Subsidies and User Charges for Select Services in Rajasthan

Mukesh Anand

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Preface

The Study on “Subsidies and User Charges for Select Services in Rajasthan” was undertaken by the National Institute of Public Finance and Policy at the request of the Government of Rajasthan. The study seeks to quantify implicit subsidies in the provision of drinking water, irrigation, power, and road transport in the state.

The study was carried out by Mukesh Anand, Senior Economist at NIPFP with assistance from Nivedita Sarkar. The opinions expressed in the Report are that of the author and the members of the Governing Body of the Institute are in no way responsible for them.

M. Govinda Rao
Director

Report on Subsidies and User Charges for Select Services: Rajasthan

Mukesh Anand[*]

Executive Summary

Aggregate Level

The Fiscal Responsibility and Budget Management (FRBM) cell of the Government of Rajasthan (GoR) has initiated several measures to achieve fiscal consolidation in the state. The study sponsored to NIPFP to estimate and recommend measures to rationalise subsidies is one such initiative.

In addition to income or price subsidies that are explicit, subsidies in respect of public services can arise when user charges are well below the cost of providing them.

At the state government level, there are few examples of direct or explicit subsidy. Unlike the federal government that clearly identifies (explicit) food and fertiliser subsidies, specifically, in Rajasthan there does not appear to be any explicit subsidy in the sectors analysed in this report namely, *drinking water*, *irrigation*, *power*, and *road transport*.

Revenue gap, estimated as the difference between revenue expenditure and revenue receipts, in *drinking water*, *irrigation*, and *power* grew at the rate

[*] Sr. Economist, National Institute of Public Finance and Policy, NIPFP, email: manand@nipfp.org.in

of respectively 11, 11, and 24 percent per annum between 1990-91 and 2006-07.

For the truncated period 2001-02 to 2006-07, the scenario looks significantly different. Revenue gap in case of *drinking water* declined at nearly 14 percent per annum. Growth rate of revenue gap decelerated to 5 percent per annum in *irrigation* services, although in *power* it accelerated to 29 percent per annum.

Total cost of service delivery, impacting the budget of GoR, for *drinking water*, *irrigation*, *power*, and *road transport* grew at respectively 13.07, 9.56, 14.58 and 11.77 percent per annum, between 1990-91 and 2006-07.

Receipts (including user charges, interest, and dividend) from service delivery, into the budget of GoR, for *drinking water*, *irrigation*, and *power* grew at respectively 13.57, 1.75, and (-) 12.08 percent per annum, between 1990-91 and 2006-07.

Total cost under-recovery for *drinking water*, *irrigation*, *power*, and *road transport* grew at respectively 12.33, 10.83, 18.51, and 9.98[1] percent per annum, between 1990-91 and 2006-07. During the same interval Gross State Domestic Product (GSDP) grew at 11.18 percent per annum.

Median under-recovery rates for *drinking water*, *irrigation*, *power*, and *road transportation* turn out (approximately) to be respectively 50, 90, 91, and 100 percent, over the period 1990-91 and 2006-07.

[1] For *road transport* this pertains to period between 1994-95 and 2006-07.

Revenue gap, on an average, accounts for 67, 80, 77, and 19 percent of under-recovery respectively in *drinking water*, *irrigation*, *power*, and *road transport* services. It is desirable, that revenue gap is reduced to a minimum.

Of the four sectors, *irrigation* accounts for the largest volume of under-recovery with a median rate exceeding 0.93 percent of GSDP. *Power* follows closely behind with a median rate of 0.78 percent of GSDP. However, under-recovery from *power* appears to be increasing sharply and, since 2002-03, it has outstripped the level in *irrigation* services. *Drinking water* and *road transport* services complete the list with a median rate respectively of 0.36 and 0.01 percent of GSDP.

Recovery rate and user charge rationalisation and reform should carefully evaluate sector specific taxes and inequality issues.

Segregating total revenues from each sector into two broad groups namely, tax and non-tax (that includes grants, charges, interest, and dividends), it is observed that the average proportion of resources constituted by former are 0, 17, 60, and 99 percent respectively for *drinking water*, *irrigation*, *power*, and *road transport* services. It is perhaps fair to direct revenues from such taxes to compensate for losses on account of respective service delivery.

Over the years, access inequality (across rural and urban areas) in *drinking water* and *power* appears to have declined. However, consumption inequality may not necessarily reflect a similar pattern. Inequality in access to irrigation (across size class of land holdings) appears to have widened. Inequality in irrigation water use may fare worse.

Benefits from public expenditure on services accrue disproportionately to those less deserving of government patronage. But across the board reduction in public expenditure and/ or raising rates (user charges), may strain universalisation of accessibility / connectivity and in turn be regressive.

Current design of some sector specific taxes raises costs of service. Reform of user charges ignoring this umbilical link may exacerbate regressivity.

Wider inputs from supplementary research maybe desirable, as (partial) incidence analysis may be inadequate to suggest clear reform measures. An overriding emphasis on equity in access may lead to sparsely spread resources that fail to deliver service of any acceptable quality.

Service level: Power

Per unit energy charges as prescribed in the tariff order are at significant variance with per unit price of energy (that includes other fixed charges) faced by consumers. Such a specification betrays the objective of cross-subsidisation. There is apparently a presumption about subsidised and subsidising sectors.

Unit price of energy varies significantly across consumer categories and average price depends critically on the proportion of energy consumed by different categories. The ratio between the maximum (non-domestic) and minimum (flat rate agricultural) price in 2006-07 was 4.6 for DISCOMs as a whole.

In that year, *agricultural* categories consumed more than one-third of the energy sold, while *non-domestic* category consumed less than six percent.

Importantly, there has only been a (desirable) marginal decline in energy sold to flat rate agricultural category. In comparison, energy sold to metered agricultural category has shown the highest rate of annual increase (about 35 percent per annum). Thus, share of energy towards agriculture has grown.

Increase in the share of energy directed to *subsidised* consumer categories (with relatively lower revenue yields) negated most technical gains from Feeder Renovation Programme (FRP, in terms of energy supply efficiency or reduction in distributional losses).

Tariff differential appears to have forced out several 'high value' consumers who find it cheaper to arrange for alternative captive power (and with improved quality of supply), rendering the public sector power companies more exposed to commercial risk. It is important to prevent this erosion of 'value' consumers, but more importantly, it may be detrimental to the cause of environment if such captive generation uses non-renewable sources of energy.

The extant tariff structure has wider (often perverse) repercussions, especially when tariff categories encompass both intermediate consumers and final consumers. Existing categorisation discriminates (perversely) between the power used in *production* (of good or service say, water for irrigation or for drinking) and that used in *consumption* (of that good or service). Tariff prescribed for power used in production is, in most cases, higher than average cost. Consequently, this raises input costs for (public sector) producer of (irrigation) water. In contrast, power used for *consumption* of water (for irrigation on farms) faces *agricultural* rate that is significantly lower than average costs. Further, despite characterisation of irrigation as an economic service (to be administered along commercial lines) water for irrigation is

priced substantially below its average production costs. This fosters overuse / or misuse of both water and power on farms.

Current tariff categorisation for *power* presents another dilemma. Although *drinking water* is characterised as a *social service* (when satisfaction of minimum needs predominates cost concerns), the power used in supply of drinking water faces industrial tariff rate, and constitutes the largest (more than 60 percent) component of cost for that service. This raises the cost of production of an admittedly essential commodity. It is desirable that tariff fixation for power respects the social dimension of output. There is thus a more persuasive case for category rationalisation also.

Service level: Road Transport

The Rajasthan State Road Transport Corporation (RSRTC) has been registering losses in its City Transport Service (CTS) operations. It transpires that CTS delivers less than 4.18 kilometers per litre. Efficiency of operations however depends critically on (a) vintage of vehicles; (b) quality of vehicle maintenance; (c) traffic density; and (d) average operating speed.

Apparently certain practical considerations lead to operational disadvantages for RSRTC. These are that, (a) private operators manage more trips per bus suggesting a lower turnaround time than RSRTC on CTS; and (b) RSRTC may have relatively higher personnel input costs (higher wages as also higher staff per bus ratio).

While some disadvantages arise out of technical choices, there are others that arise out of policy choices, for example, (a) private operators may adopt a flexible tariff schedule depending on time-of-day operations; (b) RSRTC has to mandatorily offer concessional (or even free) service to certain

categories of people such as students, journalists, senior citizens, handicapped persons; (c) RSRTC has to run services on decidedly uneconomical routes; and (d) distinction in the terms for charging license fee from RSRTC as compared to other operators, that ostensibly puts the former at a disadvantage.

To mitigate the demands placed on RSRTC, arising out of policy decisions, the government has also allowed certain concessions to RSRTC, for example, (a) RSRTC faces a reduced tax rate of 13 percent on diesel, as compared to 20 percent for private operators; (b) RSRTC is allowed a concession of two months' value of special road tax; and (c) certain routes are *nationalized*, meaning that only state transport corporations can run their services on such routes.

While nationalisation offers special advantages to RSRTC, quite often the potential on such routes is undercut because of relative inflexibility in operational procedures. Further, covert operations due to policy induced suppression of competition, often, results in poor quality service to the commuters.

Cost per employee for RSRTC is almost three times that faced by private operators. It is desirable to improve employees' productivity, but it may be undesirable to benchmark with private sector using purely financial indicators.

Although, bus:staff ratio in RSRTC has been brought down to 1:4 from 1:7, even then this is higher than in the private sector. However, one may study the feasibility of introducing conductor-free operations on specific long-distance routes (with limited points for embarking / disembarking enroute).

Supplemented with appropriate communication technology, this may improve safety and reliability of operations.

It is important to note that a public sector organisation like RSRTC has also the additional responsibility to continually upgrade work and service conditions. Often private sector operators are seen to dilute both work and service conditions. A study may be conducted to decipher whether privately operated buses are involved in relatively more accidents and relatively greater violation of traffic rules including jumping of lanes, driving beyond designated speed limits, hedging and delaying tactics at the bus stops and traffic signals, overloading (packing more passengers than permissible) of vehicles etc.

Increase in fare rate has more or less kept pace with increase in Consumer Price Index for Urban Non-Manual Employees (CPI (UNME)). However, the proportion of fare constituted by basic charge has been continuously losing ground to the passenger tax component. This basic charge is the net realisation for RSRTC (per passenger per kilometer). Revision in basic charge has lagged the general increase in CPI (UNME).

It appears that prices of inputs, specific to road transportation service, have also risen significantly faster than basic charges. A back-of-the-envelope calculation suggests that, assuming 50 percent load factor, about 10 percent increase in *basic charge* (to 50-51 paise) may wipe out RSRTC losses.

Assessment (A) and Recommendations (R)

A1

Urgency in introducing correctives could be guided by magnitude of impact on state economy. Of the four sectors, *irrigation* accounts for the largest volume of under-recovery with a median rate exceeding 0.93 percent of GSDP between 1990-91 and 2006-07. *Power* follows closely behind with a median rate of 0.78 percent of GSDP. However, under-recovery from *power* appears to be galloping and, since 2002-03 has outstripped the level in *irrigation* services. *Drinking water* and *road transport* services clocked a median rate respectively of 0.36 and 0.01 percent of GSDP.

Misuse or overuse of water and energy on agricultural farms is encouraged due to under-pricing of irrigation and power services for agriculture. Overuse impedes coverage, and creates pressures for (avoidable) capacity expansion.

User charges in irrigation are based on recommended / desirable quantity of water by crop type per unit of area cultivated. There is reason to believe that water drawn exceeds recommended levels. Most irrigated farms utilise the flooding technique that fosters overuse of water.

R1

Wherever feasible, adoption of improved methods of irrigation must be encouraged. Assessment of water charges must also acknowledge irrigation techniques adopted. Feasibility study of extending capital subsidy to switch to water-conserving methods must be undertaken earnestly. User charges must be revised biennially (or synchronised with recommended crop cycles) and indexed with inflation.

A2

Current spread of network does not cover the entire population for equitable delivery of most (*drinking water*, *irrigation*, *power,* and *road transport*) public services. Extensive network expansion disregarding costs of supervision and monitoring may also foster misuse and misappropriation.

R2

Equitable services are desirable, but in a resource constrained economy, the objective of service delivery may not supersede cost concerns for all services. Intensive network development may enhance productivity in services.

Equitable services at equitable prices would necessarily entail large redistribution due to inequitable costs. Network expansion though planned in advance, can only be implemented in phases to facilitate decongestion or to retard migration.

A3

Service-specific non-tax revenue receipts comprise of (a) user charges; (b) central grants-in-aid; (c) interest on loans; and (d) dividend from public sector. The last two components are negligible for most practical purposes.

Median under-recovery rate for *drinking water, irrigation, power,* and *road transportation* is respectively (approximately) 50, 90, 91, and 100 percent, over the period 1990-91 and 2006-07. Revenue gap, on an average, accounts for 67, 80, 77, and 19 percent of under-recovery respectively in *drinking water, irrigation, power,* and *road transport* services.

R3

It is desirable, that revenue gap is reduced to a minimum. The state government exercises significant control only over user charges and some sector specific taxes. Except for road transport, extant sector specific taxes are inadequate to finance revenue gap. There is thus a strong case to raise **average** tariff on drinking water, irrigation, and power services. However, raising tariffs should (a) accompany improvement in quality and reliability; and (b) be subsequent to measures that enhance efficiency of service delivery.

A4

Under-recovery may also arise due to high costs (overuse of factors) or higher expenditure. Apart from cost overruns commonly incurred in execution and completion of capital projects, there is evidence to believe that current costs are significantly higher than desirable.

High current costs arise out of input use inefficiency and/or from output delivery inefficiency.

R4

Technical (input use) inefficiency issue has not been addressed in this report. It is recommended that a study of this nature may be undertaken to identify slack in factor / resource utilisation.

Inefficiency in output delivery appears to be substantial. Almost half of drinking water and about a third of energy do not yield revenue. Suggestions for capacity expansion should be entertained only after exhausting all possible options to reduce non-revenue output.

A5

There is merit in allowing under-recovery of some costs in water services, both for drinking and irrigation purposes. But, policy in this regard should be made explicit and losses on this account should be estimated from time to time, particularly in respect of the latter.

R5

Current expenditures on drinking water and irrigation services respectively constitute on an average 85 and 83 percent of total annual costs. Appropriate combination of user charges, grants-in-aid and sector-specific taxes should at least recover all current costs. User charges should contribute the largest proportion and ideally could be uniform per unit of consumption. Sector specific taxes could be in the nature of fixed charges and should be made adequately progressive.

A6

Per unit energy charges as prescribed in the tariff order differ significantly from per unit (average) price of energy. Over time, cross-subsidisation may extract a high cost by incentivising diversion. Tariff on energy for producing a good or service is higher than for consuming that good or service (*water* is a prime example).

R6

It is desirable that the power regulator addresses energy rates as also average prices with due regard to the level of fixed charges faced by different categories. Gradual reduction in cross-subsidy in pricing energy should be encouraged.

A7

Increase in share of energy to agriculture without commensurate increase in irrigation coverage indicates sub-optimal or even misuse of both power and water. This is also indicative of gradual erosion of large scale industrial consumer base. Demand aggregation to ascertain peaks may become more cumbersome with serious implications for grid management.

R7

The distorted tariff structure needs urgent regulatory redressal to incentivise assured and stable demand / uptake.

A8

Introduction of feeder renovation programme has helped reduce distributional losses.

R8

The programme should be strengthened to minimise non-revenue (or unaccounted) energy.

A9

Sector specific taxes, if imposed on inputs into the service, raise the cost of production and delivery. Extant design of special road tax in lieu of the erstwhile passenger tax raises the cost of production of road transport service. When price of output is also administered, it leaves little room for managerial manoeuvrability, especially for a public sector provider that cannot be seen to dilute service standards or working conditions. This places a public sector operator in a disadvantageous position in comparison to a private operator.

R9

The feasibility of reverting to a design of consumption based equivalent passenger tax may be studied.

A10

Assimilating current technological advances could improve factor productivity in long-distance operations / routes.

R10

GPS-enabled conductor free operations on long distance routes with limited points for embarking and disembarking would reduce labour cost, while improving productivity and reliability of service.

Part I

Aggregate Sector Level

Budgetary Implications of Costs of and Recovery from Select Public Services in Rajasthan♥

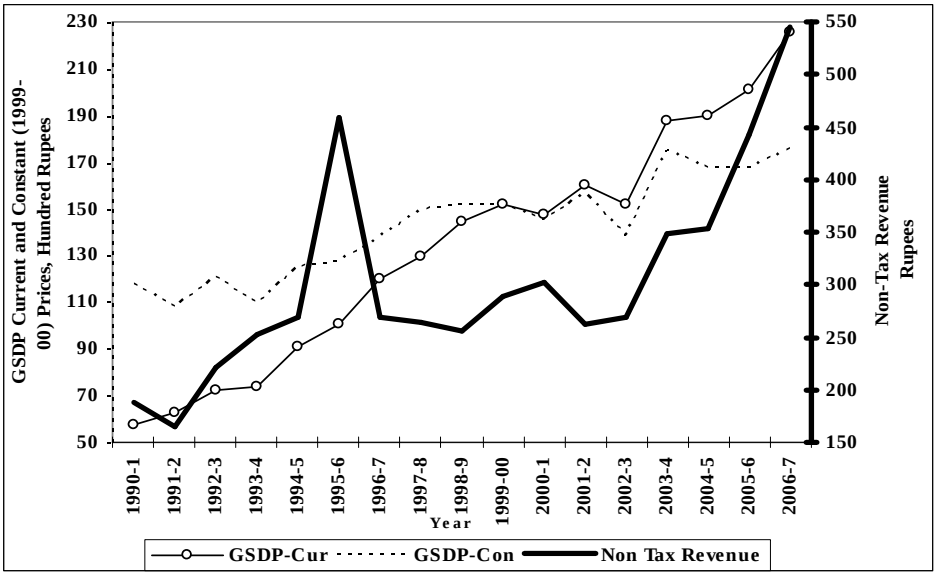
1. Introduction

The Gross State Domestic Product (GSDP) of Rajasthan (at current factor costs) has grown at 11.18 percent per annum between 1990-91 and 2006-07. However, per capita GSDP at current and constant (1999-00) prices grew at a trend rate of 8.59 and 2.92 percent per annum respectively. Over the same period, nominal price[2] level grew at a trend rate of 5.5 percent per annum. In comparison, per capita non-tax revenue has grown at a trend rate of barely 4.95 percent per annum.

♥ The study was commissioned by Finance Department (FD) of Government of Rajasthan (GoR). Subhash Garg, Principal Secretary, FD, GoR piloted the study. Support and suggestions from Vinod Pandya and S C Dinkar helped to keep the report on track. J L Jangid and Raman Gulati extended full co-operation. Encouragement and suggestions on drafts of this report from Indira Rajaraman (Member, Thirteenth Finance Commission) are gratefully acknowledged. Nivedita Sarkar extended deft research assistance while editorial inputs were provided by Rita Wadhwa and Kavita Issar. Access to Public Finance Information System databank of National Institute of Public Finance and Policy (NIPFP) facilitated data organisation. M Govinda Rao, Director NIPFP, and Tapas Sen, Professor at NIPFP gave several helpful comments on a presentation based on the draft report. The section relating to *power* sector benefited from discussions with R G Agarwal, M L Gupta, R G Gupta, T T Aggarwal, Anand Joshi, and K L Gupta. Pankaj Patni, Aparna Sahay, Vimal Jain, and Bhagwan Sahay Sharma gave insightful suggestions for the part on *road transportation*. Several other officials of RSRTC and Transport department of GoR also extended support. The author is however solely responsible for all errors of commission.

[2] Represented here as an index and estimated as ratio of GSDP at current prices to GSDP at constant (1999-00) prices.

Figure 1: GSDP at Current and Constant (1999-00) Prices (`00 Rupees), Non-Tax Revenue (Rupees), Per Capita



Source: Basic Data: Central Statistical Organisation (CSO) for GSDP (1999-2000 series, February 28, 2008 update) and Finance Accounts, Government of Rajasthan for Expenditure and Revenue.
Notes: GSDP in hundred rupees on the left scale (LS); revenue in rupees on the right scale (RS).

Assuming that supply (level or quantity) of public services has risen commensurate with growth in population, it appears that the Government of Rajasthan has not been able to revise user charges in line with increases in prices or increases in the cost of public services provided. This has (likely) resulted in lower recovery[3] rate from these services. As a corollary, there is likelihood of an increase in implicit budgetary subsidy (*see*, Annexure B for definition and dimensions of subsidy). In what follows, the fiscal situation in the state is analysed to contextualise the importance of containing and appropriately targeting implicit subsidies arising from cost under-recovery.

[3] Recovery from a service or good pertains to revenues mobilised from charges (mostly) in proportion to consumption of particular good or service. In this report in particular, cost and recovery relate to interaction of state budget in that service, either served directly by a relevant department or indirectly, through a corporation with a majority control of government.

Aggregate Revenue Structure and Trends in Rajathan, 1990-91 to 2006-07

Table 1 reveals that non-tax revenues in Rajasthan grew at a trend rate of 7.15 percent per annum between 1990-91 and 2006-07. However, revenues from taxes (own taxes plus share of federal (net) proceeds assigned to the states) have grown at a much faster rate.

Table 1: Government Revenue in Rajasthan: Trend Growth Rate (TGR) of its Components

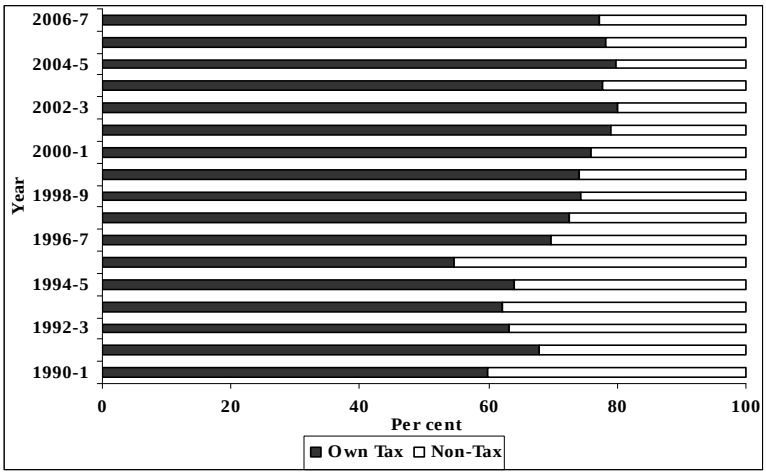
Period	Total Revenue	Total Tax Revenue	Non-Tax Revenue	Grants-in-Aid and Contributions	Total Own Revenue	Own Tax Revenue
1	2	3	4	5	6	7
1990-91 to 2006-07	11.71	16.87	7.15	3.96	12.16	14.30
2001-02 to 2006-07	16.22	16.83	18.07	12.04	16.21	15.70

Source: Authors' own computation; Basic Data: Finance Accounts, Government of Rajasthan.
Notes: Own revenue (column 6) constitutes of own tax revenue (column 7) and own non-tax revenue (column 4). Total tax revenue (column 3) consists of own tax revenue (column 7) plus share of net proceeds assigned to the states. Total revenue includes grants-in-aid and contributions (column 5) from all sources.

Non-tax revenues as a proportion of own revenues declined from above 40 percent in 1990-91 to less than 25 percent in 2006-07 (*figure 2*). While one may observe significant variation over the period, this proportion has been consistently below 25 percent since 2001-02. This indicates a growing tendency for tax-based financing as opposed to direct charge or tariff based provisioning of public services.[4]

[4] This is not entirely an undesirable mechanism when there are multiple excludable public goods. Indeed it is the most likely design with most functional governments.

Figure 2: Structure of Own Revenue

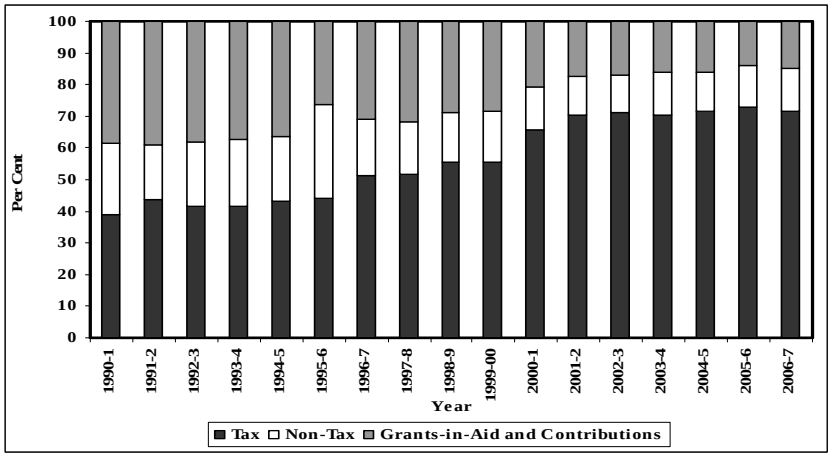


Source: Same as *Table 1*.

The proportion of own revenue out of total revenue has increased due to growth in own tax mobilisation, while there has been a decline in proportion of transfers (from centre to the state of Rajasthan) in the form of grants-in-aid and contributions (*figure 3*).[5] Significantly, such transfers as a proportion of total revenue have declined from around 40 percent in 1990-91 to less than 15 percent in 2006-07.

