

May 24, 2005

**DRAFT WORKING PAPER
COMMENTS WELCOME
Version 4**

What do we know about Sub-Saharan Africa's Infrastructure and the Impact of its 1990s reforms?

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** I am grateful to Mavis Ampah, Philippe Benoit, Cecilia Briceno, Arnaud Desmarchelier, Amadou Diallo, Katarina Gassner, Ana Goicoechea, Augustin Mapapa Mbangala, Mukami Kariuki, Vivien Foster, Nigel Ings, Peter Kolsky Jean-Michel Marchat, Jacques Morisset, Paul Nomba Um Eustache Ouayoro, Anwar Ravat, Martin Rossi, Gaetane Tracz, Lourdes Trujillo, David Veredas, Tito Yepes, Michael Warlters, Quentin Wodon and Michel Wormser for comments, inputs, discussions and suggestions. I am particularly grateful to Ana Goicoechea and Professor Lourdes Trujillo have audited in detail, and often generated, the quantitative evidence used in the paper from many sources, including background papers prepared by a team of WBG staff and academic consultants specialized in various dimensions of infrastructure policy. Any mistake and all interpretations are however my responsibility alone and should not be viewed as engaging the World Bank or any of the members of its board.*

Executive summary

This paper is a desk study on infrastructure in Sub-Saharan Africa (SSA) with three main purposes:

1. to take stock of basic characteristics of the region in terms of access rates, quality and costs of delivering infrastructure services (including electricity, telecoms, water & sanitation and transport but excluding urban transport, irrigation and dams).
2. to provide a preliminary assessment of the impact of the main 1990s reforms in the sector.
3. to offer initial guidance for the analysis of possible new institutional, contractual and regulatory designs for the next wave of reforms for SSA.

The main conclusions of the paper can be summarized as follows:

- **We don't know precisely how well SSA is meeting its infrastructure needs** (including MDGs) simply because the quality and quantity of data has become so poor
 - Improving Africa' ability to monitor and benchmark its performance should be a top priority for the international community and is likely to be a major challenge requiring significant coordination across countries and donors.
- Based on the partial information available, there is however little doubt that **SSA's access rates and their quality continue to be low by any standard**
 - The simple average for access rates in the region are 15% of the population for electricity, 64% for water, 36% for sanitation; 9% for telecoms and around 60-70% for transport depending on how access is measured;
 - Rural areas enjoy much less access than urban areas across sectors.
- **In many countries, costs appear to be high** in most sectors, even by regional standards
- **The poor are hurt the most by the failures of the sector:**
 - Access to improved services and affordability continues to be an issue for over 50% of the population, in particular when rationing is accounted for in the estimates of affordability;
 - The poorest seem to have benefited only very modestly from the reforms of the 1990s since both;
 - The disappointing infrastructure performance is costing SSA on average the equivalent of 1% of its GDP per capita in its annual growth performance. Lower growth also tends to hurt more the poor.
- **Africa needs to spend about 9% of its GDP to meet the MDGs** (5% investment+4% O&M):
 - This means that current expenditure levels in the sector needs to almost triple;
 - SSA's absorptive capacity for such a major scale up is probably limited but current analytical tools tend to underestimate it:
 - Accounting for the growth feedbacks of infrastructure investments, the relative targeting of infrastructure official development aid (ODA) on tradable vs. non-tradable is likely to drive both the absorptive capacity and the distribution of the benefits from any additional ODA.

- **Increased Private sector Participation in Infrastructure (PPI) when combined with better commitment to regulation will help** access, affordability, quality and fiscal savings much more than reforms considered in isolation
 - it will be particularly important to be able to count on increased collaboration with the local and African large, medium and small scale private sector:
 - the foreign private sector is much less present in SSA than sometimes argued (large scale private operators are in 20% of the countries for water, 28% for electricity and around 40-50% for telecoms) and has remained reluctant to enter the region possibly since the East Asia crisis and certainly since September 11 and the associated economic slowdown in international capital flows
- **These two reforms will not be enough** to address all of SSA's infrastructure needs
- **SSA will also need to be able to count on:**
 - significant additional ODA
 - improved cost recovery but designed to be consistent with the ability to pay of users;
 - major efforts to eliminate corruption—*recent evidence shows that its reduction contributes more than PPI or the creation of agencies to increase access rates and service quality.*
 - a redesign of the regulatory function better tailored to meet local needs and constraints—*but knowing that during the 1990s, the creation of "independent" regulatory agencies contributed to offset the negative effects of corruption on access growth rates in most sectors,*
- **The other main lessons of the 1990s to be considered in the next wave of reforms include the facts that:**
 - **Geography matters:**
 - landlocked countries (LLC) have seen their access rates improve faster in electricity and telecoms than coastal countries (CC);
 - there is no significant difference between LLC and CC in water sector reforms;
 - in LLC, the introduction of road agencies has generally been associated with improvements in road density while in CC, the adoption of a road agency is correlated with a marginally reduction in road density;
 - in both CC and LLCs, road agencies are associated with improvements in the quality of networks.
 - **Legal and cultural history also matters:**
 - in general, Anglophone countries have better increases in access to electricity and roads while non-Anglophone countries are better at speeding up access rates in telecoms and in sanitation;
 - PPI and independent agencies tend to be associated with better improvements in access in Anglophone countries in all sectors, except water;
 - There is no clear pattern on the impact of water sector reform, even if political instability or corruption are significant costs drivers in that sector regardless of the legal and cultural history.

- **Time matters**
 - Since most reforms discussed here are recent, not enough time may have elapsed to be able to draw a definitive conclusion; both successes and failures may actually be temporary for now!
- **The solution to today's SSA's infrastructure challenges must look much beyond the PPI and independent agencies debate and recognize that:**
 - ODA is unavoidable;
 - the private sector, in particular the local one, is unavoidable;
 - improved cost recovery is unavoidable;
 - domestic capital needs to be tapped;
 - differences in legal and cultural traditions should be addressed in the design of future institutional and contractual arrangements;
 - incentives of all actors to deliver on commitments need to be improved;
 - governance and accountability need to be improved through institutional designs and basic accounting practices
 - Specially when dealing with regulated monopolies and when decentralizing responsibilities for service delivery.
- **The search for the solution will have to be much more country and often sector specific; moreover, it will require a much better coordination by all actors involved**
- **The search will also require much more analytical work if the mistakes of the past are to be avoided:**
 - The more systematic reliance on local small and medium enterprises functioning under a competitive environment to avoid excessive markups will help a lot in the short run to allow a transitional time for the international community and African governments to develop a more encompassing menu of policy actions better tailored to SSA's needs and preferences.
 - Better targeted direct or indirect subsidies for the neediest should also be considered during the transitions to new modes of infrastructure service delivery—including the option of subsidies financed by the international community.

Ultimately, this paper is only a small step in the efforts of the international community in defining an action plan intended to implement the wide range of support given to the idea of scaling up infrastructure activities in Africa. In 2005/2006, the international community of donors has committed to deliver a much more in depth document (a "flagship study") on Africa's infrastructure which will:

- (i) improve factual knowledge of the state of infrastructure, the associated institutions in Africa and the main policy issues;
- (ii) define a baseline performance assessment that refines significantly the one provided in this paper and provides a much more precise benchmarking exercise to individual countries;
- (iii) identify reforms that would allow quick and yet, sustainable performance improvements in the sector.

Preface

This paper is a desk study commissioned by Michel Wormser, AFTPI Director of the World Bank. Its main purpose is to take stock of the stylized economic facts and identify emerging policy issues in SSA's infrastructure sector, based on existing sources of information. The paper is about the region, not about individual countries in the region although it could clearly help them benchmark their performance.

While the paper does not provide major new in-depth sector specific assessments, it does rely on some new quantitative insights from a new research database and from academic research on the macroeconomic relevance of the sub-sectors, on their relative importance on the poor's expenditure patterns and on the effects of the main 1990s reforms on access rates, on prices and on service quality. Most importantly, the paper provides an integrated "macro" view of the "micro" policy issues emerging from a cross-sectoral analysis.

