

urban infrastructure" (MoUD and MoUEPA, 2005a). The Mission comprises of two sub-missions: Urban Infrastructure and Governance (UIG), and Basic Services for the Urban Poor (BSUP). The main thrust of the UIG is on financing major infrastructure projects relating to water supply, sewerage, drainage, solid waste management, road network, urban transport and redevelopment of inner (old) city areas.

The Government of India increasingly realises the importance of India's urbanisation, and the need for it to be sustainable. This concern has been articulated in various government reports and programmes: Sustainability has been highlighted as a major concern in both National Urban Transport Policy and also National Urban Sanitation Policy. Sustainability is also one of the primary mandates for National Transport Policy Development Committee. There is a separate National Mission on Sustainable Habitats (under the National Action Plan for Climate Change), that envisions energy efficiency as an integral component of urban planning, and aims to make Indian cities' sustainable through a variety of means.

While the need for urban sustainability gets articulated in various policy circles, the government also realises the importance of the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the primary national government urban infrastructure fund, as an instrument for shaping urban growth, and hence has far reaching impacts on urban development and sustainability. Some of these aspects of investments currently being made throw up an opportunity to review and assess where and how considerations about environmental sustainability may be promoted.

While the JNNURM does not have an explicit environmental sustainability focus, it has been and will continue to be the primary line of government funding in urban India and thus presents the maximum opportunity for promoting environmentally sustainable urbanisation in India. Moreover, since successors of JNNURM are likely to remain main sources of investment in urban areas, the impacts of other initiatives such as National Mission on Sustainable Habitat will be realised only if JNNURM II targets environmental sustainability more explicitly. Hence it is imperative to incorporate a framework for sustainability in JNNURM II. Also, it is important to integrate other parallel initiatives by the government like National Mission for Sustainable Habitat with JNNURM.

Inserting metrics of the environmental sustainability in JNNURM investments could start to shift the capital investments in a different direction. Even if the government did not adopt formal sustainability criteria, such toolkits could be useful in framing the public consultation and city development plans that are already an established part of selecting investments to be funded under JNNURM. The toolkit would be especially influential in the smaller cities that JNNURM II is likely to focus on. Since these cities have relatively weaker administration, settings have less formalized project prioritization and their greater infrastructure gaps mean more room to start putting infrastructure on a sustainable path rather than retrofit.

1.3 Objectives of the Study

The current study seeks to undertake an analysis of sustainability of JNNURM, the largest chunk of public sector funding yet to be channelled into urban India. The focus of this study is on the UIG sub-mission of JNNURM. The study seeks to ask two key questions of JNNURM:

a. To what extent have considerations of environmental sustainability been incorporated within (explicitly or implicitly) in vision and programme design of JNNURM?
b. To what extent and how were the sustainability goals, as outlined in the vision and programme design, met during implementation?

The study will focus on the first question, and pilot the methodology for answering the second question. The above two-pronged analysis of the programme will help assess the extent to which this programme has facilitated and encouraged urban sustainability. Based on these findings, a set of specific recommendations shall be developed, ensuring that investments in the next proposed phase of this programme are directed towards urban sustainability.

1.4 Scope of Work and Methodology Adopted

Given the practicalities of scale of implementation of national flagship programmes such as the JNNURM, the project is intended to formulate a simple set of guidelines/ checklists. The intention of this study is not to come up with a comprehensive set of guidelines that would cover all issues, but to come with a basic set of feasible rules of thumb. While this study will briefly cover social and economic sustainability, the focus of this report is on environmental sustainability.

These rules of thumb would be developed through a comprehensive review of frameworks for assessing the environmental sustainability of infrastructure in general and different sector in specific. The following sectors would be covered, as these form the pre-dominant areas of outlay: Transportation, Water Supply, Sewerage and Sanitation, Solid Waste Management and Drainage. Urban policy frameworks in India with special reference to infrastructure will also be reviewed to understand the Indian context. This too will help build a set of indicators for further review and analysis.

The first stage of study will also involve secondary review of the literature available on JNNURM, including policy guidelines, reform guidelines, status of the projects, etc. against the set of indicators developed. There would also be a desk review of 20 CDPs developed by the existing JNNURM cities to assess which particular issues of sustainability have been addressed by cities.

In the second stage, field work in one of the cities under JNNURM will be conducted to further understand the process, status of projects and reforms and what measures of sustainability have or have not been incorporated.

The secondary review and field work will form basis of the formulation of recommendations in the third stage. At the end of the study, one will have guidelines, both at the national/ state level and city level to direct the investments made through JNNURM and similar programmes towards environmentally sustainable urbanisation.

1.5 Structure of the Report

The next section gives an overview of the JNNURM, the programme under review. This is followed by the section on overall urban policy framework in India with special reference to infrastructural services including water supply, sewerage, storm water drainage, solid waste management and transportation. The next section discusses sustainability in these specific sectors and gives an overview of the situation in India. The following section is essentially a commentary on sustainability in JNNURM in which the overall programme and 20 CDPs are evaluated against a set of indicators laid out in the same section. Policy implications of this analysis are given in the next section followed by a description of next steps involved in the study.

2 Overview of JNNURM

2.1 Program Brief

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM), launched in December 2005, is a flagship project of Government of India. The objective of the project was to lead "a reforms driven, accelerated development of Indian cities, with a particular focus on urban infrastructure". The duration of the Mission was seven years beginning from 2005-06 to 2011-2012 (MoUD and MoUEPA, 2005a). The ongoing projects have been given a two-year extension upto 2013-14 to complete implementation (MoUD, 2012).

The Mission comprises two sub-missions: Urban Infrastructure and Governance (UIG) administered by MoUD, and Basic Services for the Urban Poor (BSUP) administered by MoHUPA. These 2 sub-missions focussed on select 65 cities (35 cities million plus cities and 30 others including capital cities/ the cities of religious/ historic/ tourist importance). For all other medium and small towns in the country, the UIDSSMT (Urban Infrastructure Development Scheme for Small and Medium Towns) and the IHSDP (Integrated Housing and Slum Development Programme) were launched. These sub-missions and programs replaced a couple of earlier government programmes (AUWSP, IDSMT under UIG and UIDSSMT, and VAMBAY, NSDP under BSUP and IHSDP programs).

The focus area of the UIG and UIDSSMT is urban infrastructure: water supply, sewerage, drainage, solid waste management, road network, urban transport and redevelopment of inner (old) city areas. BSUP and IHSDP, on the other hand, focus on shelter for the urban poor, including re-development of slums. The current study focuses on UIG sub-mission of JNNURM.

Detailed information on JNNURM and UIG is available in ANNEX 1.

2.2 Intent and Program Design

The Government of India realised the importance of urban areas, and their contribution to economic growth. Lack of inadequate infrastructure was identified as one of the road blocks to development of Indian cities. JNNURM was launched as an attempt to close the investment gaps in urban infrastructure.

It was estimated that over a seven-year period, the 63 Urban Local Bodies (original list of ULBs) would require a total investment of Rs. 12,05,360 million (Rs. 1,20,536 crores) in basic infrastructure and services with annual funding requirement being Rs. 1,72,190 million (Rs. 17,219 crores) (MoUD and MoUEPA, 2005a). In order to facilitate this infrastructure creation, the need for a national level initiative was felt that would bring together Central, State and Local Government and catalyse investment flows in the urban infrastructure sector.

In addition to the investment requirements, a need for reform initiatives was also felt in order to create investor-friendly environment, catalyse investment in urban

infrastructure, and ensure sustainable infrastructure development and efficient and sustained service delivery. The stated aim of the programme is to expedite and facilitate "planned development" of identified cities, while its focus is to improve efficiency of urban infrastructure, service delivery, and accountability of local bodies, and also increase community participation.

The Government of India proposed substantial assistance through the JNNURM over the seven-year period. During this period, funds were to be provided for proposals that would meet the Mission's requirements. Under JNNURM, financial assistance was made available to ULBs and parastatal agencies which could deploy these funds for implementing the projects themselves or through the special purpose vehicles (SPVs) that would potentially be set up. The Central and State assistance is not expected to cover entire costs of all projects but is expected to facilitate further investment in the urban sector, the SLNA / ULBs would leverage additional resources from other sources as well. Investment by private sector through PPP has been proposed that enables sharing of risks between the private and public sector. Differential financing pattern was envisaged in JNNURM as given in the Annex. The process of accessing funds is also detailed out in the Annex.

2.3 Program Coverage

JNNURM UIG gave assistance to 65 mission cities across 29 states and 2 Union Territories. Out of the 65 selected, 35 were million-plus cities according to the Census 2001, the remaining 30 included 18 state capitals and 12 cities of religious/ heritage/ tourism importance. These mission cities accounted for 42 per cent of the total urban population in 2001. There were only six non-class I cities in the list; Kohima and Panaji being Class II, and Nainital, Itanagar, Bodhgaya and Gangtok being Class III (Census of India, 2001).

Based on information from government websites and documents, the selection process for the cities is not very clear. Although all million plus cities were covered, how the additional cities were selected is unclear. There was no assessment carried out for particular cities before selection.

2.4 Analysis of Money Spent

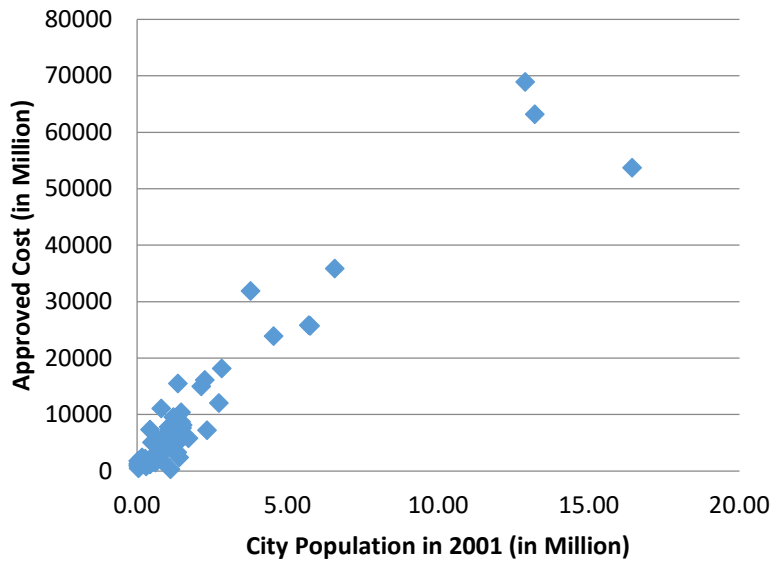
All financial and other data on JNNURM is regularly updated on a website dedicated to the mission (http://jnnurm.nic.in/). This section presents key analysis of the financial data available. The data available online is aggregated by city and by project; with details on approved cost, commitments across Centre, and State governments and ULBs, the amount released by Centre, the amount utilised by every project, and the status of project completion.

2.4.1 Utilisation vs. City Size

Reported data on 65 cities on the JNNURM website shows that total utilisation under the mission has been 361,101 million rupees against total approved cost of 622,508 million. Analysis of funding patterns (with data available on http://jnnurm.nic.in/ as on 28th

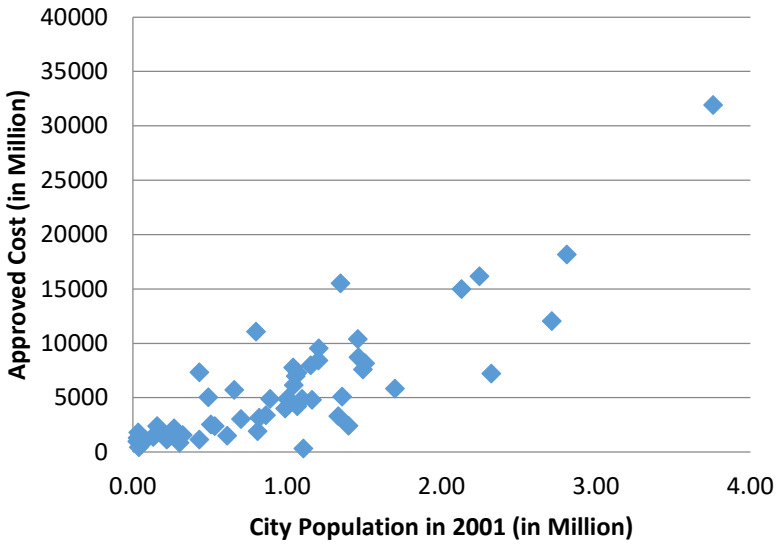
September 2012) indicates that the total amount of funding approved is proportional to the city size in general (refer Fig. 1 and Fig. 2). Hence, the per capita approved cost, apart from few outliers, is below Rs. 10,000(Fig. 3). Per capita utilisation for most of the cities is below Rs. 5,000 indicating average 50 per cent utilisation as compared to approved cost (Fig. 4). While per capita costs can be one of the indicators of meaningful distribution of funds, there are a couple of factors to be taken into account. Most of the previous government schemes have been implemented in bigger cities and these cities have also had access to multilateral assistance, as also private investments.

Fig. 1: City Population vs. Approved Cost



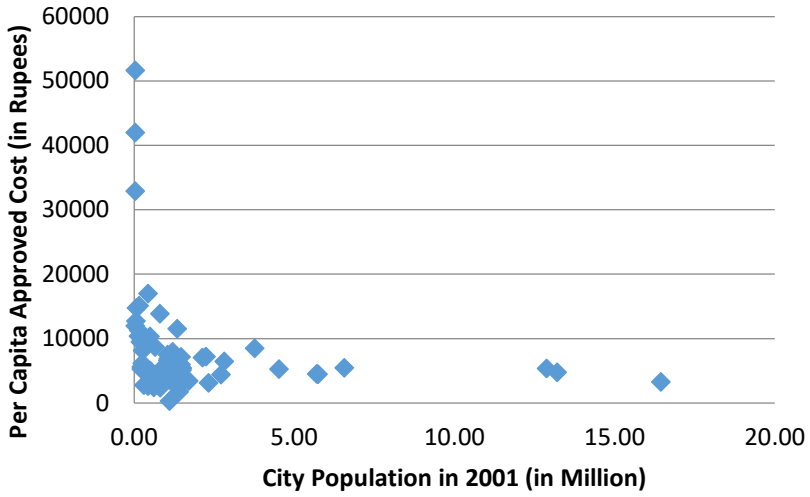
Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012; Census of India, 2001

Fig. 2: City Population vs. Approved Cost (< 4 million cities)



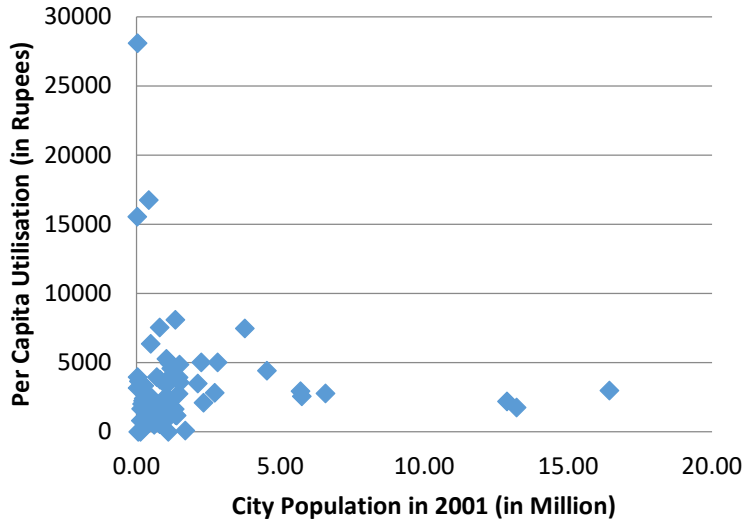
Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012; Census of India, 2001

Fig. 3: City Population vs. Per Capita Approved Cost



Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012; Census of India, 2001

Fig. 4: City Population vs. Per Capita Utilisation

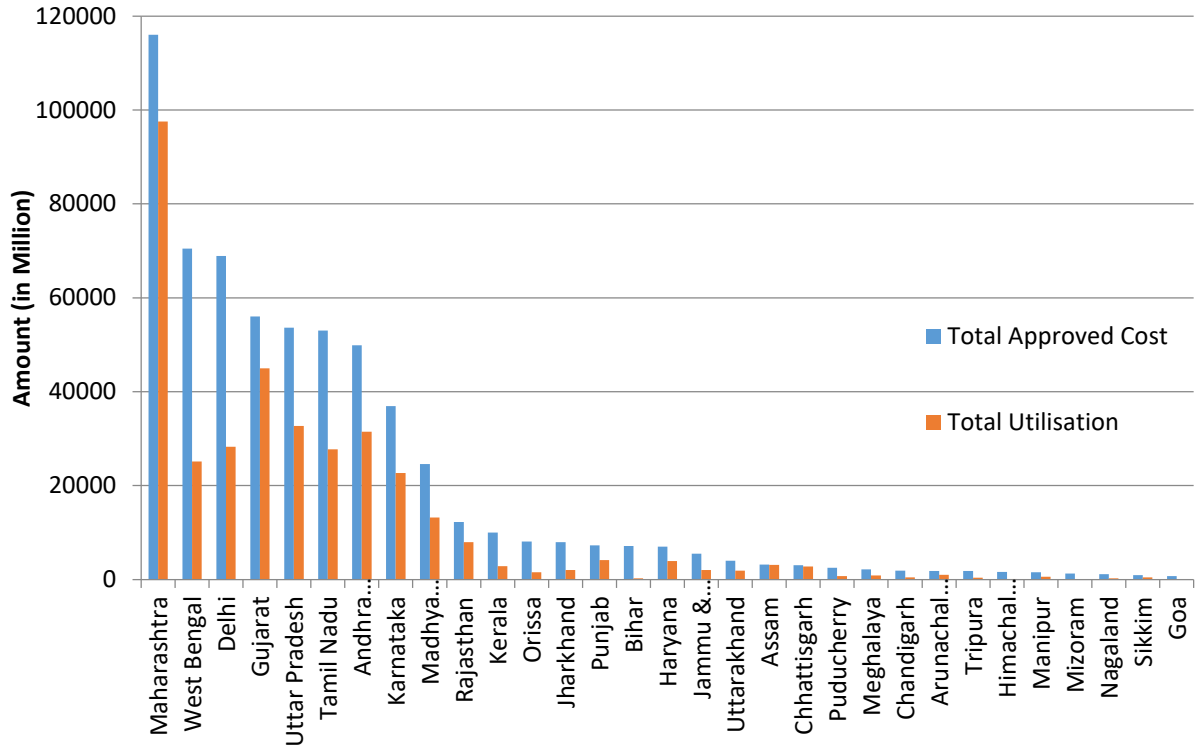


Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012; Census of India, 2001

2.4.2 Utilisation vs. State Level of Urbanisation

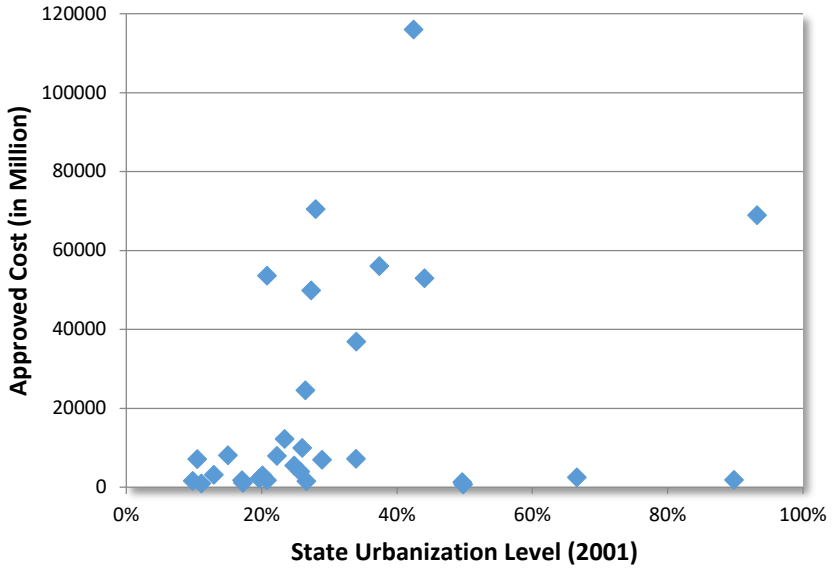
The state-wise approved costs and total utilisation are given below (Fig. 5). Analysis of state-wise funding and levels of urbanisation do not show any correlation (Fig. 6).