[5] The representation pertains to data from state (budgets) finance accounts. This is however, not an accurate description. In the last few years, a growing volume of funds are routed directly (from federal government) to societies or local level institutions (by-passing state budget). These resources are utilised as public expenditures intended to enhance, supplement or, complement (local) public services (executed by state-level parastatals and often manned by state-level employees). Thus, exclusively (state) budget-based analysis obscures the level and incidence of public expenditure. Adjusting for this is however, outside the purview of this study.

***Figure 3*:** Revenue Components (Share in Percent)



Source: Same as *Table 1*.

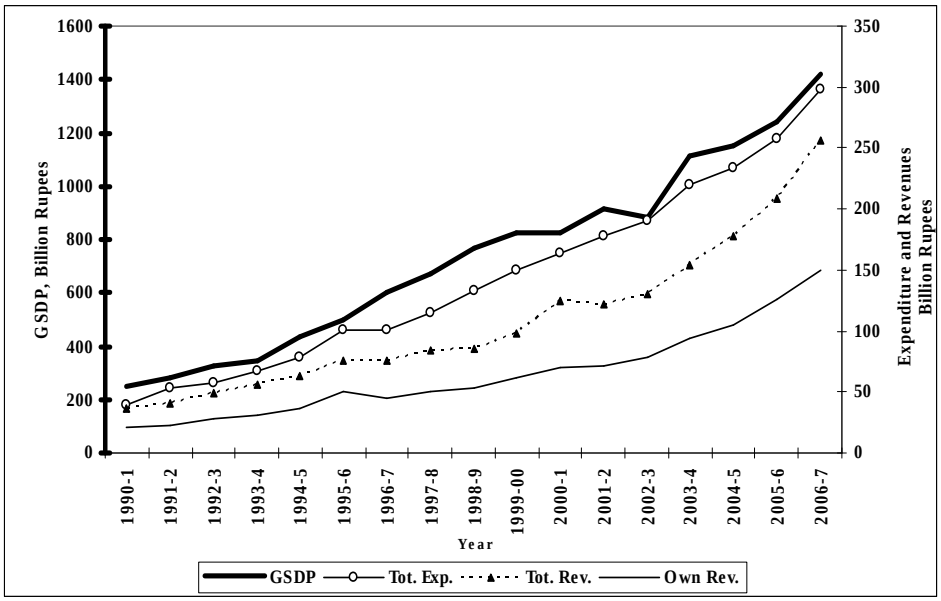
Column 3 of *Table 1* shows that, total tax revenues have grown at a faster rate than own tax revenues (*column 7*). Thus, federal (net) tax proceeds assigned to the state of Rajasthan contribute the fastest growing revenue component over the period 1990-91 to 2006-07. With continually larger, and arguably feasible space being captured (or retained) by the federal government, several governments at the sub-national level have been experiencing increasing constraint in mobilising own revenues. Despite such constraints, tax-based financing of public services has continued to be the mainstay of public policy at the state level [*see* also Anand, Bagchi, and Sen (2004); and Kurian (2000)]. As a corollary therefore, it appears that cost-based pricing for public services (in the form of user charges) is yet to gain currency.

Deficits in Rajasthan Budgets, 1990-91 to 2006-07

Governments at the provincial level are faced with mounting difficulties in curtailing expenditure, especially, states like Rajasthan. In terms of geographical area, Rajasthan is the largest among 35 state and union

territories in India and faces severe cost disabilities in provisioning for minimum (desirable) public services.[6] *Figure 4* depicts the widening gap between own revenue and expenditure. In the last few years however, the gap appears to have stabilised (and even started narrowing).

Figure 4: Trends in Revenue and Expenditure in Rajasthan, 1990-91 to 2006-07



Source: Same as *Table 1*.
Notes: 1 billion (10^9) equals 100 crore, 1 crore equals 100 lakh.

Table 2 reveals that, over the years, the growth rate of expenditure exceeded that of revenues resulting in the emergence of deficits (*cf. Table 1*). Thus, between 1990-91 and 2006-07, while the total expenditure grew at an annual rate of 12.53 percent, the growth of revenues was lower at 11.71 percent.

[6] 5.5 percent of Indians inhabit Rajasthan that covers 10.41 percent of the total land area of India. The density of population (as per 2001 census), at 165 for Rajasthan, is the lowest among all non-special category states.

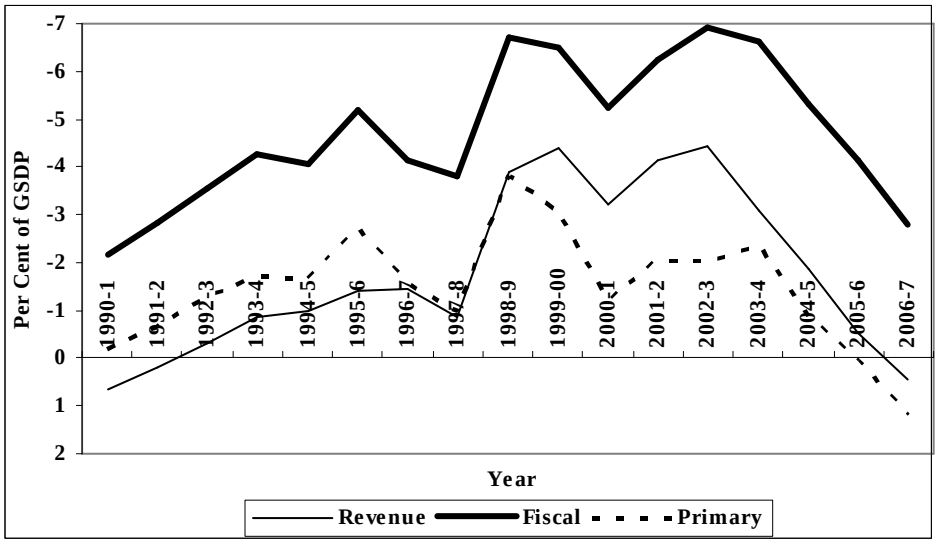
Table 2: Government Expenditure in Rajasthan: TGR of Broad Functional Groups

Period	Total Expenditure	General Service	Social Service	Economic Service
1	2	3	4	5
1990-91 to 2006-07	12.53	14.87	12.86	9.47
2001-02 to 2006-07	10.68	7.04	9.65	18.68

Source: Same as *Table 1*.
Notes: Total Expenditure includes both revenue and capital expenditure.

The deficits showed an increasing trend until 2002-03, but thereafter have shown a sharp decline (*figure 5*). Fiscal deficit grew at a trend rate of 14.8 percent per annum between 1990-91 and 2006-07 and peaked at 6.90 percent of GSDP in 2002-3. Corresponding revenue deficit for that year was recorded at 4.44 percent. Since then however, there has been a sharp improvement in state finances. In 2006-07, surplus on revenue account stood at 0.45 percent of GSDP while fiscal deficit had been pruned to 2.79 percent of GSDP.

Figure 5: Deficits in Rajasthan State Budgets



Source: Same as *Table 1*.

One important factor contributing to fiscal stress in the state is proliferation of subsidies. Subsidies are believed to be ubiquitous in the

mechanism of public expenditure and lackadaisical approach towards pricing of public services.

Aggregate Expenditure Structure and Trends in Rajasthan Budgets, 1990-91 to 2006-07

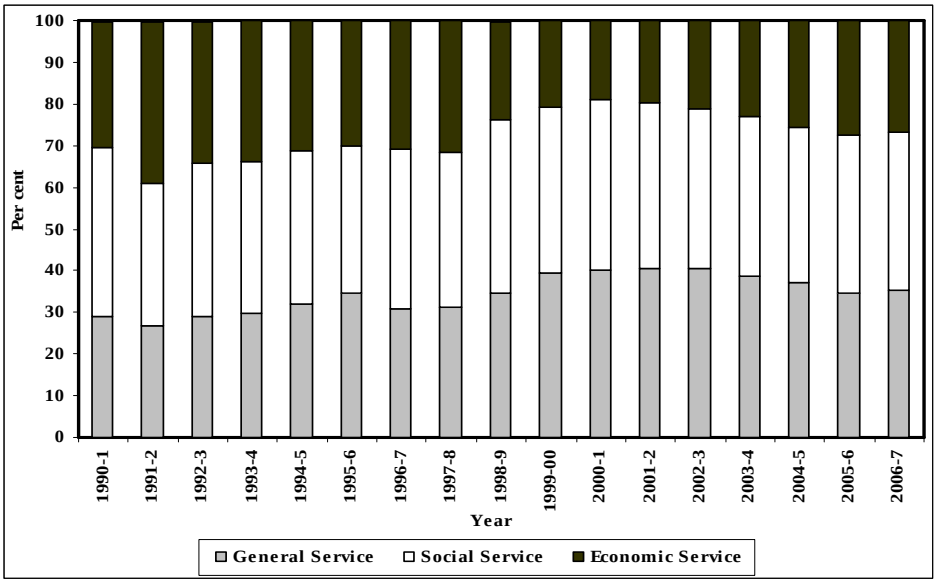
Scrutiny of public expenditure, for the years between 1990-91 and 2006-07, reveals (*see Table 2*) that expenditure on *general* services has grown significantly faster than that on *economic* and *social* services.[7] As a result, structure of expenditure has changed substantially with *economic* services entailing the smallest proportion.[8] But, *economic* services, are presumably the ones that, allow for greater possibility to impose and collect user charges (that is, consumption of these services is amenable to excludability, metering, and pricing). Is it then that slow growth in non-tax revenues is a result of relative slowdown in growth of (or expenditure on) *economic* services?[9] Is it that there is a conscious government policy to continually reduce its exposure in certain *economic* services?

[7] This may be due to the steep growth in interest payments (part of *fiscal* services).

[8] Since the turn of century, however, expenditure growth on *economic* services has risen faster. This is likely being driven by renewed efforts to boost expenditure on infrastructure sectors.

[9] World Bank (2006) has identified three important areas for improvement in cost-recovery with a view to boost non-tax revenues in Rajasthan. The first of these relates to auctioning of mineral leases. The second concerns appropriate water-rate structure to represent the true scarcity value, and the third relates to higher education and specialised care in urban hospitals. The last two fall in *social services* group.

Figure 6: Share of Total Expenditure (Broad Service Groups in Percent)



Source: Same as *Table 1*.

Dearth of *general* services may cause widespread negative externalities and are unlikely to have market-based alternatives. On the contrary, *social* services are perceived to foster positive externalities.[10] There is thus a strong case for providing such (*general* and *social*) services in the public sector. Most public services are provided publicly (that is, by government or public sector), but some of them are only publicly financed (but privately provided). A large majority of these services are, however, privately consumed. That is, there accrue large individual (private) benefits (due to significant internalisation possibilities) although there remain strong and positive externalities. With extant technological capabilities, it may be possible to monitor consumption of several such services (with sufficient accuracy).

[10] Some researchers (Srivastava and Sen, 1997 and Srivastava *et al*., 2002) have also attempted to classify services into merit and non-merit and, within merit into merit-I and merit-II categories.

Given that most such services have significant external economies, there is a case for providing them below the average cost. Often, it is also assumed that wider the range of beneficiaries from an expenditure programme, lower is the element of subsidy, especially when the state (public sector) is the sole (dominant) provider. This weakens the constituency to account for their economic costs, making it difficult to identify subsidy. However, excludability arising from the design of service delivery mechanism often induces rivalry in consumption (*see* also *section 5* on incidence of expenditure), frequently camouflaging elite-capture. In practice, capacity constraints accentuate rivalry, though these are often assumed away in theoretical descriptions. For example, irrigation services from canals disproportionately favour those with land-holdings alongside the canal, while those in interior regions often have to be content with a trickle. Similar is the case of drinking water service that, in the absence of a 24-hour supply, militates against those at the fag-end (or tail-end) of distribution network. Needless to add that subsidies, inherent in provisioning of public services, have unintended incidence and perhaps disproportionately benefit the least deserving.

Thus, it is desirable to estimate subsidy in public services to facilitate informed policy appraisal. For example, if extant public services are to be provided solely by the private sector, then he (the private provider) may expect to be subsidised to the estimated level of under-recovery (assuming an efficient production technology in public sector and extant tariffs to be binding on private producers). Alternatively, in a situation where incremental provisioning (to satisfy unmet needs or demand) is mandated to come forth (supplied) only from private sector at full-cost pricing, such estimates of under-recovery in public sector service delivery could be interpreted as a measure of rent that may possibly be captured by the private sector.

To ascertain elements of explicit (if any) and implicit subsidy, this report attempts to quantify the subsidy component from the state budget, in four sectors namely, *Drinking Water* (PHED), *Irrigation*, *Power,* and *Road Transport*. Special emphasis is laid on deriving practicable guidelines to not only contain under-recovery but also rationalise them. The report is therefore divided into two parts. The first part provides an estimate of under-recovery at the aggregate (sector) level and further draws out a basis for rationalisation. The second part of the report makes an effort to propose measures that may help contain under-recovery by curtailing costs or raising revenues or both. The analytical approach for the second part is specifically tailored for the sectors. However, the first part adopts a uniform approach and the methodology to estimate implicit subsidy (unrecovered cost) along with some underlying assumptions are described in the following section. *Section 3* summarises elements of aggregate expenditure and revenue in these sectors. *Section 4* analyses estimates of unrecovered cost in relation to cost of service, and as a proportion of GSDP. This is followed by a rudimentary incidence analysis to derive some cues for rationalising subsidies, in *Section 5*. A short summary of the analysis and concluding remarks on the first part are offered in *Section 6*.

2. Cost Under-recovery Formulation

Subsidies, like taxes, may be analysed along two dimensions – the first pertains to degree (or extent) of subsidisation in terms of nominal and effective subsidies, while, the second relates to incidence by groups of population (income classes, producer groups, consumer groups). The current exercise is severely limited to answer the above, and should be considered as an exploratory effort to make some headway along these dimensions.

At the state government level, there are few examples of direct or explicit subsidy. Unlike the federal government which provides explicit subsidies such as food and fertiliser subsidies, most state governments do not have significant explicit subsidies. This is particularly true of the sectors analysed in this report on Rajasthan.[11] However, most of the economic and social services provided by the state involve significant cost under-recoveries, which are in the nature of implicit subsidies. It is important to quantify these subsidies with a view to estimate the fiscal cost, and properly target them to intended groups.

Relatively fewer studies on implicit subsidy estimates, at the sub-national level, are available in public domain. Ahuja and Gupta (2005) have estimated subsidies in Rajasthan state budgets.[12] Mundle and Rao (1991), and Srivastava and Sen (1997) have advanced a methodology to estimate implicit subsidy (*S*) on a specific ***good or service*** as unrecovered cost. The present study adopts a similar approach incorporating certain refinements from Anand and Jha (2004), and unrecovered cost in a service is estimated as follows:

$$\mathbf{S = RX + d*K_a + i_b*L_0 + i_e*Z_0 - (RR + I + D).....(\mathit{i})}$$

Cost *Receipts*

where,

[11] From *Finance Accounts*, we attempted to segregate grants, transfers and assistance in the sectors analysed. No grants or transfers were made during the period 1990-91 and 2006-07 in any of the sectors under analysis. Assistance in drinking water supply accrued mostly to local bodies (municipalities or *zilla / taluk panchayats*).

[12] IDSJ: Institute of Development Studies, Jaipur. Their approach is similar to a measure of revenue gap, and includes current capital expenditure. Net expenditure, derived as revenue plus capital expenditure less non-tax revenue, on the sector / service, appears to be a simplistic approach to estimate subsidy. Under a cash accounting system (of presentation of government budget accounts), this approach is inadequate (even misleading).

S is under-recovery or implicit subsidy, and estimated as the difference between *cost* incurred in, and *receipts* from, provisioning of a good or service.[13]

Cost is determined by expenditures that include (a) current expenses; and (b) annualised components of cost of capital assets (depreciation), loans (interest) and equity investments (opportunity cost).

(a) current expenses **RX**, are given as revenue expenditure on the good or service; and

(b) annualised components of capital costs include,

(i) depreciation of assets $\mathbf{d*K_a}$ where, **d** is depreciation rate and $\mathbf{K_a}$ is sum of capital expenditure (adjusted for unfinished work / incomplete projects) on the good or service excluding equity investment, at the beginning of the period,

(ii) interest on loans $\mathbf{i_b*L_0}$ where, $\mathbf{i_b}$ is the average rate of interest on loans, estimated as a ratio of interest paid during the year to opening stock of debt and, $\mathbf{L_0}$ is the sum of outstanding loans advanced for the good or service at the beginning of the year / period, and

(iii) opportunity cost of equity investment $\mathbf{i_e*Z_0}$ where, $\mathbf{i_e}$ is the interest rate on deposits with maturity period of 5 years and above with commercial banks and, $\mathbf{Z_0}$ is the sum of equity invested in public enterprises classified within the good or service category at the beginning of the period.[14]

[13] This is analogous to the concept of *current ratio* in corporate financial accounting.

[14] Analysis in *Section 1* revealed the existence of revenue deficits in several years. In such a situation the approach adopted here may yield an under-estimate of the true cost of current expenses. There is also a view that the opportunity cost of equity investment should be identical to average interest cost of state government borrowings. A comparison of values in

Receipts constitute of

(a) revenue receipts **RR**, from good or service, that include non-tax revenues, and grants-in-aid and contributions (for the specific sector) from central government;

(b) interest **I**, paid by public enterprises falling within the good or service; and

(c) dividend **D**, earned on equity investments in public enterprises falling within the good or service.

Revenue receipts in each sector are discussed in the next section. Two relatively minor components of receipts namely, (a) *interest receipts* from loans in each of the sectors and, (b) *dividends* earned on equity investments, are mapped onto sectors from details respectively in statements 18 and 14, of Finance Accounts.[15] Revenue expenditure for each of the four sectors, as well as new capital expenditure and net new loans are also discussed in the next section.

3. Revenue and Expenditure at Aggregate Sectoral level

Table 3 presents expenditure on four services namely, *drinking water*, *irrigation*, *power*, and *road transport* as a proportion of expenditure on broad service groups under which they are classified.

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cols 2 and 3 of *Table 4* would give an idea of the likely variation in costs due to alternative assumptions. *See* also footnote 19.

[15] These have not been presented separately, but are included in the estimate of recovery for each sector, as shown in *Annexure D*.

Table 3: Sector Expenditure as Proportion of Expenditure on Broad Service Groups

Year	Expenditure on drinking water as percent of expenditure on social services	Sector expenditure as percent of expenditure on economic services		
		Irrigation	Power	Road Transport
1	2	3	4	5
1990-91	14.57	36.15	0.20	0.56
1991-92	16.73	23.51	37.19	0.32
1992-93	16.21	32.07	15.38	0.52
1993-94	17.85	31.29	17.21	0.72
1994-95	18.78	33.94	7.39	1.14
1995-96	18.50	30.82	17.57	0.00
1996-97	17.37	30.50	18.26	0.00
1997-98	19.49	28.70	28.43	0.00
1998-99	18.97	39.54	9.40	0.00
1999-2000	15.26	37.86	15.53	0.00
2000-01	15.91	35.59	16.49	0.00
2001-02	15.84	33.88	18.74	0.00
2002-03	17.44	28.03	24.77	0.00
2003-04	14.87	33.89	24.27	3.51
2004-05	15.81	28.70	25.75	0.16
2005-06	16.52	26.84	25.69	0.15
2006-07	17.94	22.09	30.87	0.00
TGR 1990-91 to 2006-07	**12.67**	**8.56**	**22.75**	

Source: Same as *Table 1*.
Notes: Total expenditure includes both revenue and capital expenditure.

Over the period 1990-91 to 2006-07, expenditure on *drinking water* supply constituted about one-sixth of expenditure on social services. Among the economic services included in this study, *road transport* service constituted only a minuscule proportion of the allocation for economic services. In contrast, *irrigation* and *power* services consumed respectively almost one-third and one-fifth of total expenditure on economic services.

Expenditure on *drinking water* grew at a trend rate of 12.67 percent per annum, compared to 12.86 percent per annum for social services as a whole. As a result, share of *water* supply services out of expenditure on social services has declined. Next, expenditure on economic services grew at a trend rate of 9.47 percent per annum, while that on *irrigation* services grew at 8.56

percent per annum. However, expenditure on *power* grew almost two and one-half times faster (than on economic services as a whole) at 22.75 percent per annum. Thus, share of *irrigation* service out of expenditure on economic services has declined, while that of *power* has grown rapidly. *Annexure C* (*tables C.1* to *C.4*) presents revenue from and expenditure on each of these services for the period between 1990-91 and 2006-07.

Drinking Water

Revenue receipts in *drinking water* service grew at a trend rate of 13.72 percent per annum between 1990-91 and 2006-07. Of these receipts, more than two-thirds constitute grants from central government while, urban and rural water supply schemes contribute, on an average, merely 17 and 4 percent respectively. In contrast urban and rural water supply schemes consume respectively (almost) 60 and 37 percent of revenue expenditure, with only a minuscule proportion going as assistance to local bodies. One may thus observe that, despite the amended constitutional guidelines, drinking water supply service in Rajasthan continues to be administered centrally.

Improvement in access to piped water supply in rural areas has however, received a fillip in recent years with almost three-fourths of capital expenditure being allocated to rural water supply schemes (*see* also *Section 5* on incidence analysis). Growth in capital expenditure, though lower than the rate for revenue expenditure, maintained pace with growth in GSDP and clocked a trend rate of 12.36 percent per annum. Net loans and advances grew at 28 percent per annum between 1990-91 and 1997-98, but since then outstanding loans have remained at rupees 3766.69 lakh.

Irrigation

The irrigation sector comprises of three services namely, *major and medium irrigation, minor irrigation,* and *command area development*. In recent years almost 60 percent of revenue receipts are derived under the first two heads. More than 75 percent of receipts in *command area development* (that constitutes more than one-third of receipts in *irrigation*) come as grants from central government. Revenues from irrigation have however, grown only at 1.79 percent per annum between 1990-91 and 2006-07.

The lion's share of revenue is contributed by only a few of the large plethora of irrigation schemes and projects. For example, three major irrigation projects namely, *Bhakra Dam, Chambal,* and *Indira Gandhi Canal* projects together contribute almost one-quarter of irrigation revenues. Another 12 percent is contributed by medium irrigation from *Gang Canal* while, *deepening of tube wells and tanks* for minor irrigation yielded 19 percent of total revenue from irrigation services.

In comparison to the low rate of growth in revenue receipts, revenue and capital expenditure grew respectively at 9.53 and 7.40 percent per annum. *Major and medium irrigation* consume almost 70 percent of capital expenditure on irrigation services with the remaining allocated to *minor irrigation* and *command area development*. However, in 2005-06 there was nearly a three-fold increase in capital expenditure on *minor irrigation*. In recent years, almost 35 percent of revenue expenditure in irrigation goes towards *Indira Gandhi Canal* project, while it also consumes nearly 43 percent of capital expenditure on major and medium irrigation. Again, *Indira Gandhi Canal* area accounts for almost 77 percent of recent capital expenditure on command area development schemes. Net (new) loans and

advances grew at almost 3 percent per annum between 1992-93 and 1997-98, but ever since net repayments have trickled-in regularly.

Power

Though erratic, some revenue from *power* sector is being realised since 2000-01. More than 95 percent of revenue expenditure is incurred as contribution towards interest payments of the corporations, formed by unbundling of the erstwhile Rajasthan State Electricity Board (RSEB). The remainder is incurred on *rural electrification* / *tribal area sub-plan*. Prior to 2000-01, capital expenditure in *power* was also erratic and mostly in the form of equity participation in RSEB. Post 2000-01 however, capital expenditure has risen rapidly and clocked triple digit growth rates. The sector booked net repayment (of loans and advances) of nearly rupees 1379 crore in 1998-99, but since then net (new) loans and advances have grown rapidly at nearly 20 percent per annum.

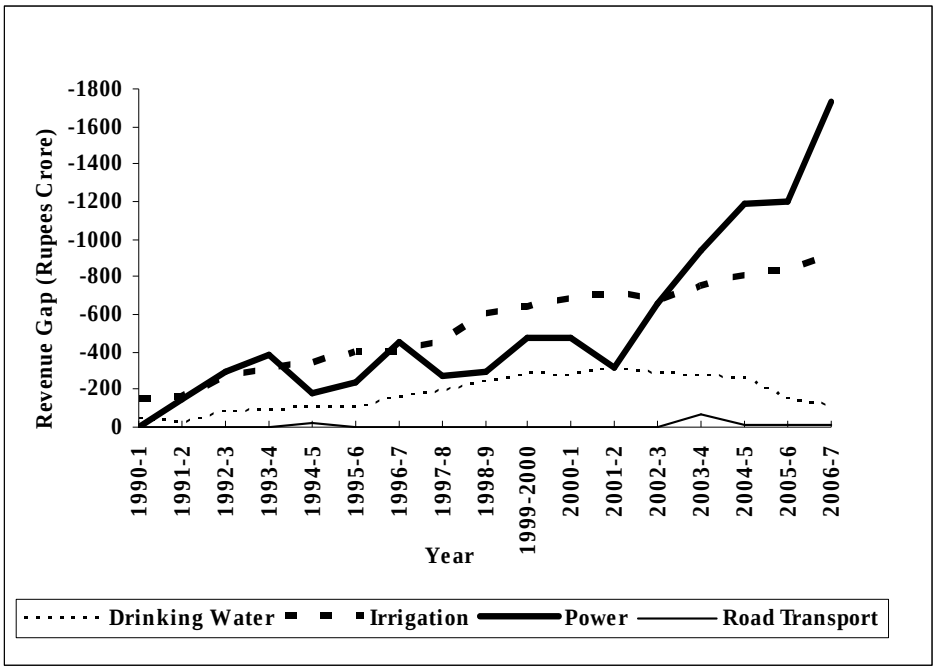
Road Transport

Government engagement in this sector is mostly through Rajasthan State Road Transport Corporation (RSRTC). No non-tax revenues accrue to the budget from this service. The state budget however, provided for intermittent revenue and capital expenditures, but no loans and advances accrue in this sector.