To be accessible to a wide range of readers, the paper is a policy snapshot - rather than a full technical diagnostic - with messages for the six main groups composing Africa's infrastructure policy constituency:

- the *sector specialists and sector Ministers* who know the details on their sector better than anyone but seldom have the time to step back and get a sense of the more macro-oriented view other policymakers tend to have of their business;
- the *Ministers of Finance and the Ministers of Planning* who wish to get a sense of what gets rationed at the sectoral level and how it gets rationed when infrastructure assets are eroded or resource needs ignored;
- the *donors* who wish to improve their knowledge of the issues to address and who want to improve coordination, not only in terms of resources allocation but also in terms of policy support provided to the countries;
- the *development policy watchdogs* who need basic quantitative information to anchor their performance assessments; and,
- the *consultants, policy advisors, academic and other researchers* who need better data to generate evidence on the sources of failures and successes and come up with better solutions to Africa's long lasting problems in the sector;
- the *media* who want to get better information to inform civil society.

The paper draws on original research and on a series of papers and notes recently prepared by academics and sector specialists at the request of the World Bank on various dimensions of infrastructure policy in Africa. A much more detailed study is expected to be conducted later in 2005 by the international donor community (a "flagship" study of Africa's infrastructure) to: (i) improve the factual knowledge of the state of infrastructure and the associated institutions in Africa and the main policy issues; (ii) define a baseline performance assessment that refines significantly the one provided in this paper and allows a much more precise benchmarking exercise to individual countries.; (iii) identify reforms that would allow quick and yet sustainable performance improvements in the sector.

List of background papers produced in preparation of the forthcoming performance diagnostic

1. Ampah, M.A. (2005), “A note on Recent Economic Developments in Africa’s ICT sector”
2. Desmarchelier, A (2005), “A regional baseline performance snapshot for Africa’s transport sector”
3. Diallo, A. B. and Q. Wodon (2004), “A note on Access to Network-Based Infrastructure Services in Africa: Benefit and Marginal Benefit Incidence Analysis”
4. Estache, A., B. Speciale and D. Veredas (2005), “How much does infrastructure contribute to Sub-Sahara Africa’s growth?”
5. Estache, A. and K. Gassner (2004), “A snapshot of Electricity in Sub-Sahara Africa: emerging policy issues”,
6. Estache, A. and A. Goicoechea (2005), “An infrastructure research database for Sub-Sahara Africa”
7. Estache, A., A. Goicoechea, M. Manacorda and L. Trujillo (2005),), “How effective were regulators and private participation in Africa’s utilities”
8. Estache, A. and M.E. Pinglo (2005), “Cost overrun vs cost under-runs in World Bank projects in Africa”, Power Point presentation
9. Estache, A. and M. Rossi (2005), “Efficiency Drivers of African Water Utilities”
10. Estache. A. and G. Tracz (2004), “A snapshot of Water and Sanitation in Sub-Sahara Africa: emerging policy issues”,
11. Estache, A.and T. Yepes (2005), “Assessing Africa’s investment needs”
12. Kariuki, M. (2005), “A note on Small Scale Provision of Water Supply in Africa”
13. Mbangala, M. A. (2004), “A survey of economic efficiency measures on Sub-Sahara Africa’s infrastructure”
14. Ouedraogo, F. (2005), “Ports, Airports and Rails: Reform Status in Sub-Saharan Africa”, Power Point presentation
15. Ravat, A. (2005), “Institutional limitations to the absorptive capacity of a scaled up lending for Africa’s infrastructure: a checklist for the Commission for Africa”
16. Tovar, B and L. Trujillo (2004), “ A short note on the economic efficiency of East African Electricity Operators”
17. Warlters, M. (2005), “Public and Private Costs of Infrastructure Financing in Sub-Sahara Africa”

Many other sources have been used in the preparation of this document. They are quoted in footnotes and in a bibliography at the end of the paper.

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1. Introduction

1. Sector reforms do not happen in a vacuum. They have a “macroeconomic” context interacting with the sector specific context most specialists tend to focus on. The recent history of this “macro” context in Africa gives a good sense of the somewhat unusual complexity of the environment in which sector specific reforms need to be implemented. This chapter offers a brief overview of the sequence of “macro” events that have driven infrastructure gaps to become an impediment to growth and hence an impediment to poverty alleviation for many countries in the region. It concludes by explaining why and how this very basic stock taking exercise of success and failures in Africa’s infrastructure policies can be used to improve accountability of all actors involved in the region.

2. *A small bit of history and a glimpse of the future.* Right after a majority of countries achieved political independence, the infrastructure designed fitted Africa’s economic structure, which was at that time, commodities and minerals export oriented. This infrastructure supported reasonably strong economic growth from the early 1960s until the 1970s oil shocks.¹ Between then and the mid-1990s, the economic situation became rather gloomy. This long economic slow down, combined with growing interest in regional trade or other economic agreements² and increased urbanization of the continent, catalyzed change --albeit slow-- in Africa’s economic structure.³ These changes led to a growing mismatch between the demand and the supply for infrastructure in the region. By the end of the 1990s, the gap grew significantly in spite of the good economic recovery achieved since the middle of the decade. This is probably why infrastructure is likely to be at the top of the region’s reform agenda in the foreseeable future. Indeed, to meet the Millenium Development Goals (MDGs), the average annual infrastructure expenditures (the sum of investment and maintenance expenditures) need to be around 9% of GDP between 2005 to 2015, much more than twice what Africa has spent on the sector over the last 40 years or so.⁴

3. *How the infrastructure gap came about.* The household demand for infrastructure never stopped growing throughout the various economic cycles but the corresponding supply, only grew very modestly on average, as shown in chapter 3. This gap was not simple to deal with politically but neither was the gap associated with the evolution of the demand from the agricultural, industrial and services activities in increasingly open economies. After independence, the progressive changes in the economic structure of the continent were indeed instrumental in fueling not only the quantitative but also the qualitative mismatch between the supply and the demand for infrastructure. For instance, as early as the mid-1980s, there was a generalized sense that there was too much emphasis on the paving of roads in sparse networks. The view was

¹ As pointed out by S. Brunel (2004), Africa’s colonization dramatically modified the use of space in the region, shifting growth and urbanization from inland to the littoral. Most African capitals are ports built at the end of railways designed to carry flows of raw materials and people from the inland. She also points out that transport networks inherited from that growth located perpendicularly to the seashores rather than a network designed to occupy space widely. This is one of the reasons why the economic capitals of Africa are often so peripheral and why increasingly, political capitals are moved to more central locations.

² There is no country in Africa who is not a member of at least one of the 10 regional economic groupings!

³ The urban population now represents 40% of the total, vs. 30% 25 years ago. This is about 300 million people

⁴ Sachs and his colleagues talk about needs equivalent to 13% of GDP in their UN paper.

that the demand had switched to denser networks of lower quality but better maintained roads. Adjusting to this evolving demand, the rate of investment in paved roads dropped but the necessary improvements in network quality and coverage --including cross-country--did not follow in equivalent proportions. Similarly, in energy, the demand for cross-country transmission lines as engines of collective growth for various parts of Africa has long been recognized. The coordination of investment decisions in these networks has however proven to be much more complex than in other developing regions of the world and as a result, demand continues to be rationed in many countries.

4. ***The fiscal crisis and the “one size fits all” cuts did not help infrastructure.*** The mismatch between demand and supply has been amplified by the recurrent fiscal crises that accompanied the various economic crises. The policy responses to these fiscal crises, in particular from the mid-1980s onward, were often based on public expenditure adjustments set to address short term fiscal concerns. This may not have been the optimal policy in a continent in which the long term growth requirements needed a much more careful look at the relevance of the fiscal composition. These adjustments were too often blind to the sectoral allocations needed to support growth. They were also blind to the complementarity between expenditure categories within sectors—the commitment to maintenance is a condition to ensure the cost effectiveness of most investment decisions in infrastructure—which is characterized by potentially much longer lived assets than other sectors.⁵ The upshot is that fiscal shortfalls and/or cuts led to under-maintenance and under-investment across infrastructure subsectors.