Fig. 5: Total Approved Cost and Utilisation across States



Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012.

Fig. 6: State Urbanisation Level vs. Approved Cost

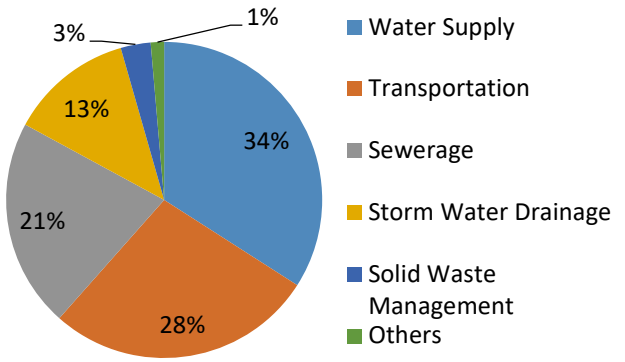


Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012; Census of India, 2001

2.4.3 Utilisation across Sectors

The eligible sectors under the UIG sub-mission of JNNURM are given in the Annex. However, the guidelines do not stipulate the share of each sector. As stated above, total amount utilised till September 2012 is 361,101 million rupees. Distribution of amount utilised across sectors is as given in the Fig. 7. Maximum investment has gone into water supply projects followed by transportation and sewerage.

Fig. 7: Utilisation Across Sectors

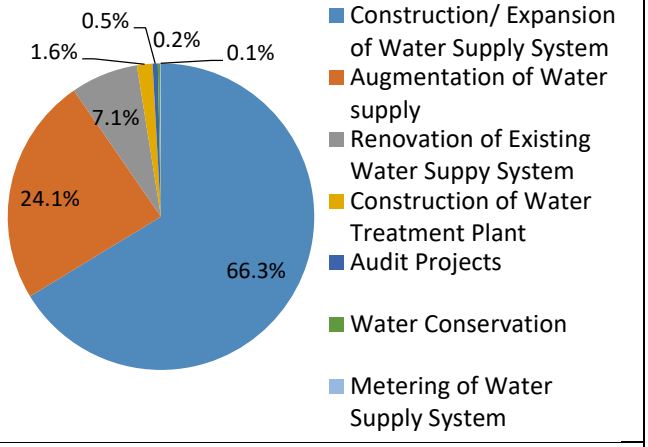


Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012

a. Water Supply

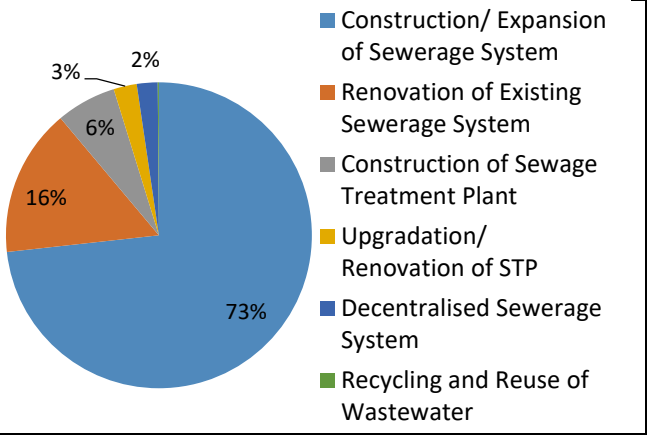
Total amount utilised in water supply sector is 123,009 million rupees. Two-thirds of the money in the water supply sector has been spent on laying down new pipes and expanding the water supply system. Almost a quarter was spent on augmenting water supply. Water treatment plants received only 1.6% of the funding while projects like water conservation and metering of water supply system are a one-off instance in the entire list.

Fig. 8: Utilisation in Water Supply Sector



Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012.

Fig. 9: Utilisation in Sewerage Sector



Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012.

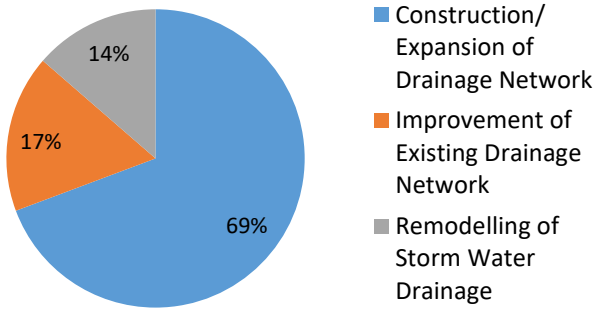
b. Sewerage

Total amount utilised in sewerage sector is 77,152 million rupees. Almost three-fourths of the spending in this sector has been on the construction and expansion of sewerage system, essentially an off-site system. Only one project on a decentralised sewerage system and one involving recycling and reuse of wastewater have been implemented.

c. Storm Water Drainage

Total amount utilised under storm water drainage projects is 45,708 million rupees. More than two-thirds of the investment has gone into the expansion of the drainage network while the remaining one-third has been utilised for improvement and remodelling of the existing storm water drainage network.

Fig. 10: Utilisation in Storm Water Drainage Sector



Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012.

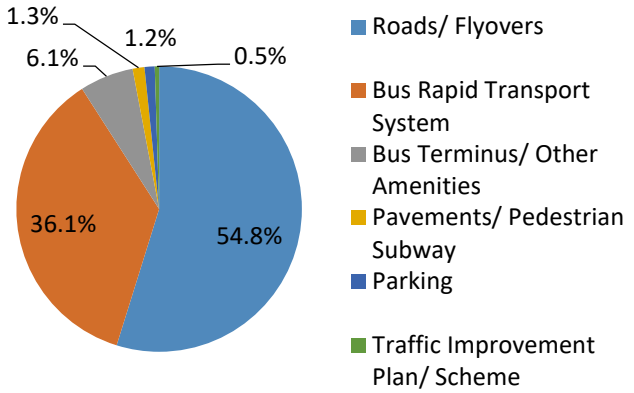
d. Solid Waste Management

Total amount utilised in solid waste management projects is 11,073 million rupees. Since most of the projects in solid waste management were titled as solid waste management for the city, it was difficult to further classify the projects.

e. Transportation

Total amount utilised in transportation sector is 99,229 million rupees. More than half of the money in transportation sector has been spent on building roads and flyovers. Public transportation has received about 36% of the investment. Only 1.3% of money has gone into construction of pavements and pedestrian subways.

Fig. 11: Utilisation in Transportation Sector



Source: Analysis of data sourced from http://jnnurm.nic.in/, September 2012.

Overall, 622,508 million rupees have been approved; out of which 287,780 million rupees have been committed by the Central Government and the rest by the State and local government. Central assistance released amounts to 179,717 million rupees. Total utilisation has been 361,101 million rupees (including state and ULB contribution[1]). Out

[1] Amount committed and released by the state government and urban local body is not given in the documents.

of 554 approved projects, 143 projects have been completed; 42 in water supply, 62 in transportation, 18 in sewerage, 13 in storm water drainage, 5 in solid waste management, and 3 other projects.

3 Review of Policy Framework in India

Although there were a few government schemes directed at urban India since independence, and a renewed interest in urban areas since 1980s, the Indian government has only recently recognised the importance of urbanisation (Sivaramakrishnan, 2011). A review of the urban policy framework in India, with a special emphasis on urban infrastructure, is presented below.

3.1 Urban and Infrastructure Development in Five Year Plans[2]

A review of the Five Year Plans[3], the primary instrument of planning in India, shows that though there were some investments made towards infrastructure development in urban India since independence, rural and industrial development was the primary focus of public investment for the first three decades.

The First Plan laid stress on surveys of urban conditions and the preparation of master plans for cities. The Plan also provided for subsidised housing schemes and advocated slum clearance. Provisions of environmental services were dealt under the health component and Public Health Engineering Departments were created in the states to provide for the same. The Second Plan highlighted the need for developing competent staff and strengthening local government, while the Third Plan called for the preparation of regional and urban development plans. By the end of the Third Plan period, almost all the states had introduced town planning legislation. Environmental improvements in slums gained importance and provisions for water supply and sanitation were also made separately under the health budget. The Fourth Plan recognised the concept of minimum needs, and asked for fulfilment of these needs. Water and Sanitation was moved from the Ministry of Health to the Ministry of Works and Housing.

Urban development was recognised as a separate subject only in the Fifth Five Year Plan of 1974. The Fifth Plan (1974-79) concentrated on completion of earlier programmes. Slum Improvement was made a part of the Minimum Needs Programme (MNP). The MNP continued in the Sixth Five Year Plan (1980-85), and the focus for water and sanitation was on completion of spill over programmes. This Plan emphasized the crucial linkage between water, sanitation and housing, and also focused on small and medium size towns. In 1981, the GoI launched the Integrated Low Cost Sanitation (ILCS) programme with an aim to abolish manual scavenging. During the Seventh Five Year Plan (1985-1989), the Urban Basic Services Programme (UBSP) was launched in collaboration with UNICEF, while the Environmental Improvements of Urban Slums Programme (EIUSP) continued under the MNP. In 1985, the National Commission for Urbanisation was constituted that submitted its report in 1988.

[2] Based on Government of India Planning Commission's Five Year Plans Documents accessed at http://planningcommission.nic.in/plans/planrel/fiveyr/welcome.html, September 2012.

[3] Five Year Plans guide the socio-economic development of India. These are developed, executed, and monitored by the Planning Commission.

In 1990-91, the UBS scheme was revised to bring about functional integration with EIUS and came to be known as Urban Basic Services for the Poor (UBSP) with 100 per cent central funding. The focus was on integration of projects and converting dry latrines to remove scavengers. In 1996, the GoI launched National Slum Development Programme (NSDP) with the objective of upgrading urban slums by providing physical, social amenities and shelter upgrading.

The Ninth Five Year Plan (1997-2002) emphasized the strong linkages between sanitation and health. Alongside government schemes, the 1990s witnessed a range of donor funded projects taking off in various cities. During the same time, recognising severe gaps in infrastructure provision, the GoI constituted an expert group on the Commercialisation of infrastructure projects in 1996. In 2001, the GoI launched VAMBAY with the primary objective of facilitating construction and upgradation of dwelling units in slums and to provide a healthy and enabling urban environment through community toilets under the Nirmal Bharat Abhiyan (Clean India Campaign).

The Ninth Plan was the first plan to highlight the goal of developing economically efficient, socially equitable, and environmentally sustainable entities as a core objective. In this way, the Planning Commission begins to adopt the language of the Green Agenda for urban sustainability.

With regards to the environmental sector, the Tenth Plan (2002-2007) continued on the same trajectory as the Ninth Plan. On the other hand, for the housing and urban affairs sector, the Tenth Plan began to address urban poverty alleviation and slum upgrading, issues which were targeted by JNNURM. The Eleventh Plan, still under implementation, uses JNNURM as the tool for achieving balanced and sustainable urban development.

The approach paper to the XII Five Year Plan recognises the potential of Indian urbanisation to enable growth and employment creation, along with the potential for synergistic rural-urban linkages. It also highlights the severity of urban India's challenges, and hence places a high priority on urban development. Key intervention areas identified by the Planning Commission include: long-term urban and regional planning, investment in new urban infrastructure assets and maintenance of assets with separate budget for O&M expenditure, strengthening urban governance, strengthening soft infrastructure along with building hard infrastructure, addressing basic needs of the poor and ensuring environmental sustainability of urban development.

Sustainability concerns are explicit in the Twelfth Plan. It calls for ensuring the environmental sustainability of urban development through the creation of an institutional mechanism for convergent decision-making. The Plan specifically recommends for improved water management, including recycling of waste water in large cities and new townships, and strengthening of public transport, especially in under-served urban centres.

3.2 Landmarks in Urban and Infrastructure Development

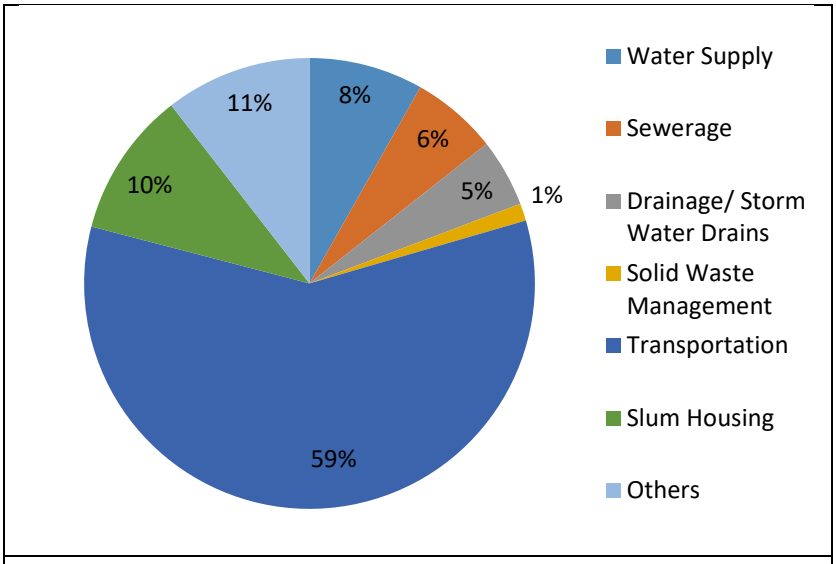
The National Commission on Urbanisation was set up in 1985 under the chairmanship of Charles Correa to understand the process of India's urbanisation and make recommendations for the same. Released in 1988, NCU report called for balanced and sustainable development of urban centres in the city. The recommendations of NCU Report were essentially advisory in nature. No effort was made at either central or at state level to implement them and the exercise remained on paper (Planning Commission, 2007).

About a decade after NCU, the GoI constituted the expert group on the Commercialisation of infrastructure projects in 1996 under the chairmanship of Dr. Rakesh Mohan. The group identified serious deficiencies in terms of access to facilities, the lack of O & M, and a huge gap in investment. Lack of investment was attributed to two reasons: limited financial capacity of the government and the services being not financially sustainable on their own. An important issue the report stressed was the need of an independent regulator with statutory powers for each sector. Moreover, it clearly recommends the separation of regulatory and operator roles (MoF, 1996).

While urban infrastructure received attention in various plans and programmes, it was only in 2005 that a concerted effort was made to provide for urban infrastructure services. JNNURM was launched in order to cater to the infrastructure demands of cities. It linked funding for provision of infrastructure with the implementation of reforms. It made available funding for cities to invest in water supply, sewerage, drainage, solid waste management and urban transportation. Provision of basic services to the urban poor was given due importance in the JNNURM (MoUD and MoUEPA, 2005a).

The High Powered Expert Committee (HPEC) was set up by MoUD in 2008 for estimating investment requirements for the provision of urban infrastructure services. Recognising inevitability of urbanisation, and deficit of services in urban areas, the Committee made recommendations on how to deal with the challenge. It has projected huge investment requirements for providing public services to specified norms and also supporting the growth process 0.7 per cent of GDP in 2011-12 to 1.1 per cent by 2031-32. It also proposed framework for governing and financing such infrastructure and public services. The Committee has estimated an overall funding of 39,18,670 crores to be spent over 25 years. This implies 35 times increase in investment as compared to investments made under JNNURM (HPEC, 2011). A shift in the proposed sectoral composition can be seen with almost 60 per cent of the investment to be made in transportation sector. The focus of the transport projects, however, remains on roads. The HPEC recommendations seem to continue to allocate substantial funding to the larger cities.

Fig. 12: Sector-wise Urban Infrastructure Requirement as proposed by HPEC (2012-31)



Source: HPEC, 2011.

The HPEC made a case for a comprehensive framework for urban policy and planning to be achieved through increased investment in urban infrastructure provision and maintenance, renewal and development of urban areas including slums, regional and metropolitan planning, integration of transportation and land use planning, provision of services to the urban poor, institutional reforms and decentralisation. The HPEC has also proposed for New and Improved JNNURM (NIJNNURM) with hundred per cent coverage and increased outlay (HPEC, 2011).

3.3 Sectoral Policies and Programmes

A brief review of national policies, programmes and schemes under each sector is presented below; implications to sustainability are discussed.

3.3.1 Water Supply

Water supply and Sanitation are State Subjects according to the Indian Constitution[4]. However, the Government of India, provides considerable financial and technical assistance to States, and thereby issues recommendations and advisories that support the proper implementation of national level schemes and programs.

There is no national level policy for urban water supply in India. The National Water Policy, 2002 and subsequent Draft National Water Policy, 2012 briefly talked about urban water supply and sanitation and suggested use of surface water for urban domestic water supply. It recommends the re-use of treated water for secondary purposes and integration of water and sewerage schemes.

[4] The Constitution of India provides for legislative subjects under three Lists: List 1 ('Union list' containing subjects for Parliamentary legislation and Central authority), List II (or the 'State List' containing entries which are matters of state legislation and state authority) and List III ('Concurrent List', over which both Union and states have authority and can be subjects of legislation by both legislatures)

There are water quality criteria in place for water pollution management and control. These are set by the Central Pollution Control Board (CPCB) of the Government of India. National Urban Water Awards are presented by the Government of India to recognise best efforts in water supply services since 2008.

The government of India launched a Service Level Benchmarking Initiative for environmental services: water, waste water, solid waste and drainage. A Handbook on Service Level Benchmarking (SLB) was developed and released by the MoUD in 2008. It identified minimum set of standard performance parameters for the environmental services; defined a common minimum framework for monitoring and reporting on these indicators; and set out guidelines on operationalizing this framework in a phased manner. The intention of the initiative is to enable the cities to benchmark their current status against a set of parameters, and also measure their progress. The initiative will create consensus on desired service standards, enable comparisons across time and cities, highlight and help address issues of data quality, and enable ULBs to self-report. The emphasis is placed on performance improvement planning based on the SLB data generated. The indicators do not talk about environmental sustainability explicitly but focus on the coverage of environmental services and efficiency in cost recovery.

Service level benchmarks for water supply sector are presented in Box 1.

Box 1: Service Level Benchmarks in Water Supply Sector

Coverage of water supply connections	100%
Per capita supply of water	135 lpcd
Extent of metering of water connections	100%
Extent of non-revenue water	20%
Continuity of water supply	24 hours
Quality of water supplied	100%
Cost recovery in water supply services	100%

Even though provision of water is a state subject; given the importance of sector a number of central programmes and schemes are in place for urban water supply. Launched in 1993-94, centrally sponsored Accelerated Urban Water Supply Program (AUWSP) was meant to finance the infrastructure for safe and adequate water supply facilities to urban population of the towns having population less than 20,000 (as per 1991 Census). The underlying objectives of the program were to improve the environment and the quality of life, and to enhance socio-economic conditions and productivity to sustain the economy of the country. The program emphasised rationalisation of tariffs, increased investment in water supply sector, extension of subsidies to target groups, water conservation, and operation and maintenance (O&M). Distribution systems were given priority over new capital works along with leak detection and preventive maintenance and rehabilitation of existing system. The programme has been subsumed under JNNURM since 2005.