While not a precise description, some indication as to the direction and level of under-recovery in a service can be deciphered by analysing *revenue gap*[16] estimated as difference of revenue expenditures from revenue receipts.

[16] This is analogous to the concept of *operating cash flow ratio* in corporate financial accounting. Alternatively, one may bifurcate revenue receipts into states own revenue and central grants-in-aid. The former could be utilised to measure revenue gap, and the latter could be treated as a component financing that gap. In this report however, we focus on

Figure 7: Revenue Gap (rupees crore)



Source: Same as *Table 1*.

Figure 7 shows that revenue gap in *power* rose vertically after 2001-02. As a result, this gap in *power* has surpassed the level in *irrigation* services. Revenue gap in *drinking water*, *irrigation*, and *power* services grew respectively at (almost) 11, 11, and 24 percent per annum between 1990-91 and 2006-07. In contrast, for the truncated period between 2000-01 and 2006-07, revenue gap in *drinking water* service has declined at nearly 14 percent per annum. During that interval, growth rate of revenue gap decelerated to 5 percent per annum in *irrigation* services, while that in *power* accelerated to 29 percent per annum. The next section attempts a more detailed approach to estimate and analyse cost under-recovery as defined in *Section 2*.

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distinguishing components of costs and receipts by their nature (current and capital) only and not by their source.

4. Key Cost Parameters, and Estimates of Costs, Receipts and Under-recovery

The formulation for cost under-recovery (formula *i* described in *Section 2*) utilises data on cumulated capital expenditure (and outstanding loans). Further, equity investments are separated from cumulated capital expenditure and the remainder adjusted for (expenditure locked-in) unfinished capital works.[17]

Benefits (and subsidies, if any) accrue only upon completion of respective works. Capital expenditure on unfinished works does not constitute current stock of capital and, therefore does not contribute in current public service delivery (Anand and Jha, 2004). Details of unfinished (incomplete) capital works are collated from annexure to statement 13 in *Finance Accounts*. The stock of capital is arrived at by lowering cumulated capital expenditures by value of unfinished works.[18] However, government capital expenditure in *power* and *road transportation* sectors is in the form of equity and loans, and precludes the need for any adjustment in capital stock. *Table 4* summarises key cost parameters utilised in this study.[19]

[17] Most large projects would have several works component. The adjustment alluded to does not exclude the cost of entire capital project, but only that pertaining to unfinished (sub-parts) works contracts.

[18] Such data are available only from 1996-97 onwards for *irrigation* works and 1997-98 onwards for *drinking water* works. Value of unfinished works, varies between 11.9 and 33.5 percent (of cumulated capital expenditure) in *drinking water* and between 13.3 and 24.6 percent in *irrigation*. Missing values, to complete the series from 1990-91 onwards, are estimated using average ratio of cumulated capital expenditure on unfinished projects (in a given sector) at the beginning of the period, to total cumulated capital expenditure at the beginning of the period. This yields unfinished capital works to the tune of 18.62 and 19.26 percent of cumulated capital expenditure, for *drinking water* and *irrigation* respectively. Note that incomplete works in the Bisalpur project have been included in irrigation sector.

[19] At least two refinements are possible in estimating depreciation cost. The *first* relates to choice of replacement cost instead of historical costs, and *second* to writing-off of stock of vintage exceeding its assumed life. *Ceteris paribus* (compared to current use of data for formulation *i)*, the former would raise cost while the latter, lower it. Ideally, cost of assets should be based on replacement costs. Thus depreciation of an asset, in the t^{th} year of its life, should be $d*(1 + \pi_t)^{t-1}$ times the historical cost (where, π_t represents average inflation upto t^{th}

Table 4: Key Cost Parameters (percent)

Year	Average interest rate on loans	Interest rate on equity investment	Depreciation Rate of Capital Assets	
			Drinking water and Irrigation	Power and Road Transport
1	2	3	4	5
1990-91	8.37	11.00		
1991-92	9.91	13.00		
1992-93	10.50	11.00		
1993-94	11.03	10.00		
1994-95	11.49	11.00		
1995-96	11.71	13.00		
1996-97	12.41	12.50		
1997-98	12.94	11.75		
1998-99	13.56	11.00	3.00	10.00
1999-2000	13.38	10.25		
2000-01	12.69	9.75		
2001-02	13.24	8.25		
2002-03	12.29	5.88		
2003-04	12.08	5.38		
2004-05	10.99	6.00		
2005-06	9.56	6.67		
2006-07	9.38	8.37		

Source: Authors computations, Basic Data: *Finance Accounts*; *Handbook of Statistics on Indian Economy*, RBI, 2006-07.

Notes: Average interest rate on loans is estimated as a ratio, of interest paid during the year to the opening stock of debt. The numerator is interest on internal debt (major head 2049) less interest on small savings, provident funds etc. (sub-head, 03), and the denominator is the opening stock of public debt; opportunity cost of equity investment is estimated as the interest rate on deposits with maturity period of 5 years and above with commercial banks.

An unchanging (linear) flat rate of depreciation is charged as the cost of capital stock. However, depreciation in *power* and *road transportation* sectors is higher than that in *drinking water* and *irrigation* sectors. This is mainly due to differences in nature of assets. Assets in *power* and *road transportation* sectors constitute mainly of machinery and rolling stock, while those in *drinking water* and *irrigation* sectors pertain mainly to civil construction. We assume average life of assets involving civil construction as significantly longer (33 years) than that for machinery and rolling stock (10

year). Again, replacement cost approach necessitates exclusion (writing-off) of capital expenditure pre-dating the assumed life of an asset. In Mundle and Rao (1992), cost of capital assets consists of depreciation and interest components and no distinction is made between cost of borrowing, and equity. The former is to reflect that capital expenditure is financed from fresh borrowing and derives its credence from prevalence of revenue deficits. However, this may over-estimate cost. While, new borrowing may support whole or part of new (current year) capital expenditure, it appears inappropriate to add an interest charge (cost) on (all) cumulated capital expenditure, as this assumes perpetuity of loans (no repayments) that finance this expenditure.

years). This completes the discussion on data requirements for the adopted formulation.

Data presented in last section are adjusted, as discussed here, and key cost parameters are plugged into formulation *i* as described in *Section 2*. This gives us the estimates of under-recovered costs in each of the sectors/services. Note that these are estimates of annualised budgetary cost of service delivery and budgetary receipts following norms of commercial accounting and the panels in *Figure D.1* (*Annexure D*) depict costs and receipts for each sector.

Of the four sectors, cost of service delivery has grown fastest in *power* followed by *drinking water*, *road transportation*, and *irrigation* sectors in that order (*Table 5*). In contrast, receipts accruing to budget from *power* sector have declined rapidly at a rate of 12.08 percent per annum. No receipts accrued to the budget from *road transportation* sector since 1997-98. However, receipts in *drinking water* and *irrigation* sectors grew respectively at 13.57 and 1.75 percent per annum.

Table 5: Trend Growth Rates in Cost of and Receipt from Service Delivery, 1990-91 to 2006-07 (percent)

Sector	Drinking Water	Irrigation	Power	Road Transport
1	**2**	**3**	**4**	**5**
Costs	13.07	9.56	14.58	11.77
Receipts	13.57	1.75	-12.08*	

Source: Authors' own computation
Notes: * denotes between 1993-4 and 2006-7.

Subtracting receipts from costs for each sector yields the estimate of under-recovery in that sector / service (*see Annexure D, Figure D.2*). *Table 6* summarises the trend rate of growth for cost under-recovery between 1990-91 and 2006-07 as well as for truncated period between 1996-97 and 2006-07. Under-recovery in *power* sector has grown rapidly, clocking a trend rate of 18.51 percent per annum between 1990-91 and 2006-07. Under-recovery, in

drinking water and *irrigation* sectors, has grown respectively at 12.33 and 10.83 percent per annum. *Road transportation* was a surplus sector, but since 1994-95 has been reporting under-recovery that has grown, although at a lower trend rate than other sectors, at 9.98 percent annum.

Table 6: Cost Under-Recovery: Trend Growth Rate (Percent)

Period	Gross State Domestic Product	Sector			
		Drinking Water	Irrigation	Power	Road Transport
1	2	3	4	5	6
1990-91 to 2006-07	11.18	12.33	10.83	18.51	9.98*
1996-97 to 2006-07	8.16	3.67	7.48	18.86	19.35

Source: Authors' own computation; GSDP data from CSO
Notes: * pertains to period between 1994-95 and 2006-07.

In the last few years since 2001-02, under-recovery in *power* sector has risen steeply, while that in *drinking* water plateaued and even declined. For the truncated period between 1996-97 and 2006-07 both water services namely, *drinking water* and *irrigation* report a lower rate of growth in cost under-recovery than that for GSDP. Although negligible in comparison to others, cost under-recovery in *road transport* has registered the highest TGR of 19.35 per cent per annum between 1996-97 and 2006-07.

As mentioned, empirical studies analysing subsidies at the sub-national level broadly estimate under-recovery of costs. Note however that, the critical input relates to appropriate identification of incidental costs. Annualised costs (used in this study) may be significantly different from the realised (observed) annual financial expenditures. It is important to bear in mind that, capital *expenditures* tend to be lumpy, and in certain instances even *receipts* are lumpy.[20] As a result, cost under-recovery expressed as a percentage of annual

[20] In a sense utilising accrual accounting and *social* costs, that differs from financial / market costs under cash accounting. Thus for example, annual capital cost (depreciation) is

sectoral expenditure may likely portray wide (even extreme) fluctuations. However, level (absolute) values of estimated under-recovery exhibit significantly low volatility. These are depicted in *Figure D.2* (*see Annexure D* and note the close correspondence with *Figure 7*).

It is observed that value of under-recovery has risen steadily. However, expressed as a percentage of costs (*Table 7*), under-recovery in each sector appears to fluctuate over the years, particularly in *power* and *road transportation*. Summary statistics pertaining to under-recovery rate in each of the sectors is presented at the end of *Table 7*. **Median under-recovery rates for the four sectors namely, *drinking water, irrigation, power,* and *road transportation* turn out (approximately) to be respectively 50, 90, 91, and 100 percent.**

Table 7: Under-recovery Rate (percent of cost)

Year	Sector / Service			
	Drinking Water	Irrigation	Power	Road Transport
1	2	3	4	5
1990-91	45.36	73.00	100.00	-49.43
1991-92	29.71	74.55	46.34	18.84
1992-93	53.17	85.80	100.00	-6.52
1993-94	49.79	86.38	33.64	-8.46
1994-95	50.81	87.81	58.67	100.00
1995-96	44.83	86.60	64.07	34.65
1996-97	51.89	85.21	60.30	75.36
1997-98	51.92	89.68	60.75	100.00
1998-99	52.34	90.06	71.01	100.00
1999-2000	56.30	90.89	75.57	100.00
2000-01	48.86	91.65	91.15	100.00
2001-02	55.66	93.13	95.32	100.00
2002-03	51.38	91.60	97.04	100.00
2003-04	48.92	91.82	95.68	100.00
2004-05	45.89	92.37	94.72	100.00
2005-06	32.86	92.47	94.53	100.00
2006-07	30.93	92.81	95.47	100.00

determined as a proportion of cumulated capital expenditure on the sector / service. However, no adjustments are made for lumpiness in revenue receipts.

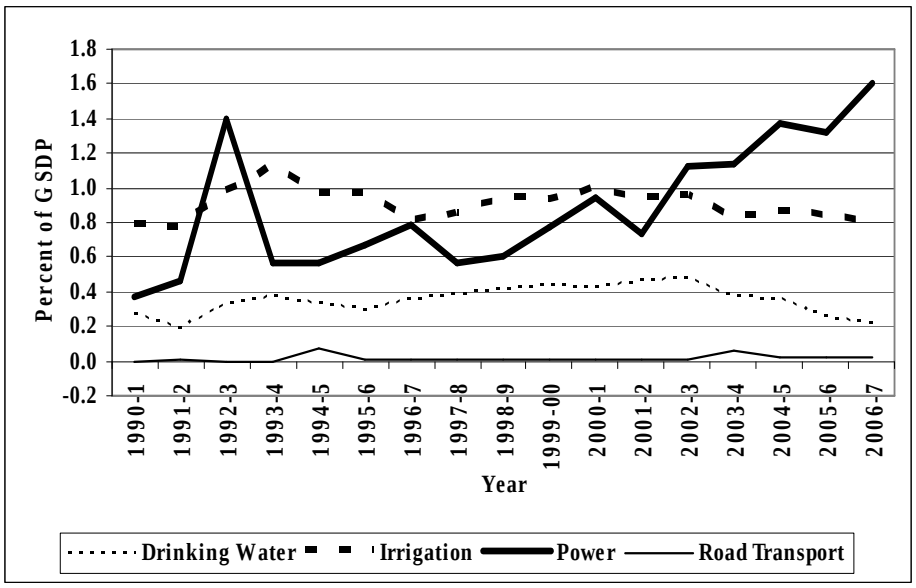
Table 7: Under-recovery Rate (percent of cost) (contd.)

Year	Sector / Service			
	Drinking Water	Irrigation	Power	Road Transport
1	2	3	4	5
Summary Statistics				
Average	47.10	87.99	78.49	68.50
Maximum	56.30	93.13	100.00	100.00
Minimum	29.71	73.00	33.64	-49.43
Median	49.79	90.06	91.15	100.00

Source: Author's own computations.

While under-recovery rate is an important indicator, urgency in introducing correctives could be guided by their likely impact on the state economy. This can be deciphered from *Figure 8* where under-recovery in each sector is presented as a proportion of GSDP. Gross under-recovery, for the four sectors combined, peaked at 2.71 percent of GSDP in 1992-93 with *power* constituting more than one-half at 1.40 percent of GSDP. Combined under-recovery declined to 1.80 percent of GSDP in 1997-98, but started rising again and has attained a high of 2.64 percent in 2006-07 (again, contributed largely by a sharp surge in under-recovery in *power* sector at 1.61 percent of GSDP).

Figure 8: Cost Under-recovery (percent of GSDP)



Source: Authors' own computations

One may notice that, as a proportion of GSDP, cost under-recovery for all sectors (except *power*) appears to be either declining or stationary since 2003-04. Though, for a larger part of the period between 1990-91 and 2006-07, under-recovery from service delivery, as a proportion of GSDP fluctuates within a bandwidth for each sector. Except for episodic sharp surges in the *power* sector, under-recovery seems to be substantial in water services which include *drinking water* and *irrigation*. Under-recovery from *water services* had reached a peak of 1.5 percent of GSDP in 1993-94 and remained at a high of 1.42 percent of GSDP between 2000-01 and 2002-03.

Of the four sectors, *irrigation* accounts for the largest volume of under-recovery with a median rate exceeding 0.93 percent of GSDP.[21] *Power* follows

[21] Mention must be made that demands (of charges) on departmentally administered services, often are in arrears. There maybe lumpiness in billing and collections. In most cases, in a going concern, the arrears may even out, but here there is likelihood that arrears may spill over multiple periods and moreover, there may also be instances of write-offs and waivers.

closely behind with a median rate of 0.78 percent of GSDP. However, under-recovery from *power* appears to be galloping and, since 2002-03 has outstripped the level in *irrigation* services. *Drinking water* and *road transport* services complete the list, clocking a median rate respectively of 0.36 and 0.01 percent of GSDP.

5. Rationalising Reform in Recovery Rates

In its more elementary form, cost under-recovery is equivalent to accounting loss from provisioning of some particular service. The advantage with governments however, is that, "…for multiple excludable public goods, there is an additional degree of freedom because the government budget constraint requires only that total revenues cover total costs. This constraint allows for the possibility of cross-subsidisation between different public goods, a possibility that has traditionally not been considered in the analysis of public-good provision" (Hellwig, 2007). Additionally, loss on account of provisioning of any particular public good / service maybe compensated or financed, to a certain degree, by funds from taxation.[22] In particular, revenues from sector-specific taxes could possibly be interpreted as recoveries from (or due to) provision (or existence) of service. Alternatively, current (accounting) losses may be financed by borrowing, in which case some costs are passed on to next generation and contained in the measure of deficit. This intergenerational sharing of cost maybe especially desirable if it facilitates some intra-generational redistribution reflected in a reduction in access / consumption inequality. In the following sub-sections, we first take a look at some sector-specific taxes and then briefly discuss the access inequality in public service

[22] These mimic upfront payment or admission fees in some cases. Unless adjusted for, existence of such taxes cause interpretational difficulties when, depending on the analysts disposition, the same product or service could be argued to be taxed or subsidised. However, note that tax-funds are fungible and earmarking revenues (from sector-specific taxes) for expenditure on those very services maybe difficult.

delivery. This provides background for the rationale to reform aggregate recovery rates.

a) Sector-specific Taxes

Among the existing taxes, sector-specific tax handle for *drinking water* includes water (prevention & control of pollution) cess (110) under *other taxes and duties on commodities and services* (major head 0045) while, that for *irrigation* constitutes of *land revenue* (major head 0029)[23] specifically two of its components (a) land revenue / tax (101); and (b) rates and cess on land (from tax department, 103, 001). Tax handle specific to *power* constitutes of *taxes and duties on electricity* (major head 0043), and that for road transport, especially passenger traffic, consists of *special road tax* on RSRTC and other stage and contract carriages (under major head 0041). *Table 8* summarises proceeds from these taxes.

Table 8: Sector Specific Taxes (rupees lakh)

Year	Drinking Water	Irrigation	Power	Road Transport
1	2	3	4	5
1990-91	0.00	1951.75	5355.81	
1991-92	0.00	1682.56	5335.69	
1992-93	0.00	1697.95	5013.19	7155.37
1993-94	0.00	1118.68	5732.08	7809.77
1994-95	0.00	1830.47	7425.73	9501.22
1995-96	0.00	1758.23	8034.57	11591.25
1996-97	0.00	1971.79	9196.34	11903.14
1997-98	0.00	1635.44	8896.45	15259.46
1998-99	0.00	1128.46	9187.41	17306.04
1999-2000	0.00	1353.04	19367.23	19029.96
2000-01	0.00	1297.25	25190.16	16514.77
2001-02	0.00	1161.20	25088.38	15641.12
2002-03	0.00	1031.69	23984.99	16114.62
2003-04	0.00	1318.79	28028.65	20536.62
2004-05	0.00	960.71	44276.25	23453.76
2005-06	0.00	1539.90	47135.30	23893.43
2006-07	0.00	1510.05	51588.30	28195.30
TGR (1990-91to 2006-07)		**-2.38**	**17.35**	**8.96***

Source: *Finance Accounts, Budgets*, various issues; Transport Department.
Notes: * 1992-93 to 2006-07

[23] Strictly speaking, not all of such revenue accrues from irrigated areas only.

There is no collection from cess on water and, that from land revenue appears to be declining. Taxes and duties on electricity have been growing, although there has been no upward revision in the rates. Collections from levy of electricity duty are subvented by the power distribution companies. Yield from *special road tax* (SRT) has lagged behind GSDP growth or total revenues.[24]

Thus, segregating the total revenues from each of the services into two broad groups namely, tax, and non-tax (that includes grants, charges, interest, and dividends), it is observed that the average proportion of resources constituted by the former are 0, 17, 60, and 99 percent respectively for *drinking water*, *irrigation*, *power*, and *road transport* services. It is perhaps fair to direct revenues from such taxes to compensate for losses on account of respective service delivery. Except in road transport, complete allocation of sector specific taxes is insufficient to eliminate even the revenue gap.

b) Incidence Analysis of Expenditure on Public Services

In this sub-section we briefly discuss the issue of incidence. While, this is only illustrative, we hope that incidence analysis provides inputs for a more comprehensive approach towards reform in subsidies arising from public expenditure and mechanism design of public service delivery. We estimate inequality in (accessibility to) services in terms of Lorentz ratio (or Gini co-efficient).[25] The ratio varies between 0 (perfect equality) and 1 (perfect inequality). Over time, an increase (decrease) in this ratio is indicative of worsening (improvement) of incidence.

[24] Note that SRT impinges as a cost for RSRTC as well as for other operators. However, RSRTC is allowed a concession of two months value of SRT in lieu of free or concessionary service to certain categories of people. Private operators are not under any obligation to extend concessionary service. Note further that revenue mobilised from SRT far exceeds (budgetary) under-recovery from this sector.

[25] Gini co-efficient or Lorentz ratio are individual based measures and may not be best suited to depict inequality for grouped data.

Drinking Water

We estimate inequality in reference to connectivity to *tapped drinking water supply within premises, between rural and urban areas.* The basic data is collated from census and it is observed that for Rajasthan as a whole, Gini co-efficient declined from 0.16 to 0.09, between 1991 and 2001. Of the total number of households, proportion of households with tapped water supply within premises has gone up from less than 20 percent to almost 27 percent during the same period. Thus one observes a seven percentage point increase in connectivity and a seven percentage point decline in inequality.

Inequality in consumption or volumetric use of tapped water may however, be at variance from the inequality in connectivity. Further, inequality decline in connectivity to tapped water supply across rural and urban regions, may not necessarily translate into lowering of inequality in availability and consumption of tapped water (in volumetric terms). In other words despite a decline in connection inequality, there is always a possibility of an increase in consumption inequality.[26]

Further, there is wide scope of improving delivery, as almost 40-50 percent of water pumped into the drinking water network system is lost (due to leakages, pilferage etc.). Revenue water is significantly lower than half of total supply. Anecdotal evidence further suggests that the poor and un-connected may be spending more to collect / gain access to drinking water.

[26] The measure of consumption inequality may likely have to incorporate hours of supply as also quality of water supplied. The latter has been a continuing cause of worry with alarming revelations in recent chemical tests for contamination etc.

Irrigation

Data from Directorate of Economics and Statistics, Government of Rajasthan, on distribution of operational land-holdings by size classes, reveals that between 1992 and 2003 there has been some decline in inequality. The Gini co-efficient declined from 0.60 to 0.57. The average size of land-holdings has also declined from 4.11 to 3.91 hectares. Closer analysis revealed that there has been a steep decline in number of holdings for size above 20 hectares.

Inequality in irrigation across size class of land-holding in 1992 was 0.44 (0.46) during the *kharif* (*rabi*) season. However, inequality rose significantly to 0.60 (0.54) during the *kharif* (*rabi*) season in the year 2003.[27] Total operated area declined by almost 10 percent between 1992 and 2003. It is quite likely that inequality in actual water use for irrigation may be significantly larger.

Power

The Gini co-efficient for inequality in connectivity to electricity, across rural and urban households, has declined from 0.28 in 1991 to 0.15 in 2001. However, as in case of *drinking water*, this provides very little evidence of a decline in inequality in terms of units of energy consumed. There is also a need for better understanding of incidence across broad categories of consumers. There appear to be significant losses in distribution (delivery), and padding these into user charges may not be justifiable beyond a point.

[27] The number of size-classes reported (recorded) in the year 2003, is larger than in 1992. In the year 2003, less than 15 percent of the total operated area constituting about 19 percent of net sown area was irrigated, in the *kharif* season. While during the *rabi* season, 20 percent of the total operated area constituting almost 71 percent of the net sown area used irrigation.
In the year 1992, less than 22 percent of the total operated area constituting about 29 percent of net sown area was irrigated, in the *kharif* season. While during the *rabi* season 35 percent of the total operated area constituting almost 65 percent of the net sown area used irrigation.

Road Transport

Unlike other services, expenditure on *road transport* services is less amenable to incidence analysis. Presumably these services are consumed more by the relatively poor in comparison to relatively well-off. To that extent, it appears that the poor maybe deriving relatively larger proportion of benefits from this sector/service.

Analysis of incidence by income/region/asset groups may be an appropriate metric for rationalisation of subsidies if, redistribution of resources is the principal objective of a public expenditure programme. On such a metric, *irrigation* sector expenditures appear to be regressive. Next, despite reduction in access inequality, there exists wide consumption inequality in *drinking water* and *power* sectors. In that sense, benefits from public expenditure accrue disproportionately to those less deserving of government patronage. It is likely that reduction in public expenditure and/or raising rates (user charges) may strain accessibility / connectivity and in turn be regressive.

6. Summary and Concluding Remarks

Analysis in *Section 4* reveals that between 1990-91 and 2006-07, under-recovery (***S***) in the four sectors combined varied between 2.71 and 1.42 percent of GSDP. Prior to 1999-2000, this proportion remained below two percent, except in 1992-93 and 1993-94. However, since then this proportion has averaged 2.41 percent of GSDP. Thus aggregate under-recovery in public services appears to be ratcheting-up gradually.

While efforts to improve revenues (to circumscribe the level of under-recoveries) are desirable, often equitable expenditure allocation is the guiding maxim. In several instances, this entails (high) complementary private

(admission) costs, that may turn out to be prohibitive. In particular, this appears to be the case with *irrigation* services for small land-holders. Complementary costs in irrigation could be for installation of pump sets, and / or for hooking up to power distribution line.