5. The inefficiency of many of the public enterprises responsible for the delivery of infrastructure services did nothing to help the fiscal situation. Instead, they contributed to inflate costs, hence increasing the severity of the budget constraints and ultimately the infrastructure gaps. The excessively mis-targeted contradictory policies aimed at addressing the sector’s problem were counter-productive in many more ways—too many to cover them here. Some of these actually further fueled the fiscal problem they were trying to address and contributed to the erosion of a potential tax base expansion much needed to finance the increasing capital and recurrent expenditure required by this sector and others.

6. ***Infrastructure specific policy choices of the 1990s did not help either.*** Africa’s fiscal space problem was compounded by the unfulfilled hope that private sector financing would replace public sector financing--while addressing the public sector inefficiency problem. As discussed later in the paper, at most 10-15% of the investments made during the 1990s can be credited to private investors. This is not negligible but it is not significant enough to cover the reductions associated with the fiscal adjustments.

7. More importantly maybe, what the low level of PPI reveals is that the way reforms were designed and implemented was also part of the problem since it did not manage to attract private capital in the sector—although the energy sector, and energy generation in particular, and the telecoms sector did proportionately well. In many of the reforming countries, chapters 3 to 5 will show that the restructuring intended to facilitate private sector participation also resulted in some degree of “cream-skimming”, with large urban zones considered the cream of the utilities’ business, thereby increasing the gap between rural and urban access rates for public services. In some others, it increased the

⁵ The heated debates of governments—and often the Bank sector staff—with the IMF on Road Funds serves as a witness to the divergence of views on this topic. The debate is however on very solid concerns. According to Desmarchelier (2005), the ratio of actual to required maintenance in roads for a sample of averaged 42.4% and varied from 0.28% in DR Congo (in 2003) to 89.3% in Burkina Faso (2001). It was below 50% for 6 of the countries.

fiscal costs of the sector when the profit centers used historically to finance cross-subsidies were concessioned. This was done without significant fiscal compensation to the state, at least not enough to replace the cross-subsidies lost through the restructuring processes by direct subsidies when full cost recovery was not an option.

8. The main lesson so far may be that working with the private sector is a necessity for Africa but that a menu of cost effective solutions for public private partnerships adapted to the continent has not yet been identified. From the perspective of a large share of the population and for many potential investors, the 1990s may have been somewhat of a lost decade in infrastructure. Indeed, the evidence presented later in this paper shows that the unrealized policy hopes of the 1990s have unfortunately contributed to ration infrastructure investment and quality, with often dramatic distributional consequences.

9. *Where do we go from here?* The fact that in 2005, Africa is enjoying a high profile of its infrastructure activities as a result of various international initiatives provides a unique opportunity to try to get a better quantitative sense of what has been achieved so far, of what went wrong and what went right during the 1990s. Without quantitative evidence, the history of policy effectiveness tends to be rewritten to suit the needs of the various stakeholders. The debates on the achievements of the 1990s are likely to be long and occasionally futile because few are likely to be grounded on solid evidence. The strong international political commitment to address Africa's needs for efficient, equitable and fiscally sustainable infrastructure services demands the definition of a quantitative baseline of the needs, of the initial policy conditions and of the relevance of the major institutional factors that may have been underestimated during the 1990s.

10. Without a much better analytical assessment of the needs, of the policy issues and of the options to address them, there is a risk that many of the new solutions to Africa's infrastructure problems will be ad-hoc and uncoordinated across donors, as they have sometimes been in the past. Moreover, the investment needs are so large that it may seem to some that there can be no bad project. However, the uneven performance of Africa's infrastructure in comparison to other regions, the increasing fiscal costs of the sector, the political frustration with the reforms of the 1990s and the strong impression that the poor have been left out of many of these reforms; all argue against that vision. Too many mistakes have plagued the implementation of many of Africa's infrastructure reforms during to the 1990s. The lack of a serious baseline has allowed multiple "blame games" that don't do much to address the needs of the populations, the producers and the investors skipped by the 1990s reforms.

11. *Defining a baseline to increase accountability of all the actors.* The main ambition of this paper is to set up an initial current and up-to-date quantitative baseline performance assessment along all the relevant policy dimensions. This baseline is unlikely to be encompassing but it should be substantive enough to document some of the key mistakes of the past and allow a sharper vision of the sector potential role anchored in a robust and coordinated strategy for the region and the countries within the region. This is needed to ensure accountability of all actors going forward without losing the lessons from the experience so far. This is why the basic principle underlying the discussions in this paper is the same implicitly built-in the MDGs: *"What gets measured, gets done"*, with the corollary that *what doesn't get measured is likely not to get done!*

12. Under the general guidance of this principle, the baseline provided here focuses on:

- growth, its infrastructure needs and the growth required to finance infrastructure;
- fiscal sustainability of national and international resource allocation decisions;
- efficiency - both in terms of costs and technology choices;
- equity - both terms of access and affordability;
- quality - both technical and economic; and
- institutional strength - in its various dimensions, including governance.

13. ***How good is the baseline presented here likely to be?*** The baseline provided here requires improvements in depth and quality because the paper identifies many holes in basic policy oriented data. However, it is unlikely to require annual updates of the data already collected. Indeed, it takes time to build road networks, transmission and distribution lines or water treatment stations. It takes even longer to build the institutions and the governance structures needed to ensure the sustainability of any desired change. This implies that even year to year changes are unlikely to be dramatic. Five to ten years periods are needed before noticeable changes can be assessed.

14. Overtime, however, the monitoring of incremental changes allowed by this baseline will provide useful reality checks. Seeing access rates only catch up with population growth rates over a decade as they largely did during the 1990s is a sign of failure in a region with access rates lagging behind the rest of the world in most sectors. Seeing access rates improvements failing to reach all income classes should be viewed as an even bigger failure. Looking forward, with the mandate of the MDGs, the NEPAD and the Commission for Africa and with the numerous actors who have expressed support for the high priority given to infrastructure activities, a repeat of the 1990s performance would be a collective failure. This is why the benchmarking of the 1990s performance offered in this paper is so important. It sets the tone and defines the very pragmatic challenges the African people, donors, investors and operators will have to address collectively.

15. ***What should be the future use of this baseline?*** Because the quality of the data, in particular the data on quality, is so unsatisfactory, it is important to recognize that the conclusions delivered by this paper are preliminary. As more and better data becomes available, policy conclusions will be refined. The focus of forthcoming reforms will also be more precise as more and better data becomes available. It is also important to recognize that the assessments provided here focus on the country performances, not the performance of the utilities or the agencies that have been subject to specific reforms. For example, a concession contract very often concerns a utility catering to the needs of only a small fraction of the population. Similarly, the creation of a regulatory agency is often associated to the reform of a utility and does little for rural access. While these specific reforms may be good for the performance of specific utilities or agencies they were targeting, they will not necessarily have a major positive impact on the performance of the country in terms of access or quality--in some cases they could have a negative impact. This may reflect the narrowness of the reform efforts. It may also reflect the shortness of the time elapsed before assessing the country-wide impact. When one of the specific reforms can be associated with a country-wide improvement in the sector, it may reflect strong spillover effects or the payoffs of other reforms not picked up by the utilities or agency specific reforms. In sum, the story told here is the story of the average

impact of a reform on a country. This important viewpoint is however a partial one. To get a full sense of what drove the changes of the 1990s, a fuller assessment is needed as a follow up to this initial partial diagnostic.⁶

16. A **“Road Map” to the paper**. Since one of the main objectives of the paper is to provide a cross-sectoral view of the issues, the paper uses the accumulated knowledge covered in the background papers and many other sources to illustrate and document the policy issues of relevance to all sectors.⁷ The specific content of each chapter can be summarized as follows:

- Chapter 2 provides an overview of the importance of the sector for growth. It covers estimates of the social rates of return generated in the sector. It also provides a rough order of magnitude of the total costs of capital and operational & maintenance needs across infrastructure activities to sustain the 7% growth rate built in the MDGs.
- Chapter 3 gives a more detailed sense of the demand for infrastructure. It considers the two main sources of demand. The first is the demand by investors and in that context reviews the investment climate. The second is the demand by households. In that second context, the chapter documents the slow progress achieved during the 1990s and the impact of the reforms on the various income classes, emphasizing the issues of concern to the poorest. It builds on the information generated by macroeconomics poverty assessments and provides a first and quite unique sense of the importance of the expenditure patterns of the poor and on how basic access to some infrastructures taxes or helps their lives.
- Chapter 4 focuses on the quality of the services as well as on their economic efficiency. For quality, it distinguishes between technical and service orientation. The discussion on economic efficiency aims at giving a meaning to the cost effectiveness of the sector. Unfortunately, costs, including those of monopolies, are seldom monitored in the region. Because of this, the chapter relies on a survey of the evidence available from academic studies on the economic performance of water, electricity, telecom and railways operators. Its main purpose is to show that partial technical performance indicators (e.g labor productivity, water or energy losses, ...) can be misleading when assessing the financial and economic performance of operators. In particular, it shows that these indicators ignore costs related issues crucial for a continent concerned with its ability to finance its needs and concerned with tariff level inconsistent with the poorest users’ ability to pay.
- Chapter 5 provides a snapshot of the current market structure, of the reforms intended to change this structure as well as the institutions governing the sector. It shows how reforms are associated with changes in access rates, quality and affordability. It provides a basic statistical analysis comparing the average performance of Francophone and Anglophone countries as well as landlocked and coastal countries. It also summarizes the results of more academic assessments of the impact of infrastructure reforms in Africa, including an overview of the evidence available on the level of corruption in the sector and its impact on Africa’s infrastructure performance.

⁶ This fuller assessment is expected to be the focus of a study to be conducted collectively by the international aid community from mid-2005 to mid-2006.

⁷ The paper does not address the complex issues relevant to the reconstruction of post-conflict countries.

- Chapter 6 concludes the paper with a discussion of the main issues that need to be addressed in order to ensure that the next wave of infrastructure reforms meets the expectations much better than the reforms of the 1990s managed to do. It is not a blue print for reforms; it is only an initial discussion of some of the key policy issues any blueprint will have to address. The chapter also provides a brief inventory of additional information that will have to be generated to ensure accountability in the next wave of reforms.

2. The MDGs, growth and their infrastructure needs

1. This chapter takes stock of what we know about the interactions between growth and infrastructure in Africa, about the returns to investment and maintenance in the sector, about the investment needs implied by the MDGs and about some of the “macro-policy” challenges the public sector needs to address to make the most of its resources. Before getting into quantitative discussions of these concerns, however, the chapter provides a brief overview of the way in which infrastructure is being addressed by the new “macro-policy” tools adopted by the development community. The assessment of the effectiveness of the implementation of these tools is indeed essential to any effort to ensure the effectiveness of any infrastructure specific policy.

PRSPs, MDGs and Infrastructure

2. *A history of incomplete PRSPs?* A casual search on the web on public speeches by key African politicians over the last 5 years suggests that infrastructure is at the top of the list of concerns for many of them. It is on that list with AIDS and with education. Consultation processes widely published—but conducted outside of bureaucratically managed consultation processes—such as the *Voices of the Poor* book by Narayan-Parker and Walton (2000) reveals that these politicians are in tune with the poorest who also list access to better infrastructure services as critical to their quality of life. Yet, the Poverty Reduction Strategy Papers (PRSPs) initiated in the mid-1990s have not been always consistent with these alternative “information revelation mechanisms”. In most instances, infrastructure concerns picked up in PRSPs tend to be defined in relatively general terms or in ad-hoc ways—often as a demand derived from very specific, sometimes very local, growth or poverty reduction concerns without obvious regards to the global visions of the needs.⁸ Even when explicitly dealing with infrastructure, the PRSPs tend to be partial. The role of infrastructure in agricultural growth and rural poverty reduction dominates the infrastructure coverage of these PRSPs for most countries. For some, it is complemented by a discussion of its importance for the promotion of small enterprises or for the effective use of local job markets—i.e. Uganda.⁹ Few PRSPs yield a very clear and specific support for an encompassing infrastructure strategy—e.g. Ghana or Mali seems to stand out as an exception in this respect.¹⁰

3. This mismatch between PRSPs and alternative preference revelation mechanisms—whether public speeches or root-level consultation processes—is puzzling and has no simple explanation. It certainly reveals possible weaknesses in the PRSP consultation mechanisms, including the difficulty of reconciling a long term view with short term views. The long term view is driven by planning processes in a sector in which large sunk costs are needed to maximize opportunities for returns to scale. It also drives the concern for a long term financing commitment matching the long amortization periods. The short term view typically emerges from consultation processes—“*we want access and we want it now at any costs*”.

⁸ Leonard, T. (2005) offers a useful survey of the literature on infrastructure and PRSPs; Ellis and Freeman (2004) illustrate some of the limitation of PRSPs including for decisions regarding infrastructure in very specific contexts for 4 countries.

⁹ For detailed overviews, see Nankani and Allen (2004), Craig and Porter (2003) or Oxfam (2004) for instance.

¹⁰ In his review of infrastructure presence in PRSPs, Murooka (2004) provides detailed information on 17 SSA countries. Ghana, Mali and Senegal stand out only in the clear priority assigned to infrastructure.

Without cost recovery designs and complementary commitments to subsidies which account for the ability to pay of the users, these two views of the world are inconsistent. The lack of support for the recognition that services have to be paid by either users or taxpayers built-in the short term view fueled the fears of many potential private investors. This fear was largely underestimated by the international donor community and many of the participants in the PRSP-driven consultation processes. This underestimation led to the reduction in its support to public sector financing of infrastructure. In sum, as a consequence of a consultation process which may not have appreciated the option and associated trade-offs clearly enough, the donors pulled out of the sector--and the large international private sector never really showed up to replace it in SSA as discussed later.

4. ***The matching incompleteness of the MDGs.*** The introduction of the MDGs did not do much to address the PRSPs gaps.¹¹ While it managed to focus the international and local communities' attention on key development issues, it failed to make the interdependence of these MDGs transparent enough. The consequence is that resource allocation decisions have been biased, typically penalizing infrastructure, including the infrastructure MDGs. For instance, better water services can be a cost effective solution to get to the health goals and free resources to finance other MDGs. The same applies to a comparison of the allocation of resources between communications technologies and education. The emphasis on MDGs also failed to appreciate the role of some activities left out of these highly visible targets, such as transport or energy. Yet, these are major inputs into many of the MDGs. Indeed, there is plenty of evidence suggesting that health and education improve when infrastructure improves. More precisely, between 1960 and 2000, the correlation between average education levels of Africa's population and the various subsectors ranged from 0.51 (roads) to 0.70 (telecoms).¹² This somewhat naïve argument for the relevance of infrastructure is in fact quite robust and has been confirmed by much more cautious econometric studies of the engines of growth in the region—these studies are reviewed below.

5. ***The development community seems to now be getting there.*** These “historical” process failures are progressively being corrected. A more encompassing vision of the needs of the poorest is now increasingly integrated in the country's development strategies and in the commitments made to Africa by the international community—e.g. the forthcoming PRSP for Senegal seems quite promising in this regard or the collaborative work being conducted by the donors community in Uganda or Mozambique. This implies that macroeconomic assessments of the infrastructure needs are emerging in major policy documents. The NEPAD outputs, the Sachs papers, the Commission for Africa report, the 2005 Global Monitoring Report or the forthcoming OECD-DAC report on infrastructure for the poor, all offer estimates of these needs, at least at a fairly aggregate level. In that debate the linkages between infrastructure and growth are central.

¹¹ Moreover, according to end of 2004 estimates, SSA is likely to fall just short of meeting the water MDG—75% of coverage by 2015-- and is substantially behind on the sanitation MDG with 85% of SSA countries unlikely the MDG target of 66% of coverage.

¹² Correlation is a statistical measure of the degree to which two indicators are linearly related. This correlation measure can reflect direct or indirect causation but also a simple statistical oddity. In this context, however, the correlation is taken to be an initial indication of a link between education and infrastructure that deserves better scrutiny.