Another Centrally sponsored scheme of Integrated Development of Small & Medium Towns (IDSMT) initiated in the year 1979-80 and subsequently subsumed in the UIDSSMT Scheme (JNNURM) in 2005, also provided funding for water supply projects to

towns/cities with an urban local body and population upto 5 lakhs. The underlying premise of IDSMT was that investment in the development of small urban centres would help in reducing migration to large cities and support the growth of surrounding rural areas as well. The scheme aimed at improving infrastructural facilities and helping in the creation of durable public assets; decentralising economic growth and employment opportunities and promoting dispersed urbanisation; increasing the availability of serviced sites for housing, commercial and industrial uses; integrating spatial and socio-economic planning as envisaged in the Constitution (74th Amendment) Act, 1992; and promoting resource-generating schemes for urban local bodies to improve their overall financial position.

Mega cities (Mumbai, Kolkata, Chennai, Bangalore and Hyderabad) also received central assistance for water supply under the programme called 'Infrastructure Development in Mega Cities'. This programme is on-going. In addition to the programmes and schemes discussed, water supply has been provided to the slums and urban poor through a number of other schemes discussed later.

In addition, there are a number of smaller schemes for specific regions (north-eastern urban areas) and towns for specific improvements in water systems including Lump Sum Provision for the Projects/Schemes for the Benefit of North-Eastern States including Sikkim and Urban Infrastructure Development Scheme in Satellite Towns.

3.3.2 Sanitation and sewerage

Along with investments in water supply, the AUWSP used to fund limited investments in sewerage systems in Indian cities – especially since sewerage was assumed the only solution suitable for urban India until the mid-2000s when on-site sanitation was recognized as a legitimate alternative, and found a place in the National Urban Sanitation Policy (NUSP) formulated in 2008.

The aim of NUSP is to transform urban India into "community-driven, totally sanitised, healthy and liveable cities and towns".

The goals of the Policy are to generate awareness of environmental health and change behavior to adopt healthy sanitation practices; achieve open-defecation free cities and sanitary and safe disposal; re-orient institutions to mainstream sanitation; and promote proper operation and maintenance of sanitation facilities. It stress on the outcomes of universal coverage and 100% treatment of waste, but does not stipulate a particular method. It also recommends looking beyond conventional sewerage systems, stresses process, and hence recommends constitution of a City Sanitation Task Force for each city, preparation of City Sanitation Plans and State Urban Sanitation Strategy. The projects identified under CSPs are to be funded wherever possible from existing schemes like JNNURM UIG and UIDSSMT.

Rapid implementation of these plans is encouraged through a national award scheme that rewards cities based on outcomes. While this policy pertains to management of human excreta and associated public health and environmental impacts, it recognises

that integral solutions need to take account of other elements of environmental sanitation, i.e. solid waste management; generation of industrial and other specialized / hazardous wastes; drainage; as also the management of drinking water supply.

The Policy has several implications for urban sustainability. Hundred per cent coverage and open-defecation free cities would mean increased access to safe sanitation and reduction in water contamination, both of which would lead to improved health outcomes. It also suggests recycling and reusing treated wastewater for non-potable uses, which conserves water. Providing for operation and maintenance of the system through levy of tariffs and proper revenue collection has been recommended in the policy to ensure financial sustainability. The policy addresses the needs of the urban poor by highlighting the disease burden caused by inadequate sanitation, and puts as its top priority 100% coverage of all urban residents, including homeless.

In parallel, the service level benchmarking initiative also proposed for sewerage and sanitation sector, indicators for coverage and proper collection and treatment. The other benchmarks are as given in Box 2.

Box 2: Service Level Benchmarks in the Sanitation Sector

Coverage of toilets	100%
Coverage of sewage network services	100%
Collection efficiency of the sewage network	100%
Adequacy of sewage treatment capacity	100%
Quality of sewage treatment	100%
Extent of reuse and recycling of sewage	20%
Efficiency in redressal of customer complaints	80%
Extent of cost recovery in sewage management	100%

Sanitation rating exercise for Class I cities was also commissioned by the MoUD in the year 2009. The key indicators used in the exercise included: no open defecation, adequate public sanitation facilities, elimination of manual scavenging, proportion of total human excreta generation that is safely collected, treated and disposed of, and proportion of treated wastewater recycled and re-used. Process related indicators included: monitoring and evaluation systems in place to track incidences of open defecation, all sewerage systems working properly and no ex-filtration, all septage cleaned and safely transported and disposed after treatment, from on-site systems. Outcome related indicators included: quality of drinking water, water quality in water bodies in and around city, and reduction in water borne diseases (MoUD, 2009a).

In terms of programmes, there has been no dedicated urban sanitation programme at the national level, and JNNURM and UIDSSMT schemes being funding lines to draw on, for urban sanitation projects. Some cities like Mumbai also have water and sewerage projects financed by external support agencies like the World Bank.

3.3.3 Storm Water Drainage

Storm water drainage in India has not received dedicated attention in either the policy framework or in national programmes. Storm water drainage projects were subsumed under the JNNURM/UIDSSMT schemes as infrastructural services. The service level benchmarks have been set for the sector by MoUD recently.

Box 3: Service Level Benchmarks in Storm Water Drainage Sector

Coverage of storm water drainage network	100%
Incidence of water logging/flooding	0

Key indicator used sanitation rating exercise included: proportion of total storm water and drainage that is efficiently and safely managed, storm water drainage systems functioning and maintained (MoUD, 2009a).

3.3.4 Solid Waste Management

While there is no policy on national solid waste management, the Municipal Solid Wastes (Management and Handling) Rules stipulate the standards in the sector. These rules were formulated by the Ministry of Environment and Forests in 2000 and are applicable to every municipal authority. The rules lay out recommendations for municipal solid waste management in India. The Rules recommend segregation of waste through community participation; prohibit manual handling of the waste, and mandates covered vehicles to be used for transportation of waste. Landfilling has been restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. The rules also lay out minimum standards for water and air quality in order to prevent pollution.

Service level benchmarks for solid waste management are given in Box 4. Key indicators used in sanitation rating include: proportion of total solid waste generation that is regularly collected, treated and safely disposed of, city wastes cause no adverse impacts on surrounding areas outside city limits, efficient solid waste management (collection and treatment) (MoUD, 2009a).

Box 4: Service Level Benchmarks in Solid Waste Management Sector

Household level coverage of solid waste management services	100%
Efficiency of collection of municipal solid waste	100%
Extent of segregation of municipal solid waste	100%
Extent of municipal solid waste recovered	80%
Extent of scientific disposal of municipal solid waste	100%

3.3.5 Transportation

Realising the growing problems in mobility on the one hand and its importance in accelerating economic growth and improving quality of life on the other, National Urban Transport Policy (NUTP) was formulated in 2006.

The policy envisions people-centric transportation plans, liveable cities and evolution of appropriate urban form`. The objective is to ensure access to safe, affordable, quick, comfortable, reliable and sustainable transportation for all urban residents. It aims to achieve this through integrating land use and transport planning, equitable allocation of road space with people as focus and not vehicles, promoting and reserving lanes for public transportation, providing infrastructure for non-motorized transport, disincentivising private car use, improving access to business areas and planning for freight traffic. The policy also recommends for reducing pollution through change in travel practices and use of cleaner technologies. Institutional and financial mechanisms and capacity building have been proposed to realise the objectives of the policy; importance of pilot projects has been highlighted.

The policy has both direct and indirect implications for urban sustainability. Direct impacts include possible reduction in emissions due to decrease in use of personal vehicles, increase in public transportation and non-motorised vehicles. The policy will also make transportation more equitable by increasing access, and possibility improved road safety. Possible indirect impacts include restriction of urban sprawl by designing of transportation system, which encourages growth around itself.

Service level benchmarks for urban transport have been developed by the MoUD that evaluate level of services in urban transport on the basis of presence of public transport, pedestrian infrastructure, non-motorised transport facilities, travel speed along major corridors, availability of parking spaces, road safety, pollution levels, integrated land use transport system, and financial sustainability of public transport.

There have not been any national level programmes on urban transportation except Infrastructure Development in Mega Cities and IDSSMT and subsequently JNNURM.

3.4 Infrastructure and Urban Poverty in India

As discussed in the section on Five Year Plans, infrastructure provision to the urban poor has taken place through a number of schemes and programmes including EIUS, UBSP, NSDP, VAMBAY, etc. Since JNNURM all these schemes and programmes have been subsumed under JNNURM for mission and non-mission cities (BSUP and IHSDP respectively).

Realising the growing problem of slums and the limitations of piecemeal programmes and schemes, MoHUPA launched RAY in 2009 with the vision of a “Slum free India”, aiming to tackle the challenge of slums and accessible shelter in urban areas. An on-going program, it hopes to bring slums within the formal system, address failures of the formal system, and tackle the challenge of shortage of land and housing.

RAY lays down conditionalities for the States to access funding through the program; the critical conditionality being security of tenure and legal title to the poor. It also stresses the implementation of three pro-poor reforms under JNNURM: internal earmarking within local body budgets for basic services to the urban poor; provision of basic services to urban poor, and earmarking at least 20-25 per cent of developed land in all housing projects (both public and private agencies) for housing for economically weaker segments and lower income groups. It also requires each state to prepare a Plan of Action for Slum Free Cities, and a specific plan for identified cities. The states also need to commit to a 'whole-city' approach.

The support from the Government of India would include financial and technical support. RAY is also significant because though it lays out a particular methodology of process to be followed, it is agnostic about specific solutions taken up by the city, and approves of a whole range of models from in-situ slum upgradation to low cost housing.

The scheme essentially is in the framework of equity and access to housing and sanitation services. The environmental aspects of sustainability do not feature explicitly. The scheme, however, emphasises on the provision of total sanitation with individual water sealed toilets and water connections to each household. Provision of total sanitation in slums is in line with the objectives of the NUSP. The scheme also calls for reconfiguration of slums based on the plan for internal infrastructure giving due importance to the provision of infrastructure in the first place.

4 Sectoral Analysis

4.1 Sustainability in Specific Sectors

4.1.1 Water and Wastewater

The essential functions of urban water and waste water systems are provision of clean water for all users, removal and cleansing of waste water, and taking care of storm water to avoid flooding (Hellstorm et al. 2000). To move towards additional goals of environmental sustainability, the system should uses resources efficiently, minimise waste through reduction of losses, reuse and recycling, contribute to public health, and be flexible and adaptable, and also encourage people to change behaviour (Balkema et al. 2002, Hiessl, Walz and Toussaint, n.d.; Hellstorm et al. 2000; Lundin and Morrison, 2002; Valentin and Spangenberg, 2000; Milman and Short, 2008). Most common characteristics of sustainable water and wastewater system are given below.

Environment	Water Supply: Optimum resource utilisation (water, energy and land), Reduction in consumption levels, Reduction in losses, Protection of water sources Waste Water: Optimum resource utilisation (water, energy and land), Reduction in waste (water, emissions) Minimum acceptable quality of effluents, sullage and septage Common: Re-use of water and energy, Integration in natural cycles, increased resilience and adaptability
Design and Technology	Durability, ease of construction, flexibility/ adaptability, ease of maintenance, reliability, transferability
Social & Public Health	Increased Coverage and Accessibility to safe drinking water and improved sanitation facilities, Reduced risk of infectious and other diseases (including protection from toxic compounds), Cultural Acceptance, Equity (present and inter-generational), Awareness/ participation,
Economic	Low per capita cost, low costs of O & M, affordability, cost effectiveness
Compiled from: Balkema et al. 2002, Hiessl, Walz and Toussaint, n.d.; Hellstorm et al. 2000; Lundin and Morrison, 2002; Valentin and Spangenberg, 2000; Milman and Short, 2008; MoUD, 2009a.	

The current water and wastewater system in most developed and developing countries is characterised by centralised structures and open loop design (Balkema et al. 2002; Hiessl, Walz and Toussaint, n.d.). These systems were developed in industrialised countries between 1850-1920 and later spread to other parts of the parts through colonialism (Graham and Marvin, 2001).

The centralised systems require high levels of resources such as energy, money, space and expertise and also pose threat to environment through emissions (Balkema et al. 2002). Most of these systems mix different waste (e.g. domestic with industrial), thus making recovery and reuse of resources more expensive and difficult. (Balkema et al.

2002; Hiessl, Walz and Toussaint, n.d.) In addition, these infrastructure systems are associated with long life spans and huge sunk costs, and hence there is often high path dependency and high lock-in (Hiessl, Walz and Toussaint, n.d.; Nielsen et al. 2007). These systems are often bounded by large institutional apparatus, and often the investments are often made in routine ways because of inertia (Nielsen et al. 2007). In developing countries, there are additional challenges of covering existing backlog, providing for additional population and also coping with high capital costs (Varis and Somlyody, 1997).

There are apparently limits to how sustainable these conventional systems can be made. These systems were conceptualised and designed primarily to provide service provisions to large number of urban residents and ensure public health, and not for sustainability (Nielsen et al. 2007). Since service provision is the primary purpose, cities increasingly depend on the conventional technology to source water from far away resources.

Historically, upgradation of infrastructure, especially waste water treatment has focussed on decreasing the pollution load, whereas the more sustainable approach would be to recycle water (Niemczynowicz, 1993). Some of the alternative technological options are rainwater infiltration, recycling water or using rainwater for toilet flushing, urine separation etc. (Balkema et al. 2002).

While there are several technological breakthroughs which could be more sustainable, but it is not clear how easily these can be integrated into existing systems or whether one will need to opt into newer systems (Balkema et al. 2002; Hiessl, Walz and Toussaint, n.d.). Moreover, there are huge financial implications for restructuring these existing systems (Hiessl, Walz and Toussaint, n.d.). However, there might be a possibility of this assimilation happening as major parts of existing systems, atleast in developed countries are reaching end of their useful life (ibid). Moreover, as there is incomplete coverage in developing countries, alternative technological trajectory might be possible.

4.1.2 Storm Water Drainage

Storm water drainage in urban areas is generally characterised by two interconnected drainage systems: the major system that reduces the risk of flooding and the minor system that eliminates inconvenience due to collection of surface water (UNESCO/IHP, 2006). Urban drainage interacts with the natural water system. Drainage also interacts with other water infrastructures and water resources. For example, there is often an influx of sewage and solid waste in storm water drains leading to pollution of receiving bodies (UNESCO/IHP, 2006).

With increase in urbanisation and built-up areas, there is a high incidence of impervious surfaces that leads to increased incidence and magnitude of storm water runoff and local flooding (Nielsen et al. 2007). Furthermore, the increase in impervious systems reduces the surface water recharge and also results in reduced groundwater recharge. Also, climate change is an additional challenge to drainage systems, as the rainfall patterns change, and the intensity of rainfall increases (Nielsen et al. 2007).

For storm water drainage to be sustainable it needs to go beyond its function of carrying rainwater, and reducing flooding, and needs to work with natural water cycles. This implies reducing run-off by either allowing water to percolate to the underground water table, or reach surface water with minimum losses on the way. In addition, to be truly sustainable, there needs to be synergy between the natural drainage systems, and man-made ones. This means ensuring that processes of urbanisation do not disrupt natural water channels by construction of buildings and infrastructures in their course.

Characteristics of sustainable storm water drainage system will be:

Environmental	Preservation of natural drainage system, reduced run-off, ground water recharge, surface water recharge
Design and Technology	Ability to respond to seasonal fluctuations
Social and Public Health	Increased coverage, reduced instances of flooding, reduced risk of water-borne diseases
Economic	Low per capita cost, low O&M cost, cost effectiveness
Compiled from: UNESCO/IHP, 2006; Nielson et al. 2007; Sharma, 2008; MoUD, 2009a; MoUD, n.d.	

In developing countries, the incidences of local flooding are much higher, as urbanisation is often fast and unplanned, with drainage systems not in place. Even when in place, these systems are frequently unable to cope with sudden and heavy drains. There is an additional issue in developing cities of urban poor often dwelling along drainage channels, or in flood plains, at considerable health risks to themselves.

4.1.3 Solid Waste Management

Compared to industrial and other waste streams, municipal solid waste is more complex as it comprises of different heterogeneous wastes (Wang and Nie, 2001). Municipal solid waste is composed by different kinds of materials including paper, plastic (heavy plastic, bags and bottles), glass, organic, wood, metals, scraps, inert matter, and textiles (Costi et al. 2004). As cities grow economically and lifestyles change, the waste generated grows in quantity and the composition of the waste also changes (World Bank, 2001; Rathi, 2005; UNEP, 2009).

The overall goal of solid waste management is to collect, treat and dispose solid waste generated in an urban area to cause least environmental damage, in a socially acceptable manner, and most economically (World Bank, 2001). Work on municipal solid waste management began in the 1970s. The 1980s saw an understanding of solid waste management at the system level (Morrissey and Browne, 2004). During the 1990s, the concept of integrated solid waste management gained importance. Integrated solid waste management refers to the strategic approach to sustainable management of solid wastes covering all sources and all aspects, covering generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximizing resource use efficiency (UNEP, 2009).

The issues of solid waste management differ in developed and developing countries. Higher income countries generally recycle more, and have the capital to invest in new

technologies to better treat their waste, but generally generate much more waste. On the other hand, in lower income countries, per capita waste generation is less, but is inefficiently handled. There is often low collection of waste, and even when collected, dumping in open. Inefficient management and disposal of solid waste has severe health consequences, and is also responsible for air, water and soil pollution (Kathiravale and Yunus, 2008).

In order to promote environmental sustainability, solid waste management needs to work towards the following: minimisation of waste production, maximisation of material re-use, recycling and recovery, safe disposal of remaining waste keeping in mind the absorption capacities of local sinks (Baud et al. 2001; Kathiravale and Yunus, 2008).

Characteristics of Sustainable Solid Waste Management System:

Environmental	Waste minimisation, (reduce, re-use and recycle), Minimal resource use (land, energy), Reduction in Emissions
Technological	Appropriate
Social and Public Health	Change in consumption practices, participation, acceptance (e.g. segregation of waste at source), Reduced risk from waste, especially for workers
Economic	willingness to pay, per capita cost
Compiled from: Pacheco, 1992; Baud et al. 2001; World Bank, 2001; Morrissey and Browne, 2004; Kathiravale and Yunus, 2008; UNEP, 2009; MoUD, 2009a.	

The main options for waste disposal (MSW) conventionally have been sanitary land-fills. With limited land available within urban areas, landfilling is invariably done in the surrounding rural areas. Several technological options exist to reduce waste reaching land-fills. These include incineration, composting and recycling, and decentralized management. While incineration reduces the original volume of combustible solid waste by 80-90%, it often is an expensive capital investment for developing countries, and can pose health risks (Sharholy et al. 2008; Troschinetz and Mihelcic, 2009). With high levels of organic matter in the mix, composting is increasingly a desirable option for developing countries.

Besides environmental costs, there are often additional human costs associated with processes of solid waste management in developing countries. The collection and segregation is done by urban poor, often women and children, who have no protection against the waste.