Recovery rate may be improved by either reducing costs or improving revenue collection. There appear to be significant opportunities along both these dimensions. Further, the methodology adopted does not facilitate separation of aggregate level under-recovery into components benefiting producers from that accruing as subsidy to consumers. The former entails adjudging *efficiency* based on clear identification of a benchmark from some best-practice production / delivery system. Such benchmarks are based on an engineering system approach, and often overlook behavioural dimensions, that profoundly influence choice of technology and associated costs.[28] There is particularly large scope to reduce distributional losses in *drinking water* and *power* supply. For example, as per our estimates, recovery rate in drinking water has averaged above 50 percent. But losses from leakages and pilferage also hover around 50 percent. Clearly, minimising leakages and pilferage would minimise non-revenue water. Appropriateness of cost recovered (and by corollary charges levied) should be judged against the proportion of produced water made available at the tap heads. One of the basic requirements in this endeavour is to ensure universal metering of supplies (both in *drinking water* and *power*).

It is most likely that (level) estimate of cost under-recovery, based on methodology / formulation described in *Section 2*, would rise. However, there is a commensurate need to evaluate whether under-recovery is permissible (under explicitly stated policies of the government) as long as there is reason

[28] Though assumed away in part-I (that takes the current production technology choice as given), this constitutes the central agenda for part-II of the report.

to believe that these feed forward into raising economic employment, output and productivity. Though outside the purview of the current exercise, these are often overriding concerns guiding public expenditure programmes. Mechanism design for service delivery[29] should however endeavour to minimise elite capture of benefits from these services. The approach to reform in public services thus broadly hinge on the potential to distribute (a) burden of costs through tax and non-tax measures; and (b) benefits from expenditure through equitable access and supply.

Combining the analysis in *Section 3* (on revenue gap) with that in *Section 4* (on under-recovery), **it is observed that revenue gap, on an average, accounts for 67, 80, 77, and 19 percent of under-recovery respectively in *drinking water, irrigation, power,* and *road transport* services. It is desirable, that the revenue gap is reduced to a minimum.** Moreover, stress should be laid on minimising inefficiencies that not only curtail loss (or waste) of output, but also raise revenue yield from improved availability (and therefore consumption) at the point of consumption (delivery).

It is observed that, out of the specific budgetary resources that may be mapped onto the given public services, on an average for the period 1990-91 to 2006-07, *taxes* constituted 0, 17, 60, and 99 percent respectively for *drinking water*, *irrigation*, *power* and *road transport* services. It is perhaps fair to direct revenues from such taxes to compensate for losses on account of respective service delivery.

Concluding paragraph to the last section hinted at inadequacy of incidence analysis to suggest concrete steps for reduction or increase of

[29] Studies pertaining to *mechanism design* provide insights into outcomes from interaction of information (asymmetries), incentives, and institutions.

expenditure (and consequently cost under-recovery). It is not obvious, whether costs (borne) are evenly distributed or if they exhibit inequality analogous to expenditure incidence (access) inequality. If inequality in incidence of expenditure is similar to inequality in cost incidence, then net benefit (or subsidy) garnered by individuals is in proportion to the level of service consumed.

In case accessibility or connectivity entails complementary private expenditure, then public service outreach is likely to be concentrated within relatively affluent sections. This is an often observed scenario with several excludable public goods. It is precisely in this context that sector-specific taxes may be a useful tool. While excess benefit to individuals or consumers is ostensibly equivalent to cost under-recovery, adjusting for revenues from sector-specific taxes improves this measure. Unfortunately, the current design of some sector-specific taxes appears to exacerbate regressivity.[30]

Wider inputs from supplementary research may be desirable, as (partial) incidence analysis may often appear inadequate to suggest reform measures. For example, the overriding objective of a public expenditure (or

[30] *Table 9* presents a comparative assessment of inequality in access to certain public services in the states of Gujarat, Madhya Pradesh, Rajasthan, and India as a whole.

Table 9: Gini co-efficient for Inequality in Access, 1991 and 2001, percent

Year	State	Drinking Water	Irrigation*		Power
			Kharif	Rabi	
1991*	Gujarat	11	55	43	9
	Madhya Pradesh	16	48	45	16
	Rajasthan	16	44	46	28
	All India	19	56	55	21
2001*	Gujarat	10	62	58	6
	Madhya Pradesh	6	66	66	8
	Rajasthan	9	60	54	15
	All India	14	60	60	16

Notes: For irrigation, the years correspond to 1992 and 2003 respectively

Between 1991 and 2001, there is a marked reduction in access inequality in *drinking water* and *power*. But there appears to be an increase in inequality in access to *irrigation*. However, reduction or increase in access inequality alone maybe insufficient to assess welfare changes. Several instances of public expenditure may result in Paretian inequality. Paretian inequality refers to a situation where additional benefits may favour the upper classes disproportionately.

even subsidy) programme on irrigation maybe to increase agricultural productivity and output (to address a wider issue of food security). It is most likely that incidence analysis may throw up a result that expenditure (or subsidy) benefits the large land-holders disproportionately more than small land-holders. Can one assume that productivity gains (increase in yield and / or decline in costs) would have been possible with more equitable distribution of irrigation waters? Clearly, incidence analysis, in isolation is insufficient to derive any conclusions on (un)desirability of the irrigation expenditure (subsidy) programme without complementary analysis, that measures the benefits in terms of enhanced productivity and output (that contribute to food security). In generalising, given the revenue constraints, an overriding emphasis on equity in access may lead to thinly spread resources that fail to deliver service of any acceptable quality.

Part II

Specific Services

Contours of the Study

This part of the report attempts to derive cues for controlling under-recoveries in *power* and *road transport* and focuses on select specific services.[31] *Section 3* of *Part I* described that three of the four sectors being analysed (namely, *irrigation*, *power*, and *road transport*) fall in *economic* services group and one (namely, *drinking water*) falls in *social* services group. This classification hints at the *essentiality* of a service but is insufficient to adjudge the degree of externality in pursuing these activities. Several services though are characterised by increasing returns to scale (IRS), and derive advantages from operating unhindered networks.

IRS is largely manifest in declining marginal costs and average costs. Decline in costs depends on several factors including spatial (geographical) density of the network at various heirarchical levels and whether the network utilises some forces like a natural grade (as in canal irrigation). Locational advantages accrue to consumers from positioning in the vicinity of nodal points in distribution/supply/service network. But not all nodes may be placed at an identical hierarchical level. This introduces a degree of complexity in judging the extent of interdependence and externality. This also introduces some complexity in pricing of ostensibly similar or identical service.

Two (of the three) *economic* services, namely, *power* and *road transport* are mandated to corporations (companies) in Rajasthan. The government is essentially an investor in these corporations, but in its capacity as a majority lender or shareholder has a critical role in their functioning. The prices of their services are administered or regulated. Moreover, as detailed in

[31] The original intent of the report was to subject *drinking water* (PHED), and *irrigation* sectors to a similar investigation. Unfortunately, commensurate data, supportive of such analysis, were not forthcoming. See, *Annexure E* for a truncated exercise.

Part I, there are taxes specifically impinging on consumption of these products or services (apart from taxes on inputs used in their production).

As per the constitution, *water* falls in the state list (List-II), and *electricity* falls under the concurrent list (List-III). Subsequent upon the 73rd and 74th constitutional amendments, both in rural and urban areas, drinking water supply is assigned to local bodies. Minor irrigation, water management, and watershed development are also functions of rural local bodies. Further rural electrification including distribution of electricity is one of the functions to be transferred to rural local bodies (RLBs), however, this is not so for urban electrification.

As per *Schedule VII* of *Article 246*, *water* includes water supplies, irrigation and canals, drainage and embankments, water storage, and water power. Further, as per *Schedule XI* of *Article 243G* minor irrigation, water management and watershed development, drinking water, rural electrification, including distribution of electricity, non-conventional energy sources and maintenance of community assets are functions to be transferred to the RLBs. *Schedule XII* of *Article 243W* assigns water supply for domestic, industrial, and commercial purposes to urban local bodies.

Constitutional authority circumscribes the effectiveness of tools of government intervention like, taxes and subsidies. Such tools are often utilised to nudge or correct certain market imperfections. Thus subsidies that need to be addressed or corrected or reduced are ones that (a) are not necessary to correct for market imperfections; or (b) do not pursue valid policy objectives. But several services in the public sector are due to (or address presently) missing (non-existent) markets. In certain cases though, governments

intervene to develop a market and provide for infant industry protection.[32] While recognising these concerns, this part of the report has a limited objective to investigate factors that influence costs and recovery. Both *power* and *road transport*, sectors are treated distinctively. The defining characteristics necessitating this approach are as follows: (a) *power*, essentially has a homogenous product supplied by a discriminating monopolist; and (b) *road transport*, is a multi-product/service with essentially homogenised pricing. The discriminating criteria in *power* has two principal dimensions namely, *area/region* and *economic activity*, while there is no discrimination in *road transport* (by residency or economic activity).[33] The analysis for each sector therefore is presented in separate sub-parts with their respective summary and suggestions.[34] The report finally ends in a pedagogical epilogue.

[32] However, like any protected industry, there is always a likelihood of the protected being unwilling to let go the protection. In certain cases even the protector may be unwilling to let go his / her (strangle) hold, leading to stunted growth of market / industry. In larger (societal) interest, it is perhaps desirable that the infant (protected) outgrows its parasitic disposition. Further, just as a parent nurtures its progeny, governments would perhaps do best to let the infant roll off on its own, and disallow prospects for (parasitic growth) dependence.

[33] This is not strictly true, as certain groups do enjoy subsidised road transport service. However, the discrimination essentially has a social dimension.

[34] Sectioning and numbering of figures and tables are also initialised for each sub-part.

Part II A:[35] Power

1. Introduction

Power sector in most states of India has become a fiscal drag. Several state governments have therefore initiated measures to contain its perverse influence. On March 21, 2000, the Government of Rajasthan approved a provisional Financial Restructuring Plan of the state power sector and drafted a provisional transfer scheme. On July 19, 2000, GoR accomplished the first major reform milestone by notifying "Rajasthan Power Sector Reforms Transfer Scheme 2000" and thereby restructured its vertically integrated Electricity Board (RSEB) to form 5 successor companies namely (*see* Rajasthan Power Sector, 2005):

a) *Rajasthan Rajya Vidyut Utpadan Nigam Limited* (RVUN) to manage the electricity generation business of erstwhile RSEB.
b) *Rajasthan Rajya Vidyut Prasaran Nigam Limited* (RVPN) to manage the electricity transmission and bulk supply business of erstwhile RSEB. In addition, RVPN owns Rajasthan's capacity share in the shared power stations of BBMB, Chambal Complex, and Satpura.
c) *Jaipur Vidyut Vitran Nigam Limited* (Jaipur DISCOM) to manage the electricity distribution and retail supply business of erstwhile RSEB in Alwar, Bharatpur, Jaipur city, Jaipur district, Dausa, Kota, Jhalawar, and Sawai Madhopur circles.
d) *Ajmer Vidyut Vitran Nigam Limited* (Ajmer DISCOM) to manage the electricity distribution and retail supply business of erstwhile RSEB in Banswara, Udaipur, Chittorgarh, Bhilwara, Ajmer, Nagaur, Sikar, and Jhunjhunu circles.

[35] Analogous analysis for certain specific services in *drinking water* and *irrigation* could not be pursued on account of unavailability of appropriate data.

e) *Jodhpur Vidyut Vitran Nigam Limited* (Jodhpur DISCOM) to manage the electricity distribution and retail business of erstwhile RSEB in Sriganganagar, Hanumangarh, Churu, Bikaner, Barmer, Jodhpur city, Jodhpur district, and Pali circles.

The provisional notification was subsequently finalised by GoR for transfer of personnel on January 18, 2001 and transfer of assets and liabilities on January 18, 2002.

Power sector policy in Rajasthan is governed by the *Electricity Act of 2003*. The *Act* empowers the government to also support certain sections / sectors through certain enabling clauses. Mechanisms in the *Act* provide for charging certain consumer categories, more than costs, for example, commercial sector. The regulator may however set limits on the tariff bands and suggest how much more (than cost) to be charged from the commercial/industrial sector and how much less to be charged from the domestic/agricultural sector.

Thus, tariffs vary both by *type of consumer* as well as *connected load*. *Table 1* categorises states into a broad range of average values for power tariff. In most cases, range (in *Table 1*) pertains to (simple) average rate across types of consumers namely, domestic, commercial, agricultural, and industrial users. While average tariff rates have a wide dispersion, weighted average (using consumption weights by type of consumer) may be significantly different (*see* for example, the average *realised price* in *Tables 5* and *7* discussed in *Sections 3* and *4* respectively).

Table 1: Power Tariffs in the States (paise per KwH; March 31, 2004)

States	Range
Jammu and Kashmir, Himachal Pradesh, Meghalaya, Assam, Maharashtra, Orissa, West Bengal	150 - 350
Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Punjab, Rajasthan, Uttar Pradesh, Kerala, Tamil Nadu	351 - 450
Delhi, Gujarat, Haryana, Madhya Pradesh, Karnataka	451 - 600

Source: *Cement Statistics*, 2004, Cement Manufacturer's Association
Notes: KwH (kilo watt hour); 100 *paise* equals 1 rupee.

Table 1 pertains to comparable tariffs in force as on March 31, 2004, but in Rajasthan the relevant tariff order is in force since April 1, 2001. Subsequently, however, tariffs in Rajasthan have been revised from January 1, 2005. Thus, *realised price* (*see, Table 5*) of power is more or less unchanged between 2001-02 and 2004-05 in Rajasthan. But, a perceptible upward revision can be deciphered in 2005-06 and 2006-07.

Despite upward revision in tariffs, especially for the (so-called) subsidised groups, the value of under-recovery from power sector in the budget of GoR has risen rapidly. Estimates presented in *Part I* (*Section 4*) of this report suggest that between 1990-91 and 2006-07, under-recovery from power grew at a trend rate of 18.51 percent per annum. During the same period, GSDP of Rajasthan grew at 11.18 percent per annum. As a result, under-recovery from power services impacting the state budget has risen sharply from 0.38 percent of GSDP in 1990-91 to 1.61 percent in 2006-07.

Part I of the report however, concerned itself with power sector at macro level only. Here, we have a micro focus in a few select services with a view to derive specific insights for (a) agricultural electricity supply in Kotputli block; (b) Alwar district electricity supply, with special reference to

Alwar and Bhiwadi cities; and (c) agricultural supply in Sikar and Jhunjhunu districts. Data supportive of such analysis may however be nuanced. While, compilation, maintenance, and quality of feeder level technical information has undergone significant upgradation, accounting information especially concerning finance and costs, is difficult to come by at that level. Especially, information on distribution of assets, employees, available energy etc. at the feeder level is, relatively less reliable. In practice, energy is collectively purchased by DISCOMs. Given the objectives specific for this study, one can concentrate only on DISCOM and sub-DISCOM functions (disengaging from generation and transmission activities).

For administrative purposes, each DISCOM is sub-divided into circles (for example, Jaipur DISCOM is subdivided into eight circles namely, Alwar, Bharatpur, Dausa, Jaipur city, Jaipur district, Jhalawar, Kota and Sawai Madhopur) that are expected to evolve as individual cost and profit centres. Several functions however, continue to be performed at an aggregated level and collectively decided, even if differentially impacting the individual DISCOMs or the sub-DISCOM performance.

Both production and consumption attributes, respectively summarised into cost and price factors perhaps contribute to the explosive growth in under-recovery. Primal among these has been the energy loss in distribution. Loss during distribution indicates inefficiency in service delivery and results in lowering revenue yield. This is discussed at aggregate and DISCOM levels in the next section. *Section 3* analyses average *realised price* for each DISCOM and the variation across different consumer categories is presented in *Section 4*. Insights from sub-DISCOM level analysis, forging a head-way for micro focussed specific services are attempted in *Section 5*. Finally, Section 6

summarises the broad findings and while concluding, recommends wider appreciation of linkages between various services in the public sector.

2. Distributional Efficiency

Inefficiency in service delivery is measured by energy loss during distribution of power, and assessed as difference between energy available and energy sold (both measured in KwH).[36] Between 2001-02 and 2006-07, highest distributional loss for Jaipur DISCOM (henceforth JaD) was 39.07 percent in 2002-03. However both Ajmer and Jodhpur DISCOMs (henceforth JoD) reported their highest distributional loss in 2003-04. On an average, Ajmer DISCOM (henceforth AjD) suffers the highest distributional loss of 40.53 percent, with JoD following closely at 40 percent. Average loss during distribution for JaD is slightly lower at 37.22 percent.

Table 2: Distribution Losses: DISCOMs (percent)

Year	Jaipur	Ajmer	Jodhpur	Total
2001-02	38.12	35.76	39.52	37.67
2002-03	39.07	39.70	40.95	39.83
2003-04	37.76	44.48	42.56	41.50
2004-05	37.60	43.58	42.38	41.06
2005-06	37.31	42.08	41.76	40.24
2006-07	33.45	37.56	32.84	34.62
Summary Statistics				
Minimum	33.45	35.76	32.84	34.62
Maximum	39.07	44.48	42.56	41.50
Mean	37.22	40.53	40.00	39.15

A feeder renovation programme (FRP) introduced in 2006-07, facilitated a perceptible reduction in distributional losses. For example, between 2001-02 and 2005-06, for the three DISCOMs put together, average energy loss during distribution was about 40 percent (the figures are 38, 41,

[36] Power transmission is undertaken at very high voltages and this helps to check / minimise transmission losses (assumed to be less than 3 percent). However, distribution networks in India usually operate at relatively lower voltages that are afflicted with high energy losses.

and 41 percent respectively for JaD, AjD and JoD). Both JaD and JoD showed a marked decline in distributional losses in 2006-7 especially when compared to their 2001-02 levels. Although AjD reported a larger distribution loss in 2006-07 as compared to 2001-02, there is significant reduction when compared with immediately preceding years. Preliminary estimates for later years also show that FRP is continuing to yield dividends.

Average distributional loss in 2006-07 stood at 35 percent suggesting that FRP has induced almost a 14 percent reduction in average (over 2001-02 to 2005-06) distributional losses. But, loss reduction is uneven across DISCOMs. While, JoD reduced its distributional losses by more than one-fifth, JaD has reduced it by about one-eighth. Consequently, in 2006-07 distribution losses for JaD and JoD were 33 percent each, while that for AjD was 38 percent. Further, energy distribution losses may not be uniform within a DISCOM as well. For example, in Alwar circle (one of the eight under JaD), distributional loss was rapidly brought down from 46 percent in 2001-02 to 37 percent in 2002-03. There has been a continual improvement since then and energy loss during distribution stood at less than 27 percent in 2006-07.[37] One may however safely assert that between one-third and two-fifths of energy available does not yield revenue. In the next section we briefly discuss the wedge this (non-revenue energy) drives between price faced by consumers and revenue yield for suppliers. Note that, it is this specific concern that makes the power sector regulator a key mediator to balance stakeholder interests.

[37] It is likely that success in energy loss prevention may depend critically on dispersion and demand of consuming categories. A deeper analysis highlighting this aspect is attempted in *Section 5*.

3. Price and Revenue Yield

Total revenue realised divided by the total energy available gives average *revenue yield* per unit. Revenue realised depends on (a) energy distributed or sold; and (b) mix of consumers (rather, relative energy share of different consumer categories) facing varying tariffs. Some technical losses may be unavoidable while stepping-down voltage for energy distribution, but the number of such stages before reaching the final consumer may be crucial. Perhaps, even pilferage could be significantly lowered with fewer step-down stages. Relatively larger concentration of industrial and commercial consumers could also improve yield, provided they are located distinctively to detect / prevent diversion. Finally, with no reduction in distribution losses and / or no change in relative shares of consumer groups (say, due to inelasticity of consumption demand), an upward revision of tariffs would also raise revenue yield.

Table 3 depicts that average yield for JaD was more or less constant between 2001-02 and 2004-05. However, since then it has risen significantly and recorded almost a 17 percent increase. In contrast, yields for AjD and JoD declined continually between 2001-02 and 2004-05. This is largely due to deterioration in energy loss during distribution (*Table 2*). In 2005-06, both AjD and JoD regained the 2001-02 revenue-yield level and further surpassed it in 2006-07, registering seven and 15 percent increase respectively. Improvement in revenue yield and average price realisation appear largely as a result of new tariff order applicable from January 1, 2005.

Table 3: Average Yield per Unit Available (rupees per KwH)

Year	Jaipur	Ajmer	Jodhpur	Total
2001-02	2.17	2.14	1.96	2.10
2002-03	2.16	1.99	1.91	2.03
2003-04	2.19	1.86	1.86	1.98
2004-05	2.22	1.87	1.81	1.98
2005-06	2.45	2.13	1.99	2.21
2006-07	2.59	2.28	2.28	2.40
Summary Statistics				
Minimum	2.16	1.86	1.81	1.98
Maximum	2.59	2.28	2.28	2.40
Mean	2.30	2.04	1.97	2.11

Revenue yield (or even realised-price, *see* later) could also be affected if for some reason there are arrears in revenue collection. Collection efficiency is a summary indicator for arrears (or dues) on the part of consumers. This is estimated as a ratio of revenue realised to energy charge assessed. *Table 4* shows that for the three distribution companies put together, this ratio averages above 99 percent. JoD at 97.9 percent has the lowest average collection efficiency over the period 2001-02 to 2006-07.[38] Payment arrears thus do not appear as a problem for the DISCOMs.

Table 4: Collection Efficiency (percent)

Year	Jaipur	Ajmer	Jodhpur	Total
2001-02	100.68	100.41	98.93	100.11
2002-03	99.79	98.55	98.07	98.89
2003-04	100.21	98.35	97.82	98.94
2004-05	99.68	98.73	96.48	98.49
2005-06	99.25	98.96	96.36	98.35
2006-07	99.53	100.63	99.75	99.94
Summary Statistics				
Minimum	99.25	98.35	96.36	98.35
Maximum	100.68	100.63	99.75	100.11
Mean	99.85	99.27	97.90	99.12

Realised Price

Total revenue assessed when divided by the total energy sold gives the average *realised price* per unit of power. Under (normal, free) market

[38] However, collection efficiency may vary at sub-DISCOM level or at circle level perhaps significantly depending on the dominant consumer category in that circle. *See Section 4* and *5* on energy share of consumer categories.

conditions (of perfect competition) average price realisation should depict a nominal increase (decrease) commensurate with increase (decrease) in nominal costs. In regulated pricing regimes however, one may also expect average price to be constant or even declining over certain specified intervals of time.

Under the extant system, incorporating an element of cross-subsidy (across sections / groups of consumers), average price (henceforth *price* refers to *realised price*) should be closely linked to the weighted average of tariffs as determined (from time to time) by the regulator.[39] Price in JaD is significantly higher than that in AjD or JoD. Even minimum price in JaD, between 2001-02 and 2006-07, was higher than average price in AjD and JoD (*Table 5*).

Table 5: Average Realised Price per Unit Sold (rupees per KwH)

Year	Jaipur	Ajmer	Jodhpur	Total
2001-02	3.48	3.32	3.27	3.36
2002-03	3.56	3.35	3.29	3.41
2003-04	3.52	3.40	3.31	3.42
2004-05	3.57	3.35	3.26	3.41
2005-06	3.94	3.72	3.54	3.75
2006-07	3.91	3.63	3.41	3.67
Summary Statistics				
Minimum	3.48	3.32	3.26	3.36
Maximum	3.94	3.72	3.54	3.75
Mean	3.66	3.46	3.35	3.50

Between 2001-02 and 2004-05, average price in JaD was five percent higher than price per unit in AjD, which in turn was two percent higher than that for JoD (328 paise per unit). Consequent upon the new tariff schedule effective from January 1, 2005, average price in JoD, for the period 2005-06 and 2006-07, has risen by 6 percent to 347 paise per unit. Average price in

[39] Normally, a scheme of tariffs should enable (ensure) achievement of the objective of minimal basic provisioning as well. Pricing by a discriminating monopolist could then be based on a careful balancing of willingness to pay as well as ability to pay principles.

JaD is seven percent higher than in AjD, which in turn is six percent higher than that for JoD.

Thus, average prices in JaD and AjD between 2005-06 and 2006-07 are 11 and 10 percent higher than the respective average prices for corresponding DISCOMs over the period 2001-2 to 2004-05. Average for DISCOMs however, hides the wide range of prices faced by various categories of consumers, as well as consumer category-wise differences across DISCOMs. This is discussed in detail in next section, but note the price mark-up [defined as (Realised Price per Unit – Revenue Yield) / Revenue Yield] in *Table 6*.

Table 6: Price Mark-up (percent)

Year	Jaipur	Ajmer	Jodhpur	Total
2001-02	37.70	35.50	40.17	37.60
2002-03	39.20	40.58	42.09	40.49
2003-04	37.63	45.40	43.82	42.12
2004-05	37.80	44.30	44.41	41.95
2005-06	37.78	42.68	43.88	41.22
2006-07	33.76	37.17	33.01	34.66
Summary Statistics				
Minimum	33.76	35.50	33.01	34.66
Maximum	39.20	45.40	44.41	42.12
Mean	37.31	40.94	41.23	39.67

Comparing *Tables 2* and *6*, one may note that mark-up percentage is more or less synchronised with proportion of energy loss during distribution. *While a reduction in distribution losses subsequent to implementation of FRP has helped raise revenue yield for the DISCOMs, tariff regulation has also helped to check price mark-up over revenue yield.*

4. Prices Faced by Consumer Categories

Price paid includes certain fixed charges, apart from energy charges based on a tariff rate and in proportion to the quantum of energy consumed.[40] In most cases consumers face certain minimum (or even presumptive) charges. Energy charges determined by the regulator are also distinguished by certain qualitative characteristics of supply (like high tension, HT / low tension, LT). *Table 7* shows the estimated average price per unit of power, juxtaposed with tariff (energy charges as prescribed in relevant tariff orders) rates for the respective consumer categories. Rate changes along with some restructuring of tariff, impacts the price for various consumer categories differently (*compare*, cols. 4 and 7).