Infrastructure and growth

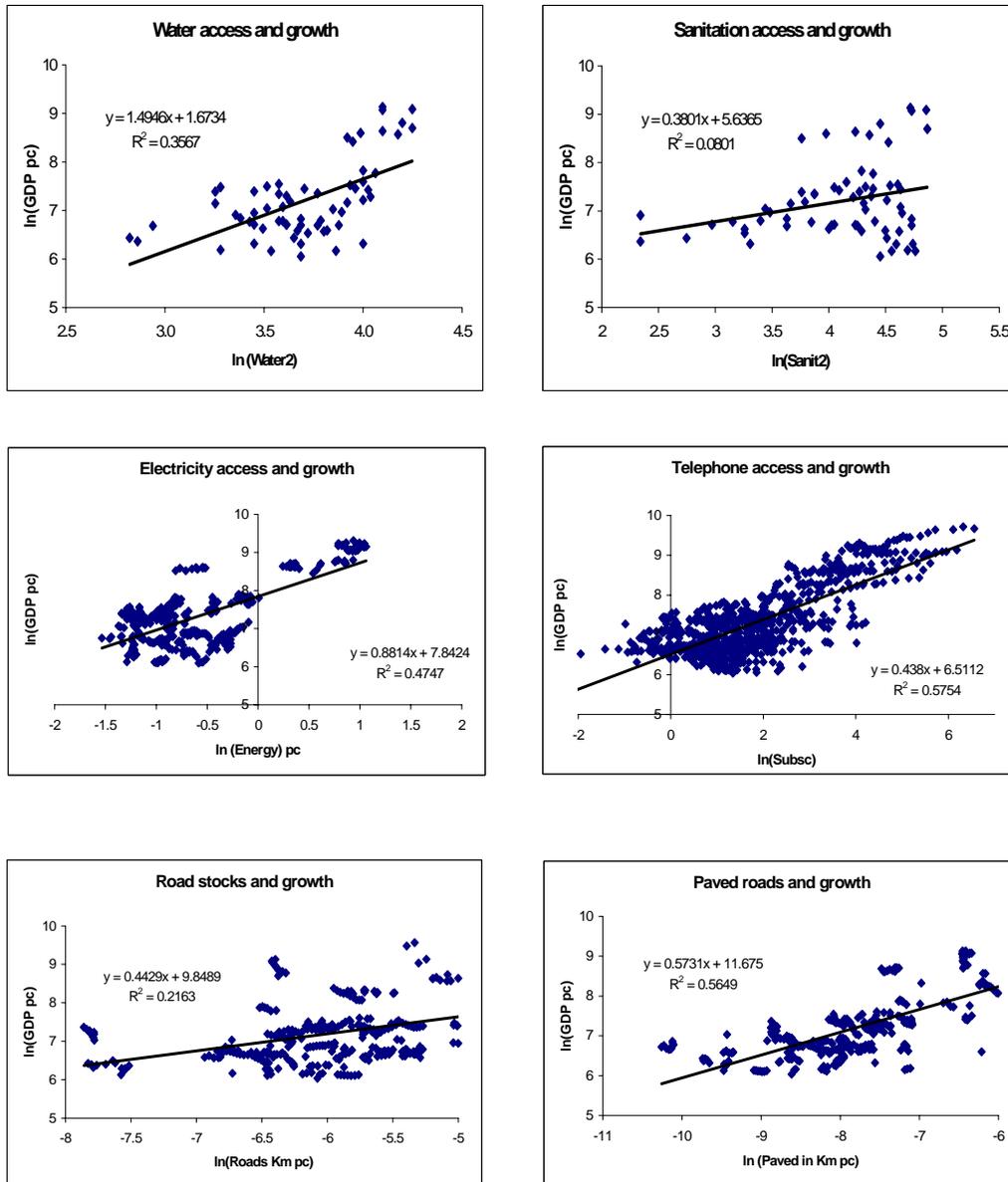
6. ***Why too few macroeconomists cared about Africa's infrastructure.*** The last 15 years have seen quite a significant literature on the engine of growth or on growth convergence in Africa. Most of it has ignored the role of infrastructure. A few reasons may be advanced. First, it may be that the strong correlation between human capital and infrastructure access rates mentioned earlier resulted in decisions to ignore the variables on infrastructure in econometric models. Second, it may simply be because the data volume and quality was not up to the standards available for health or education. Or third, it may be that there was a strong sense that infrastructure variables were better dealt with in the context of structural models which had run out of fashion by the end of the 1980s when the new growth theory moved towards the center of macroeconomic research. Whatever the reason, the upshot was that infrastructure had disappeared from the macroeconomists' radar screen during most of the 1990s and until not too long ago.

7. ***Yet infrastructure matters to growth!*** Whatever the reasons for ignoring infrastructure, most papers that made the effort to model infrastructure seriously found strong evidence of its importance for growth. Figure 2.1 provides a very simple intuitive illustration of the correlation between these two policy variables from the estimation of a linear "trend" in Africa over a 37 year period for each key subsector. GDP growth per capita (y) is a function of a synthetic infrastructure stock index (x). The slope is clearly positive for all sectors, implying that more infrastructure stocks are associated with higher growth rates and there are very few outliers which would put that conclusion into doubt (Botswana, South Africa and Mauritius are recurrent high performing outliers. They are among the five richest countries of the region—the others are Namibia and Gabon).

8. While the trend lines provided in Figure 2.1 are clearly only illustrative, it is tempting to squeeze as much information as possible out of them. Ignoring important issues such as causality, lags and other determinants of the interactions as well as the poor specifications of this model, the results provide a very rough sense of the elasticity of growth to access rates in these subsectors.¹³ The highest "elasticity" is for the water sector, probably capturing many of the other benefits associated with water. The lowest elasticity is for sanitation. This simple correlation has the highest explanatory power for telecoms services and access to paved roads—high both of these sectors explain a much higher share of growth than any of the other sector analyzed here. It is also interesting to note that according to these simplistic regressions, access to paved roads seems to have a higher correlation than to the size of the full road network.

¹³ The reader is referred to a later section for a discussion of more robust econometric evidence on the relative importance of the various sector and to the Estache, Speciale and Veredas (2005) background paper.

Figure 2.1:
**When Africa's infrastructure stocks per capita increase...so does its income per capita:
 (1960-1997)**



Source: Author's computation based on the data supporting the Serven-Calderon (2004) paper

9. *Evidence of infrastructure as one of Africa's growth engine?* While there is a large volume of academic and non-academic discussions on the role of infrastructure for growth, a survey of the most widely read academic literature reveals only 5 published studies on Africa addressing the issue over the last 10 years or so.¹⁴ Whatever the approximation used for

¹⁴ For a recent overview of the research on growth in Africa, see Ndulu and O'Donnell (2005) or Ndulu (2004). The only papers covering infrastructure quantitatively are Easterly and Levine (1997), Esfani and Ramirez (2003),

infrastructure, it shows that it influences positively either growth or growth convergence.¹⁵ The strongest impact comes from the telecoms sector, followed by roads and electricity. The evidence on the link of access to water or sanitation is more complex. This is probably because this sector has the highest correlation with health or education as well as with the other subsectors. Indeed, the importance of the water and sanitation sector is particularly strong in Africa when it is considered in isolation from the effects of other sectors—as seen in Box 1—although when it is considered jointly with any other public service, its obvious importance is watered down.¹⁶ The clear message from this research is indeed that there will be no growth and no significant poverty alleviation in Africa without a major improvement in the level and state of its infrastructure.¹⁷ The latest study shows that over the last 30 years, infrastructure investments accelerated the annual growth convergence rate by over 13% in the region.¹⁸

10. ***Everything points to the crucial role of transport...the omitted MDG.*** While the transport sector has been largely ignored in the MDG debate, it is quite present in PRSPs. In that respect, the PRSPs are proving to be better at internalizing the empirical evidence on the engines of growth, in particular for landlocked countries. Indeed, in addition to the few studies on the role of transport in growth, there are many studies on its importance for trade—another engine of growth in the region.¹⁹ Most of these studies find that the landlocked characteristic matters to growth and implicitly or explicitly argue that this increases the demand for transport services. They also confirm the Amjadi and Yeats (1995), Longo and Sekkat (2001) or Venables-Limao (2001) results showing that the lack of transport networks is hurting intra-regional and international trade.²⁰ In the context of Africa, there is also often an emphasis on the relevance of infrastructure for agricultural growth.