4.1.4 Transportation

Recognition of the impact of urban traffic and transportation on the environment dates from the 1960s (Wee, 2012). Since then, increasing levels of motorised vehicle ownership and use have led to steady increase in a host of problems, including accidents, congestion, and environmental issues of noise and air pollution. The concern of fossil fuel depletion is a direct concern related to the traffic and transportation issues.

The history and development of contemporary cities is intricately tied up with different types of transportation systems. While there are huge discussions on sustainability in urban transportation systems, there is consensus on some critical issues. These are:

- Cities need to be built for people, not for cars.
- Reduction in privately owned automobiles
- Shift to public transportation systems
- Shift to non-motorised modes like walking and cycling
- Use of better technology, and shifting to non-carbon sources of fuel

The other critical issue is the link between transportation systems, urban form and land use planning. Much of the work has been done on understanding the relation between automobile use, and urban form; studies that examine relation of form to other modes of travel are rare (Vance and Hedel, 2007). In one of the earliest international comparative studies, Kenworthy and Laube find a strong connection between automobile dependence, and land use pattern. There was a high co-relation with automobile dependency and density. While later studies confirm this connection, the jury is still out on causality (Vance, 2007). But there is no doubt, that appropriate land use policies can be conducive to sustainable transportation systems (Wee, 2012; Kenworthy, 2006).

Moreover, much of the discussions of harmful environmental impacts of transport have been limited to emissions. There is general agreement, but little understanding of loss of productive land, and land fragmentation, increase in local flooding due to increase in paved areas, and ground pollution due to bitumen and concrete roads. Road construction and widening also are likely to lead to loss of trees and biodiversity.

Characteristics of Sustainable Transportation System:

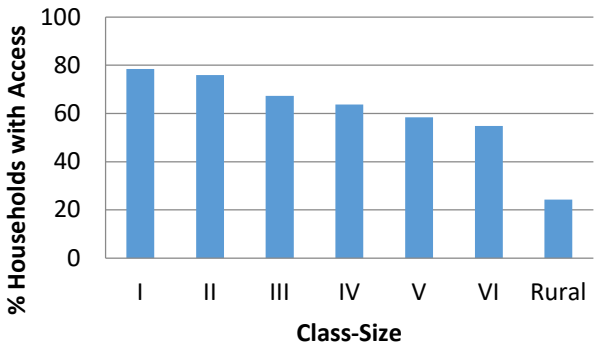
Environmental	Reduction in use of fossil fuels, non-motorised vehicles, reduced emissions, reduced car use, reduced pollution levels, clean technology
Design and Technology	Appropriate options
Social and Public Health	Access, connectivity, choice (public transport), safety (reduced accidents, reduced air-borne diseases), reduced noise levels
Economic	Efficient, affordable, cost effective, reduced travel distance and time
Compiled from: Button, 2002; Ravetz, 2001; Jeon and Amekudzi, 2005; MoUD, n.d.	

4.2 Overview of Sectors in India

4.2.1 Water Supply

Fig 13. Access to Household Water Connection (2001)

India is ranked as one of the lowest domestic and industrial water users in per capita terms (Amarasinghe et al. 2005). According to the 2001 Census, 64% of urban population is covered by individual connections and stand-posts. More than 20 million people do not have access to safe water supply in India (Census of India, 2001; Singh, Upadhyay and Mittal, 2010). Class-wise data indicates how access to household water connection varies across different class sizes.



Source: Census of India, 2001.

While the planning/design norm as per the Centre of Public Health and Engineering Organisation (CPHEEO) is at 135 litre per capita per day (lpcd), approximately 203 of the Class I towns in India have per capita availability less than 100 lpcd (CPCB, 2009). The agency decides on extraction, quantities and supply channels based on accepted norms and water resource allocations. Typically, water is supplied for just one to three hours per day, regardless of the quantity available, or in some cases, water supply is only on alternate days. There are wide seasonal variations as well. There are also wide variations within a city as there are often piped water services that are not extended to the entire city (NIUA, 2005).

The existing piped infrastructure suffers from a high degree of operational inefficiencies with approximately 40-50 per cent of the water pumped into the system being not available for consumption since it is lost in transmission, through theft, and so on (Singh, Upadhyay and Mittal, 2010; CGWB, 2011). Many large Indian cities have to source water from long distances ranging from 50 to 200 km due to exhaustion or pollution of nearby sources (CSE, 2012). This increases the cost of raw water and enhances the possibility of leakage during transmission. Significant dependence on groundwater is reported in most Indian cities irrespective of the size (Datta, 2005; CSE, 2012). Almost 50% of urban water demand is met by groundwater sources (ibid).

Though the predominant mode in Indian cities remains that of centralised pipe water supply provided by the concerned government agency, the real picture is more varied and complex. Due to limited coverage in terms of actual infrastructure and services, end-users access other modes of supply like self-supply (surface/ground water extraction through own asset), tanker supplies (usually sourced from peri-urban bore-wells) or communal water sources (ponds, lakes, etc.) (Srinivasan, 2008). The decision-making agents in the different modes of supply (other than the ULB) are mostly private parties, comprised of households and small business, with a few larger business entities in the packaged water market. Studies on coping strategies by households also point to the discerning ability of households to differentiate quality of water in each supply-mode and optimise access (Srinivasan, 2008). Temporal variability of centralised water supply has also been reported in some of the urban centres and resultant gaps are satisfied by alternate modes of supply (ibid).

There are over 20 million private wells in India in addition to the government tubewells (Datta, 2005). Unregulated groundwater use and pollution generation has crossed sustainable limits in many parts of the country (Datta, 2005). While there is a mix of surface and groundwater supply in the city cores, peripheral areas and city extensions essentially depend on ground water (CGWB, 2011).

The limited infrastructure for wastewater collection and treatment (only 30% of urban wastewater is safely treated according to CPCB, 2009) has rendered surface water sources within the city boundaries polluted and unsafe and also contaminated the groundwater making it unfit for domestic consumption.

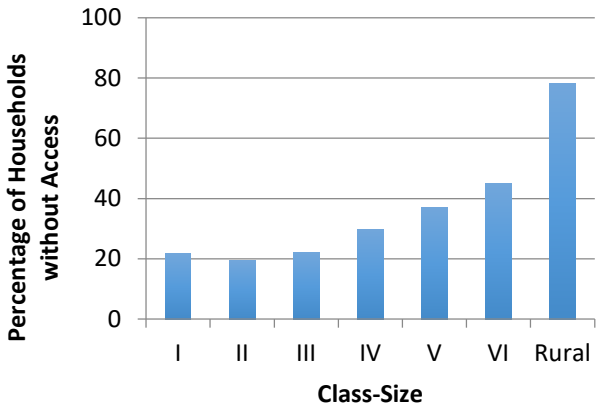
Urban local bodies and utilities are plagued by a host of management problems. Low tariffs, operational inefficiencies, and poor collection practices by the utilities have resulted in low cost recovery rates at 40-50 per cent of O&M cost in most cities (Singh, Upadhyay and Mittal, 2010). These shortcomings are compounded by the low levels of technical, financial, and managerial capacity of local governments, which are inadequate to meet the service needs of their citizens. Consumer level metering is still not the norm in most cities and, where adopted, the maintenance and functionality of meters tend to be poor.

The public sector is clearly struggling to meet the demand. There is a likelihood of this situation getting aggravated with increasing urban population, and additional demands on water. Climate change is likely to add to the woes. The story of each city may be different, but the main reasons for the water crisis are common: increasing demand, inequitable distribution of water supply, transfer losses, lack of ethical framework, inadequate knowledge and resources, major land-use changes, long term water level declines, increase in salinity and pollution (Datta, 2005; Singh, Upadhyay and Mittal, 2010).

4.2.2 Sanitation and Sewerage

The 2011 Census indicates that around 81% of urban households have access to toilet facilities within the household premises, 6% access public toilets, and 12% have no access to toilet facilities and are forced to resort to open defecation. This number might be an under estimation of people without access to safe sanitation, as it also includes dilapidated toilets with non-functional waste disposal systems and highly overloaded community toilets (CSE, 2012). There is also a difference across different

Fig 14. Lack of Latrines (2001)



Source: Census of India, 2001.

classes of cities. According to 2001 Census, as much as 45% of households did not have access to latrines (Fig. 14).

Almost 80% of the water supplied for domestic use comes out as wastewater (CPCB, 2009). Majority of the households in India are dependent on on-site sanitation systems, only a third of the city population is serviced by city-wide piped infrastructure. Even in cities where a sewerage system exists, the coverage is partial, and limited to affluent and planned localities. There is no reliable data on wastewater generation and collection, however, it is estimated that collection is only one third of total waste water generated (CPCB, 2009).

The sewerage systems, where they exist, are faced with multiple problems. Often the trunk sewers are laid down, but the distribution network is not connected to the main, leading to inadequate collection, and hence the system does not function properly. Sometimes, the sewerage network does not function optimally due to infiltration of storm water or solid waste. The sewers in most Indian cities are badly maintained resulting in frequent blockages, siltation, missing manhole covers, gulley pits. There is no preventive maintenance; repairs are done only in case of crisis (WSP, 2008).

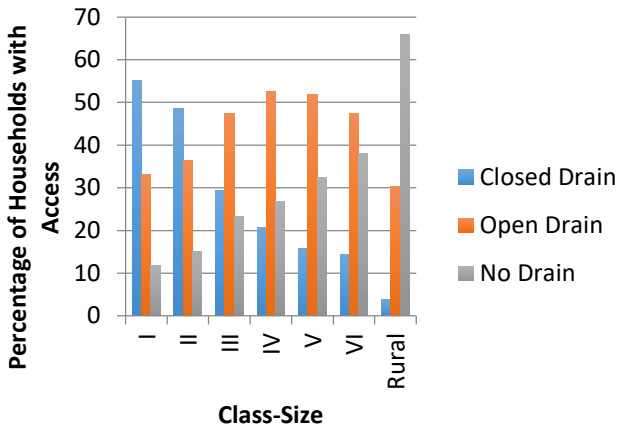
Again, there is limited data available on waste water treatment. However, a CPCB study shows that treatment capacity exists only for 30% of the total sewage generated in Class I and II cities. It is estimated that most plants work only at 70% of their capacity, and hence the total untreated sewage is estimated at 30,000 MLD. Problem is sometimes exacerbated by mixing of industrial water with domestic waste-water. There is minimal reuse/ recycling of waste water (CPCB, 2009). Moreover, 39% of plants do not conform to standard rules laid down under Environmental (Protection) Rules. Treatment plants may not function properly for a number of reasons: insufficient wastewater due to inadequate conveyance system, frequent power cuts, breakdowns due to lack of maintenance.

Disposal of sewage is the biggest point source of river pollution in India. Due to non-availability of proper collection, conveyance and treatment systems in most Indian cities, there is serious contamination in ground water and also surface water. In most cases, wastewater is let out untreated, which either sinks in the ground and potentially pollutes underground aquifers, or is transported along natural or manmade drainage channels, causing pollution in downstream areas (CPCB, 2009).

4.2.3 Storm Water Drainage

Fig 15. Storm Water Drainage in India (2001)

Compared to water supply and sanitation sectors, there is little data available on storm water drainage and little work has been done on this. Less than 20% of the road network is covered by storm water drains (MoUD, 2009a). According to Census 2001, 12% of households in Class I cities did not have access to drainage system; this proportion was as high as almost 40% for Class VI cities.



Source: Census of India 2001.

Storm water drainage in urban India is characterised by inadequate coverage. Most cities in India do not have an effective storm water drainage system in place. Growth and densification of Indian cities have ignored natural waterways on one hand and increased impermeable surfaces on the other (MoUD, 2009a). Sometime there is also illegal development on natural areas, or on drainage systems. Often, often permanent changes to the catchment are caused, leading to changes in runoff patterns. The most visible outcome is an increase in both magnitude and frequency of flooding. Flooding is a common, annual event in Indian cities.

In recent years, frequency of flooding has increased, and the issue is often in the limelight due to huge traffic jams caused. While the natural drainage system of most cities has been disrupted, the problem of flooding is also exacerbated due to ineffectiveness of storm water drainage systems, which often are clogged by debris, and poorly maintained (Mohapatra and Singh, 2003; Sharma, 2008).

Storm water drainage also poses additional health issues. As stated in the sanitation section, storm water drainage often carries sullage which is then disposed of untreated into surface water bodies. To address this issue, in some cities, major drainage channels are intercepted before reaching the water body, and treated. It involves huge investments in hardware creation and but it is usually ineffective and extremely energy consuming as the amount of water to be treated is huge.

4.2.4 Solid Waste Management

Annual generation of municipal solid waste in India is estimated to be about 115000 metric tonnes (Planning Commission, 2007). Per capita waste generation in cities varies between 0.2–0.6 kg per day and it is increasing by 1.3% per annum (Planning Commission, 2007; CPCB, 2004). With the growth in urban population, the increase in solid waste is estimated at 5% (Planning Commission, 2007). Per capita generation of solid waste is lesser in smaller cities and towns as compared to large cities and metros (CPCB, 2004). Owing to urbanisation and changing lifestyles, there has been an eight-fold increase in generation of solid waste from 1947 to 2008 (Sharholy et al. 2008).

Waste collection and safe disposal is the responsibility of the urban local body of the city. The coverage in terms of waste collection ranges from 70 per cent to 90 per cent in major metropolitan cities, and is less than 50 per cent in smaller cities (Planning Commission, 2007), average collection being almost 70% (Rathi, 2006; Sharholy et al. 2008). It is quite possible that actual collection rates are much less than the official figures. The collection efficiency in Indian cities is governed by availability of manpower and transportation facilities, which in turn are dependent on the financial situation of the urban local body. It is found that 50 per cent of the waste is collected manually (CPCB, 2000); this poses health hazards to the workers on-site.

Besides low collection rates, there are other problems. Though the proportion of organic waste to total waste is much higher in India (about 60%) as compared to other countries, segregation at source is rarely practised UN-HABITAT (2010). The proportion of recyclable material in collected waste is also low because of segregation and collection being done by rag pickers generation sources, collection points and disposal sites (Sharholy et al. 2008).

The collected waste is transported to disposal sites to processing or disposal sites through a variety of vehicles, either owned by the municipal body or private contractor. Collection and transportation of waste constitute about 80-95 per cent of total expenditure in solid waste management (Sharholy et al. 2008).

Land-filling is the most common method of solid waste disposal practised in India. Even with a high proportion of organic waste providing an opportunity for composting, the burden on landfill sites is huge because less than 30% of solid waste is segregated (MoUD, 2009a; Planning Commission, 2007). Disposal practices at the open dumping sites are highly unscientific and hazardous for the on-site workers; at many places, waste is dumped at low lying areas without any consideration. The expansion of city limits has brought old landfill sites within the city.

Two innovative mechanisms of waste disposal being adopted in India include composting (aerobic composting and vermi-composting) and waste-to-energy (WTE) (incineration, pelletisation, biomethanation); however, these concepts are still being tested out in India and the implementation is very limited (Sharholy et al. 2008).

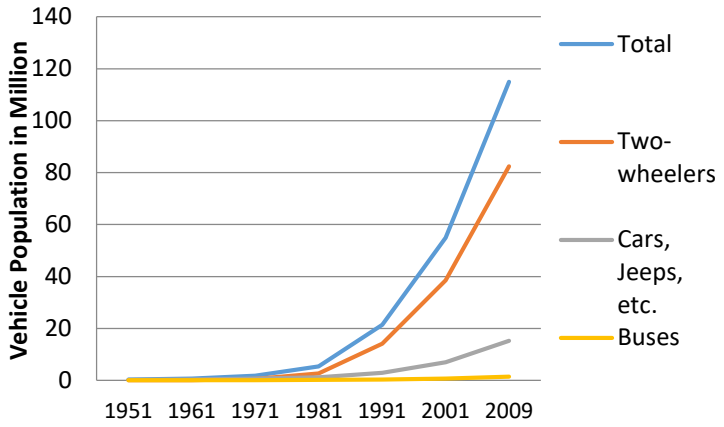
The Municipal Solid Waste Rules were put in place in 2000; however, the enforcement has been poor. Though several NGOs, CBOs and private companies are also involved in the collection of solid waste, yet attention is rarely paid to proper and safe disposal.

Inadequate collection efficiency and poor management of solid waste lead to health hazards and contamination of groundwater and surface water. Focus remains on increasing collection efficiency of solid waste and its disposal. Even though there has been effort towards segregation of waste and composting, reduction in generation of solid waste has not been given due importance in India.

4.2.5 Transport

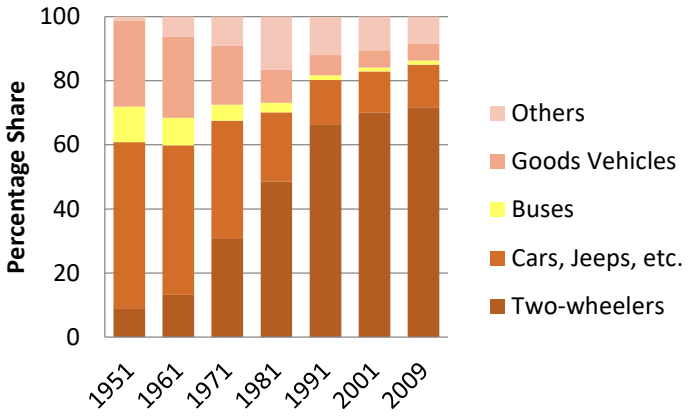
India has seen a tremendous growth in ownership of motorised vehicles, especially two wheelers (Fig. 16). Almost 70% of the vehicle population in India constitutes of two-wheelers (Fig. 17). Cars and two wheelers together make up 85% of vehicles on India's roads, but account for only 29% of trips and are a significant cause of congestion (Fig. 18).

Fig. 16: Growth of Vehicle Population in India (1951 - 2009)



Source: MoRTH, 2011.

Fig. 17: Vehicular Composition in India (1951 - 2009)

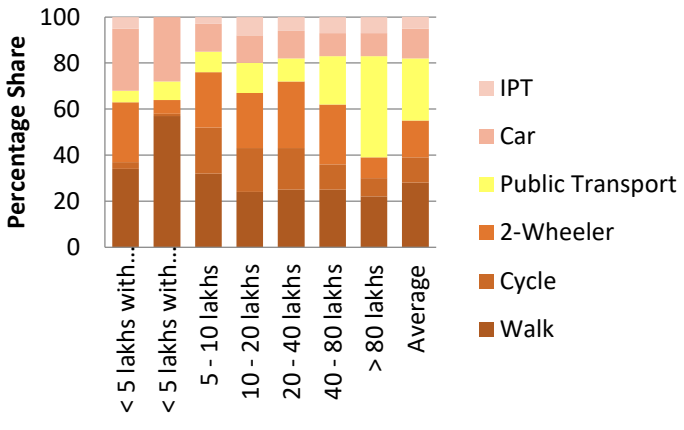


Source: MoRTH, 2011.

While reasons for growth of personal vehicles are many, studies indicate that one of the possible reasons is the lack of adequate public transport (Pucher et al. 2005). The number of buses, which account for 90% of public transport, has remained almost constant. Only a few cities have a public transport system and bulk of cities are dependent on personal transport or para-transit.

Fig. 18: Modal Split of Trips by Type of Cities (2007)

Even in cities where public transport is available, it is grossly inadequate, and inefficient (Pucher et al. 2005). Though a large percentage of urban residents still walk or cycle, an 'epidemic' of traffic accidents puts them at high risk.



Source: MoUD and Wilbur Smith, 2008.