[40] Prices faced by consumers may be significantly different from the ostensible per unit energy charges described in tariff orders. For example, there is an element of electricity duty and / or an element of service tax. There is also a rent for connection, or a meter rent. Again, there may be some distinction by geographical segmentation (rural or urban) and consumption slab (above or below a particular number of units of energy).

Table 7: Prices and Tariff Rates for each Consumer Category (paise per KwH)

Category[Φ]	Price			Tariff Rate			Price Rank[$]	
	2001-02	2006-07	Change (per cent)	2001-02[#]	2006-07[*]	Change (per cent)	2001-02	2006-07
1	2	3	4	5	6	7	8	9
Domestic	338	439	29.88	275	350	27.27	5	8
Non-Domestic	615	610	-0.81	490	490	0.00	15	16
PSL	637	566	-11.15	330	375	13.64	16	15
AGR-M	156	201	28.85	90	110	22.22	2	2
AGR-F	103	132	28.16				1	1
AGR-N	275	445	61.82	275	340	23.64	3	9
AGR-P	357	375	5.04	165	210	27.27	6	4
IND-S	497	485	-2.41	344	350	1.74	14	14
IND-M	469	480	2.35	372	375	0.81	13	13
IND-L	451	458	1.55	401	401	0.00	10	11
PWW-S	424	421	-0.71	344	350	1.74	9	7
PWW-M	465	446	-4.09	372	375	0.81	11	10
PWW-L	465	480	3.23	401	401	0.00	12	12
Mixed	416	399	-4.09	372	375	0.81	8	5
Traction	409	408	-0.24	401	401	0.00	7	6
Total	**336**	**367**	**9.23**				**4**	**3**

Notes: Φ: Consumer categories include, domestic, non-domestic, public street lighting (PSL), agriculture metered (AGR-M), AGR flat rate (AGR-F), AGR nursery (AGR-N), AGR poultry (AGR-P), industry-small (IND-S), IND-medium (IND-M), IND-large (IND-L), public water works-small (PWW-S), PWW-medium (PWW-M), PWW-large (PWW-L), Mixed and Traction; *Price* relates to average for a given consumer category across DISCOMs; *Tariff rate* relates to JaD. JoD and AjD also utilise an identical tariff schedule. Normally, each category of consumer faces multiple tariff rates depending on the slab / range of consumption. Figures reported are per unit (energy charges / or variable) tariff rate for the highest slab. #: Tariff order effective from April 1, 2001 to December 31, 2004. *: Tariff order effective from January 1, 2005. $: Ranked by ascending magnitude of *realised price*.

Of the 15 categories of consumers, the highest average price in 2006-07 is faced by non-domestic consumers (shops and business establishments) followed by public street lighting, with flat rate agricultural consumers facing the lowest price. Over the period 2001-02 to 2006-07, flat rate agricultural consumers continue to face the lowest price across DISCOMs. Domestic consumers appear to face the median price. But even this median is almost 20 percent higher than the average price across consumers in 2006-07. On an average, for the three DISCOMs in 2006-07, the maximum price is about 4.6 times the minimum price. But, the picture is not uniform across time or across DISCOMs. For example, in 2001-02 for all DISCOMs put together, public street lighting faced the highest price. Both JaD and JoD reported the highest

average price for PSL, but the price for PSL in AjD was ranked seventh highest among the 15 consumer categories. It maybe noted that charges for this are generally paid by local bodies.

Certain peculiarities contravening commonly held views are observed, for example, of the three categories of industrial consumers (small, medium, and large), the highest price is faced by small industry units and the lowest by large units. But, there is significant uniformity in prices faced by industrial consumers across DISCOMs. In contrast, of the three catogories of public water works, while small PWW face the lowest price in all years, medium sized PWW face the highest price in some intermittent years. Next, out of four categories of agricultural consumers, flat rate category faces the lowest price with metered consumers facing the next higher price. But, prices faced by nursery and poultry based agriculturalists are significantly higher.

The estimate of coefficient of variation[41] for prices, across consumer categories, however shows that its value has declined between 2001-02 (0.36) and 2006-07 (0.29). This is indicative of some reduction in degree of price discrimination between differing consumer categories. This is also commensurate with a graduated move to reduce cross-subsidisation.

Cross-Subsidy between Consumer Categories

Assuming revenue neutrality at an aggregate level, cross-subsidisation, if any, can be gauged by analysing two ratios namely, (a) energy share; and, (b) value share for the different consumer categories. *Energy share* of a consumer category relates to the proportion of total energy sold to that category. Analogously, *value share* of a consumer category relates to the proportion of energy sales revenue from that category. If for any category

[41] This is estimated as a ratio of standard deviation to mean, of a set of observations.

energy share exceeds value share, then the particular category is cross subsidised by one for which value share exceeds its energy share. On an average, a little less than one-quarter of total energy sold goes to large industrial users, and a little more than one-third is directed to agricultural consumers (that are, for the state as a whole, divided almost equally between flat rate and metered consumers). Less than one-fifth of total energy sold goes to household consumers. Thus four out of the 15 categories account for more than three quarters of total energy sold, but these contribute only two-thirds of total revenue realised.

Table 8: Proportion of Energy Consumed and Sales Revenue Contributed by each Category (percent)

Category	Energy Share		Value Share	
	2001-02	2006-07	2001-02	2006-07
Domestic	20.52	18.77	20.64	22.48
Non-Domestic	6.21	6.28	11.37	10.44
PSL	0.63	0.66	1.19	1.01
AGR-M	4.89	16.14	2.27	8.85
AGR-F	25.43	17.05	7.77	6.13
AGR-N	0.35	0.03	0.29	0.03
AGR-P	0.16	0.02	0.17	0.02
IND-S	3.29	2.86	4.86	3.78
IND-M	4.79	5.54	6.69	7.25
IND-L	23.98	23.25	32.17	29.02
PWW-S	2.23	2.32	2.82	2.67
PWW-M	0.95	0.76	1.31	0.93
PWW-L	2.34	2.15	3.24	2.81
Mixed	2.56	2.79	3.17	3.04
Traction	1.67	1.40	2.04	1.56
Total	**100.00**	**100.00**	**100.00**	**100.00**

A closer inspection reveals that in the year 2006-07, out of a total of 15 categories only two agricultural categories namely, *AGR-M* and *AGR-F* have value shares lower than their corresponding energy shares. Further, between 2001-02 and 2006-07 for the two categories together, while energy share (*Table 8*) increased by about one-tenth (from 30 to 33 percent), value share increased by about one-half (from 10 to 15 percent). The remaining two agricultural categories namely, *AGR-N* and *AGR-P* have similar magnitudes

for energy and value shares. Note that in 2006-07 value share of even *domestic* (household) category is higher than its energy share. *Table 7* revealed that, in 2006-07 average price for *domestic* category is significantly higher than average price across all consumer categories. Further, average price for domestic category has risen quite close to average price for *industrial* category.[42] Observe that, despite an upward revision in tariffs, ranking of average price, for all categories put together, has fallen. This portends an ominous development.

Part I of this report showed that power sector in Rajasthan is affected by large under-recoveries averaging more than 1.3 percent of GSDP in the five years between 2002-03 and 2006-07. Indeed under-recoveries have grown vertically in last few years reaching 1.61 per cent of GSDP in 2006-07. Preceding discussion reveals that, revenue under-recovery from consumer categories that benefit from (ostensibly) lower tariffs is inadequately neutralised by excess recovery from consumer categories facing higher tariffs. One may therefore conclude that, *the system of cross-subsidisation in the power sector is fairly ad-hoc*. We touch upon this briefly in the next section, where we discuss the rank correlation coefficient for *realised price* of energy for different consumer categories between (a) years; and (b) regions / circles.

Assuming no production inefficiency, relative to an arbitrarily chosen benchmark consumer category, some consumer groups may appear to be subsidised. This assertion could be justifiable if only one can analyse a scenario that (a) adjusts for cost escalation/revenue loss from delivery inefficiency; and (b) allocates various cost components for the different

[42] Disparity (inequality) between energy intensity and value intensity, arising out of differential prices faced by different consumer categories, measured as Gini co-efficient shows a decline from 0.27 in 2001-02 to 0.22 in 2006-07.

consumer categories. The latter exercise may be especially involved and is not considered here.[43]

There apparently are significant opportunities for revenue increase and/ or cost reduction. If energy loss during distribution could be effectively channelled to the final consumer (assuming that there exists unmet energy demand) at the average price, then additional revenue mobilised far exceeds the estimate of budgetary under-recovery in each of the years between 2001-02 and 2006-07. Alternatively, if one assumes that there is no unmet demand, then there is little scope of raising revenue, but distributional loss elimination would also mean that there would be huge savings on costs in purchase / production of power. In reality complete elimination of distributional loss may be impracticable. If distribution loss in 2006-07 could be pegged at 20 percent instead of the actual 35 percent, then the DISCOMs could have sold another 44810 lakh KwH of energy. At the prevalent average price this could yield approximately Rupees 1644 crore amounting to 72 percent of under-recovery in power sector, for that year.

5. Sub-DISCOM Level Analysis

Micro study at sub-DISCOM level could be helpful in identifying certain key areas of action. At this level, some data relating to energy sold, sale revenue, and cost components were collated for the following, namely: (a) Alwar city; (b) Alwar circle; (c) Kotputli / Jaipur district circle (JDC); (d) Sikar circle; and (e) Jhunjhunu circle.[44] Relatively clean and complete data is

[43] For example, in 2006-07 value intensity of domestic category exceeded its energy intensity. One may be motivated to believe that instead of being cross-subsidised, domestic category may be a cross-subsidising sector.

[44] Sikar and Jhunjhunu circles come under AjD, while the other chosen circles fall under JaD. Detailed analysis is limited due to some errors in data.

available only for Sikar circle.[45] For this circle, *Table 9* reveals that average price for commercial (non-domestic) category was 6.7 times that for flat rate agricultural consumers in 2001-02. By 2006-07, this ratio had declined to 4.1.

Table 9: Average Price, Energy and Value Share by Consumer Categories for Sikar Circle

Category	Average Price (paise per KwH)		Energy Share (percent)		Value Share (percent)	
	2001-02	2006-07	2001-02	2006-07	2001-02	2006-07
Domestic	376	464	15.56	13.13	26.62	22.56
Non-Domestic	721	641	3.12	3.20	10.26	7.59
PSL	674	475	0.29	0.31	0.88	0.55
AGR-M	154	223	13.65	27.53	9.56	22.76
AGR-F	108	155	55.75	43.30	27.34	24.81
AGR-N	367	693	0.22	0.03	0.38	0.07
AGR-P	371	553	1.31	0.01	2.21	0.02
IND-S	590	506	2.27	2.00	6.10	3.75
IND-M	502	506	1.32	1.36	3.00	2.54
IND-L	528	493	1.62	3.73	3.90	6.82
PWW-S	434	417	4.00	3.93	7.90	6.07
PWW-M	447	445	0.34	0.33	0.69	0.55
PWW-L	452	468	0.18	0.12	0.37	0.21
Mixed	459	449	0.37	1.02	0.78	1.70
Total	220	270	100.00	100.00	100.00	100.00

While price range has narrowed between 2001-02 and 2006-07, rank-order of prices across consumer categories has also undergone a change. The rank correlation co-efficient for price of energy between 2001-02 and 2006-07, for the various consumer categories in Sikar circle is 0.43. Rank-order of price for a given year for various consumer categories, in different circles also differs significantly. For example, rank correlation co-efficient of prices in 2006-07, for various consumer categories in Sikar circle and all DISCOMs combined, is only 0.57.

[45] Data for Jaipur district circle is also clean but lacks the relevant cost details. Cost information is also missing for Alwar city and Alwar circles. Jhunjhunu circle data although complete, appears to have a few errors. Errors are also apparent in data for Alwar city and Alwar circle. This section may however, be suitably modified after correcting for errors and data-gaps.

On comparing *Tables 7* and *9*, it is found that in 2006-07 all (except four) consumer categories[46] respectively faced a higher average price in Sikar circle than for all DISCOMs combined (or even AjD). Agricultural consumers using flat rate power in Sikar circle faced an average price that is more than 17 percent higher than average price for corresponding users of all DISCOMs combined.[47] Despite this, average price for all categories combined in Sikar circle is lower by about one-fourth than that for all DISCOMs together (or for AjD). This is because of high energy share of agricultural users in Sikar (70.68 percent) that is almost double that for all DISCOMs combined (33.19 percent, or for AjD, 36.76 percent).

The proportion of energy sold to AGR-M and AGR-F combined has increased marginally from 69.4 percent in 2001-02 to about 70.8 percent in 2006-07. Although their revenue contribution (value share was less than 37 percent in 2001-02) has grown, it was less than 48 percent in 2006-07. The increase in value share has been achieved by a sharp increase in proportion of metered consumption of energy in agriculture that has more than doubled between 2001-02 and 2006-07 (but with less than commensurate decline in share of flat rate energy consumption).

Sales revenue constituted merely 42 percent of attributed costs for Sikar circle, in 2001-02. However, by 2006-07 sales revenue had risen to cover almost 60 percent of attributed costs. Between 2001-02 and 2006-07, total attributed cost registered an annually compounded average growth rate (CAGR) of 4.22 percent per annum. But *power purchase*, that constituted almost 92 percent of total cost in 2001-02, grew at a lower rate of 3.43 percent per annum. Its share has thus declined to about 88 percent in 2006-07 (*Table*

[46] Three of these are small, medium, and large public water works and the fourth is public street lighting.
[47] Even the metered-agricultural users in Sikar circle faced an average price that is nearly 11 percent higher than the average for such users of all DISCOMs combined.

10). Of the six cost components, the highest CAGR between 2001-02 and 2006-07 is reported for depreciation charges and interest payments at 52 and 61 percent respectively, but their respective proportion in total costs is relatively small.

Table 10: Components of Cost and their Growth for Sikar Circle (percent)

Cost Components	2001-02	2006-07	CAGR, 2001-02 to 2006-07
Power Purchase	91.86	88.45	3.43
Employee Cost	6.15	6.97	6.89
General and Administrative Expenses	0.45	0.58	9.46
Operating Expenses	1.16	1.36	7.69
Depreciation	0.33	2.21	52.44
Interest and Other Charges	0.05	0.43	60.67
Total	100.00	100.00	4.22

Detailed analysis of the underlying reasons for the variation in growth trajectories of different cost components is not dealt with here. However, unlike most other components, cost of depreciation is a notional value. Detailed investigation of data relating to Jaipur DISCOM revealed some variation in rate of depreciation charged for various years between 2000-01 and 2006-07 (*Table 11*).

Table 11: Rate of Depreciation of Capital (percent)

Year	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Rate	4.38	5.94	6.39	6.15	5.85	5.77	4.26

While not reliably known, it is likely that similar rates are also chosen for AjD and JoD. It is perhaps desirable to explicitly mention the rationale for annual variation in depreciation rate.

Inter-regional Comparison

Preceding discussion highlighted the differences in average price arising out of differences in concentration (energy share) of different

consumer categories across different circles. This sub-section substantiates the analysis with examples pertaining to (a) a relatively heterogenous sub-urban Kotputli / Jaipur district circle (*Table 12*); and (b) a predominantly urban Alwar city (*Table 13*).

In 2001-02, price for each consumer category (except AGR-M and AGR-F) was lower in Jaipur district circle (JDC) than in Sikar circle. AGR-M and AGR-F in JDC faced energy prices that were 30 and 49 percent higher respectively, than for corresponding categories in Sikar circle. By 2006-07, however this difference had reduced substantially to 17 and 2 percent respectively. Tariff restructuring has had differential impact on other sectors also, for example, in 2001-02 price of energy for IND-M was 40 percent lower in JDC than in Sikar circle, but in 2006-07 it was estimated to be 13 percent higher.

Table 12: Average Price Faced, and Energy and Value Shares by Each Consumer Category for Kotputli/JDC

Category	Average Price (Paise per KwH)		Energy Share (percent)		Value Share (percent)	
	2001-02	2006-07	2001-02	2006-07	2001-02	2006-07
Domestic	360	471	13.40	9.50	15.62	11.39
Non-Domestic	599	633	8.33	5.23	16.17	8.42
PSL	274	397	3.48	1.43	3.09	1.45
AGR-M	200	262	12.72	20.16	8.24	13.43
AGR-F	161	157	25.35	15.18	13.21	6.08
AGR-N	NA	NA				
AGR-P	NA	NA				
IND-S	434	510	4.77	2.61	6.71	3.38
IND-M	303	572	1.28	1.31	1.26	1.91
IND-L	355	475	24.01	41.69	27.59	50.40
PWW-S	346	431	3.13	1.36	3.51	1.49
PWW-M	348	465	1.47	0.68	1.66	0.80
PWW-L	NA	NA				
Mixed	443	577	2.05	0.85	2.95	1.25
Total	309	393	100.00	100.00	100.00	100.00

In JDC, price range for energy across consumer categories appears to have widened between 2001-02 and 2006-07. However, *energy share of*

various consumer categories drives the overall average price. For example, of the total energy consumed by agricultural consumers in 2001-02, only one-third was drawn by metered consumers. But in 2006-07, almost 57 percent of agricultural consumption was metered. Further in 2006-07, around 35 percent of total energy sold was consumed in agricultural sector, while nearly 44 percent was taken up by the industries. Recall that for Sikar circle more than 70 percent of energy consumed goes towards agriculture, while industries utilise less than 10 percent. As a result, average price for all categories combined, was about 40 percent higher in JDC than in Sikar circle for 2001-02, and the difference has grown to 46 percent in 2006-07.

Analogous comparative analysis with data relating to Alwar city provides further evidence for the wide difference in average prices faced by corresponding consumers in different circles. In most cases the range of prices, across consumer categories in a circle, appears to have narrowed over years. While there is an upward revision in charges for the seemingly subsidised sector (*Table 13*), there is a perceptible decline in the average price for subsidising categories.

Table 13: Average Price Faced, and Energy and Value Shares by Each Consumer Category for Alwar City

Category	Average Price (Paise per KwH)		Energy Share (percent)		Value Share (percent)	
	2001-02	2006-07	2001-02	2006-07	2001-02	2006-07
Domestic	337	414	27.95	19.10	21.42	18.19
Non-Domestic	632	605	6.73	4.75	9.69	6.61
PSL	380	435	0.63	0.56	0.55	0.56
AGR-M	208	256	1.30	3.23	0.62	1.90
AGR-F	87	182	3.88	0.21	0.77	0.09
AGR-N	335	NA	0.02	NA	0.01	NA
AGR-P	142	218	0.01	0.00	0.00	0.00
IND-S	492	479	3.18	1.86	3.56	2.05
IND-M	467	466	8.70	6.46	9.25	6.92
IND-L	518	437	38.49	58.15	45.42	58.42
PWW-S	398	410	2.61	1.91	2.36	1.79
PWW-M	504	480	0.49	0.29	0.56	0.32
PWW-L	479	480	1.44	0.63	1.57	0.69
Mixed	406	375	4.57	2.85	4.22	2.46
Total	439	435	100.00	100.00	100.00	100.00

Between 2001-02 and 2006-07, for Alwar city circle, energy sold has grown by about 116 percent, but revenue realised has grown marginally lesser at 114 percent. Tariff restructuring has lowered the average price for all combined, by less than one percent. However, over that period average price of energy for flat rate agricultural category has increased by about 110 percent, while that for metered agricultural and domestic categories has increased by about 23 percent each. In contrast, average price for large industrial (IND-L) and non-domestic categories has declined by 16 and 4 percent respectively. Comparing across Sikar (with dominant agricultural categories) and Alwar city (with predominantly non-agricultural categories) circles the average realised price in the latter, for all categories combined, is almost 61 percent higher in 2006-07. Thus despite a uniform tariff structure for the state as a whole, different consuming categories in different circles face significantly differing (effective) prices for each unit of energy. Subsidy-incidence analysis across consuming categories is thus significantly more vexing than what appears from a simple reading of tariff structure.

6. Concluding Remarks

Energy sold by the DISCOMs, between 2001-02 and 2006-07, has grown at 7.56 percent per annum. JoD reported the highest average increase in sale of energy at 9.54 percent per annum followed by JaD and AjD respectively at 9.17 and 4.08 percent per annum. However, average price during the same period has the slowest growth rate in JoD at 1.19 percent per annum. Average prices in JaD and AjD grew at significantly higher rates of respectively 2.61 and 2.19 percent per annum. In 2006-7, average price of energy for JaD, AjD and JoD respectively was 391, 363, and 341 paise per KwH.

Unit price of energy varies significantly across consumer categories and average price depends critically on the proportion of energy consumed by different categories. The ratio between the maximum (non-domestic) and minimum (flat rate agricultural) price in 2006-07 was 4.6 for DISCOMs as a whole. In that year, agricultural categories consumed more than one-third of energy sold while non-domestic category consumed less than six percent. Importantly, there has only been a (desirable) marginal decline in energy sold to flat rate agricultural category. In comparison, energy sold to metered agricultural category has shown the highest rate of annual increase (about 35 percent per annum). Thus, share of energy towards agriculture has grown.

Increase in share of energy directed to *subsidised* consumer categories (with relatively lower revenue yields) negated most technical gains from FRP (in terms of energy supply efficiency or reduction in distributional losses). Financial losses for the utilities (and consequent under-recovery in government budgets) have therefore continued to rise. *Revenue gap* (difference between cost and sales) in 2006-07, for DISCOMs as a whole, was 87 paise per unit. However, there is substantial variation in this gap across DISCOMS that for 2006-07 were 57, 118 and 93 paise per unit respectively for JaD, AjD and JoD.

There is apparently a presumption about the subsidised and subsidising sectors. Per unit energy charges as prescribed in the tariff order (and that engages most regulators' attention), are at significant variance with per unit price of energy (that includes other fixed charges) faced by consumers. Such a specification betrays the objective of cross-subsidisation. Moreover, the extant tariff structure does not appear to promote optimal energy use / consumption.

The basis for current categorisation and the rationale behind tariff distinction needs careful justification. Especially, effort must be made to elucidate any equity / efficiency objectives that these may serve. Increased awareness of existing price discrimination continually raises pressure against a cross-subsidising regime. It is hardly surprising then, that the power sector regulator finds it difficult to raise tariffs for *industrial* and *commercial* consumer categories. The maximum to minimum price ratio was almost six in 2001-02. The differential was wider in the past, but has been gradually narrowed in the last few years.

Tariff differential has likely pushed out several 'high value' consumers who find it cheaper to arrange for alternative captive power (and with improved quality of supply), rendering the public sector power companies more exposed to commercial risk. One needs to be aware that it becomes difficult to woo back customers that may have incurred high (and sunk) capital costs to take up captive generation. These consumer categories perhaps facilitate greater stability in demand. It is therefore of grave policy immediacy to prevent this erosion of 'value' consumers, but more importantly, it may be detrimental to the cause of environment if such captive generation uses non-renewable sources of energy.

Tractability of public expenditure and its incidence may be better assessed by strengthening accountability at sub-DISCOM level. For example, it is likely that both capital and operational costs for a diffused rural (predominantly agricultural) distribution network may be significantly different from a dense urban network (*say*, in terms of population served, or in terms of area of economic activity served). This would enable improved assessment for (regional) distributional impact of (agricultural) power subsidy.

In this regard, it is also desirable to rationalise and streamline accounting practice for depreciation charges that reflect current consumption of assets.

The extant tariff structure has wider (sometimes detrimental) repercussions as tariff categories encompass both intermediate consumers and final consumers. That is, current categorisation discriminates (perversely) between power used in *production* (of good or service *say*, water for irrigation or for drinking), and power used in *consumption* (of that good or service).[48] Tariff prescribed for power used in production, is in most cases higher than average cost. Consequently, this raises input costs for (public sector) producer of (irrigation) water. In contrast, power used for *consumption* of water (for irrigation on farms) faces *agricultural* rate that is significantly lower than average costs.[49] Further, despite characterisation of irrigation as an economic service (to be administered along commercial lines) water for irrigation is priced substantially below its average production costs. This fosters overuse and / or misuse of both water and power on farms.

Next, cost of production of (irrigation) water and its structure differ significantly depending on the technology of provisioning, say whether it is canal irrigation or lift irrigation. While, not a direct concern of this section of the report, it is likely that irrigation subsidy may be disproportionately higher in areas or districts with greater reliance on lift irrigation. It is hardly surprising then that irrigation sector recorded very high under-recovery for the last several years that averaged 0.88 percent of GSDP between 1990-91 and 2006-07 (*see Part I* of this report).

[48] Price discrimination may be introduced if there are justifiable grounds to discourage use of power in production activities and promote use of power in consumption activities.

[49] Power used at the point of consumption of drinking water, faces varying tariffs that may be domestic, industrial or commercial rates, depending on the specific point of consumption. In the absence of a round the clock drinking water service, several consumers may feel compelled to install pumps to draw / suck out water from the water distribution network.

Finally, power used in production and supply of drinking water faces industrial tariff rate, and constitutes the largest (more than 60 percent) component of cost for the service. Current tariff categorisation presents another dilemma where drinking water is characterised as a social service (when satisfaction of minimum needs predominates cost concerns). But, charging of industrial tariffs (that are higher than average costs) raises the cost of production of an admittedly essential commodity. *Part I* of this report argued that cost under-recovery in drinking water services could be reduced by raising revenue from increased supply through minimisation of non-revenue water. Preceding discussion suggests that cost under-recovery could also be reduced by saving on costs if tariff rate for power used in production of drinking water respects the social dimension of output.