11. ***The permanent concern for the relevance of infrastructure for agriculture.*** An exceptionally large share of the good policy research on the role of infrastructure in Africa is conducted by think tanks concerned with agriculture. This is not unexpected. Diao et al (2003) for instance show that growth in African agriculture is critically constrained by high marketing costs in the region, largely due to high transport costs—as well as competition policy issues allowing excessive controls by intermediaries in the sectors. In that context, a recent IFPRI paper suggests that improving transportation infrastructure could increase agricultural income by as much as 10%.²¹

12. ***Institutions associated with infrastructure investments matter too.*** In a recent study of the engines of growth during the 1970-1990 period, Naude and Krugell find that over 50% of the variation in growth per capita in Africa is explained by institutional variables. They

Calderon and Serven (2004) and Estache, Speciale and Veredas. (2005). Many other mention infrastructure as an important variable but don't model it.

¹⁵ Estache, Speciale and Veredas (2005)

¹⁶ See Estache, Speciale and Veredas (2005) who compare the relevance of infrastructure stocks in an augmented Solow model with and without human capital variables. There are also a few studies looking at the importance of being landlocked for a country. They are reviewed in Ndulu (2004)

¹⁷ see the recent overview by Benno Ndulu (2004) on the academic front—and the bibliographical references at the end of this note; see also the various background notes prepared for the OECD-POVNET poverty task force, the paper by the Commission for Africa (2004), a recent paper by the Economic Commission for Africa (2004) or the views emerging from the donor community on their web site.

¹⁸ Estache, Speciale and Veredas (2005)

¹⁹ See Ndulu (2004) for a recent survey

²⁰ Sachs and Warner (1997) were among the most vocal to argue the relevance of this variable initially. See Ndulu (2004) for a survey; one exception not covered by Ndulu's survey is Naude and Krugell (2003) who find no evidence for the role of geography once institutions are taken into account

²¹ Abdulai, Diao and Johnson (2005),

confirm results offered by Rodrik et al (2002). This conclusion is quite important in a sector in which restructuring to promote competition and improve governance—including the accountability of the regulatory function—tends to be the norm to improve efficiency but also to address corruption. However, the problem with the attempt to assess the relevance of institutional changes such as the creation of regulatory institutions in any sector is that it takes time to build these institutions. It also takes time to assess the sustainability of their impact if any. There are however studies that do it for the infrastructure sector in general and they all find that the main institutional change that matters is restructuring in order to increase competition.²² Some studies, including one for Africa’s telecoms sector, also finds that privatization alone is associated with few benefits, and is negatively correlated with connection capacity but combined with an independent regulator, it is positively correlated with telecom performance measures.²³ This interaction between reforms and institution building will be discussed in more details in chapter 5. The main point here is that any support to Africa’s infrastructure will require not only a commitment to finance constructions but also a willingness to build the necessary institutions. The 18—24 months it takes to build a road may seem an eternity to some, but it is fast when compared to the time needed to undo wrong institutional incentives while trying to rebuild those needed to ensure the long term viability of this road.

Some quantitative sense of the impact of infrastructure

13. While the growth and trade models give a useful general sense of the importance of the sector, it may also help to try to focus on a couple of more specific quantitative indicators of the importance of the sector. This section highlights three indicators:

- the first is the social rate of return from investment projects in the sector which provides quantitative evidence at the microeconomic level;
- the second is an assessment of counterfactuals on the impact of infrastructure on growth which provides a quantitative sense of the macroeconomic importance of the sector; and
- the third is an estimate of the trade effects of infrastructure investment.

14. ***What’s the social rate of return on investing well in infrastructure?*** The macroeconomic assessments provided by growth models are complemented by evidence available from project level data. All multilaterals and most bilateral agencies tend to rely on cost-benefit analysis to assess the social returns on their projects. While there are methodological problems with this information—e.g. not all sectors follow the same approach--, it still provides a useful benchmark. Table 2.1 summarizes the information on ex-post rates of return as estimated by the World Bank’s Operations Evaluation Department for World Bank projects for which 95% or above of the loan commitments had been disbursed between 1964 and 2003.²⁴ The most interesting results are that: (i) in general, Africa is not very different from the other developing countries, and, maybe much more surprising, (ii) the returns on market enlarging sectors—telecoms, transport—enjoy significantly higher returns than the more “welfare” oriented sectors—Energy and W&S.²⁵ Note also that in recent years, the economic impact of these projects has improved significantly.

²² E.g. Stern and Holder (1999) or Ros (1999)

²³ Wallsten (2001)

²⁴ For more details, see Briceno, Estache and Shafik (2004)

²⁵ Because of the way they are computed, these rates of return are closer to financial rates of return and tend to underestimate the social rates of return. The underestimation is likely to be quite significant. For Uganda, for

Table 2.1: Social Rates of Return on World Bank Infrastructure Projects

	Energy/Mining	Telecoms & Information	Transport	Urban	Water and Sanitation
	Un-weighted average for 1964-2003				
Africa	14.1	20.6	25.5	21.3	7.5
Developing World	18.4	21.5	25.4	19.2	9.2
	(Un-weighted average for 2000- 2003)				
Africa	47.6	n.a.	27.1	n.a	n.a
Developing World	44.	36.7	36.5	16.4	16.6

Source: Estache and Liu (2003)

15. *What's the cost of not investing in infrastructure?* Some of the most policy relevant work in recent years has been the quantitative assessment of the opportunity cost in terms of growth of the infrastructure gaps discussed earlier. Two stand out as particularly useful for Africa. Esfahani & Ramírez (2003) estimated that if Africa had had East Asia's growth rate in telephones per capita (10% vs. 5%) and in electricity generation (6% vs. 2%), its per capita growth rate would have been at least 0.9% higher. Calderon and Serven (2004) do a similar exercise but with a synthetic indicator of infrastructure services and generate counterfactuals of what the growth rates of a large set of countries (including over 20 African countries) would have been under various infrastructure levels scenario. For instance, if Niger had the infrastructure stock of South Korea, its average growth rate between 1996 and 2000 would have been 1.9% points instead of -1.55%. Box 2.1 shows the results for a larger set of 21 African countries, using South Korea as comparators. It shows that on average, for these countries, the growth per capita would have been 1.04% points higher than observed. Note that these are of course rough estimates.

16. *What's the trade effect of infrastructure investment?* Given that infrastructure is so important for the trade-oriented development strategy adopted by the majority of African countries—in particular the landlocked countries, two research results should be quite illustrative for policymakers. Limao and Venables (2001) estimate that the median transport costs for trade within Africa are twice those estimated for East and South Asia and that it contributes to Africa's poor growth performance.²⁶ According to Longo and Sekkat, a 1% increase in the stock of transportation and telecommunication infrastructure would boost intra-Africa exports by 3%. Richaud et al. (1999) suggest that 25% of the total gains from improving infrastructure in the region accrue to neighboring countries from trade and FDI mostly. While the policy advice is obvious from this research, its implementation is not likely to be an easy exercise as indicated by Simuyemba (2000).

instance, Fan, Zhang and Rao (2004), estimate that the marginal returns to government intervention for feeder roads in rural areas is equivalent to a benefit-cost ration of over 7.

²⁶ Limao and Venables (2001).

Box 2.1**How much faster would Africa have grown
... if it had enjoyed Korea's infrastructure stock and quality?**

Relying on an analytical approach proposed by Calderon and Serven (2004), it is possible to calculate the increase in the average growth of GDP per capita that African countries would have had if they had been able to count on the level of infrastructure development of Korea (in terms of infrastructure stocks and quality) during the 1996-2000 period. The results were generated for the 21 countries for which the data was available. The second column gives the actual growth rates. The third column gives the percentage point increase that would have been achieved under the proposed simulation. For instance, if Burkina Faso has enjoyed Korea's infrastructure quantity and quality, its per capita GDP growth rate would have been 2.18% (0.59+1.59) instead of 0.59%.