The transportation issue that seems to attract the most attention is congestion, as it is the most highly visible. The dominant policy response to congestion has been to improve road infrastructure for improved movement of motor cars (Tiwari, 2002). This bias persists despite the fact that there are a large number of captive users for whom the primary mode of transportation is walking or cycling. This captive audience exists because the urban poor in India cannot even afford costs of public transportation. Until now, this was facilitated by the fact that many Indian cities were mixed use, and largely mixed income. Now, the urban poor are being displaced to the periphery, either being forced out of land markets or being evicted (Badami, 2009). Budgets for provision of facilities for pedestrians and cyclists are minimal. Unsafe, inadequate pedestrian facilities lead to the increased use of motor vehicles, even for short distances (Badami, 2009).

Traffic accidents are given far less importance as compared to the issues of air pollution (Tiwari, 2003; Badami, 2009). This can be attributed to the fact that air pollution affects everyone in the city including the car users, while traffic accidents are considerably skewed, affecting mostly pedestrians, cyclists and two-wheelers. The elite and upper middle class, who are mostly car users, are not affected substantially by this issue. Also, whatever little attention that this issue gets is focussed on fatalities, while the number of people suffering minor and major injuries is substantially higher (ibid).
While the national transportation policy talks about encouraging non-motorised vehicles and pedestrians, there is little evidence from the ground to show so. Most projects still are focused on expanding and widening the road network.

There are also larger contradictions at the policy level. While national transport policy encourages public transport, the rise in the increase of vehicle ownership is considered as one of the indicators of economic growth by the Government of India (Badami, 2009).

5 Sustainability and JNNURM

5.1 Sustainability Framework

Based on the literature review, and review of key issues in India, a select set of criteria for sustainability frame were selected. These indicators have been broadly divided into four categories: Environmental, Design and Technology, Social and Public Health, and Economic. Design and Technology was added as a separate category as review shows that design of the infrastructure is a key determinant of sustainability of an infrastructure system. As stated in the scope of study, the focus here is on environmental sustainability, hence only select indicators under social and economic categories have been chosen; essentially those that may undermine the entire system and have tremendous implications on sustainability.

Also, some indicators, though important, have been left out for various reasons. These include ones that are difficult to gauge from mere literature review, or insufficient information is available e.g. participation, and cultural acceptance. Some broader criteria like resilience have been left out since they are more complex, second order goals of the system, and difficult to define and evaluate. Important aspects have been included as individual criteria instead, e.g. adaptability and sustainability of source.

Literature review also reveals the need for each city to have its own context specific priorities, and solutions. Hence, no specific technology e.g. sewerage, or system like a metro rail system, has been chosen as a criterion. The criteria instead are representative of broad sustainability or system goals like source sustainability or equity. We have deferred from defining exact goals, as we believe these again have to be set at local levels, depending upon the current situation; otherwise there is a danger of setting of setting goals too high or low.

An attempt has been made to use the same set of criteria across different sectors. It is however, recognised that not all of these criteria will be applicable to all sectors, and their importance will differ. A brief description and rationale of the 14 indicators is given below.

5.1.1 Environmental

a. **Resource Use (Water/ Energy/ Land/ Material):** One of the core sustainability goals is to reduce use of natural resources as far as possible. This criterion has been used to assess whether attempts have been made to design systems that economise on the use of each of these resources. While each of the four key resources (water, energy, land, material) are relevant for each of the sectors, yet one resource might be far more important for a particular sector.

b. **Sink/ Waste (Air Pollution/ Waste/ Water):** On the other end of the cycle, it is also essential to reduce waste generated from the systems, and to treat these adequately.

c. **Sustainability of Source/ Sink:** This criterion is especially important for environmental services. It is important to ensure that source(s) of water supply for the city are adequately protected, and that it is being replenished adequately. Similarly, the carrying capacity of sinks should not be exceeded.

5.1.2 Design and Technology

a. **Performance (Coverage, Quality, Reliability):** Besides the imperative of environmental sustainability, the infrastructure systems must provide reasonable services to the users. In the context of infrastructure backlog, one of the foremost criteria is that both the physical infrastructure and services must be extended to the entire city. Mere extension of services is not sufficient; there must be compliance to a certain minimum standard. Lastly, the systems needs to reliable and not prone to disruptions.

b. **Efficiency**: The system must deliver efficiently what it was designed for. This would mean that it is not performing sub-optimally, and there are minimum losses of water, energy and material.

c. **Adaptability:** It is important to increase adaptability of the system, because if the system can adapt to changed circumstances, it will increase the resilience of the system.

5.1.3 Social and Public Health

a. **Equity:** As stated earlier, there is a strong linkage between urban poverty and infrastructural services. Given the already unequal distribution of infrastructure and services, it is essential to move towards more just infrastructure systems. This aim is also in line with several national policies, and international goals like MDGs. Moreover, there are often separate specific programmes to target urban poverty; however, concerns of urban poor might not be taken in consideration while doing city level planning. Hence, it is important how concerns of equity have been mainstreamed in city planning, even while exact solutions might differ. Also, this criterion can be used to assess equitable access across other groups like women, children, community etc.

b. **Public Health:** While public health is an aspect of urban poverty and equity, it is a critical issue in Indian setting, and hence has been addressed separately. The

urban poor in India carry disproportionate health burden, even while contributing least to overall environmental risks. Moreover, inappropriate and dysfunctional environmental services pose a health risk to the entire urban population as well. One needs to assess whether this concern has been addressed, and how.

5.1.4 Economic

a. **Per Capita Investments:** As there is a deficit of infrastructure and services in India, there would be substantial capital investments required to cover the backlog, hence it is best to optimise capital investments. Often, investments are earmarked assuming a particular technology. It is important to assess per capita investment costs across different technologies and plans and then select an appropriate path. The least inexpensive may often not be an ideal solution, but this criterion will help question often static assumptions of technology.

b. **Operation and Maintenance:** Lack of proper maintenance and ensuing problems like breakdowns are common problems in Indian cities. There are often not enough resources to ensure operation and maintenance, and the resources required for this are often not factored in while choosing a particular technology. Hence, one needs to assess whether this issue is being addressed at various levels.

5.1.5 Process

a. **Inter-linkages:** There are often dependencies between different infrastructure systems, and proper/ improper functioning of one might be dependent on another e.g. clogging of sewerage system because of infiltration of solid waste. This criterion is thus to assess whether these inter-linkages have been recognised, and whether overall priorities have been set keeping these in mind.

b. **Integration:** The CDP often is only one of the planning documents for a city, the others being master plan, sanitation plan, mobility plan, etc. One needs to assess whether the CDP takes cognisance of these documents, and makes an attempt to dovetail different plans.

c. **Capacity Development:** Inadequate capacity at the level of local bodies is often cited as one of the key issues in urban governance. This criterion is to gauge whether this need has been recognised, and what steps have been taken to address this.

d. **Monitoring and Evaluation:** Typically, there is a paucity of data and information at city level as there is often no benchmark; it is difficult to assess how much progress has been made. Thus, it is important to set up an M & E system, no matter how rudimentary, to know in which direction the city is headed.

5.2 Indicators for Sustainability Analysis of JNNURM

Table 1: Indicators for Sustainability Analysis of JNNURM							
Component	**Criteria**		**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
Environmental	Sustainability of source/ sink		Is the source(s) sustainable? Are they been adequately protected? Is the water being replenished?	Has carrying capacity[5] of sinks been considered (e.g. What is the maximum load that the river can carry?)	Has carrying capacity been considered?	Has carrying capacity been considered?	
	Resource Use/ Source	Water	Have strategies for optimisation of water use been put in place? (e.g. Efficiency and reduction of losses? Recycling? Better Technology? Provision of different, appropriate quality water for different purposes? Recycling?	Covered under water			

[5] It is recognized that carrying capacity is a contested term, and it is argued that there is no fixed carrying capacity, and can be extended with use of technology etc. However here the term is used to assess whether certain limitations of natural resources.

Table 1: Indicators for Sustainability Analysis of JNNURM							
Component	**Criteria**		**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
		Energy	Is there cognisance of the energy requirements of the entire system? Is there a plan to economise energy used for energy used for sourcing, distribution and treatment? Any plans of bringing down per capita energy use?	Is there cognisance of the energy requirements of the entire system? Is there a plan to economise energy used for transportation and treatment (e.g. pumping sewage)? Any plans of bringing down per capita energy use?	Is there a cognisance of the energy requirements of the entire system?	Is there a cognisance of the energy requirements of the entire system? Is there a plan to minimise energy used for energy used for transportation and treatment? Any plans of bringing down per capita energy use?	Is the cognisance of the energy requirements of the entire system? Is there a plan to shift to more sustainable fuel mix? Are fuels source sustainable? Any plans of bringing down energy use per passenger per kilometre?
		Material	Is this concern mentioned?	Is there this concern mentioned?	Is there this concern mentioned?	Any thought to reduce consumption and waste generation? Any plans of reuse and recycling of materials?	
		Land	Is this concern mentioned?	Is there this concern mentioned? Is the technolog	Is linkage between urban planning, and disruption	Is there thought given to how much land will be	Has the linkage been land use planning and

Table 1: Indicators for Sustainability Analysis of JNNURM							
Component	**Criteria**		**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
				y use land intensive? If so, what are the plans to reduce land footprint?	of channel realised? Is there plan to protect the "land" around the channels? Will the water disrupt ecosystems and biodiversity?	needed? Any plans of optimisation?	transport been realised? Are they plans to use transport as a means to achieve optimal densities?
	Waste/ Sink	Waste water	To be covered in waste water	Are there plans to maximise treatment through a variety of means? What is the quality of effluent been released? Has pollution of ground water aquifers been considered?	Is it recognised that storm water may get polluted either by sewerage or solid waste? Can storm water be prevented from being polluted? Has pollution of ground water aquifers been considered?	Can the amount of water being polluted (through infiltration of solid waste) be minimised? Has pollution of ground water aquifers been considered (in dumping grounds, and land-fill sites?	
		Waste				Are there plans for segregation? Are different	

Table 1: Indicators for Sustainability Analysis of JNNURM							
Component	**Criteria**		**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
						chains of waste been treated properly? Has leachate been properly treated?	
		Air Pollution	Is there a cognisance of emissions?	Is there a cognisance of emissions?	Is there a cognisance of emissions?	Is there a cognisance of emissions, especially during treatment? If incineration is used, is it being toxic waste is being separated?	Is there cognisance of emissions?
Design and Technology	Performance	Coverage	Does the system provide clean drinking water to everybody?	Is there a vision or plan to make the city open defecation free? Is there some plan to ensure that all residents (and migrant population) have access to "improved" sanitation	Is there a plan to extend storm water drainage in entire city?	Is there a plan to make provisions for collection of solid waste to be extended to the entire city? Are they plans to ensure safe disposal of all wastes?	Are there plans of making each part of city accessible by public transport? Have feeder services been thought through?

Table 1: Indicators for Sustainability Analysis of JNNURM							
Component	**Criteria**		**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
				facilities? Does sanitation system collects, conveys and treats adequately?			
		Quality	Is there a concern for quality of water? Are there any steps being taken to ensure minimum quality of water? Are there minimum standards for duration of time the water is being supplied?	Have any minimum standards been set for provision of sanitation facilities? Has only construction toilet been thought of, or has thought been given to disposal system?	Are they some criteria for minimum functionality of the system?	Are they some minimum functionality of the system? Is there minimum frequency of waste collection?	Are they certain minimum standards for a. public transport b. roads, especially comfort levels for pedestrians and cyclists?
		Reliability	Will there be disruptions in service delivery? Is there plan for O & M systems and procedures?	Will the public/ community toilets remain functional? What is the plan to ensure that a treatment system works? Is there plan for O & M systems	Will there be disruptions e.g. flooding? Is there plan for O & M systems and procedures?	Will there be disruptions? Is there plan for O & M systems and procedures?	Will the system deliver function equally for all users? Is it biased towards car users? Will there be disruptions e.g. Jams? Is there plan for O & M

Table 1: Indicators for Sustainability Analysis of JNNURM						
Component	**Criteria**	**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
			and procedures?			systems and procedures?
	Efficiency	Any plans for increasing efficiency of system? (e.g. to reduce non-revenue and unaccounted water? to increase energy efficiency?)	Any plans for increasing efficiency of system?	Any plans for increasing efficiency of system? Any planning of synergising with natural drainage systems?	Any plans for increasing efficiency of system? Segregation? Recycling? Reuse? Has it been considered how efficiency of other systems might be reduced because of solid waste?	Any plans for increasing efficiency of systems? Technology? Better feeder services?
	Adaptability	Has adaptability of infrastructures and plans been considered? Is there a back-up plan if the current sources fail to meet the requirements?	Has adaptability of infrastructures and plans been considered?	Has adaptability of infrastructures and plans been considered? How the system responds to changed pattern of rainfall?	Has adaptability of infrastructures and plans been considered? How the system responds to changed quantity and composition of waste?	Has adaptability of infrastructures and plans been considered? How the system responds to changing modal split?

Table 1: Indicators for Sustainability Analysis of JNNURM						
Component	**Criteria**	**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
Social and Public Health	Equity	Is there a cognisance of differential socio-economic conditions of users/ residents? Plan to move to more equitable distribution? How will it be ensured that the urban poor and vulnerable will have access to physical infrastructure and services? Are the steps in line with national and state policies? Have issues of affordability been though through?	Is there a cognisance of differential socio-economic conditions of users/ residents? How will it be ensured that the urban poor and vulnerable will have access to physical infrastructure and services? Are the steps in line with national and state policies? Have issues of affordability been though through?	How will it be ensured that the urban poor and vulnerable will have access to physical infrastructure and services? Are the steps in line with national and state policies?	How will it be ensured that the urban poor and vulnerable will have access to physical infrastructure and services? Are the steps in line with national and state policies?	How will it be ensured that the urban poor and vulnerable will have access to public transport? Is the link between concern between livelihoods and access to transport recognised?
	Reduction in Diseases	Has the linkage between water and health been recognise	Has the linkage between sewage and health been recognise	Has the linkage between water and health been recognise	Has the linkage between pollution and health been recognise	Is linkage between transportation and health been realised?

Table 1: Indicators for Sustainability Analysis of JNNURM						
Component	**Criteria**	**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
		d? Is there some plan to reduce the incidence of relevant diseases?	d? Is there some plan to reduce the incidence of relevant diseases?	d? Is there some plan to reduce the incidence of relevant diseases?	d? Is there some plan to reduce the incidence of relevant diseases? Specifically, have safety of workers been thought of? Has the concern of dumping sites near poor neighbourhoods been considered?	Have both traffic accidents and emissions been recognised as causes? What is being done to address both?
Economic	Per capita investments	Has capital costs (per capita) across different technology and planning were considered? Is a certain technology or solution assumed? Have life cycle and their replacement cycles	Has capital costs (per capita) across different technology and planning were considered? Is a certain technology or solution assumed? Have life cycle and their replacement cycles	Has capital costs (per capita) across different technology and planning were considered? Have life cycle and their replacement cycles have been thought through?	Has capital costs (per capita) across different technology and planning were considered? Have life cycle and their replacement cycles have been thought through?	Has capital costs (per capita) across different technology and planning were considered? Is a certain technology or solution assumed? Have life cycle and their replacement cycles

Table 1: Indicators for Sustainability Analysis of JNNURM						
Component	**Criteria**	**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
		have been thought through?	have been thought through?			have been thought through?
	Operations and Maintenance	Is there a Financial Operating Plan to ensure resources for O & M?	Is there a Financial Operating Plan to ensure resources for O & M?	Is there some plan or strategy to take care of O & M?	Is there some plan or strategy to take care of O & M?	Is there some plan or strategy to take care of O & M of different components (road, public transportation? Cost recovery?
Process	Interlinkages with other sectors	Have the interlinkages between sectors identified? Do overall plans and priorities reflect these inter-linkages?	Have the interlinkages between sectors identified? Do overall plans and priorities reflect these inter-linkages?	Have the interlinkages between sectors identified? Do overall plans and priorities reflect these inter-linkages?	Have the interlinkages between sectors identified? Do overall plans and priorities reflect these inter-linkages?	Have the interlinkages between sectors identified? Do overall plans and priorities reflect these inter-linkages?
	Integration	Does CDP refer/ recognise other planning documents (e.g. Master Plan) and relevant policies? Does it take heed of them, or are	Does CDP refer/ recognise other planning documents (e.g. Master Plan) and relevant policies? Does it take heed of them, or are	Does CDP refer/ recognise other planning documents (e.g. Master Plan) and relevant policies? Does it take heed of them, or are	Does CDP refer/ recognise other planning documents (e.g. Master Plan) and relevant policies? Does it take heed of them, or are	Does CDP refer/ recognise other planning documents (e.g. Master Plan) and relevant policies? Does it take heed of them, or are

Table 1: Indicators for Sustainability Analysis of JNNURM						
Component	**Criteria**	**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
		there contradictions?	there contradictions?	there contradictions?	there contradictions?	there contradictions?
	Capacity Development	Is there recognition of the need for capacity development (implementation, procurement, design, management etc.)? Is there a plan in place to augment capacities? Is there recognition of limitation of capacities outside the public sector (e.g. Vendors/ consultants for design and construction?	Is there recognition of the need for capacity development (implementation, procurement, design, management etc.)? Is there a plan in place to augment capacities? Is there recognition of limitation of capacities outside the public sector (e.g. Vendors/ consultants for design and construction?	Is there recognition of the need for capacity development (implementation, procurement, design, management etc.)? Is there a plan in place to augment capacities? Is there recognition of limitation of capacities outside the public sector (e.g. Vendors/ consultants for design and construction?	Is there recognition of the need for capacity development (implementation, procurement, design, management etc.)? Is there a plan in place to augment capacities? Is there recognition of limitation of capacities outside the public sector (e.g. Vendors/ consultants for design and construction?	Is there recognition of the need for capacity development (implementation, procurement, design, management etc.)? Is there a plan in place to augment capacities? Is there recognition of limitation of capacities outside the public sector (e.g. Vendors/ consultants for design and construction?
	Monitoring and Evaluation	Is the need for M & E recognised? Has a plan been put in	Is the need for M & E recognised? Has a plan been put in	Is the need for M & E recognised? Has a plan been put in	Is the need for M & E recognised? Has a plan been put in	Is the need for M & E recognised? Has a plan been put in

Table 1: Indicators for Sustainability Analysis of JNNURM						
Component	**Criteria**	**Water Supply**	**Sewerage and Sanitation**	**Storm Water Drainage**	**Solid Waste Management**	**Transportation**
		place for it?	place for it?	place for it?	place for it?	place for it?

5.3

5.4 Sustainability Analysis of JNNURM

5.4.1 Overall Analysis

This section analyses the overall JNNURM (guidelines and reforms) against the sustainability frame developed above. Since the objectives of JNNURM were not limited to providing funding to urban areas, but also to initiate reforms, a whole set of documents were prepared under CDP. The documents reviewed in this section include: JNNURM and UIG Overview, Toolkits for Project Preparation, DPR Preparation and Appraisal, Primers for Mandatory and Optional Reforms. Guidelines for CDP preparation have been reviewed in detail in the next section[6]. All these documents have been accessed from the JNNURM website at: http://jnnurm.nic.in/on 1st September 2012.