Part II B: Road Transportation

1. Introduction

Set up on October 1, 1964, the Rajasthan State Road Transport Corporation (RSRTC) is now in its 44th year of service. Over years, the number of vehicles under its operation has registered more than ten-fold increase (10.5 times from 421 in 1966-97 to 4421 in 2006-07) with a similar magnitude of increase in staff strength (10.6 times from 2047 in 1966-7 to 21798 in 2006-07). The number of depots increased from nine to 50, and the number of passengers per day utilising its services has increased more than 35 times (from 0.31 lakh to 10.89 lakh). The total operated distance increased almost 36 times from 167.83 to 6055.48 lakh kilometres between 1966-97 and 2006-07. The corporation often generated some surplus until 1996-97. Since then however it has been in deficit, although the annual deficit appears to be diminishing in the last couple of years.

RSRTC operates on nearly 2800 routes. Of these, three specific service routes namely, Jaipur-Delhi, Ajmer-Merta and City Transport Service (CTS) are subjected to detailed investigation here.[50] In the year 2006-07, these three routes together contributed about 5.48 percent of operational revenue and entailed 5.19 percent of total cost of RSRTC. In the next *section*, we briefly document user charges or fares across states on a comparable basis. Production subsidy (if any), in the extant case, accrues to the public sector corporation. This may alternatively be interpreted as the cost of public sector inefficiency. Total units supplied as a ratio of total units targeted, can be a

[50] The analysis is limited to public service from only the public sector. These routes however, are also serviced by private operators, and it is perhaps safe to also assume that private sector operators generate profits.

probable measure for distribution/supply efficiency.[51] *Section 3* presents a crude measure of distributional efficiency in service delivery. Production (input use) inefficiency may be identified, crudely, by analysing the structure of costs. Change in this structure over time, often provides some cues on the relative direction of efficiency. These are discussed in *Section 4*. Average realisation per unit of service supplied,[52] when compared against average expenditure per unit produced, gives a rough estimate of the consumption subsidy.[53] This is analysed in *Section 5* before presenting some concluding observations in *Section 6*.

2. Fare Rates for Road Transportation Service

User charges for ordinary road transportation services are summarised in *Table 1*. It is observed that there are significant differences across states in fare rates for ostensibly similar services.

Table 1: Gross Fares in Road Transport, 2002-03 (paise per passenger Kilometre)

States	Range
Jammu and Kashmir, Bihar, North Bengal STC, Tripura, Tamil Nadu, Karnataka KSRTC	20 – 30
Andhra Pradesh, Orissa, Calcutta STC, South Bengal STC, Manipur, Nagaland, Kerala, Gujarat, Maharashtra, Madhya Pradesh, Rajasthan	30 – 40
Assam, Himachal Pradesh, Punjab and PEPSU RTC, Uttar Pradesh, Haryana	40 – 50
Mizoram, Sikkim	> 50

Note: Gross fare includes passenger tax. Fares pertain to 'ordinary' bus service. The categorisation or choice of range is based on visual inspection and class intervals may not be uniform.
Source: Ministry of Shipping, Road Transport and Highways, Government of India.

[51] This however may be an underestimate, as it precludes a situation where the target itself maybe defined significantly below the technical capacity.
[52] This is estimated by dividing total (gross) collections through bills / demand with total units recorded in those bills.
[53] This is likely an overestimate, as it subsumes production subsidy.

Most road transport corporations however, also extend services of different quality (express, deluxe, air-conditioned) for discerning travellers. Charges for these are normally set in some multiple proportion of ordinary service. Tariff fixation along with other specifications relating to work conditions, influence the financial and operational health of public services.

During the period between 1966-97 and 2006-07, consumer price index for urban non-manual employees (CPI (UNME), RBI, 2006-07) has jumped almost 18 times from 146 to 2599 (1960: 100) but the fare rate for ordinary services of RSRTC has also increased about 18 times (from 2.5 to 46 paise per kilometre). *Table 2* presents changes in tax inclusive fare rate in the last few years.

Table 2: RSRTC fare rate, paise per seat per kilometre

Class	14-01-1999	31-07-2005	09-09-2005	02-04-2006	06-07-2006
Local	33	36	38	40	46
Express	40	43	45	47	50
Semi Deluxe	46			50	55
Deluxe	67				75
A/C	120				125
CTS	40.23				

Source: Personal Communication.

Ticket cost includes fare, toll tax,[54] and insurance costs.[55] Fare consists of basic charges and a tax component. The latter component had risen to 35 percent in 1973 (from 12.50 percent in 1959) of basic charges.

[54] The toll tax structure in Rajasthan is as follows:

- Rupee 1: If fare between 20 – 40 rupees with one toll station (*naka*) enroute
- Rupees 2: If fare more than 40 rupees, and only one toll station enroute
- 2 * Number of tolling stations: If fare more than 40 rupees

[55] Insurance includes medical and life cover components with following premium charges:

- Rupee 1: If fare between 16-23 rupees,
- Rupees 2: If fare higher than 23 rupees.

3. Distributional /Supply/ Delivery Efficiency

Distributional (or delivery) efficiency[56] is measured by quantity of goods and services made available (or consumed) as a ratio of quantity of goods and services targeted (or produced). In road transportation this may be measured as a ratio of *operated distance* to *scheduled distance* for a specified route.[57] Thus supply efficiency here is in the nature of target achievement. *Table 3* presents this measure for two years, for three specific routes analysed in this report. Note that there may be multiple (alternative) routes between the terminals with differing route-lengths.[58] Further, we assume no qualitative difference between the depots in terms of inputs utilised or service produced. For example, *Deluxe* depot runs only air-conditioned service on Jaipur – Delhi route, while *Jaipur* depot offers only regular (ordinary) service on that route. The distance in the former is 281 kms, while in the latter it works out to 286 kms.

[56] This is different from *production efficiency* that may be based on cost minimisation or minimum input use, or *capacity utilisation* that could be based on installed capacity.
[57] Note that ratio of operated trips to the number of scheduled trips may also yield a similar result, if there is only a unique route between two terminals.
[58] Further, there may be (several) other routes where the aforementioned terminals constitute merely a branch of the whole path. These are however, assumed to constitute only a small fraction of service on that route and, ignored.

Table 3: Distributional Efficiency (percent)

Route – *Depot (Route length(s))*	2005-06	2006-07
Jaipur – Delhi	*95.43*	*97.87*
Deluxe (281)	*98.81*	*98.97*
Jaipur (286)	*93.82*	*97.25*
Ajmer – Merta	*95.18*	*91.45*
Ajaymeru (90)	*97.43*	*91.12*
Nagaur (72, 80)	*90.94*	*93.62*
City Transport Services (CTS)	*91.81*	*91.16*
Jhalana Dungri	*86.76*	*88.38*
Sanganer	*94.00*	*91.85*
Vidyadhar Nagar	*89.36*	*90.90*
RSRTC	*98.43*	*98.90*

Source: RSRTC, MIS Data.

Supply efficiency ratio for RSRTC as a whole, was 98.43 and 98.90 percent respectively for the years 2005-06 and 2006-07. It is observed that, all three services analysed here yield a ratio that is on an average lower than that for RSRTC as a whole (service between Jaipur and Delhi from Deluxe depot being the only exception). The ratio for Jaipur – Delhi service averages above 95 percent. Of the three services analysed here, CTS reports the lowest ratio, but even that averages above 90 percent, except for services from Jhalana Dungri depot (that reports a ratio lower than 90 percent in both years). Note that this ratio is a summary indicator for *reliability* of service and needless to add that efforts should be made to continuously improve upon this.

4. Cost Structure

Employees' compensation constituted less than 23 percent of total costs in 1964-65. This proportion rose to nearly 36 percent by 2004-05[59] and in 2006-07 constituted almost a third (32 percent) of total costs. Employees'

[59] Classified as *fixed costs*, its proportion in total costs should ideally decline with increase in the scale of operations. This indicates that a substantial component may indeed be variable. The classification does not appear to be following usual economic characterisation.

compensation thus forms a major component of total costs of RSRTC apart from fuel costs. In 1964-65, cost of diesel consumption accounted for less than a quarter of total costs. This proportion had been rising slowly and reached about 31 percent in 2004-05, but by 2006-07 it surged to almost two-fifths (38 percent) of total costs.

The surge in fuel cost component is largely due to a sharp movement in the price of diesel (especially there has been frequent upward revision in the last couple of years). This could only be marginally neutralised by improvement in fuel efficiency of vehicles. The corporation averaged 4.80 kilometres per litre in 1965-66, but this fell sharply to 3.99 kilometres per litre by 78-79. It attained a peak of 5.09 kilometres per litre in 2005-06, but has again declined to 5.00 kilometres per litre in 2006-07.

Analysis of cost structure helps identify critical inputs. In the extant case, these are fuel and labour that together constituted almost 70 percent of total costs in 2006-07. Prices of these inputs are administered by the government but more importantly, these are seen to be ratcheting-up. Another component of cost to RSRTC and, also a policy tool in the hands of the government are taxes. The sum of special road tax, inter-state tax and Motor vehicle tax borne by RSRTC,[60] constituted 16.08 percent of total costs in 1992-93. This declined to 9.26 percent by 2006-07. It is however, apparent that a continually larger fraction of total costs are getting out of the grips of RSRTC. Thus cost structure alone may be insufficient to guide measures to improve operational efficiency. Other factors influencing efficiency of operations relate to the policy environment that determines the contours for

[60] These are taxes specific to road transportation service only. There are however, taxes inherent in other inputs. For example, tax on diesel that is included in the cost of diesel consumed by RSRTC.

economic activity of various economic agents. Some of these are discussed in the concluding section.

5. Cost under-recovery

A rough estimate of consumption subsidy (assuming efficient production) or, more appropriately under-recovery of cost, may be derived by comparing average realisation per unit produced (earnings per kilometre) against average expenditure per kilometre. While earning (revenue realisation) per kilometre is readily available by specific routes, expenditure data is not available at a similar level (but is available only for depots as a whole). Expenditure of a depot constitutes of fixed costs and variable costs. Allocation of fixed cost on a particular route could be based on the proportion of scheduled kilometres (that is, scheduled kilometres on a given route divided by scheduled kilometres for the whole depot). Analogously, variable costs on a particular route may be allocated based on the proportion of operated kilometres (that is, operated kilometres on a given route divided by operated kilometres for the whole depot). The apportioned (fixed and variable) costs are added up to arrive at total costs (expenditure) on a specific route.

Normalising expenditure and earnings both, to per kilometre terms facilitates comparability between different specific services. *Table 4* presents these for the routes as a whole, and for the routes by each serving depot. RSRTC reported cost under-recovery to the extent of 7 and 5 percent respectively for the years 2005-06 and 2006-07. But, cost under-recovery in CTS increased from 14 to 18 percent despite significant (almost 30 percent) improvement in operating revenue per kilometre from Jhalana Dungri depot.

Table 4: Revenue and Cost in Rupees per Km., and Under-recovery in Percent

Route – *Depot (Route length(s))*	Op. Rev. Per Km.		Tot. Cost Per Km.		Under-recovery	
	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07
1	**2**	**3**	**4**	**5**	**6**	**7**
Jaipur – Delhi	27.60	30.80	15.52	18.27	-78	-69
Deluxe (281)	*55.02*	*58.37*	*14.57*	*21.13*	*-278*	*-176*
Jaipur (286)	*13.80*	*14.83*	*16.00*	*16.61*	*14*	*11*
Ajmer – Merta	10.17	12.32	15.88	17.53	36	30
Ajaymeru (90)	*10.67*	*12.84*	*16.10*	*17.70*	*34*	*28*
Nagaur (72, 80)	*9.15*	*9.00*	*15.43*	*16.38*	*41*	*45*
City Transport Services (CTS)	16.05	16.21	18.73	19.81	14	18
Jhalana Dungri	*10.31*	*13.40*	*18.45*	*18.82*	*44*	*29*
Sanganer	*17.56*	*17.71*	*18.48*	*20.27*	*5*	*13*
Vidyadhar Nagar	*14.66*	*14.80*	*19.19*	*19.42*	*24*	*24*
RSRTC	14.34	15.51	15.34	16.41	7	5

Notes: Km.: kilometres; Op. Rev.: operating revenue; Tot.: total; Estimates are based on operated (or actual) kilometres;[61] Negative under-recovery denotes *excess*.
Source: Same as *Table 3*, and Monthly Progress Report, RSRTC, March issues of 2005-6 and 2006-7.

Cost per kilometre (compare *columns 4* and *5*) increased for all routes and offset most of the gains from improved revenue realisation (*columns 2* and *3*). There is a sharp rise in costs of Sanganer depot, accompanied by only a marginal increase in average operating revenue. Recovery rate on Ajmer-Merta route has improved, but the gains have been due to its operations from Ajaymeru depot only. Operational efficiency on this route from Nagaur depot appears to have worsened. There appears to be a marginal decline in revenue realisation accompanied by rise in costs.

[61] Given some slack in target achievement (*Section 3*), use of scheduled kilometers in place of operated kilometers would likely lower the estimates for per kilometer revenue and costs, but leave the estimate of under-recovery unchanged. Operating revenue constituted 98.4 percent of revenues in 1965-66. This declined marginally to 97.9 percent in 1992-93. By 2006-07, this fell further to 95.1 percent.

Revenue from operations on Jaipur – Delhi route, is more than expenditure. This is on account of the premium services offered from the Deluxe depot. But, there has been a sharp decline in margin of excess recovery between 2005-06 and 2006-07. In contrast, there is under-recovery in normal or ordinary services operated from Jaipur depot. For example, in 2006-07 almost 11 percent of costs of operation of ordinary service between Jaipur and Delhi, remained un-recovered. It is perplexing that in 2005-06, cost of operations for ordinary services of Jaipur depot were higher than that for premium service of the Deluxe depot. In contrast, operating revenue per kilometre from the Deluxe depot was more than four times that of ordinary services of the Jaipur depot.

Cost of running a service depends on efficiency of operations. Important factors affecting operational efficiency are the (a) average age of vehicles in operation; and (b) average operating speed. *Table 5* gives the average age of vehicles and aggregate fuel efficiency (kilometre per litre of diesel) for the depots. Note that vehicles on CTS are of a significantly older vintage. The average age of vehicles in all relevant depots appears to have increased between 2005-06 and 2006-07, except in the case of Deluxe depot.

Table 5: Factors Affecting Cost of Operations

Depot	Average Age of vehicles in Years		Average Kms. Per Litre	
	2005-06	2006-07	2005-06	2006-07
Deluxe	2.13	1.76	5.60	5.27
Jaipur	2.36	2.72	5.42	5.26
Ajaymeru	5.98	6.37	5.08	5.03
Nagaur	4.94	5.20	5.07	5.01
Jhalana Dungri	6.70	7.56	4.75	4.73
Sanganer	9.84	10.93	4.48	4.39
Vidyadhar Nagar	9.01	9.71	4.57	4.54
RSRTC	4.9	5.11	5.09	5.00

Notes: Data pertains to depot as a whole (not specific for the route).
Source: Monthly Progress Report, RSRTC, March issues of 2005-06 and 2006-07.

Several factors influence the realised average speed of operations, for example, road type, congestion, or traffic density. These also impact efficiency in fuel consumption. Efficiency in fuel consumption appears to have declined between 2005-06 and 2006-07, on all routes.[62] While this can be a cause for concern to RSRTC, the solutions (like improving road conditions, reducing congestion to increase average operating speed) may not lie completely in their domain. A recent study (GoI, 2008), commissioned by the Ministry of Urban Development, presented a gloomy scenario unless emergency steps are initiated.

Revenue from service depends critically on the (a) fare rate; and (b) average occupancy (or load factor). Fare rates for road transportation services in Rajasthan have been discussed briefly in *Section 2*. Growth in fares have generally maintained pace with growth in CPI (UNME). As mentioned earlier, fare constitutes of basic charge and passenger tax, and the proportion of latter component in the fare had grown. Conversely, the proportion of basic charge (constituting the net realisation of RSRTC) in the fare had declined.

Between 1966-67 and 1982-83 basic charge had increased 2.43 times from 3.0 to 7.3 paise per kilometer, while CPI (UNME) had grown 3.05 times from 146 to 446 (1960: 100). In 1982-83, the design of passenger tax in Rajasthan was changed into a special road tax based on the cost of chassis / vehicle. As such since 1982-83, the fare does not have an exclusive passenger tax component. Between 1982-83 and 2006-07, the fare rate has grown 4.65 times from 9.9 to 46 paise per kilometer. Over the same period, the CPI (UNME) has grown 5.86 times from 83 to 486 (1984-5: 100). Thus, the revenue yielding component for RSRTC (namely, *basic charge* in the pre-

[62] Note the higher fuel efficiency for services with longer running routes, contributed largely by new vehicles complying with *Euro-II* norms.

1982-83 period and *fare* in the post 1982-83 period) has lagged the growth in CPI (UNME).

Average occupancy or *load factor* is given as actual passenger kilometers as a ratio (or percent) of available (or offered) passenger kilometers. The denominator is estimated as the product of seating capacity (total capacity) and operated kilometers.[63] The numerator is estimated as a product of number of passengers and average distance travelled by them.

Table 6: Factors Affecting Revenue

Route – *Depot*	Load Factor - Depot		Load Factor – Route	
	2005-06	2006-07	2005-06	2006-07
(1)	(2)	(3)	(4)	(5)
Jaipur – Delhi			66	71
Deluxe	*82*	*86*	*83*	*88*
Jaipur	*70*	*74*	*59*	*64*
Ajmer – Merta			54	57
Ajaymeru	*69*	*73*	*57*	*58*
Nagaur	*57*	*59*	*50*	*52*
City Transport Services (CTS)			69	69
Jhalana Dungri	*66*	*71*	*106*	*83*
Sanganer	*72*	*83*	*71*	*65*
Vidyadhar Nagar	*65*	*74*	*59*	*65*
RSRTC	67	70		

Source: Same as in *Table 3.*

From *Table 6* one may note that load factor for the depots' and RSRTC as a whole has improved between 2005-06 and 2006-07. Load factor for the three specific routes (cols. 4 and 5) analysed here, has also improved. But, a closer look reveals that CTS from two depots namely Jhalana Dungri and Sanganer show a significant decline in load factor in 2006-07 as compared to 2005-06. Note however, that the estimate of load factor depends crucially on the choice of capacity. A change in this may lead to inappropriate conclusions

[63] Seating capacity in Express, Deluxe, and A/C services is assumed as 38. Carrying capacity in CTS and local services is assumed as 50 (it used to be 54 between 1978-79 and 1988-89, 53 between 1989-90 and 1991-92, 52 between 1992-93 and 2005-06).

from annual statistical comparisons. It is perhaps desirable to quickly adopt a (management information) system that (also) enables tracking of (some) costs and revenues on per passenger-kilometre basis.

6. Concluding Remarks

In general, within city service yields lower fuel efficiency than long-distance operations. For example, in 2006-07 the three depots of Jhalana Dungri, Sanganer, and Vidyadhar Nagar together managed an average of only 4.55 kilometres per litre of diesel, even if CTS constituted about 55 percent of their total operated services. Assuming that other operations perform to overall corporation average (of 5.00 kilometres per litre), it transpires that CTS delivers only around 4.18 kilometres per litre. Efficiency of operations however depends critically on (a) vintage of vehicles; (b) quality of vehicle maintenance; (c) traffic density; and (d) average operating speed.[64]

The RSRTC has been registering losses in its CTS operations,[65] while private operators (presumably) have been relatively more successful. It is hard to say whether private operators in city services manage better fuel efficiency than CTS of RSRTC. But, apparently certain practical considerations lead to operational disadvantages for RSRTC. These are that, (a) private operators manage more trips per bus suggesting a lower turnaround time than RSRTC on CTS;[66] (b) RSRTC may have relatively higher personnel input costs (higher

[64] Cost of fuel may be reduced through improvement in the procurement process. Potential to improve fuel efficiency from adopting spares (especially tyres) with improved technology should also be studied.

[65] In 2005-06, RSRTC lost 54 paise per km on its operations, and including depreciation and interest this increased to 95 paise per km. In 2006-07, the loss was 36 paise per km, but including depreciation and interest it was 101 paise per km. A back-of-the-envelope calculation suggests that, assuming 50 percent load factor, about 10 percent increase in *basic charge* (to 50-51 paise) may wipe out all losses.

[66] Lower turnaround time in turn translates into higher average speed of operations. Assuming equal dexterity of RSRTC and private vehicle drivers, higher average speed in city services

wages as also higher staff per bus ratio).[67] While some disadvantages arise out of technological choices there are others that arise out of policy choices, for example, (c) private operators may adopt a flexible tariff schedule depending on time-of-day operations;[68] (d) RSRTC has to mandatorily offer concessional (or even free) service to certain categories of people including students, journalists, senior citizens, handicapped persons; (e) RSRTC also has to run services on decidedly uneconomical routes; and (f) distinction in the terms for charging license fee from RSRTC as compared to other operators, that ostensibly puts the former at a disadvantage.

To mitigate the demands placed on RSRTC, arising out of policy decisions, the government has also allowed certain concessions to RSRTC, for example, (a) RSRTC faces a reduced tax rate of 13 percent on diesel, as compared to 20 percent for private operators; (b) RSRTC is allowed a concession of two months value of special road tax;[69] and (c) certain routes are *nationalised*, denoting that only state transport corporations can run their services on such routes.

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are achievable through enhanced manoeuvrability that may come from operating smaller or lower capacity buses. But, lower capacity buses may not necessarily provide commensurate gains in fuel efficiency.

[67] Cost per employee for RSRTC is almost three times that faced by private operators. Although, bus-staff ratio in RSRTC has been brought down to 1:4 from 1:7, even then this is higher than in the private sector. It is important to note that a public sector organisation like RSRTC has also the additional responsibility not to downgrade service conditions (anecdotal evidence abounds on undesirable practices of several private operators to save costs). However, one may study the feasibility of introducing conductor-free operations on specific long-distance routes (with limited points for embarking-disembarking enroute). Supplemented with appropriate communication technology, this may improve safety and reliability of operations.

[68] Often, it is observed that private operators lobby for upward revision of public transport charges. Interestingly, this is not necessarily to impress rising cost of operations, but merely to garner additional head room to undercut RSRTC, that may find it difficult to adopt a system of flexible tariffs.

[69] RSRTC has however contested that this covers less than 50 percent of the loss in revenue. For example, the value of two months concession on special road tax amounts to about rupees 12 crore but the value of service consumed by concessionaires (there are 22 categories) is about rupees 25 crore.

While nationalisation offers special advantage to RSRTC, quite often the potential on such routes is undercut because of relative inflexibility in operational procedures. Although, it is desirable to improve employees' productivity, it may be undesirable to benchmark with private sector using purely financial indicators. Often private sector operators are seen to dilute both work and service conditions. A public sector entity like the RSRTC cannot be seen to indulge in such practices. A worthwhile exercise could be to decipher if such dilution in work and service conditions have indeed exposed the passengers and public to greater risk. For example, whether privately operated buses are involved in relatively more accidents and relatively greater violation of traffic rules (including jumping of lanes, driving beyond designated speed limits, hedging and delaying tactics at the bus stops and traffic signals, overloading (packing more passengers than permissible) of vehicles.

It was noted in the last section that increase in fare rate has more or less kept pace with increase in CPI (UNME). However, the proportion of fare constituted by basic charge had been continuously losing ground to the passenger tax component. This basic charge is the net realisation for RSRTC (per passenger per kilometre). Revision in basic charge has lagged behind the general increase in CPI (UNME). Further, it appears that the price of inputs, specific to road transportation service, have also risen significantly faster than basic charge. Tracking these prices is however outside the scope of the current exercise.

Epilogue

Studies relating to subsidies, where these could be safely formulated in the context of international trade, often occupy centre stage. In developing economies however, this provides little succour because of relatively small magnitude of economic activity exposed to trade. Moreover, government fiscal programme is largely directed at provisioning of goods and services that are, relatively speaking, non-tradeable. Estimates of subsidies arising out of government policy / expenditure programme are relatively less well understood. Such studies are usually cast in a mould to estimate service level cost under-recovery.

Cost under-recovery essentially constitutes of three components, namely (a) inefficiency in service delivery, introducing an element of cost escalation, resulting in production subsidy; (b) subject to correcting for inefficiency, charging a price that is lower than the efficiency cost, resulting in consumption subsidy; and (c) dead-weight from externalities in production and / or consumption.

Few practicable recommendations however emerge in rationalising or reforming government fiscal programme to rein-in under-recoveries. This appears confounding, but in practice the formulation adopted to estimate cost under-recovery is insufficient to adjudge *c*, and estimates the sum of *a* and *b*. Thus, aggregate level estimate of under-recovery is not amenable for distinguishing between proportions benefiting producers from that accruing as subsidy to consumers. In other words, aggregate level studies provide limited cues to decipher whether (subsidies) under-recoveries are fostering production inefficiency or excessive consumption.

Adjudging efficiency, however, entails clear identification of a (alternative) benchmark from some best-practice production / delivery system.

Excess consumption, than hitherto desired, is also difficult to estimate as self-targeting programmes maybe extremely hard to design. Production technology benchmarks are (usually) based on an engineering system approach, and may overlook dimensions of consumer behaviour that profoundly influence choice of technology and associated costs.