Country	Actual Growth Per Capita (1996-2000)	% point increase in potential growth rate per capita assuming country enjoys South Korea's infrastructure quantity and quality	Potential Growth rate per capita assuming country enjoys South Korea's infrastructure quantity and quality (1996-2000)
Bostwana	5.32%	0.60	5.92%
Burkina Faso	0.59%	1.59	2.18%
Cote d'Ivoire	0.35%	0.64	0.99%
Ethiopia	0.47%	1.47	1.94%
Ghana	1.11%	0.65	1.76%
Guinea	0.07%	1.03	1.10%
Guinea-Bissau	1.19%	0.98	2.17%
Kenya	1.12%	0.91	2.03%
Madagascar	-0.99%	1.21	0.22%
Mali	-0.03%	1.79	1.76%
Mauritania	0.6%	1.57	2.17%
Mauritius	3.71%	0.34	4.05%
Niger	-1.55%	1.87	0.32%
Nigeria	-0.95%	1.01	0.06%
Rwanda	-0.12%	1.23	1.11%
Senegal	-0.28%	0.90	0.62%
Sierra Leone	0.08%	0.92	1.00%
Tanzania	0.58%	1.31	1.89%
Uganda	1.29%	1.16	2.45%
Zambia	-0.76%	0.51	-0.25%
Zimbabwe	1.76%	0.18	1.94%
Sample average	0.065%	1.04	1.11%

Assessing Africa 's infrastructure investment needs

17. The evidence on an infrastructure gap is hard to deny. The next question should then be how much Africa needs to allocate to the sector to meet its growth and social targets. There are various approaches to measure these investment needs in any given sector. The most common at the sector level is a bottom-up approach in which information collected at the local level can be added up to get a sense of the total need. In that context, investment requirements are assessed for each sector for a targeted coverage rate, for a given service quality level at a standard local or an international best practice cost. This kind of effort has been conducted for the water MDGs during 2003 but it has not been done for the other

infrastructure subsectors. Trying to come up with an equivalent assessment for all sectors is beyond the scope of this paper.²⁷ It is however possible to get a rough order of magnitude from a top-down approach in which estimates are conducted at the macroeconomic level.

18. ***How to get a rough sense of the infrastructure expenditure needs?*** To get a rough macroeconomic sense of the total infrastructure expenditure --investment + O&M--needs in Africa, a common, less data-intensive, to-down approach is to rely on an expenditure demand function.²⁸ The main factors driving the past evolution of infrastructure needs are used to estimate the future needs. While the approach may be less precise in the short run, it has the advantage of accounting for the sensitivity of the needs assessed vis-à-vis the growth prospects of each country and vis-à-vis the changes in the sectoral sources of growth. The estimates provided here are from a demand function for infrastructure services that reflects the expected structural change and growth in income in Africa and in the rest of the world from 2005 to 2015, based on estimates on data covering the 1960-2000 period.²⁹

19. ***Africa needs US\$40 billion a year for 10 years to reach the MDGs.*** According to the 2005 Global Monitoring Report, if Africa is to meet the key MDGs by 2015, the region needs average growth rates of over 7% for the next 10 years or so.³⁰ Table 2.2 shows that the estimated associated infrastructure expenditure requirements are of about 9% of GDP. This is, of course, only a rough order of magnitude but they are quite useful in getting sense of the challenge ahead.

**Table 2.2: Africa's expenditure needs to meet the MDGs
(% of GDP - 2005-2015)**

Needs	Electricity	Telecoms	Roads	Rail	Water	Sanitation	Total
Investment	1.2%	0.7%	2.2%	0.0%	0.4%	0.6%	5.1%
Operation and Maintenance	0.7%	0.5%	1.7%	0.2%	0.3%	0.5%	3.9%
Total expenditure	1.9%	1.2%	3.9%	0.2%	0.7%	1.1%	9.0%

Source: Estache and Yepes (2005)

20. In dollar terms, this total represents average annual investment needs of about US\$22-24 billion for the next 10 years, with a peak in the 2005-2010 period if the MDGs are to be met—that is if growth rates are at 7%/year over the next 10 years or so; if growth rates are closer to about 5%, the 5.1% of GDP investment needs only represent US\$17 billion/year. That's about US\$31 per capita per year, 8.5cts/day/capita. Adding annual operation and maintenance needs of US\$17-18 billion results in annual expenditure needs of about US\$40 billion between 2005 and 2015. Note that these figures ignore the needs in the port and

²⁷ This is one of the expected outputs of a forthcoming flagship report to be delivered by the World Bank on Africa's infrastructure needs which is one of the expected outputs of a multidonor effort to generate a good quantitative knowledge of the region's infrastructure..

²⁸ Note that these figures do not refer to any socially optimal measure of need for infrastructure service or infrastructure investment.

²⁹ The approach draws on Fay, M. (2000), "Financing the Future: Infrastructure Needs in Latin America, 2000-05." World Bank Working Paper No. 2545. The World Bank, Washington DC and later used by Fay, M. and T. Yepes (2003), "Investing in Infrastructure: What is needed from 2000-2010", World Bank, Policy Research Working Paper, 3102

³⁰ To be precise, the estimates based on a sample of 28 countries for which the required data on poverty is available suggests that a population weighted average growth per capita needed to achieve the MDGs is 5.2%. More than half of the countries in the sample need per capita growth rates of over 6%.

airport sector and most importantly leave out irrigation. It may also ignore some of important large regional projects. The estimated total needs, including needs for regional projects, conducted by NEPAD in 2002 for its Infrastructure short term action plan for the whole of Africa (NEPAD 2002), are around US\$64 billion for the next 10-15 years. This estimate included about US\$8.1 billion in needs to finance 20 top priority regional projects. Transport projects aiming at promoting the regional integration of the continent counts for 25% of these needs. The African Development Bank adds US\$4 billion needed to complete the Trans African Highway.³¹

How big is the investment increase needed?

21. ***The needs imply close to a doubling of recent investment trends.*** Based on the information available on the evolution of the capital stocks during the last 30 years or so, we can also estimate that total infrastructure expenditures of the region were around US\$10-12 billion at the most since the mid-1980s. These back-of-the-envelope calculations imply a financing gap of US\$5 billion (and up to 12 billion under some scenarios given that the investment needs range between US\$17 billion and US\$24 billion depending on the growth scenario considered). In other words, infrastructure expenditure need to be increased very significantly (maybe by as much as 100%) to meet the demand.

22. ***...but growth is needed to pay for infrastructure.*** One of the main difficulties with the case made for more infrastructures is that it ignores Africa's basic infrastructure dilemma. Indeed, however good the recent growth performances may have been, they appear to be unable to generate the resource needs for most countries. Anecdotal evidence suggests that in many countries, growth has indeed been insufficient to even generate the matching public revenue requested by donors as part of their aid commitments in the sector. This is more than most countries have been able to achieve in recent years. This implies that something has to change. Drastic policy decisions need to be identified by the key stakeholders concerned with the well being of Africans and in particular Africa's poorest if the infrastructure expenditure levels needed to achieve the MDGs are to be reached.³²