Table 2: Overall Sustainability Analysis of JNNURM

Component	Criteria	Summary of Issues highlighted in various JNNURM Documents	Sustainability Implications
Environmental	Resource Use/ Source	*Optional Reform at ULB Level: Revision of Byelaws to Make Rainwater Harvesting Mandatory*[7] • The main objective is to recharge ground water and augment overall availability; rainwater itself can meet domestic water demands in certain situations. • RWH will also help in reducing energy required for pumping out/ up groundwater by raising the aquifer level. • Rainwater harvesting will also help in reducing surface run-offs and flooding of roads and other low lying areas. *Optional Reform at ULB Level: Bye-laws for Reuse of Wastewater:* The aim is to use the water efficiently and provide for the growing	As stated in the document, rainwater harvesting is likely to augment water supply. However, rainwater harvesting does not define a sustainability goal, but is a specific strategy. It is not clear a. whether rainwater is the most suitable strategy b. whether in certain cases; RWH will be

[6] One set of documents that have not been reviewed at the moment are the checklists for sector specific DPRs, these will be reviewed in the next stage i.e. fieldwork. Overall guidelines for the preparation of DPR have been reviewed at this stage.

[7] Except for Imphal and Kohima, Rainwater harvesting reform has been implemented in all other cities.

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
		demands; treated wastewater can provide incremental supply for non-potable applications • Burden on existing resources will be reduced • This will lower the volume of sewage to be discharged, which will reduce the pollution levels in the existing water bodies *Toolkit for DPR Preparation:* • Raw water analysis report, source reliability study and report to be part of the DPR	successful at all. Reuse of Water is a suitable and relevant goal/ criterion. It is not possible to assess impact of this byelaw, till one has seen the byelaws formulated. This will be done in the fieldwork. Addresses the issue of source sustainability and water quality
	Waste/ Sink	*Toolkit for Project Appraisal:* • Solid waste management projects to include considerations/introduction of systems/bye-laws/policies and measures to improve source separation and recycling, taking into account existing formal and informal activities and the requirements of different waste reusers/reprocessors. • Introduction of acceptable and reliable treatment and/or disposal system for solid waste (which could	Segregation is required, but this analysis needs to be done at city level instead of project level

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
		include waste reuse and/or reprocessing to a product of market value (gas, energy, manure, etc.).	
	Sustainability of Source/ Sink	*Toolkit for Project Preparation:* • Environmental compatibility to be considered while planning for projects *Toolkit for DPR Preparation:* • Environmental Impact Assessment to be part of the DPR along with Environmental Management Plan • List of negative externalities to be given including recognition of trade-off. Pollution, reduced green cover, displacement, etc. are some of the negative externalities mentioned.	While these analysis need to done at the project level, these also need to done at the city level
Design and Technology	Performance (Coverage, Quality, Reliability)	*JNNURM Overview:* • Hundred per cent coverage has been envisaged as one of the outcomes of JNNURM. *Toolkit for Project Preparation:* • Technical feasibility to be part of the project proposal *Toolkit for Project Appraisal:* • Planning to include: targets of service levels proposed to be achieved, such as reduction in system losses/ Unaccounted for Water (UFW), expanding service coverage in terms of	While 100% coverage is the final goal, it may not be realistic for all urban areas to achieve it immediately. Hence it would help if intermediate goals are set.

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
		population served, delivery of water supply (duration of supply/quality of supply), support activities proposed to be undertaken as a part of this plan including water audit, energy audit, system performance benchmarks (pressure/ flow measurements) to be maintained. *Toolkit for DPR Preparation* • Project reports to list out benefits from societal perspective like access, coverage, service quality, improved efficiency, supply continuity, safety, environment improvement, improved quality of life, etc.	This planning is needed across projects
	Efficiency	*JNNURM Overview:* • Focus on efficiency in urban infrastructure and service delivery features in the mission statement of the JNNURM • Optimisation of life cycle cost *Toolkit for Project Preparation:* • Selection of the most technically feasible and commercially viable option	Efficiency and optimisation of life cycle costs are both relevant goals, but nothing more can be said till fieldwork. No clear definition of what is considered technical feasibility
	Adaptability		

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
Social and Public Health	Equity	• *Mandatory Reforms at ULB Level: Basic Services for the Urban Poor and Internal Earmarking of Funds for the Urban Poor*[8]The goal is to "Provide basic services (including water supply and sanitation) to all poor including security of tenure, and improved housing at affordable prices and ensure delivery of social services of education, health and social security to poor people". • It is envisaged that all urban poor settlements will be integrated and mainstreamed with municipal supply networks resulting in sustainable improvements in quality of life of the urban poor *Mandatory Reform at ULB Level: Levy of Reasonable User Charges by ULBs and Parastatals* • Talks about cross subsidisation for the vulnerable group; the reform proposes to set affordable and acceptable user charges. *Toolkit for Project Preparation:*	Earmarking of funds is not enough, but integration of poor households into the main infrastructure systems is necessary. This has been mentioned below, but it is not clear whether there is synergy between projects for the urban poor, and overall planning. It is not clear whether only cross subsidisation is sufficient to extend services.

[8] Internal earmarking of funds for services to urban poor has been achieved in all cities except Panaji, Vadodara and Porbandar; however, provision of basic services to the urban has not been achieved in 54 cities.

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
		• Social and political acceptability	
	Reduction in Diseases	*Mandatory Reforms at ULB Level: Basic Services for the Urban Poor* • Improved quality of environment in the cities • Provision of basic services to urban poor is expected to improve their quality of life and reduce vulnerability • Reduction in incidence of diseases is set as one of the indicators to assess improvement in quality of lives of slum dwellers.	
Economic	Per capita investments	There is no mention of per capita investments; Overview documents on JNNURM only talk about adequate funds for meeting deficiencies in urban infrastructural services. *Toolkit for Project Appraisal:* • The proposal to demonstrate technical feasibility and selection of a least life-cycle cost-based option for implementation as well as sustainability through financial and economic viability parameters. • Technical designs shall be based on least-cost solution, taking into account life-cycle costs and demand assessment based on actual consumption estimates.	It is not clear whether it refers to different designs, within the same "technology" or across technology
	Operations and Maintenance	*JNNURM Overview:* • O & M has been identified as a crucial aspect in ensuring	O & M is a critical issue in Indian cities,

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
		sustainable infrastructure development. • The mission calls for establishing linkage between asset creation and maintenance and optimisation of life cycle cost of projects. • Strategy for O&M is a pre-condition to avail JNNURM funding. • Creation of revolving fund to meet O&M requirements of assets created, over the planning horizon. (is this revolving fund for O & M) *Mandatory Reform: Levy of Reasonable User Charges by ULBs and Parastatals*[9] • Objective of this reform is to enable ULBs/parastatals to start recovering O&M costs by 2012. *Toolkit for Project Appraisal:* An investment proposal shall be considered sustainable if its cash flows are able to meet the financial commitments underlying the project, its operations and maintenance expenditure and set aside revenues to provide for replacement investments.	and hence it is laudable that the government recognises this issue. However, the JNNURM funding can only be availed for capital expenditure, and given the weak state of ULB finances; it is not clear how the O & M expenditure will be taken care of. Also, it is not known whether strategy for O & M functioned as a pre-condition on the ground. Not clear whether this is sufficient to recover O & M
Process	Interlinkages with other sectors	*JNNURM Overview:*	

[9] 46 out of 65 cities have not been able to recover costs in the water supply sector and only seven cities have able to recover costs in solid waste management sector. These include: Hyderabad, Vishakhapatnam, Surat, Pune, Greater Mumbai, Shillong and Chennai; these cities have also been able to recover costs in water supply sector.

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
		• Focus on integrated development of infrastructure • CDPs to integrate land use with services, urban transport and environment management • Sustainable development of cities has been mentioned as a desired outcome at the end of the mission *Toolkit on Project Appraisal:* • When water supply is augmented, it is required that provisions for wastewater disposal be considered. This should include drainage and sewerage as a parallel (or immediately following) phased activity.	While integrated development has been mentioned, most cities have relied heavily on sectoral analysis, as will be seen later
	Integration	*Mandatory Reform at State Level: Implementation of the 74th Constitutional Amendment Act and Integration of City Planning and Delivery Functions* • Convergence of planning and delivery of urban infrastructure development and management functions • Cooperation among different stakeholders *Toolkit for DPR Preparation:* • Sector-specific DPRs to be in line with National Policies and Rules. E.g. Transport related projects to be in line with NUTP.	Same as above; there is no evidence of the integration of various functions at city level

Table 2: Overall Sustainability Analysis of JNNURM			
Component	**Criteria**	**Summary of Issues highlighted in various JNNURM Documents**	**Sustainability Implications**
	Capacity Development	*Toolkit for Framework and Process:* • 5 % of central grant is reserved for preparation of CDPs and DPRs, training and capacity building, community participation, information, education and communication *Mandatory Reform at State Level: Implementation of the 74th Constitutional Amendment Act and Integration of City Planning and Delivery Functions* • Devolution of functions and powers to the urban local bodies • Development authorities and parastatals to be technical arms of the urban local bodies	Given the huge deficits, it is not clear whether 5 % is sufficient, more importantly, it is not known how well this grant has been utilised
	Monitoring and Evaluation	*Toolkit for Framework and Process:* • Monitoring framework at the national level has been developed. • Ministry of Urban Development and Ministry of Urban Employment and Poverty Alleviation would periodically monitor the schemes; State Level Nodal Agency (SLNA) to send quarterly reports. • Monitoring of progress and implementation of reforms would be outsourced to specialised/ technical agencies.	Sustainability indicators not within this remit

A preliminary analysis of JNNURM documents highlight that only a limited set of sustainability components have been mentioned. The environmental sustainability components are the weakest, where only a specific strategy of rainwater harvesting has been mentioned. It can also been seen that performance of an infrastructure system is still measured by coverage, and parameters of quality and reliability are not taken into account. While both equity and various process parameters find a place in the documents, it can only be determined from fieldwork whether these have been implemented.

5.4.2 Review of CDPs

As stated earlier, formulation of the City Development Plan (CDP) was the first step at the city level. In order to avail funding, every city was required to prepare and submit a City Development Plan. The CDP was required to:

a) Undertake situational analysis of the city including SWOT analysis
b) Develop vision for the city
c) Identify development goals and strategies
d) Identify projects to meet above stated goals and strategies and earmark projects of high, medium, low priority

Stakeholder consultations and workshops were mandatory components during the preparation of the CDP. These consultations were required at every point of the CDP preparation. The CDP was also supposed to undertake financial assessment and outline an investment plan and financial operating plan (FOP) to address the infrastructure needs in a sustainable manner.

This section reviews both the model CDP guidelines set by the national government, and also includes a review of select 20 CDPs. A subset of 20 CDPs (out of 65) was reviewed to assess inclusion of sustainability concerns in their formulation. Since maximum investment has gone into the category 'A' cities, and there were only 7 cities in the category, all of these were selected, as shown below. For the rest, the cities were selected to ensure a range of population size, state and regional coverage, a range of terrains and geographical features, and also primary function of the city (state capital, religious, tourism etc.). Overall, a spread across regions, states, class size, primary function and terrain has been achieved as shown in table below.

Table 3: Selected Cities for CDP Review

City	State	Region	Population (2001)	Class Size	JNNURM Category	Primary Function	Terrain/ Geography
Greater Mumbai	Maharashtra	West	16434386	Million Plus	A	State Capital	Coastal
Kolkata	West Bengal	East	13205697	Million Plus	A	State Capital	Plain

Table 3: Selected Cities for CDP Review							
City	**State**	**Region**	**Population (2001)**	**Class Size**	**JNNURM Category**	**Primary Function**	**Terrain/ Geography**
Delhi	Delhi	North	12877470	Million Plus	A	State Capital	Plain
Chennai	Tamil Nadu	South	6560242	Million Plus	A	State Capital	Coastal
Hyderabad	Andhra Pradesh	South	5742036	Million Plus	A	State Capital	Plateau
Bangalore	Karnataka	South	5701446	Million Plus	A	State Capital	Plateau
Ahmedabad	Gujarat	West	4525013	Million Plus	A	State Capital	Plain
Kanpur	Uttar Pradesh	North	2715555	Million Plus	B	Industrial Centre	Plain
Indore	Madhya Pradesh	Central	1506062	Million Plus	B	Commercial Centre	Plateau
Ludhiana	Punjab	North	1398467	Million Plus	B	Industrial Centre	Plain
Kochi	Kerala	South	1355972	Million Plus	B	Port Town/ Tourist Destination	Coastal
Varanasi	Uttar Pradesh	North	1203961	Million Plus	B	Religious/ Tourist Destination	Plain
Dhanbad	Jharkhand	East	1065327	Million Plus	B	Industrial Centre	Plain
Guwahati	Assam	North-East	818809	Class I	C	State Capital	Hilly
Raipur	Chhattisgarh	Central	700113	Class I	C	State Capital	Plateau
Nanded	Maharashtra	West	430733	Class I	C	Religious/ Tourist Destination	Plain
Haridwar	Uttarakhand	North	220767	Class I	C	Religious/ Tourist Destination	Plain
Panaji	Goa	West	58785	Class II	C	State Capital	Coastal
Itanagar	Arunachal Pradesh	North-East	34970	Class III	C	State Capital	Hilly
Bodhgaya	Bihar	East	30857	Class III	C	Religious/ Tourist Destination	Plain

Source: Population Data from Census of India, 2001; JNNURM Category from MoUD, 2005.

a. Review of CDP Toolkit

There were two sets of toolkits prepared by MoUD, the first one was in year 2006 immediately after the launch of JNNURM, which is the one that was used by different

cities to prepare their CDPs. The toolkit was very raw in nature, the analysis that was required to be done in the CDP was largely quantitative, and specifically regarding cost recovery. Sectoral analysis required in the CDP was to indicate adequacy or inadequacy of infrastructural services in terms of coverage, quantity and quality; the analysis should attempt to identify the factors responsible for inadequate infrastructure development. Analysis of the distributional characteristics of service delivery within the city and differences in the level of services across different socio-economic groups also received attention in the CDP toolkit.

Environmental analysis of required of factors related to infrastructure systems. Environmental analysis was to assess health impacts of environmental conditions within the city as well. City's proneness to floods, earthquakes or other national disasters was also to be included.

The CDP provided templates for situational analysis of infrastructure and service delivery; these templates were very minimalistic in nature and covered only broad level indicators of service delivery like overall coverage, per capita supply, etc. Institutional and financial analyses were paid attention to in the CDP. Detailed financial analysis of the ULBs is asked for in the CDP to estimate its capacity to operate and maintain the infrastructure created.

Developing the vision of the city by involving all the stakeholders was given due importance in the CDP toolkit; all objectives, strategies, programmes and projects must be aligned to the vision of the city. Outcomes and milestones were asked to be defined and phased out so that they would be measurable and have a time frame. Based on this, a financial plan had to be made along with the plan for implementation of mandatory and optional reforms. Alternative sources of funding need to be looked at while formulating the City Investment Plan and Financial Operating Plan.

Recognising the need for the updating of city development plans, the toolkit for the preparation of CDPs was revised in 2009-10. The revised toolkit is more comprehensive than the earlier one. The toolkit calls for inclusion of issues like environment planning, sustainable development and service level benchmarks in the CDP in addition to key aspects like urban planning, inter-sectoral and intra-sectoral linkages. The review of this revised toolkit is presented below:

Table 4: Sustainability Analysis of Revised CDP Toolkit			
Component	**Criteria**	**Summary of Issues Highlighted in Revised CDP Toolkit**	**Sustainability Implications**
Environmental	Resource Use/ Source	The CDP should reflect on conservation, sustainable use or destruction of available resource Study of physiography, climatic parameters and geology to be done to understand how development is affected by them and vice-versa. Revised toolkit also suggests doing a complete inventory of available surface water and ground water to assess the existing water supply potential. Possibilities of source augmentation should be seen by assessing rainfall, catchment areas, ground water, etc. Study of traditional water systems is proposed; this may help to reduce costs and make the system more sustainable. Provision of adequate public transport has been highlighted to discourage personal vehicles.	Implicit considerations of energy and water losses An inventory is a first step, not clear what action needs to be taken after this step
	Waste/ Sink	Baseline environmental status needs to be established by determining baseline levels of significant environmental parameters (air quality, water quality and environmental sensitivity) Coverage and types of toilets and their ecological	

Table 4: Sustainability Analysis of Revised CDP Toolkit			
Component	**Criteria**	**Summary of Issues Highlighted in Revised CDP Toolkit**	**Sustainability Implications**
		considerations need to be assessed. Potential of alternate sewerage system plus reuse and recycle of treated wastewater need to be assessed. Waste to energy options need to be looked at while planning for solid waste management	
	Sustainability of source/ sink	Areas of natural heritage and environmental sensitivity need to be outlined and immediate steps to be taken to protect these natural resources.	
Design and Technology	Performance	Reliability of service is identified as a key issue in the water supply sector Service level benchmarking should be done periodically to set targets and ensure service delivery Inadequate coverage has been raised as a concern in the toolkit, which needs to be considered while formulating strategies.	
	Efficiency	Rehabilitation of old pipes should not be seen as the only solution to reduce transfer losses, studies should be done to identify the technical causes.	
	Adaptability		
Social and Public Health	Equity	Equity in the planning process to be addressed by means of representation by	

Table 4: Sustainability Analysis of Revised CDP Toolkit			
Component	**Criteria**	**Summary of Issues Highlighted in Revised CDP Toolkit**	**Sustainability Implications**
		and participation of all stakeholders including the ones below poverty line. Consultative planning is central to the preparation of the CDP. Urban poverty need to be treated as a cross-cutting component while doing city assessment.	
	Reduction in Diseases		While this analysis is necessary, it is not clear whether the CDP is required to take the necessary steps to reduce disease burden. Also differential health impacts not taken into consideration.
Economic	Per capita investments	Possible alternatives to be assessed based on the capital costs and O&M costs involved	This does not mention the different costs of various technologies
	Operations and Maintenance	Financial sustainability of ULBs is recognised as a critical issue to implement infrastructure projects, manage operations and maintenance processes and sustain urban infrastructure through effective cost recovery mechanisms.	While this is necessary step, it is not clear how the ULBs will provide for these costs
Process	Interlinkages with other sectors	The revised toolkit suggests a resource based approach to planning taking into consideration social,	

Table 4: Sustainability Analysis of Revised CDP Toolkit			
Component	**Criteria**	**Summary of Issues Highlighted in Revised CDP Toolkit**	**Sustainability Implications**
		economic, natural and cultural resources. Inter-sectoral and intra-sectoral aspects of sectors to be addressed by CDP so that inter-linkages for sustainable development can be achieved. All services should follow 'common network' approach, which should be related to the activity pattern or land-uses in the city. Linkage between capital investment, socio-economic development, spatial development and urban poverty alleviation should be established. The toolkit recommends CDPs to not focus on admissible sectors but be as comprehensive as possible and include all sectors of planning and development. Integration of land use and transport is identified as one of the key issues. One of the roles of CDP Technical Committee is to ensure the linkages and cohesiveness among the sub-components of the CDP and suggest measures for sustainability and implementation of projects	This is an important point, but there is no guideline or examples of how to achieve this.