For example, under-recovery may arise out of (a) cost escalation, from adopting sub-optimal technology that does not minimise production costs; (b) losses due to leakages or pilferage, delivery inefficiency; (c) arrears in collection due to defiant non-payment by users / consumers; (d) inability to monitor consumption; (e) policy decision to administer user charges that bear little semblance to input costs etc. Often these factors are interlinked, thus rendering limited utility for aggregate level under-recovery estimates in guiding micro level decisions.

Public services predominantly produced in public sector are strait-jacketed with regulatory constraints not only on the price of output, but also on the price and quantity of (some) inputs. Often, this leaves little room for managerial manoeuvrability or innovation in improving production efficiency, and / or customer satisfaction. While, this study takes the current choice of production technology as given, we estimate certain characteristic ratios that may, partly or wholly, reflect components of cost under-recovery.

In India, some studies on sectoral subsidies discuss the estimate of cost under-recovery implied by the government fiscal programme. These mostly discuss single year estimates that may or may not be comparable (across studies) over time due to differences in (a) sectoral (dis)aggregation; (b) adjustments while data cleaning; and (c) estimates of chosen parameters.

Anand and Jha (2004) have questioned this approach for its relevance in guiding policy intervention.

This report incorporates some methodological modifications to provide time-coherent estimates of under-recovery. The reform approach suggested here broadly hinges on the potential to distribute the burden of costs through tax and non-tax measures, as well as the potential to distribute benefits from expenditure through equitable access and supply. The latter entails specific-service level micro-studies. The report also makes a modest attempt to provide cues for complementary inputs in reform of financing of public services, by detailed analysis of few micro-level (specific) services.

The report discusses the estimates of *annualised budgetary cost of* and *recovery from* four public services, namely, *drinking water*, *irrigation*, *power*, and *road transport* for the period between 1990-91 and 2006-07. Aggregate under-recovery in these (four) public services, as a proportion of GSDP, appears to be ratcheting-up gradually. *Irrigation* and *power*, constituting more than 80 percent of aggregate under-recovery, depict wider inequity in spread of benefits from public expenditure. Further, sectors constituting a relatively small proportion of aggregate under-recovery, namely *drinking water* and *road transport*, are biased against the relatively poor. For example, sector-specific taxes hypothetically assumed to finance service level under-recovery, appear to support a design that raises incidental costs. Worse, in case of *road transport*, revenue from such taxes far exceeds estimated under-recovery. The report highlights the growing tendency of tax-based financing and lackadaisical approach towards pricing of public services.

While provisioning of *drinking water* is classified as a *social service*, that for *irrigation*, *power*, and *road transport* are classified as *economic*

services. The underlying reason for broad classification of services (into *general*, *social*, and *economic*) is perhaps based on some perception of degree (or extent) of externality. Further, two (of the three) *economic* services, namely, *power* and *road transport* are mandated to corporations (companies), ostensibly to be operated along commercial lines.

Over the last several years, there has been a tendency towards gradual corporatisation to deliver most *economic* and even some *social* services. Often, the more ostensible reason for corporatisation and / or privatisation is the inability of the public sector to prevent leakages and / or improve efficiency of delivery. However these, alongwith the presumption of an efficient private sector, appear to be insufficient reasons for denationalisation.

In the interim, governments often continue to bear certain liabilities and / or find it difficult to redeploy some resources (or factors, especially human resource), that are rendered redundant. As a result, these services or sectors may continue to entail some public expenditure, but may not be contributing as much to the government exchequer. Subsidies are thus ubiquitous in the mechanism of public expenditure. One reason for growth in deficit, expressly, has been the pursuit of such subsidy oriented policies.

Annexures

Annexure A: Detailed Terms of Reference (ToRs)

The study is to be conducted at two levels:

(i) Aggregate level: Total implicit and explicit subsidy from state exchequer (including tax expenditures) to the specified four sectors.

(ii) Service level: The state government will identify two / three* specific services out of the services delivered by government departments / government controlled organisations.

The ToRs:

Aggregate subsidies

(i) review any of the studies done by the department on its own or through consultants on the subject;

(ii) based on government accounts / budgets document the absolute and relative (percent to the total expenditure, total revenues, sector expenditure and GSDP) trend growth in explicit subsidies provided in the sector from 1990-91 onwards;

(iii) based on government accounts / budget documents, the absolute and relative (percent to the total expenditure, total revenues, sector expenditure and GSDP) trend growth in implicit subsidies for expenditures at minor head level from 1990-91 onwards; and

(iv) recommend rationalisation of subsidies at aggregate levels by suggesting specific reforms.

Specific Service User Charges / Subsidies

(v) document cost of service delivered, user-charges recovered, and consequential explicit / implicit subsidy for specified services, 1990-91 onwards;

(vi) document the ratio of user-charges recorded to cost of service for each of these subsidies;

(vii) examine the reasons for change in the user-charges ratio over the study period;

(viii) examine the trend of user-charges recovery in Rajasthan with reference to other states; and

(ix) recommend appropriate levels of user-charge recovery for each of the identified services.

* Irrigation: Indira Gandhi Nahar Phase-I Irrigation Service, Mahi Dam Irrigation Service

Drinking Water: Jaipur Urban Agglomeration Water Supply Service (including tanker supply), one Regional Water Supply Scheme and Handpump Water Supply Schemes in one *panchayat*

Transport: Jaipur City Transport Service (RSRTC), RSRTC services on one nationalised rural route (Ajmer-Merta), and the Jaipur-Delhi-Jaipur route.

Power: Agriculture Electricity Supply in Kotputli Block, Alwar District Electricity Supply, with special reference to Alwar & Bhiwadi cities, Agriculture supply in Sikar-Jhunjhunu Districts.

Annexure B: Definition of Subsidies

Domain Description

Historically, subsidy referred to a grant or gift of money as (a) a sum of money (formerly granted by the British Parliament to the crown) and raised by special taxation;[70] (b) money granted by one state to another; and (c) a grant by a government to a private person or company to assist an enterprise deemed advantageous to the public.

The first two interpretations are almost out of currency. The third description has an underlying objective, to keep price of output (commodity or service) low. However, to achieve the stated objective one assumes a complete pass-through (to consumers) of assistance. This may not be necessarily true, unlike in the case of tax, where a complete pass-through (to consumers) can be safely assumed. There often is an underlying assumption that consumption or demand would follow automatically, when there is production or supply. However, these assumptions may not always hold.

It is often argued that a subsidy arises when a government programme benefits private actors. Thus, *tax concessions* are also a form of subsidisation. Some opine that *import tariffs* may be construed as subsidisation of import competing sectors.[71] Therefore defining subsidies only in terms of government

[70] *Subsidy* was a tax, invented in England by Thomas Wolsey in 1513, based on the ability to pay. It was created in order that Henry VIII could pay for war with France while maintaining his lifestyle.

[71] Subsidy may arise due to government actions that limit competition or raise prices at which producers could sell their products. While, a subsidy may introduce certain market distortions and / or cause production inefficiencies, there often are situations when subsidies induce an efficient solution. Again, subsidies could be inefficient, but often less so than other policy tools used to benefit certain groups. Next, direct subsidies may be *preferable* to other forms of support, such as hidden subsidies or trade barriers, just as direct taxes maybe more desirable if there was no information asymmetry. Moreover, direct subsidies may be more transparent and

transfers or fiscal expenditure may not yield the true picture. Depending on the context, a large number of government programmes may result in subsidies:

- First, the government may transfer funds to producers or consumers, that is, direct payment in cash or kind.
- Second, the government may provide goods or services for free or below market price and conversely, goods and services may be purchased by government at above market price.
- Third regulatory policies like, tax concessions may be seen as subsidies, if they create transfers from one group to another

For completeness of subsidy analysis, one should be able to refer to the following:

- form of subsidies;
- beneficiaries of subsidies;
- objectives and their effect - more specifically designed a programme, more likely that the intended beneficiary (objective) and the actual recipient (effect) coincide.

In standard supply and demand curve diagrams, a subsidy will shift either the demand curve up or the supply curve down. A subsidy that increases production will result in a lower price while a subsidy that increases demand will tend to result in an increase in price. Both result in a new economic equilibrium. The degree of change is expressed as response elasticity. The cost of a planned subsidy may be estimated as subsidy per unit (that is, difference between (old) market price and (new) subsidised price) times the new equilibrium quantity. However, the mechanism of administration may create a dichotomy between the ostensible beneficiary and actual recipient of the

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allow the political process wider opportunity to eliminate wasteful hidden subsidies. The issue, that hidden subsidies are relatively inefficient (economically speaking), but often favoured as they are non-transparent, is central to the political-economy of subsidies. Examples of industries or sectors where subsidies often abound include utilities and farm subsidies.

subsidy programme. For example, a subsidy to promote consumption of milk may appear to benefit consumers (or some subset of consumers, such as low-income households), but if supply of milk is constrained, the likely increase in demand may end in pushing up prices. The milk producer(s) may benefit and the consumer(s) may derive no net gain, as the higher prices for milk offset the subsidy. Thus, subsidies generally result in a transfer of wealth from one group to another (or transfer between sub-groups) and the net effect of a subsidy programme and, identification of winners and losers is rarely transparent.

Unlike the example of a supply-constrained sector, public utilities, once created, are presumably in ample supply (usually due to technological indivisibility in scale of operations) and the total costs remain constant regardless of number of consumers. However, depending on the form of provision, benefits may be unequally shared, especially if certain complementary private costs are to be incurred in accessing these public goods and utilities. There could then be a latent element of subsidy.

In economics, the term subsidy may not necessarily, have a negative connotation. Quite often, this may not be prescriptive but only descriptive (this is largely the context in which this current study should be placed).[72] However, a subsidy may nonetheless be characterised as inefficient relative to no subsidies; inefficient relative to other means of producing the same results; "second-best", implying an inefficient but feasible solution (contrasted with an efficient but an infeasible ideal). In another context, a subsidy may be an efficient means of correcting a market failure and entirely justifiable, particularly in provision of public goods.

[72] As in case of say, effective rate of protection, that is only a positive measure and does not provide any normative suggestions or guidelines whether to raise or lower it.

Types of Subsidy

The simplest classification of subsidies is analogous to that of taxes, and one that is also amenable to incidence analysis. Thus we may have (a) direct; and (b) indirect subsidies.

Direct Subsidies

Direct subsidies are perhaps the simplest to identify, but utilised less frequently. They involve a direct cash *transfer* to the recipient, for example, unemployment benefit. As income supplement to identifiable entities, such interventions are expected to induce minimum distortions in consumption and production decisions, but may likely impact the incentives towards labour and effort (and / or factor utilisation). These suffer from implementation difficulties due to incomplete and / or asymmetric information (or insufficient tools to elicit true (individual) characteristics).

Indirect Subsidies

Indirect subsidy is a broad terminology covering most other forms of subsidy. The term covers *transfers* intended to alter consumption or production characteristics. For example, the union government expends on food and fertiliser subsidies. It also administers a cooking fuel subsidy (coal, cooking gas, kerosene). Several state governments also extend specific subsidies in the agricultural sector like in procurement of sugar, onions and cotton, ostensibly targeted to ensure (certain minimum) availability and provisioning.

Commentary

Subsidies may be characterised in other possible ways, such as those boosting or *promoting some economic activity* (production / consumption,

saving/investment), the ones directed at *recipients* (male/female, old/young, poor/non-poor), the *source of funds* (tax on current workers/tax on future workers, tax on labour/tax on capital). But, in common parlance, *budgetary tractability* of a government expenditure programme (even government policy or regulatory announcement) often may be characterised as resulting in subsidies that are explicit/implicit or observable/unobservable. Quite often these may result in notional expenditure or forfeiting of revenue, as opposed to actual financial transaction.

Often, direct subsidy or transfers may be booked under some particular head of service depending on the sanctioning department. For example, *scholarships* offered to students, are booked (in budget) as a component of revenue expenditure in education service. However, if administered as a cash award, these do not add to cost of delivery of service. Further, recipient of such transfers may not necessarily expend these monies on purchase of educational services. On the contrary, if scholarships are administered as a waiver of fees (etc.), then these amount to an (indirect) explicit subsidy in educational services. Care must be exercised to separate out such elements in estimating implicit subsidy as unrecovered cost.

In its role as a producer (provider), government behaviour could be analysed in the framework of a discriminating monopolist that mimics price discrimination (cross subsidisation) to maximise a welfare objective (as distinct from a profit maximising objective). Unlike their role as producer (or even consumer), governments could be considered as a factor of production with taxes as its measure of value added (or factor return).[73] Finally, non-

[73] Taxes could be treated as an item of basic cost. Theoretically, one could estimate the optimum input quantity (that is, size of government) of this factor, with taxes as the cost of factor or marginal return to the factor. On the supply-side, tax price may be the outcome of a political bargaining process.

taxation is not equivalent to subsidisation. It may alternatively be referred as non-subsidisation, or preferably as neutral or indifferent government stance.

Annexure C

Sectoral Revenue Receipts and Expenditure

Table C.1: Drinking Water Supply (rupees lakh)

Year	Revenue Receipts	Expenditure		
		Revenue	Capital	Net Loans and Advances
1990-91	8123.80	12639.68	10903.86	134.28
1991-92	12069.03	14694.77	15597.49	140.49
1992-93	9211.52	17078.54	16866.53	134.34
1993-94	12961.83	22449.19	20992.50	191.01
1994-95	13285.93	23841.38	30225.55	277.57
1995-96	17949.60	28163.01	37416.13	318.92
1996-97	19912.84	36061.96	31478.88	420.21
1997-98	23315.56	42325.14	41615.18	750.94
1998-99	28305.34	51782.18	53829.82	0.00
1999-2000	27496.85	55927.60	34644.10	0.00
2000-01	36240.40	63000.27	43950.67	0.00
2001-02	33860.08	65902.20	46089.03	0.00
2002-03	39303.54	67723.88	60238.43	0.00
2003-04	42835.23	69671.15	56420.88	0.00
2004-05	49173.00	75106.50	62387.03	0.00
2005-06	65427.21	80491.57	80279.40	0.00
2006-07	67905.96	79650.73	123272.61	0.00
TGR 1990-91 to 2006-07	**13.72**	**12.84**	**12.36**	

Source: Same as *Table 1* in text.

Table C.2: Irrigation (rupees lakh)

Year	Revenue Receipts	Expenditure		
		Revenue	Capital	Net Loans and Advances
1990-91	7291.75	22022.95	21235.19	12.38
1991-92	7361.17	23348.82	24952.12	-0.89
1992-93	5307.10	31316.06	30831.65	7.47
1993-94	6094.72	37829.25	32291.62	2.41
1994-95	5846.64	40268.78	41576.21	22.24
1995-96	7398.66	46560.02	46861.12	17.21
1996-97	8512.25	47711.55	46226.95	8.88
1997-98	6341.11	51541.75	51642.53	4.33
1998-99	8024.17	67952.48	57323.36	-74.74
1999-2000	7707.22	71062.35	46694.30	-92.59
2000-01	7449.01	75080.91	34639.02	-235.61
2001-02	6413.27	77717.05	39995.47	-9.00
2002-03	7733.07	75021.61	37639.66	-15.97
2003-04	8186.52	82374.93	88807.17	-13.20
2004-05	8256.54	89140.14	81982.40	-10.42
2005-06	8532.82	92786.24	98411.20	-9.77
2006-07	8756.74	99380.63	75312.81	-5.44
TGR 1990-91 to 2006-07	**1.79**	**9.53**	**7.40**	

Source: Same as *Table 1* in text.

Table C.3: Power (rupees lakh)

Year	Revenue Receipts	Expenditure		
		Revenue	Capital	Net Loans and Advances
1990-91	0.00	240.62	0.00	-6065.82
1991-92	0.00	15091.04	61309.00	77521.25
1992-93	0.00	29802.14	0.00	-99850.58
1993-94	0.00	38571.57	0.00	32723.50
1994-95	0.00	17814.83	0.00	37820.98
1995-96	0.00	23217.47	30030.00	51233.76
1996-97	0.00	44773.07	11465.00	-4161.82
1997-98	0.00	27530.39	74705.00	47527.17
1998-99	0.00	29780.36	0.00	-137866.65
1999-2000	0.00	48085.41	205.00	25478.88
2000-01	10.00	47826.33	3000.00	23400.01
2001-02	2.33	31810.28	33300.00	16456.18
2002-03	139.76	66199.70	33350.00	9026.71
2003-04	1.52	94314.01	28275.68	14073.85
2004-05	10.19	118528.64	35000.00	84916.51
2005-06	0.06	119951.46	63060.00	64402.01
2006-07	493.43	174220.68	69893.43	7163.19
TGR 1990-91 to 2006-07		**23.72**		

Source: Same as *Table 1* in text.

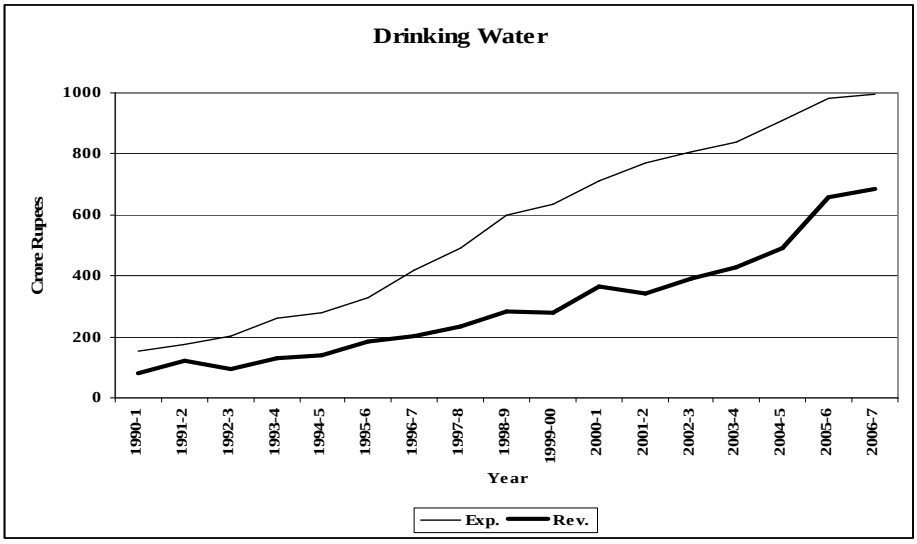
Table C.4: Road Transport (rupees lakh)

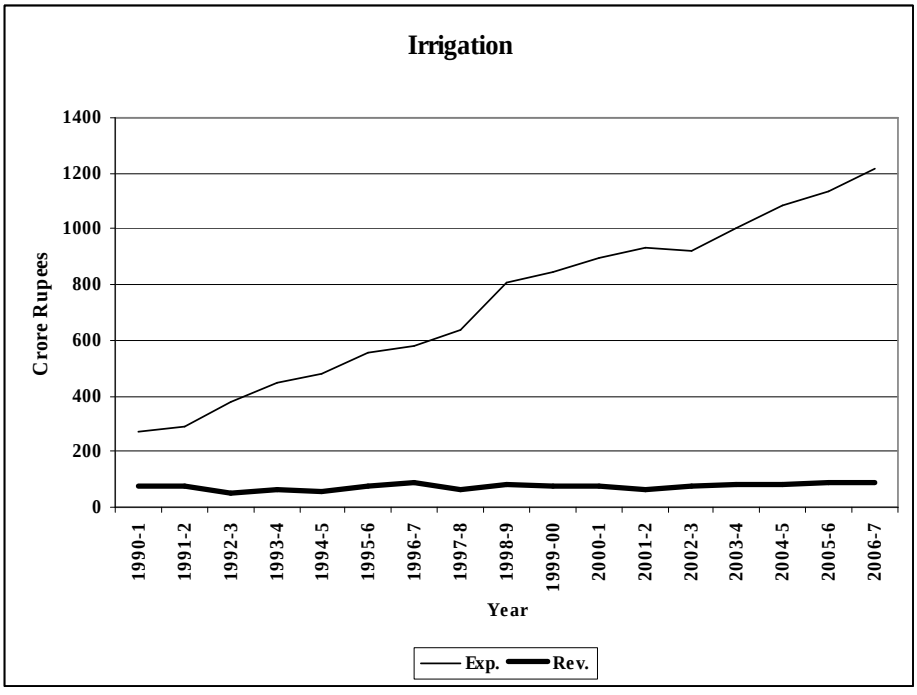
Year	Revenue Receipts	Expenditure		
		Revenue	Capital	Net Loans and Advances
1990-91	0	0	670.00	
1991-92	0	0	649.91	
1992-93	0	0	1011.56	
1993-94	0	0	1607.13	
1994-95	0	2723.00	18.07	
1995-96	0	0	10.35	
1996-97	0	0	-0.25	
1997-98	0	0	0	
1998-99	0	0	0	
1999-2000	0	0	0	
2000-01	0	0	0	
2001-02	0	0	0	
2002-03	0	0	0	
2003-04	0	6499.00	11211.00	
2004-05	0	931.00	0	
2005-06	0	1061.97	0	
2006-07	0	978.03	0	
TGR 1990-91 to 2006-07				

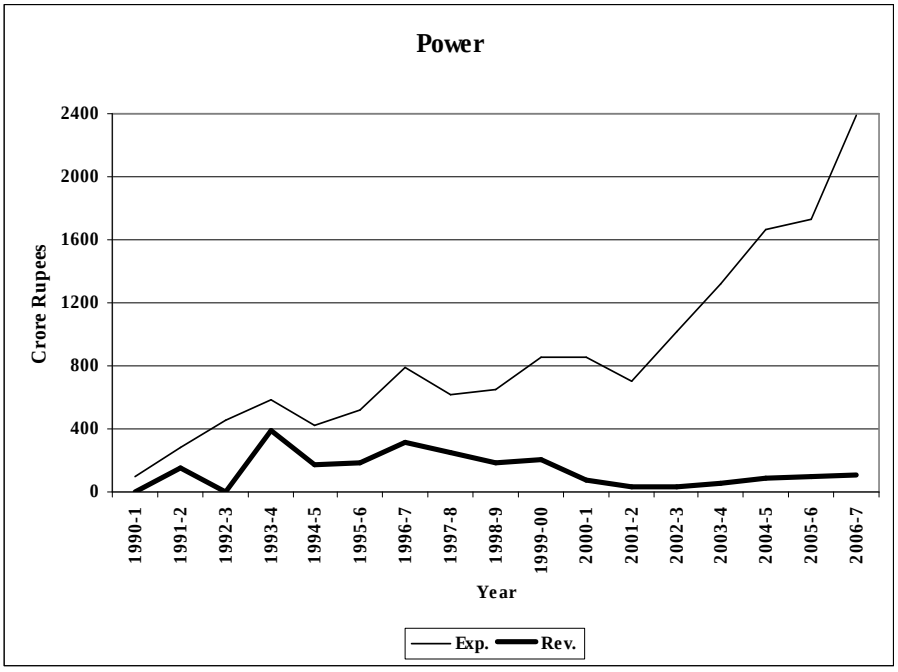
Source: Same as *Table 1* in text.

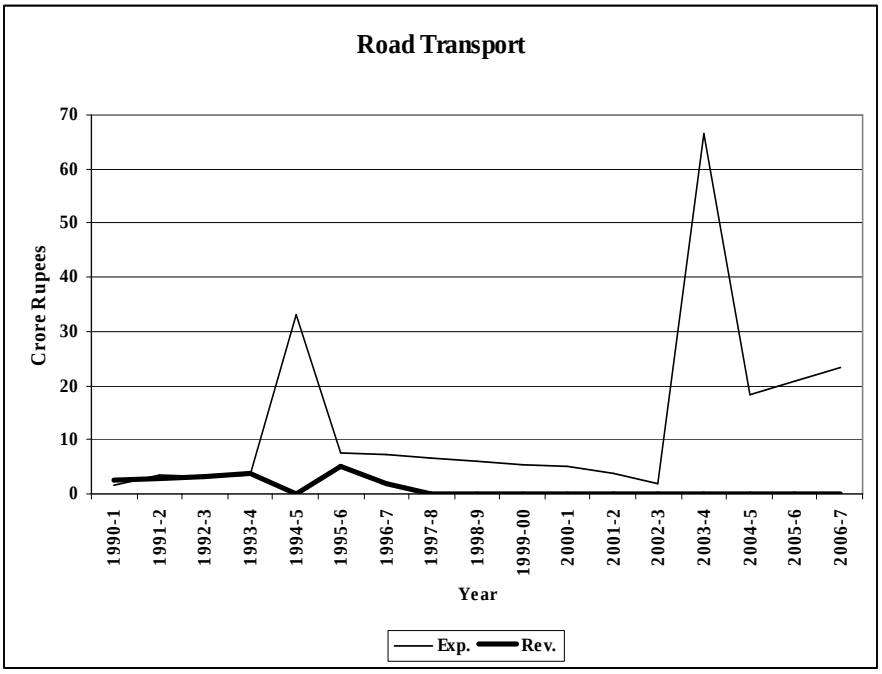
Annexure D

Figure D.1: Annualised Budgetary Cost of (Exp.) and Recovery (Rev.) from Services (rupees crore)



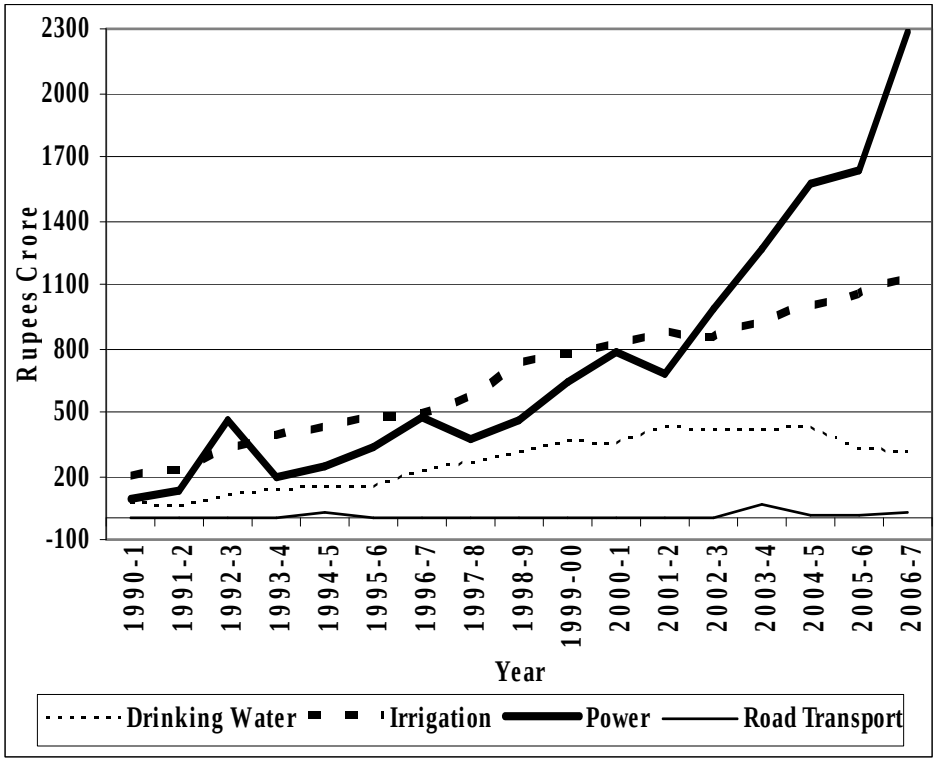






Source: Same as *Table 1* in text.
Notes: Slim lines depict costs. Thick lines depict recovery. 1 crore equals 10 million.