Table 4: Sustainability Analysis of Revised CDP Toolkit			
Component	**Criteria**	**Summary of Issues Highlighted in Revised CDP Toolkit**	**Sustainability Implications**
		for maximising the benefits to the city.	
	Integration	CDP to integrate spatial planning and infrastructure planning.	
	Capacity Development	Needs for urban reforms and institutional processes to equip ULBs to carry out infrastructure development are recognised. Institutional study should assess the need for capacity development and training for the elected representatives, staff of local body and para-statal agencies, vendors, community groups, etc. The CDP should lay out how civic agencies plan to meet human resource shortage for planning, development and urban management activities.	
	Monitoring and Evaluation	A monitoring mechanism should be established for measuring the identifiable indicators for the implementation of CDP formulated	

b. Review of CDPs

CDPs of 20 JNNURM cities were analysed for the prevalence and salience of their attention to specific sectors and sustainability dimensions thereof. The sustainability analysis of the 20 cities is given in ANNEX 2. The next step was to count the number of cities the CDPS of which took cognisance of that particular dimension. For example, if water resources were deemed important by the CDP, these were counted as “recognition” and as table 5

presents, 15 of the 20 cities were found to be doing so. Table 5 presents sustainability dimension for the 5 main sub sectors under study. The indicators against which the sub sectors have been mapped/ "counted" cover the aspects of environment, design and technology, social and public health, economic and process.

Table 5: Sustainability Analysis of Five Sub-Sectors in Selected CDPs

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	15	12	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Energy	3	3	5	2	4	3	2	1	0	0	0	0	1	0	0	0	1	3	1	0
		Land	0	0	0	0	1	2	0	0	9	8	0	0	4	4	3	0	5	3	1	0
		Material	0	0	0	0	0	0	0	0	0	0	0	0	5	7	4	0	1	0	0	0
	Sink/ Waste	Wastewater	0	0	0	0	20	15	10	1	12	4	3	0	5	0	1	0	0	0	0	0
		Waste	0	0	0	0	3	1	0	0	11	4	1	0	18	17	16	0	0	0	0	0
		Air Pollution	0	0	0	0	2	1	0	0	0	0	0	0	1	1	1	0	10	10	0	1
	Sustainability of Source/ Sink		14	13	12	0	3	1	1	0	4	8	2	0	3	1	3	0	0	0	1	0
Design and Technology	Performance	Coverage	18	19	18	0	20	19	19	0	14	11	15	0	16	14	16	0	18	16	17	0
		Quality	15	9	9	1	9	9	4	0	4	2	2	0	6	3	0	0	15	14	12	0
		Reliability	17	10	6	0	9	6	5	0	16	14	12	0	4	2	0	0	3	4	0	0
	Efficiency		17	18	16	1	6	7	10	0	8	11	5	0	8	11	7	1	17	18	16	0
	Adaptability		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Social and Public Health	Equity		18	18	12	0	17	16	16	0	12	12	12	0	14	13	11	0	13	14	13	0
	Public Health/ Reduction in Diseases		3	2	1	0	5	0	0	0	3	0	0	0	6	1	0	0	9	11	4	0
Economic	Per Capita Investments		2	1	0	0	1	3	1	0	0	0	0	0	1	1	0	0	0	1	0	0
	Operation and Maintenance		14	15	14	0	9	11	7	0	6	4	4	0	8	9	7	0	3	3	4	0
Process	Inter-linkages		1	1	2	0	1	1	2	0	2	2	2	0	0	0	1	0	1	2	1	0
	Integration		7	0	0	0	4	1	0	0	2	1	0	0	0	3	1	0	7	2	0	0
	Capacity Development		7	11	6	0	5	8	4	0	6	4	4	0	11	7	4	0	6	4	4	0
	Monitoring and Evaluation		3	8	5	1	2	7	3	1	0	3	1	1	1	2	1	1	1	1	0	1

Water supply enjoys primacy amongst the sectors as demonstrated by a large portion of sample cities and acknowledging its importance. Apart from resource use, sustainability of water sources found recognition in almost two thirds of the CDPSs including attention to investing in source protection or augmentation. The performance of the water supply system viz. coverage, quality, reliability; and efficiency aspects were accorded recognition. Similarly, operations and maintenance of water supply were recognised and proposed for budgetary allocations. Capacity of personnel involved in drinking water supply finds mention, but only a quarter of cities appear to propose investments for improvements in this area.

Sewerage and sanitation sector issues are recognised in the CDPs of most cities, and half the study CDPs have investments proposed for augmentation or improvement. The bulk of the improvements are in extension of the system, improved collection as well as improving access by specific groups of households and/ or unserved areas of the city. More than a quarter of the study cities also propose O & M related improvements in the sewerage systems. A small proportion of cities have also proposed capacity building and monitoring and evaluation in this sub-sector, albeit include financial investments of their quarter.

Storm water drainage is found to be according importance in little more than half of study cities. Again, improved coverage, efficiency and reliability in terms of being able to convey storm and waste water are recognised as important issues. Issues relating to improving access/ coverage of the storm water system, and issues of land pertaining to the same find an echo in about half the CDPs; whereas O & M and capacity building (including financial investments for these) find a place in every one in five cities under study.

Solid waste management, especially concerns ranging from collection, efficient and timely transport and disposal, and disposal systems and sites appear to have near universal appeal. More than ¾ of the CDPs have proposals for financial investment to improve solid waste management. Operations related improvements are proposed in about a third of the cities.

Urban transportation related indicators that are salient in the study CDPs include access to public transport, quality of transport infrastructure, and reliability of the public transport system. Efficiency in transport system and coverage thereof enjoy primacy in the cities' investment proposals. While explicit investments are reported only from a limited number of cities, safety and pollution related health benefits have been according salience in every three of the four cities under review.

Other inferences from the review of CDPs include:

1. The CDPs largely contain sectoral analysis and do not recognise the linkages between sectors e.g. there is hardly any recognition of how solid waste might be affection the efficiency/ functioning of sewerage/ drainage systems.

2. There is confusion between goals and strategies. Often specific strategies/ technologies are often conflated with goals e.g. sewerage, not safe collection and disposal, is often mentioned as a goal. The concern with this technological fixation is that ULBs may not notice other feasible options to achieve same goal (in this case treatment of waste water).
3. Logical connection between goals, strategies and projects is often not evident. As the tables highlight, often the goals are in place, but they do not get translated either into strategies or into projects. Sometimes it is difficult to assess the connection between goals and eventual projects.

4. There is ambiguity around words environment and sustainability. It has been used in multiple different ways in the CDP.

6 Next Steps

The immediate next step of the project is to carry out the fieldwork from 19th November, 2012 to 30th November, 2012 in Nanded. The city has been selected keeping in mind the size, language spoken and implementation of projects across sectors.

The objectives of the fieldwork are:

- To cross check status of the reforms, and their implementation status
- To understand the entire process, including:
    - CDP preparation (including approval)
    - DPR preparation
    - Special attention to budgetary concerns
- To assess the implementation of various projects
- Understand whether sustainability was taken into account
    - Overall
    - Specific criteria (subset to be identified from the matrix, focussing on issues highlighted in CDP)
- To assess discrepancies between CDP, other official realities and ground reality

In order to gather data on the above, fieldwork would involve a reconnaissance survey of the city and surroundings to get a sense of status of urban services including water supply, sewerage, drainage, solid waste management and transportation. Meetings and discussions with key stakeholders who have been involved in preparation of CDP/ DPRs and implementation of projects will be conducted. These would include: Municipal Commissioner, city engineers, concerned parastatals and line departments, consultants involved in CDP and DPR preparation and projects execution. Discussion with some citizen groups will also be conducted to understand the process of community participation in CDP preparation; these discussions will also allow gauging citizens' assessment of the service delivery, CDP preparation and the projects being executed.

Site visits to the relevant projects will be undertaken to see the physical progress of the projects and how they are being executed.

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ANNEX I: Details of JNNURM

A. List of Mission Cities under JNNURM:

4 million plus cities (7)	Other million plus cities (28)	Other selected cities/ towns/ UAs (state capitals, of religious/ heritage/ tourism importance) (30)
1. Greater Mumbai 2. Kolkata 3. Delhi 4. Chennai 5. Hyderabad 6. Bangalore 7. Ahmedabad	8. Pune 9. Surat 10. Kanpur 11. Jaipur 12. Lucknow 13. Nagpur 14. Patna 15. Indore 16. Vadodara 17. Coimbatore 18. Bhopal 19. Ludhiana 20. Kochi 21. Vishakhapatnam 22. Agra 23. Varanasi 24. Madurai 25. Meerut 26. Nashik 27. Jamshedpur 28. Jabalpur 29. Asansol 30. Dhanbad 31. Faridabad 32. Allahabad 33. Vijayawada 34. Rajkot 35. Amritsar	36. Srinagar 37. Thiruvananthapuram 38. Ranchi 39. Guwahati 40. Chandigarh 41. Mysore 42. Raipur 43. Bhubaneswar 44. Jammu 45. Dehradun 46. Puducherry 47. Ajmer-Pushkar 48. Ujjain 49. Nanded 50. Bodhgaya 51. Mathura 52. Tirupati 53. Shillong 54. Imphal 55. Aizawl 56. Haridwar 57. Nainital 58. Porbandar 59. Agartala 60. Puri 61. Shimla 62. Panaji 63. Kohima 64. Itanagar 65. Gangtok

B. Eligible Sectors and Projects under JNNURM:

The sectors and projects eligible for JNNURM assistance under **UIG sub-mission** are as follows:

1. Urban renewal, that is, redevelopment of inner (old) city areas, including:
    a. Widening of narrow streets
    b. Shifting of industrial and commercial establishments from non-conforming (inner city) areas to conforming (outer city) areas to reduce congestion
    c. Replacement of old and worn out pipes by new and higher capacity ones
    d. Renewal of the sewerage, drainage, and solid waste disposal system etc.
2. Water supply (including desalination plants) and sanitation
3. Sewerage and solid waste management
4. Construction and improvement of drains and storm water drains
5. Urban transportation including roads, highways, expressways, MRTS, and metro projects
6. Parking lots and spaces on PPP basis
7. Development of heritage areas
8. Prevention and rehabilitation of soil erosion and landslides only in cases of special category States where such problems are common
9. Preservation of water bodies

The sectors and projects eligible for JNNURM assistance under **BSUP sub-mission** are as follows:

1. Integrated development of slums, housing and development of infrastructure projects in slums in the identified cities
2. Projects involving development, improvement, and maintenance of basic services to the urban poor
3. Slum improvement and rehabilitation of projects
4. Projects on water supply, sewerage, drainage, community toilets, and baths etc.
5. Projects for providing houses at affordable cost for slum dwellers, urban poor, economically weaker sections (EWS) and lower income group (LIG) categories.
6. Construction and improvement of drains and storm water drains.
7. Environmental improvement of slums and solid waste management.
8. Street lighting.
9. Civic amenities like community halls, child care centres etc.
10. Operation and Maintenance of assets created under this component.
11. Convergence of health, education and social security schemes for the urban poor

C. Objectives of JNNURM:

The objectives of the JNNURM are to ensure that the following are achieved in the urban sector:

a) Focussed attention to integrated development of infrastructure services in cities covered under the Mission
b) Establishment of linkages between asset-creation and asset-management through a slew of reforms for long-term project sustainability
c) Ensuring adequate funds to meet the deficiencies in urban infrastructural services
d) Planned development of identified cities including peri-urban areas, outgrowths and urban corridors leading to dispersed urbanisation
e) Scale-up delivery of civic amenities and provision of utilities with emphasis on universal access to the urban poor
f) Special focus on urban renewal programme for the old city areas to reduce congestion
g) Provision of basic services to the urban poor including security of tenure at affordable prices, improved housing, water supply and sanitation, and ensuring delivery of other existing universal services of the government for education, health and social security.

D. Expected Outcomes of JNNURM:

a) Modern and transparent budgeting, accounting, financial management systems, designed and adopted for all urban service and governance functions
b) City-wide framework for planning and governance will be established and become operational
c) All urban residents will be able to obtain access to a basic level of urban services
d) Financially self-sustaining agencies for urban governance and service delivery will be established, through reforms to major revenue instruments
e) Local services and governance will be conducted in a manner that is transparent and accountable to citizens
f) E-governance applications will be introduced in core functions of ULBs/Parastatal resulting in reduced cost and time of service delivery processes.

E. **Process for Accessing Funds**

The process to be followed by cities to access funds is given below:
Preparation of City Development Plan: In order to avail funding, every city was required to prepare and submit a City Development Plan. The CDP was required to:

a) Undertake situational analysis of the city including SWOT analysis
b) Develop vision for the city
c) Identify development goals and strategies
d) Identify projects to meet above stated goals and strategies and earmark projects of high, medium, low priority

Stakeholder consultations and workshops were mandatory components during the preparation of the CDP. These consultations were required at every point of the CDP preparation. The CDP was also supposed to undertake financial assessment and outline an investment plan and financial operating plan (FOP) to address the infrastructure needs in a sustainable manner.
Preparing Projects and Detailed Project Reports: Having identified projects in the CDP, the ULBs/ parastatal agencies were required to prepare Detailed Project Reports (DPRs) for the individual projects. In order to seek JNNURM assistance, projects were to ensure and demonstrate optimisation of the life-cycle costs over the planning horizon of the project including creation of a revolving fund to meet the O&M requirements of assets created. The guidelines also suggest incorporating private sector efficiencies in development, management, implementation and financing of projects, through Public Private Partnership (PPP) arrangements for optimisation of life cycle costs. It was stated that projects with private sector participation would in fact be given preference over projects to be executed by ULBs/ parastatals themselves. DPRs would be scrutinized by the Technical wing of MoUD before they are forwarded to Central Sanctioning and Monitoring Committee for approval and sanction.
Release and Leveraging of Funds: Once the project is approved, funds from the Central and State Government will flow directly to the State Level Nodal Agency (SLNA). The funds for identified projects across cities would be disbursed to the ULB/Parastatal agency through the designated SLNA. Central assistance under investment support can be deployed in enhancing resource availability, these resources could be utilised for capital investment and O&M investments in a project; enhancing commercial viability of the project; and ensuring bankability of project. Funding pattern under JNNURM as below:

Category of Cities/ Towns/ UAs	Grant		ULB or Parastatal Share/ Loan from Financial Institutions
	Centre	State	
Cities/UAs with 4 million plus population as per 2001 census	35%	15%	50%
Cities/UAs with million plus but less than 4 million population as per 2001census	50%	20%	30%
Cities/towns/UAs in North Eastern States and Jammu & Kashmir	90%	10%	-

Other cities/UAs	80%	10%	10%
For setting up de-salination plants within 20 km from sea-shore and other urban areas predominantly facing water scarcity due to brackish water and non-availability of surface source	80%	10%	10%

Implementation of Reforms: The central assistance under JNNURM is linked to a set of reforms, in order to bring about a change in how urban governance works in India. There were a set of mandatory reforms both for the state government and the urban local body (ULB)/ parastatals, and an additional set of optional reforms for them to implement.
Two optional reforms could be implemented every year; all mandatory and optional reforms need to be implemented by the end of the seven year period.

Mandatory Reforms at the Level of ULBs/ Parastatal Agencies

- Adoption of modern accrual-based double entry system of accounting in ULBs and parastatal agencies
- Introduction of a system of e-governance using IT applications
- Reform of property tax with GIS
- Levy of reasonable user charges by ULBs and Parastatals
- Internal earmarking, within local bodies, budgets for basic services to the urban poor
- Provision of basic services to the urban poor

Mandatory Reforms at the Level of States

- Implementation of 74thConstitutional Amendment Act
- Repeal of ULCRA
- Reform of Rent Control Laws
- Rationalisation of Stamp Duty
- Enactment of the Public Disclosure Law
- Enactment of the Community Participation Law
- Assigning or associating elected ULBs with “city planning function”

Optional Reforms (common to States, ULBs and Parastatal Agencies)

- Revision of bye-laws to streamline the approval process for construction of buildings, development of site etc.
- Simplification of legal and procedural frameworks for conversion of land from agricultural to non-agricultural purposes
- Introduction of Property Title Certification System in ULBs
- Earmarking at least 20-25 per cent of developed land in all housing projects (both public and private agencies) for EWS and LIG category with a system of cross subsidisation
- Introduction of computerised process of registration of land and property

- Revision of byelaws to make rain-water harvesting mandatory in all buildings and adoption of water conservation measures
- Byelaws for reuse of recycled water
- Administrative reforms
- Structural reforms
- Encouraging PPP

ANNEX II: Sustainability Analysis of CDPs

A. Greater Mumbai

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓																			
		Energy																		✓		
		Land									✓	✓										
		Material														✓						
	Sink/ Waste	Wastewater					✓	✓			✓		✓									
		Waste									✓				✓	✓	✓					
		Air Pollution																		✓		
	Sustainability of Source/ Sink		✓		✓										✓							
Design and Technology	Performance	Coverage		✓	✓		✓												✓	✓	✓	
		Quality	✓				✓												✓	✓	✓	
		Reliability	✓				✓	✓			✓	✓							✓	✓		
	Efficiency		✓	✓							✓	✓							✓	✓		
	Adaptability			✓																		
Social and Public Health	Equity		✓	✓			✓	✓	✓			✓			✓							
	Public Health/ Reduction in Diseases																			✓		
Economic	Per Capita Investments																					
	Operation and Maintenance																			✓		
Process	Inter-linkages																					
	Integration																					
	Capacity Development																					
	Monitoring and Evaluation							✓								✓						

B. Kolkata

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water																				
		Energy																		✓		
		Land																		✓		
		Material																				
	Sink/ Waste	Wastewater					✓	✓														
		Waste														✓						
		Air Pollution																	✓			
	Sustainability of Source/ Sink		✓	✓	✓				✓				✓				✓				✓	
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓			✓	✓		✓	✓	✓	
		Quality																		✓	✓	
		Reliability	✓				✓															
	Efficiency			✓	✓			✓	✓												✓	
	Adaptability																					
Social and Public Health	Equity																			✓		
	Public Health/ Reduction in Diseases														✓				✓	✓		
Economic	Per Capita Investments																					
	Operation and Maintenance		✓	✓			✓				✓				✓				✓			
Process	Inter-linkages																			✓		
	Integration		✓																			
	Capacity Development																					
	Monitoring and Evaluation								✓													

C. Delhi

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓		✓																	
		Energy			✓		✓												✓	✓	✓	
		Land									✓	✓			✓	✓			✓			
		Material																				
	Sink/ Waste	Wastewater					✓	✓	✓		✓											
		Waste													✓		✓					
		Air Pollution																	✓	✓		
	Sustainability of Source/ Sink		✓	✓								✓										
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓										✓	✓	✓	
		Quality	✓																	✓		
		Reliability	✓				✓				✓	✓	✓							✓		
	Efficiency		✓	✓	✓		✓		✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓			✓	✓			✓	✓			✓	✓	✓		✓	✓	✓	
	Public Health/ Reduction in Diseases		✓	✓															✓	✓	✓	
Economic	Per Capita Investments																					
	Operation and Maintenance		✓		✓				✓		✓		✓				✓				✓	
Process	Inter-linkages										✓	✓							✓			
	Integration											✓				✓			✓	✓		
	Capacity Development																					
	Monitoring and Evaluation																					

D. Chennai

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓	✓																	
		Energy		✓	✓			✓	✓													
		Land													✓							
		Material																				
	Sink/ Waste	Wastewater					✓			✓												
		Waste													✓	✓	✓					
		Air Pollution																	✓	✓		
	Sustainability of Source/ Sink		✓	✓	✓							✓				✓	✓					
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
		Quality		✓	✓			✓	✓				✓						✓	✓		
		Reliability						✓	✓		✓	✓	✓							✓		
	Efficiency		✓	✓	✓				✓			✓	✓						✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Public Health/ Reduction in Diseases																			✓		
Economic	Per Capita Investments																					
	Operation and Maintenance		✓	✓	✓		✓									✓						
Process	Inter-linkages			✓	✓			✓	✓				✓							✓		
	Integration		✓								✓											
	Capacity Development			✓	✓			✓	✓													
	Monitoring and Evaluation			✓	✓			✓	✓			✓					✓					