Figure D.2: Cost Under-Recovery (rupees crore)



Source: Same as *Table 1* in text.

Annexure E

Drinking Water and Irrigation

Water policy in general and drinking water policy in particular, is often influenced by the recognition of riparian rights with fiduciary attributes. Over the years, this has raised the likelihood of a lurking *tragedy of commons*.[74] Especially in countries like India with weak human development indicators, pricing of water services involves a vast spectrum of issues. Viewed as a basic human need, access to and provision of drinking water in the public sector has been one of the foremost concerns of government.

During the course of this current exercise, analysis of specific services in drinking water and irrigation sectors, especially the latter, was severely constrained due to a variety of reasons. The analysis presented here relies largely on budget-based financial information and fails to discuss average price, cost, or revenue per unit of output / deliverable (*see*, sections on road transportation and power, for examples on the desired approach). We discuss two specific services in drinking water followed by two in the irrigation sector before concluding this annexure. Discussion on each sector attempts to summarise extant tariffs in states, highlighting the differences in adopted conventions. Data permitting, this is followed by a brief analysis of receipts and expenses incurred on specific services. Finally, the structure of expenditure on specific services is discussed to highlight certain distinctive features.

[74] Simply stated, this refers to a situation where "common" property remains unattended or is subjected to overexploitation.

E.1 Drinking Water

Drinking water policy in most states intends to foster greater efficiency in consumption and improved efforts at conservation of this natural resource. The latter includes measures to minimise ground water extraction and incentivise ground water recharge. Efficiency in consumption is motivated through efforts at devising prudent norms that form the basis for tariff distinction.

E.1.1 Tariffs and conventions across states

The schedule of tariffs for different states, follow varied conventions in setting tariffs. While most states administer tariffs based on volume of supply, there are others that utilise a non-volumetric schedule. *Tables E.1a and E.1b* group the states collecting water charges based on volumetric supply, for domestic and industrial consumers respectively. States, however, vary in their choice of basis for measuring the volume of supply. For ease of comparison, water rates are transformed into equivalent price per kilolitre.

Table E.1a: Domestic Water Rates (Rupees per kilolitre)

States / Union Territories	Rate
Arunachal Pradesh, Meghalaya, Lakshadweep	Nil
Punjab, Chhattisgarh, Rajasthan, Karnataka, Madhya Pradesh	0.01 - 0.10
Orissa, Jammu & Kashmir, Haryana, Gujarat, Maharashtra, Pondicherry	0.11 - 1.0
Bihar, Jharkhand, Himachal Pradesh	1.1 - 2.0
Manipur, Andaman & Nicobar Islands, Goa	> 2.0

Source: Central Water Commission, 2004, *Table 2.7*, pp: 21-2.
Notes: KL- kiloLitre (equals 1000 Litre or 1 cubic meter (Cu. m)), 1 litre equals 1000 cubic centimeter (cc), 1 UK gallon equals 4.546 litres, 1 US gallon equals 3.7854 litre, 1 cusec equals 1 cubic feet (cuft) per second, 1 cuft equals 28.32 litre. Effective dates for states are spread over the period from 1990 to August 2003. The effective date for Rajasthan is November 28, 1991. Subsequently, water rates in Rajasthan were revised with effect from June 1998. Revised net rate per KL is rupees 1.25 ($\leq$ 15KL), rupees 2.4 (> 15 KL and $\leq$ 40 KL), and rupees 3.2 (> 40 KL). In case of Andaman & Nicobar Islands, Madhya Pradesh, Maharashtra, and Orissa, a range of water rates was reported. The rate per KL pertains to the maximum of the range.

States administer differential rates for non-domestic (commercial establishments) as well as industrial consumers. Units for affixing water rates may however differ between domestic and industrial consumers. These have also been converted into rate per KL, to facilitate comparison. In general, commercial and industrial consumers face higher rates than that for domestic consumers. In most cases though there is no ostensible difference in quality of supply.

Table E.1b: Industrial Water Rates (Rupees per Kilo-litre)

States / Union Territories	Rate
Arunachal Pradesh, Jammu & Kashmir, Manipur, West Bengal, Mizoram, Meghalaya, Punjab	Nil
Orissa, Rajasthan, Karnataka	0.10-1.0
Bihar, Chhattisgarh, Haryana, Jharkhand, Pondicherry	1.1-2.0
Andaman & Nicobar Islands, Himachal Pradesh	2.1-4.0
Maharashtra, Andhra Pradesh	> 20

Source: Central Water Commission, 2004, Table 2.7, pp: 21-2.
Notes: See notes for *Table 1a*. Effective from June 1998, for Rajasthan, revised net rate per KL for non-domestic purposes is rupees 3.75 (≤ 15KL), rupees 6.6 (> 15 KL and ≤ 40 KL), and rupees 8.8 (> 40 KL). Effective from June 1998, revised net rate per KL for industrial use is rupees 8.8 (≤ 15KL), rupees 11 (> 15 KL and ≤ 40 KL) and rupees 13.2 (> 40 KL).

Table E.1c summarised from a report of the Central Water Commission (on Pricing of Water in Public System in India) shows only few states with a multi-tiered schedule. While *Tables E.1a* and *E.1b* summarise the average tariff rate, most states follow a multi-tiered (slabs) tariff schedule. Further, as per the revised order effective from June 1998, even Rajasthan utilises a multi-slab schedule.

Table E.1c: Domestic and Industrial Water Supply (slab-wise volumetric rate)

Categories	States / Union Terrotories
Domestic	Delhi, Mizoram, Tamil Nadu, Kerala
Industrial	Delhi, Tamil Nadu, Kerala

States utilising a non-volumetric tariff plan are categorised on the basis of implementation, in *Table E.1d* for domestic water supply and, in *Table E.1e* for industrial water supply.

Table E.1d: Water Rates for Domestic Purposes (Non-volumetric)

States / Union Territories	Rupees	Basis
Himachal Pradesh (Tribal Area), Daman & Diu	5 -15	Per tap
Sikkim	> 20	
Himachal Pradesh (Rural Area), Tripura	10 -100	Per connection
Dadra & Nagar Haveli	20 - 55	Per month

Table E.1e: Water Rates for Industrial Purposes (Non-volumetric)

States / Union Territories	Rupees	Basis
Himachal Pradesh (Tribal Area), Tripura	25 – 30	
West Bengal (Rural Area), Daman & Diu	50 – 75	Per tap
West Bengal (Urban Area)	> 75	
Himachal Pradesh (Rural Area)	50	Per connection
Dadra & Nagar Haveli	150 - 430	Per month

Despite following a volumetric convention in setting tariffs, it is perplexing that attempts to acquire quantitative information relating to production, supply, and consumption elicited a feeble response from PHED of Government of Rajasthan.

E.1.2 Receipts and expenditure in urban water supply scheme

Close scrutiny of detailed budgets of GoR reveals that revenue from user-charges on water supply to Jaipur urban agglomeration are shown to accrue under an international development assistance programme. *Table E.1f* presents receipts from and expenditure on Jaipur urban water supply scheme.

Table E.1f: Jaipur Urban Agglomeration Water Supply Scheme (Rupees crore)

Year	Rev. Rec.	Rev. Exp.	Rev. Gap	Cap. Exp.
2000-01	18.57	49.84	31.27	2.36
2006-07	24.39	76.49	52.10	20.96
Percent Inc.	31	53	67	788

Source: State Budget Documents, Government of Rajasthan, 2002-03 and 2008-09.

Between 2000-01 and 2006-07, revenue expenditure grew by 53 percent, while receipts grew by 31 percent only. As a result, revenue gap increased by 67 percent from Rupees 31.27 crore to Rupees 52.10 crore.[75] Revenue receipts covered almost 37 percent of revenue expenditure in 2000-01, but in 2006-07 this ratio had declined to 32 percent. Capital expenditure grew sharply during this period by nearly 800 percent from Rupees 2.36 crore to Rupees 20.96 crore. This was mainly on account of the water transmission system to supply Jaipur from Bisalpur project.

Discussions during the course of this study revealed that per household (water) charges in Jaipur average barely Rupees 18 per month. But, it was also mentioned that currently residents receive only intermittent water supply during the day. As a consequence, most households in Jaipur also (privately) invest in (a) construction of an underground tank, where water from public supply is collected; and (b) a pump to lift water to the overhead tank for distribution in the house.

[75] Revenue gap relates to the difference between revenue expenditure and revenue receipts.

Willingness to pay is however strongly influenced by the manner in which provisioning is implemented. While tariff revision normally faces strong opposition, a project completed with German collaboration (called *aapni yojana* in Churu district), maintaining 24*7 supply of water is apparently working well with people having adjusted to paying Rupees 50 per month.

E.1.3 Structure of cost

The analysis of cost structure (*Table E.1g*) derived from grouping revenue expenditure into four categories (namely, (a) employees compensation; (b) water and energy charges; (c) maintenance and improvement of pumps and distribution network; and (d) others) reveals only a minor change between 2000-01 and 2006-07. While in 2000-01, 35 percent of cost related to employees' compensation, the share declined marginally to 34 percent in 2006-7. Almost 56 percent of revenue expenditure in 2000-01 related to water and energy charges, and this rose to 58 percent in 2006-07. Five percent of revenue expenditure related to maintenance and improvement of pumps and distribution network. Only 3-4 percent of expenditure goes towards office expenses, maintenance of office vehicles, purification and chemical charges. Thus nearly three-fifths was expended on energy charges and, more than a third was expended on employees' compensation.

Table E.1g: Structure of Revenue Expenditure on Jaipur Urban Water Supply Scheme (percent)

Year	Employees Compensation	Water and Energy Charges	Maint. and Imp. of Pumps and Dist. Network	Others
2000-01	35	56	5	4
2006-07	34	58	5	3

Source: Same as Table E.1f.

In contrast, for rural water supply scheme, energy charges constitute a significantly higher proportion of expenditure (*Table E.1h*). The share of employees' compensation has grown rapidly between 2000-01 and 2006-07, but there is evidence of relatively faster growth in rural connectivity in recent years.

Table E.1h: Structure of Revenue Expenditure on Sahba Gandhali Rural Water Supply Scheme (percent)

Year	Employees Compensation	Water and Energy Charges	Maint. and Imp. of Pumps and Dist. Network	Others
2000-01	6	91	2	1
2006-07	23	73	3	1

Source: Same as Table E.1f.

While, the break-up of revenues mobilized as user-charges from different rural water supply schemes is not available, in several cases there are no charges or collection from / by the *panchayats*. Attempts at sectoral reforms including efforts to form village water and sanitation committees have faced a muted response.[76]

E.1.4 Suggestions

As in case of road transportation services, a large part of costs towards implementing water supply schemes pertain to inputs facing administered prices. However, there appears to be significant scope to reduce costs from synchronising public policies that encompass other services in the public sector. First, energy consumed in production and supply of water faces industrial rates that are significantly higher than average energy rate. Next, SAFEGE report[77] indicates that high staff per connection ratio (at 15 per

[76] 10 percent of the investment requirement for improving access and supply were to be provided by these committees (from their internal accruals of user charges) and remaining 90 percent were to be provided as grant-in-aid by the central government.

[77] SAFEGE Consulting Engineers in Collaboration with AIC WATSON (2000), Jaipur Water Supply and Sanitation Project: Feasibility Report, State Sector Strategy for Water Supply and Sanitation, Final Report, Appendix VII, October 2000.

thousand connections) leads to high staffing costs (especially in urban areas). However, the report laments inadequacy of staff in rural areas in absence (or weakness) of community participation.

As per the SAFEGE report, unit cost of production (Rupees 6.85 per cu. m) is thrice the average tariff (Rupees 1.82 per cu. m). That report further alludes to relevant legal aspects whereby, PHED is authorised to recover the cost of water and waste-water services through levy of water tax, a conservancy tax,[78] and water tariffs. *Part-I, section 5a* of this report revealed that there is no collection from sector-specific taxes in drinking water services. However, PHED enacts rules, bye-laws and standing orders on water tariffs.[79] Although, the *panchayats* are authorised by the *Panchayat Act* to levy and collect tariffs and taxes for water supply and sanitation services in rural areas, these powers are rarely exercised. Drinking water services are generally provided free of cost to the villages by PHED.

Highlighting some shortcomings in operation of water supply system in urban areas,[80] the SAFEGE report underlines the issue of unaccounted for water (UFW).[81] The report mentions that there is no bulk metering and that intermittent supply under low pressure sucks pollution from soils and insanitary localities. Further, water meters, being the responsibility of consumers, often led to installation of inferior (cheap) meters that frequently remained out of order. While, non-usage of ferrule leads to major leakages

[78] Cess is paid at the rate of 3 paise per kilolitre to the pollution control board, but in practice this is rarely commensurate with actual water produced.
[79] The water and conservancy tax rates are fixed through separate rules, bye-laws, and standing orders on property taxes.
[80] These are (a) low pressure leading to pollution through the distribution network; (b) intermittent supply (average of 2 hours per day in most towns and piped water systems in rural areas); and (c) frequent tripping, low voltage and inadequate hours of power supply.
[81] UFW appears due to, (a) present bursts – awaiting repairs; (b) longer standing bursts – not known or not located; (c) leakages from ferrules, communications, supply pipes, joints and valve glands; (d) reservoir and treatment plant overflows; and (e) losses from errors in metering and billing system.

from service connections the legal constraint to disconnect (not permitted even if consumer found to violate rules and regulations) demotivates supervision, and disincentivises ethical consumer behaviour.

At the aggregate level under-recovery was estimated at roughly 50 percent. Anecdotal evidence puts the level of UFW (sometimes loosely recognised as non-revenue water) at between 40-50 percent of water produced and pumped into the distribution system. Reduction of UFW is a pre-requisite for improvement in revenue mobilisation. Towards this end, the SAFEGE report suggests (a) installation of bulk water-meters for assessment of production; (b) regular and improved assessment of consumption; (c) regular and systematic leak detection and repair (to minimise transmission and distribution losses); (d) identification and disconnection of illegal connections (and even minimising public standposts); and (e) recording of complaints and interventions (and transferring responsibility for meters and service pipes to PHED). These and several other recommendations in that report have a universal appeal.

The current tariff rates vary broadly based on consumption levels, with prescribed minimum charges. Considerations for such minimum charges presumably include assumptions on average household size, minimum per capita consumption requirement etc. While not precisely known, it is likely that over last several years the nature of consumption has changed substantially with drinking water or kitchen needs perhaps accounting for less than 20 percent of household consumption. Increased use of coolers, flush latrines, washing machines are also placing higher demand. On the other hand several technological innovations go on to reduce wastage of water while addressing similar needs. Thus it is likely that direct water consumption requirements may depict a bell-shaped or inverted-U shaped relationship with

income. Hence a need for periodic reassessment of minimum requirement without disincentivising efforts to continually reduce wastage.

Cost of provisioning is predominantly influenced by nature of the source and distance of source from the point of consumption. The extant tariff specification does not account for cost disabilities. As a result it becomes difficult to assess the incidence or element of subsidy, except at the aggregate level.

E.2 Irrigation

Irrigation services place a relatively greater demand on available water. But, irrigation charges are based on assumed (not actual) usage of water depending on crop-type, area under irrigation, season, number of waterings, etc.[82] Irrigation efficiency is commonly estimated to be about 30-40 percent. That is, only between 30-40 percent of water produced for irrigation is accounted for based on prescribed norms. Thus, between 60-70 percent of water is unaccounted either due to overuse (from adoption of flooding technique on the fields) or lost during transmission mainly from evaporation, seepage, and leakage.

E.2.1 Agricultural water rates

Agricultural water rates in states are often crop and season specific, and in some cases use different measures (acres / hectares). Rates may also

[82] Frequent change in personnel, apparently in position to guide / assist with adopted approach for this study, led to several rounds of introductory discussions. These discussions however, seldom progressed beyond lamenting an administrative decision to transfer *patwaris* from irrigation to revenue department. *Patwaris* are personnel entrusted with the job of measuring land and water use for raising appropriate water bills. While there appears to be significant overlap of functions of a *patwari* in irrigation department with corresponding personnel in revenue department, transfer of *patwaris'* inadvertently led to weakening of mechanism for raising appropriate bills for water charges. This compounded the problem of data compilation, user-charge and arrear collection, and yielded in near-inaccessibility to desired data. Further, attempts to access any printed or published technical (physical, organisational) information and documents elicited only an apathetic response.

differ for flow and lift irrigation schemes. *Table E.2a* categorises the states into groups based on the maximum rate in the schedule of tariffs for each state. However, all rates are transformed into comparable unit of land size measure.

Table E.2a: Agricultural Water Rates (Rupees per Hectare)

States / Union Territories	Rate
Arunachal Pradesh, Punjab, Meghalaya, Mizoram, Nagaland, Sikkim, Andaman & Nicobar Islands, Chandigarh, Lakshadweep	No Irrigation Water Rates are in Operation
Himachal Pradesh, Manipur, Haryana, West Bengal, Kerala, Tamil Nadu, Daman & Diu, Pondicherry	≤ 200
Bihar, Jharkhand, Uttarakhand, Tripura	201 – 400
Uttar Pradesh, Goa	401 – 600
Assam, Jammu & Kashmir, Chhattisgarh	601 – 800
Dadra & Nagar Haveli, Karnataka	801 – 1000
Andhra Pradesh, Gujarat, Rajasthan, Delhi	1001 – 2000
Maharashtra, Orissa	> 2000

Source: Central Water Commission, 2004.
Notes: Rates cover both lift and flow irrigation. 1 hectare equals 10000 sq. metres, or 2.471 acres. The status of rates pertains to a period varying between March 1998 and December 2003 for different states.

An internal exercise in the irrigation department (of GoR) estimated the average water tariff across different crops as Rupees 174 per hectare. But, estimated as area-weighted average of crop specific rates, this turns out to be lower at Rupees 149 per hectare per annum. In contrast, annual average O&M expenditure (for production and supply of irrigation waters) over the years 2002-3 to 2004-5 is estimated as Rupees 82.20, 229.33 and 144.78 per hectare for O&M works, work charge and establishment charges respectively. Thus

the total average annual O&M expenditure per hectare of irrigated land is estimated at Rupees 456.31.

Commonly though, it is often believed that desired expenditure for appropriate O&M should be significantly higher. For example, a study sponsored by the GoR (conducted by M/S. Crux Consultants Pvt. Ltd.) estimated that cost of only O&M works, at 1998 prices, ranges between Rupees 232.22 and 532.31 per hectare per annum. The average of this range, recalibrated to 2006 prices was estimated as Rupees 495.10 (≈ Rupees 500) per hectare per annum. Assuming no change in annual per hectare work charge and establishment cost,[83] total per hectare O&M cost works out to Rupees 875 per annum.

It is desirable to elucidate the underlying assumptions of such a proposal to enhance transparency. However, even while assuming no change in establishment costs and work charges, it is not clear how restructuring of costs based on increased allocation for O&M works may justify / yield gains in efficiency of operations.[84] Thus, the classification of expenditure discussed above has limited ability to identify slack in input use. It is therefore desirable to utilise an economic classification, such as discussed in section E.2.3 later.

[83] At Rupees 230 and 145 respectively, by rounding-off Rupees 229.33 and 144.78 respectively.

[84] The same exercise also discusses another set of estimates where, annual per hectare cost of O&M works is chosen as Rupees 120, while cost of work charge and (50 percent of regular) establishment charges are assumed as Rupees 230 and 75 respectively. The total annual O&M cost is then deduced as Rupees 425 per hectare. Average water rate is proposed to be raised by 15 per cent per annum from Rupees 174 to Rupees 225 per hectare per annum to comply with the legal covenant for Rajasthan Water Sector Restructuring Project (RWSRP). The RWSRP envisages a minimum recovery of 50 per cent of O&M expenses and is proposed to be raised to 100 percent by 2007. A report of National Commission on Irrigation (1970), submitted in the year 1972, recommended "…the rates in a State should be such that taken as a whole irrigation schemes do not impose any burden on general revenues."

E.2.2 Receipts from and expenditure on specific services

Revenue receipts from and expenditure on *Indira Gandhi Canal (Phase I)* and *Mahi* Projects for the years 2000-01 and 2006-07 are presented in *Table E.2b*.

Table E.2b: Receipts from and Expenditure on Irrigation Schemes (Rupees crore)

Year	Revenue Receipts		Revenue Expenditure		Capital Expenditure	
	IGNP	Mahi	IGNP	Mahi	IGNP	Mahi
2000-01	15.18	0.32	255.97	50.80	3.69	15.04
2006-07	14.73	0.32	350.45	68.69	4.80	49.96
Percent Inc.	-3	0	37	35	30	232

Source: State Budget Documents, Government of Rajasthan, 2002-03 and 2008-09.
Notes: Receipts in IGNP include those from sale of water to households and other receipts. Expenditure in IGNP includes that on canal (0-74 kms. and 74-189 kms.), Kanwarsen lift, and IG Feeder (Punjab Part))

Receipts from IGNP cover about six percent of revenue expenditure in 2000-01, but by 2006-07 this had declined to nearly four percent. Receipts from *Mahi* project are considerably lower and cover less than one percent of revenue expenditure. Revenue gap in IGNP and *Mahi* projects stood at respectively Rupees 335.72 and 68.37 crores in 2006-07. Between 2000-01 and 2006-07, revenue gap in IGNP and *Mahi* projects rose by 39 and 35 percent respectively. But, increase in interest payments accounts for more than 90 percent of increase in revenue gap for IGNP, and all increase for *Mahi* project.

E.2.3 Structure of expenditure on specific services

In 2006-07, almost 86 percent (84 percent in 2000-01) of revenue expenditure on IGNP constituted of interest payments on capital receipts. All revenue expenditure under the *Mahi* project constituted of interest payments that increased by Rupees 17.9 crore between 2000-01 and 2006-07.

Less than four percent of revenue expenditure on IGNP in 2006-07, was for repairs and maintenance (including maintenance materials and minor construction work). The remainder of revenue expenditure (that is, excluding interest payments and expenditure on repairs) constituting less than 11 percent was on direction and administration. Almost 41 percent of the expenses on direction and administration of IGNP (that constituted 11 percent of its revenue expenditure), went towards compensation of employees. But, almost 58 percent related to water and energy expenses on the *Lunkaransar* (*Kanwarsen*) lift scheme. Thus apart from interest payments on capital receipts, energy charges to operate lifts entailed the largest proportion of revenue expenses.[85]

E.3 Conclusion

Of all water resources available, 80 percent are used for irrigation and 20 percent for drinking water purposes. Rajasthan with 10 percent area and 5.5 percent population has only one per cent of surface water resources and 1.7 percent of ground water resources of India. Two-thirds of the state is desertified and the state receives an average annual rainfall of 530 mm.

Almost 80 percent of potable (consumption of humans and animals) water and 63 percent of the net irrigated area are sourced from groundwater.

[85] In the year 2000-01, detailed budgets do not segregate the expenses under direction and administration from that on repairs and maintenance. However, the structure is apparently similar to that in 2006-07 with energy charges entailing the largest component of non-interest revenue expenses.

Over the years, this has led to a drastic fall in the water table and is also reflected in rising proportion of energy expenses in total cost of producing water. While there is an urgent need to curb wastage and misuse of water, this can be hardly achieved by mere tinkering of water rates. There is significant scope to reduce unused or unaccounted for or non-revenue water. It is quite likely that greater community participation and vigilance may go a long way in achieving this objective that translates into substantial economic gains.

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