E. Hyderabad

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓		✓																	
		Energy	✓	✓	✓		✓	✓	✓													
		Land									✓											
		Material														✓						
	Sink/ Waste	Wastewater					✓	✓	✓													
		Waste									✓				✓	✓	✓					
		Air Pollution																	✓	✓		
	Sustainability of Source/ Sink		✓	✓																		
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓		✓		✓	✓	✓		✓	✓	✓	
		Quality		✓				✓				✓	✓							✓		
		Reliability	✓	✓	✓						✓	✓	✓						✓	✓		
	Efficiency		✓	✓	✓		✓		✓			✓			✓	✓	✓	✓	✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓		✓		✓		✓		✓		✓	✓	✓	
	Public Health/ Reduction in Diseases																		✓	✓	✓	
Economic	Per Capita Investments																					
	Operation and Maintenance		✓	✓	✓		✓	✓			✓					✓						
Process	Inter-linkages				✓		✓		✓		✓		✓				✓				✓	
	Integration																					
	Capacity Development			✓	✓										✓				✓		✓	
	Monitoring and Evaluation			✓	✓			✓				✓										

F. Bangalore

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓	✓																	
		Energy		✓																		
		Land										✓								✓		
		Material														✓						
	Sink/ Waste	Wastewater					✓	✓	✓													
		Waste									✓				✓	✓						
		Air Pollution																		✓		
	Sustainability of Source/ Sink		✓	✓	✓																	
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓			✓	✓		✓	✓	✓		✓	✓	✓	
		Quality													✓							
		Reliability	✓				✓	✓	✓		✓	✓	✓			✓			✓			
	Efficiency		✓	✓	✓		✓		✓							✓			✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓				✓		✓	✓			✓	✓	✓	
	Public Health/ Reduction in Diseases		✓				✓													✓		
Economic	Per Capita Investments																					
	Operation and Maintenance		✓	✓	✓		✓	✓	✓						✓	✓	✓					
Process	Inter-linkages																					
	Integration		✓				✓									✓						
	Capacity Development																					
	Monitoring and Evaluation			✓				✓														

G. Ahmedabad

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓																		
		Energy																				
		Land										✓							✓			
		Material													✓							
	Sink/ Waste	Wastewater					✓	✓	✓		✓				✓							
		Waste					✓								✓	✓	✓					
		Air Pollution																		✓		
	Sustainability of Source/ Sink		✓	✓	✓							✓										
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓		✓		✓	✓	✓		✓	✓	✓	
		Quality	✓		✓			✓											✓	✓	✓	
		Reliability	✓	✓			✓	✓	✓		✓		✓									
	Efficiency		✓	✓	✓										✓	✓			✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓				✓									✓						
	Public Health/ Reduction in Diseases			✓															✓			
Economic	Per Capita Investments																					
	Operation and Maintenance			✓																		
Process	Inter-linkages																					
	Integration																					
	Capacity Development																					
	Monitoring and Evaluation			✓			✓															

Kanpur

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water																				
		Energy																				
		Land																				
		Material																				
	Sink/ Waste	Wastewater					✓	✓														
		Waste						✓			✓	✓	✓		✓	✓	✓					
		Air Pollution																	✓	✓		
	Sustainability of Source/ Sink		✓	✓	✓																	
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓				✓						✓			
		Quality	✓				✓	✓											✓	✓	✓	
		Reliability	✓	✓	✓		✓															
	Efficiency		✓	✓	✓			✓	✓						✓	✓	✓		✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓		✓	
	Public Health/ Reduction in Diseases																					
Economic	Per Capita Investments																					
	Operation and Maintenance		✓	✓	✓			✓								✓	✓					
Process	Inter-linkages																					
	Integration																					
	Capacity Development		✓				✓				✓				✓				✓			
	Monitoring and Evaluation																			✓		

H. Indore

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓																		
		Energy																				
		Land																				
		Material																				
	Sink/ Waste	Wastewater					✓	✓														
		Waste													✓	✓	✓					
		Air Pollution																	✓	✓		
	Sustainability of Source/ Sink				✓																	
Design and Technology	Performance	Coverage	✓	✓			✓	✓	✓		✓	✓	✓		✓	✓			✓	✓	✓	
		Quality	✓				✓															
		Reliability	✓	✓	✓						✓		✓		✓							
	Efficiency		✓	✓	✓		✓		✓						✓				✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓			✓	✓			✓	✓		✓	✓	✓	
	Public Health/ Reduction in Diseases																			✓		
Economic	Per Capita Investments																					
	Operation and Maintenance			✓				✓				✓				✓						
Process	Inter-linkages																					
	Integration																		✓			
	Capacity Development			✓											✓							
	Monitoring and Evaluation		✓	✓															✓			

I. Ludhiana

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓		✓																	
		Energy																				
		Land																				
		Material																				
	Sink/ Waste	Wastewater					✓		✓		✓	✓										
		Waste													✓	✓	✓					
		Air Pollution					✓												✓			
	Sustainability of Source/ Sink		✓																			
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓		✓			✓	✓	
		Quality	✓																✓	✓	✓	
		Reliability	✓	✓			✓	✓			✓	✓										
	Efficiency			✓								✓							✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓					✓												✓	
	Public Health/ Reduction in Diseases						✓												✓			
Economic	Per Capita Investments																					
	Operation and Maintenance																					
Process	Inter-linkages																					
	Integration		✓				✓												✓			
	Capacity Development			✓											✓	✓						
	Monitoring and Evaluation		✓		✓																	

J. Kochi

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water		✓	✓																	
		Energy				✓	✓			✓					✓							
		Land									✓	✓							✓			
		Material																				
	Sink/ Waste	Wastewater					✓	✓							✓							
		Waste									✓				✓	✓	✓					
		Air Pollution																				✓
	Sustainability of Source/ Sink			✓	✓						✓	✓										
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
		Quality	✓					✓			✓				✓	✓			✓	✓	✓	
		Reliability	✓	✓	✓						✓	✓	✓		✓							
	Efficiency			✓	✓		✓	✓	✓							✓			✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Public Health/ Reduction in Diseases						✓				✓				✓							
Economic	Per Capita Investments																					
	Operation and Maintenance		✓	✓	✓		✓	✓							✓							
Process	Inter-linkages																					
	Integration																					
	Capacity Development				✓			✓					✓				✓					
	Monitoring and Evaluation				✓			✓								✓						

K. Varanasi

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water			✓																	
		Energy				✓																
		Land									✓						✓				✓	
		Material																				
	Sink/ Waste	Wastewater					✓	✓	✓		✓		✓		✓		✓					
		Waste													✓		✓					
		Air Pollution																	✓			
	Sustainability of Source/ Sink		✓	✓	✓		✓															
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
		Quality	✓	✓	✓		✓	✓	✓						✓				✓	✓	✓	
		Reliability	✓		✓		✓		✓		✓	✓	✓									
	Efficiency		✓	✓	✓	✓		✓	✓		✓								✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓				✓	
	Public Health/ Reduction in Diseases														✓						✓	
Economic	Per Capita Investments																					
	Operation and Maintenance				✓																	
Process	Inter-linkages																					
	Integration																✓					
	Capacity Development		✓	✓	✓			✓	✓				✓		✓		✓					
	Monitoring and Evaluation				✓				✓				✓		✓							

L. Dhanbad

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓	✓																	
		Energy						✓														
		Land						✓														
		Material													✓							
	Sink/ Waste	Wastewater					✓	✓	✓		✓	✓										
		Waste									✓				✓	✓	✓					
		Air Pollution																		✓		
	Sustainability of Source/ Sink		✓	✓	✓																	
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
		Quality	✓	✓	✓			✓	✓		✓				✓	✓			✓	✓	✓	
		Reliability	✓	✓				✓			✓	✓	✓									
	Efficiency		✓	✓	✓							✓				✓				✓		
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Public Health/ Reduction in Diseases														✓							
Economic	Per Capita Investments						✓	✓														
	Operation and Maintenance		✓	✓	✓			✓	✓			✓				✓	✓					
Process	Inter-linkages																					
	Integration																					
	Capacity Development			✓				✓							✓	✓						
	Monitoring and Evaluation			✓			✓	✓														

M. Guwahati

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓	✓																	
		Energy	✓																			
		Land									✓	✓				✓						
		Material															✓					
	Sink/ Waste	Wastewater					✓	✓			✓				✓							
		Waste									✓	✓			✓	✓						
		Air Pollution																	✓	✓		
	Sustainability of Source/ Sink		✓	✓			✓	✓			✓											
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓				✓	✓	✓		✓	✓	✓	
		Quality	✓	✓	✓		✓									✓			✓	✓	✓	
		Reliability	✓	✓							✓	✓	✓									
	Efficiency		✓	✓	✓			✓			✓								✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity			✓			✓	✓	✓													
	Public Health/ Reduction in Diseases						✓				✓								✓	✓		
Economic	Per Capita Investments																					
	Operation and Maintenance		✓	✓	✓			✓							✓	✓						
Process	Inter-linkages																					
	Integration																		✓			
	Capacity Development		✓	✓	✓				✓				✓			✓	✓				✓	
	Monitoring and Evaluation																					

N. Raipur

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓																		
		Energy			✓		✓															
		Land										✓					✓			✓		
		Material													✓	✓	✓					
	Sink/ Waste	Wastewater					✓	✓	✓		✓	✓										
		Waste									✓	✓				✓	✓					
		Air Pollution														✓	✓					
	Sustainability of Source/ Sink			✓	✓							✓	✓									
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓			✓	✓	
		Quality	✓	✓	✓	✓	✓	✓	✓										✓	✓	✓	
		Reliability		✓							✓	✓	✓		✓							
	Efficiency		✓	✓	✓						✓	✓	✓		✓				✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓			✓	✓				✓				✓			✓		
	Public Health/ Reduction in Diseases		✓																			
Economic	Per Capita Investments		✓																			
	Operation and Maintenance		✓	✓	✓				✓				✓				✓				✓	
Process	Inter-linkages																					
	Integration		✓				✓				✓					✓			✓			
	Capacity Development			✓				✓				✓				✓				✓		
	Monitoring and Evaluation																					

O. Nanded

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓																		
		Energy	✓																			
		Land										✓										
		Material														✓	✓					
	Sink/ Waste	Wastewater					✓															
		Waste					✓								✓	✓	✓					
		Air Pollution																				
	Sustainability of Source/ Sink																					
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓						✓	✓	✓		✓			
		Quality			✓		✓												✓	✓	✓	
		Reliability	✓	✓			✓				✓	✓	✓									
	Efficiency		✓	✓	✓			✓								✓	✓		✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓			✓	✓			✓	✓			✓	✓		
	Public Health/ Reduction in Diseases										✓									✓		
Economic	Per Capita Investments							✓														
	Operation and Maintenance		✓	✓	✓		✓	✓	✓		✓				✓				✓			
Process	Inter-linkages																					
	Integration		✓				✓	✓											✓	✓		
	Capacity Development		✓	✓			✓	✓			✓	✓			✓	✓			✓	✓		
	Monitoring and Evaluation																					

P. Haridwar

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓																		
		Energy																				
		Land						✓			✓				✓	✓	✓		✓			
		Material													✓	✓			✓			
	Sink/ Waste	Wastewater					✓	✓			✓	✓										
		Waste					✓				✓	✓			✓	✓						
		Air Pollution					✓	✓											✓			
	Sustainability of Source/ Sink														✓							
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓		✓		✓	✓	✓		✓		✓	
		Quality	✓	✓	✓							✓			✓				✓			
		Reliability	✓								✓				✓							
	Efficiency		✓	✓	✓				✓			✓	✓		✓	✓	✓		✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓		✓		✓		✓		✓		✓		✓	✓	✓	
	Public Health/ Reduction in Diseases						✓								✓	✓			✓	✓		
Economic	Per Capita Investments			✓											✓							
	Operation and Maintenance		✓	✓	✓		✓	✓	✓				✓				✓				✓	
Process	Inter-linkages											✓										
	Integration		✓																✓			
	Capacity Development		✓				✓				✓				✓	✓			✓			
	Monitoring and Evaluation			✓																		

Q. Panaji

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓	✓																	
		Energy																				
		Land					✓				✓				✓	✓			✓			
		Material																				
	Sink/ Waste	Wastewater					✓	✓	✓		✓		✓									
		Waste									✓				✓		✓					
		Air Pollution																				
	Sustainability of Source/ Sink		✓	✓	✓		✓				✓	✓			✓		✓					
Design and Technology	Performance	Coverage					✓	✓	✓						✓		✓		✓	✓		
		Quality	✓		✓		✓	✓			✓				✓				✓			
		Reliability	✓		✓				✓		✓	✓										
	Efficiency		✓	✓	✓		✓				✓	✓	✓			✓	✓		✓	✓	✓	
	Adaptability																					
Social and Public Health	Equity		✓	✓			✓	✓	✓		✓	✓			✓	✓			✓	✓		
	Public Health/ Reduction in Diseases				✓														✓	✓	✓	
Economic	Per Capita Investments		✓													✓				✓		
	Operation and Maintenance		✓	✓	✓		✓	✓	✓			✓	✓		✓	✓	✓			✓	✓	
Process	Inter-linkages		✓																			
	Integration																					
	Capacity Development			✓				✓			✓	✓			✓					✓	✓	
	Monitoring and Evaluation		✓																			

R. Itanagar

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water																				
		Energy			✓																	
		Land									✓											
		Material													✓	✓	✓					
	Sink/ Waste	Wastewater					✓		✓		✓											
		Waste									✓				✓	✓	✓					
		Air Pollution																				
	Sustainability of Source/ Sink		✓									✓										
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓		✓		✓		✓	
		Quality	✓	✓			✓												✓		✓	
		Reliability	✓									✓				✓						
	Efficiency		✓					✓			✓	✓			✓							
	Adaptability																					
Social and Public Health	Equity		✓	✓			✓	✓	✓		✓	✓	✓		✓	✓			✓	✓	✓	
	Public Health/ Reduction in Diseases																		✓			
Economic	Per Capita Investments																					
	Operation and Maintenance		✓		✓		✓				✓				✓				✓			
Process	Inter-linkages																					
	Integration																					
	Capacity Development		✓				✓				✓				✓				✓			
	Monitoring and Evaluation			✓				✓				✓										

S. Bodhgaya

Indicators			Water Supply				Sewerage				Storm Water Drainage				Solid Waste Management				Transportation			
			Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E	Recog.	Imp.	Invest.	M & E
Environmental	Resource Use	Water	✓	✓	✓																	
		Energy																				
		Land																				
		Material																				
	Sink/ Waste	Wastewater					✓				✓				✓							
		Waste													✓	✓	✓					
		Air Pollution													✓							
	Sustainability of Source/ Sink										✓	✓										
Design and Technology	Performance	Coverage	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
		Quality	✓	✓							✓								✓			
		Reliability																				
	Efficiency		✓								✓	✓				✓	✓		✓	✓		
	Adaptability																					
Social and Public Health	Equity		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Public Health/ Reduction in Diseases														✓							
Economic	Per Capita Investments							✓	✓													
	Operation and Maintenance			✓				✓			✓	✓			✓	✓				✓		
Process	Inter-linkages																					
	Integration																					
	Capacity Development		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
	Monitoring and Evaluation					✓				✓				✓				✓				✓

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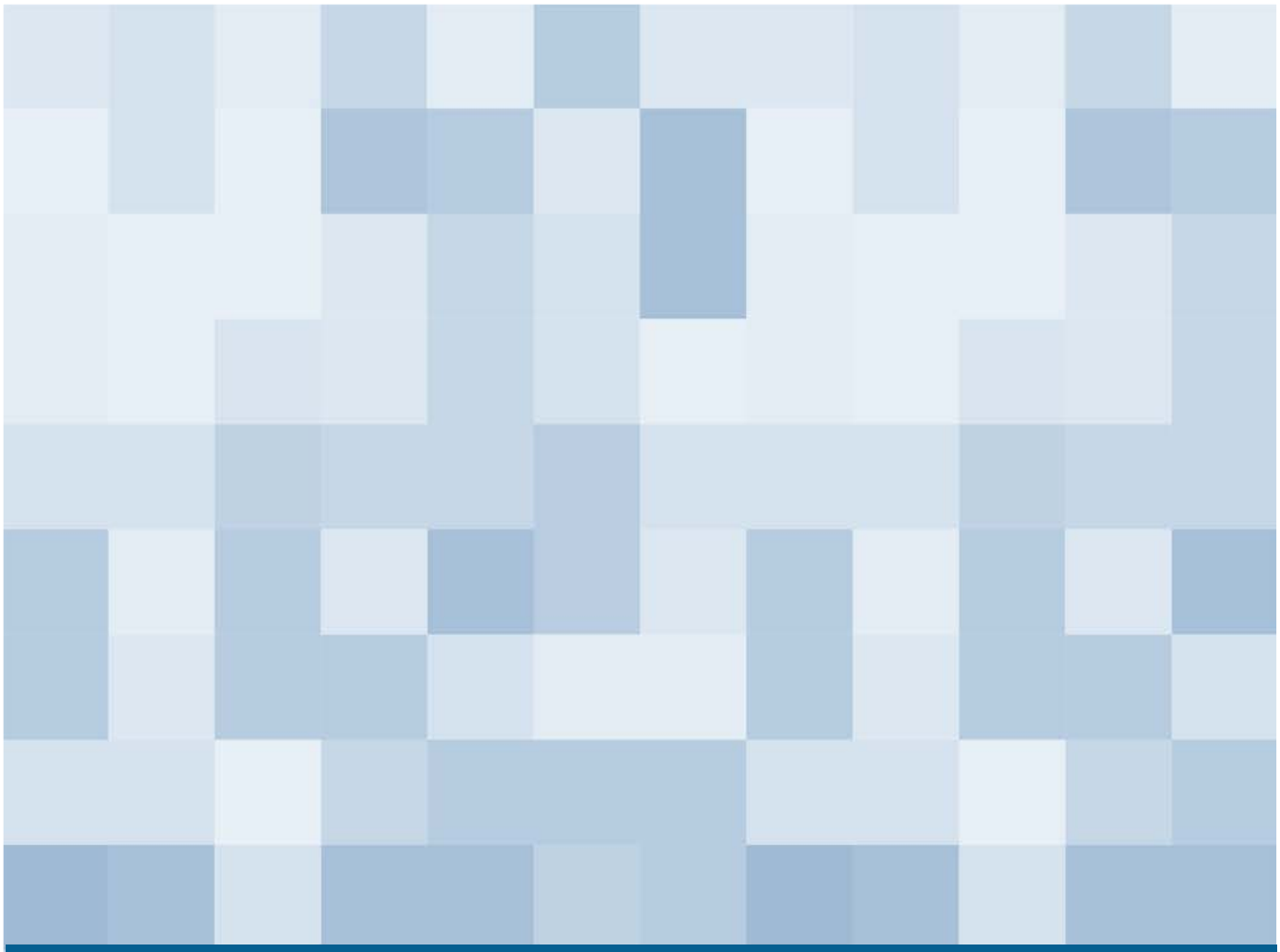

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