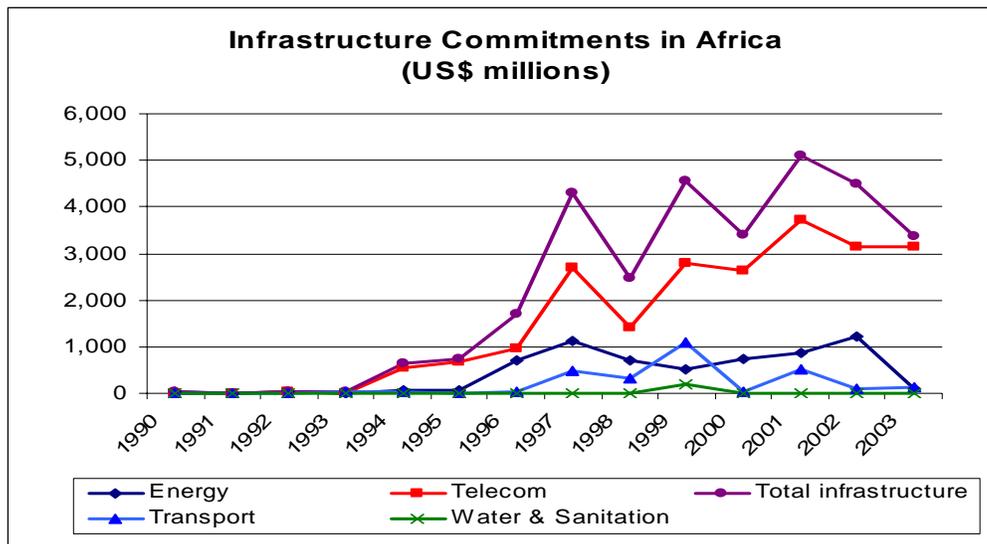
23. ***...and private financing is not likely to be the norm.*** Based on the information available on private sector commitments since 1984, the private sector allocated about US\$ 1.4 billion on an annual basis over the last 18 years or so—this refers to foreign private sector but it is the only data we have on private sector participation. These commitments were actually US\$1.8 billion over the last 5 years. This suggests that the private sector contributed at most 15% if all commitments were disbursed. It is likely that the private contribution to these investments is closer to 10%. This is significant but it would have to be increased significantly to contribute in any major way to the financing needs of the continent. To mitigate somewhat this conclusion, it may be worth pointing out that it is based on the fact that we do not know the actual economic importance of the domestic private sector. There is plenty of anecdotal evidence on their importance in delivering where no-one else does. How large a contribution this may be is for now anybody's guess.

³¹ For more details, see Desmarchelier (2005)

³² Note that this discussion ignores the restrictions associated with the limited absorptive capacity of many countries. This discussion, however, has many dimensions and goes beyond what can be addressed in this paper.

24. Figure 2.2 shows the evolution of this mostly foreign owned and managed PPI over time in the region. It shows that, in terms of FDI in infrastructure, Africa peaked in 2001, about two-three years later than most other regions, but that it has followed a downward trend since in all sectors but telecoms. Over an almost 20 years period, Africa has only managed to generate 230 projects in partnership with foreign operators and about 50% of the money has been committed to a single country: South Africa! Even ignoring the South African bias of the data, the total number of projects is small and so is the average size of projects in Africa. The average project size is indeed less than 50% of the average size for developing countries. In most sectors, Africa's share of total (mostly foreign) private investment attracted by infrastructure in the developing world is roughly 1-2% (except in telecoms, 6%).

Figure 2.2 Evolution of private sector investment in infrastructure in Africa (1984-20003)

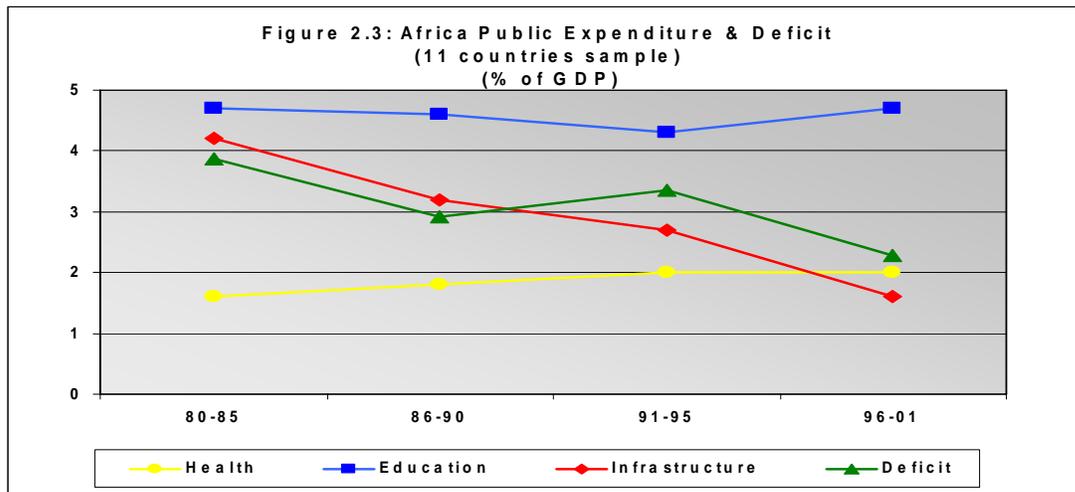


Source: World Bank PPI data base

25. *...but public sector financing declined during the 1990s.* There is no reliable data source on the level of expenditure in the various infrastructure subsectors. There is some information on government expenditures—although not on public enterprise expenditures—on Fuel and Energy, Housing and Transport and Communications statistics covered in the IMF government finance statistics (IMF-GFS). While it does not reflect well the importance of decentralized expenditures or the expenditures by public enterprises, it does give a sense of the evolution of the composition of public expenditures. Figure 2.3 summarizes this evolution for a sample of 11 African countries for which the data is available since roughly the mid-1980s. It shows that over the last 20 years or so, government expenditures on health increased from 1.6% of GDP to 2% and education expenditures remained relatively stable (although with a temporary decline in the first half of the 1990s). Infrastructure expenditures, however, as approximated here, declined from 4.2% of GDP to 1.6%.³³ It is unlikely that this reflects a major improvement in public sector efficiency—see chapter 4. In short, all of the fiscal adjustment of the 1990s has been absorbed by infrastructure. In fact, based on more country

³³ This information is not all that inconsistent with an estimate which would derive investment rates from a comparison of the changes in the value of infrastructure capital stocks assessed at constant price. This exercise implies total expenditures levels in the 1970-mid 1980s around 9% of GDP.

specific anecdotal evidence, the adjustment would have been even more dramatic if today's situation was benchmarked against the 1970s.



26. *...so what's Africa baseline expenditure level?* To get a sense of the total level of expenditure by the public sector—i.e. government + public enterprises-- in infrastructure, the only quick approach possible is to derive it from an assessment of the changes in infrastructure stock levels. Since the private sector financed 10% of the investments, about 90% of these changes must have been financed by the public sector. According to this approach, the government and the public enterprises spent at most 3-4% of its GDP during the 1990s. This is about US\$8-8.5 billion/year. This figure establishes the baseline from which the increased government commitments to the sector will be assessed. It is unfortunate that it has to be estimated in such a rough way, in light of the importance of this baseline in assessing the effectiveness of the changes the international community is trying to obtain in the sector.

27. *What's the impact on poverty reduction of an increase in infrastructure investment?* The anecdotal evidence on the importance of the sector for the poor is overwhelming and so is the evidence generated by donor agencies based on their project work. Indeed, this evidence has been strong enough to convince us that there is no education without roads, no education for girls without better service coverage in general since in many countries, girls bear the burden of the incidence of service delivery failures—they walk hours to get to market, to find wood or to find water. We also know that mortality rates among the poorest are also related to bad access to infrastructure services. In a recent overview of the drivers of rural development in Africa, Mwabu and Thorbeke (2004) cover a wide range of country specific studies which add up to very convincing evidence accumulated by studies published over the last 20 year, on the relevance of access to infrastructure for the African rural poor for instance. In the range of impact covered, they include the linkages through gender or education concern, e.g. the significant positive impact of rural transport and water access on women life style or the evidence on the improved access to improved education or health. They also point to the impact of infrastructure on the poor through its increased access on self and wage based employment opportunities.

28. The fact that this evidence continues to be mostly anecdotal or often country specific only is somewhat surprisingly after so many years. In spite of this wide coverage of experiences establishing a very strong presumption of accuracy, there is very little strong cross-country analytical evidence for Africa. To some extent this is because the main

message of the economic literature is that poverty is reduced by growth and that hence the focus should be on the impact of infrastructure on growth. It may however be useful to put things in perspective to get a sense of what this indirect effect means in quantitative terms. While these calculations may be somewhat naïve and not very analytically rigorous, they are anchored into standard public finance concepts which used to be relatively widely used in the infrastructure sector in the context of project evaluation. Essentially, the idea is that the poverty reduction effect can be estimated by combining an assessment of the growth effect of a project with the poverty reduction effect of growth. The growth effect can be assessed from the social rate of return of an investment project weighted for the size of the project in the economy while the poverty reduction effect of growth can be approximated by the elasticity of poverty rates to growth. This naïve calculation can be expressed as follows:

$$\begin{array}{ccccccc}
 \text{Poverty reduction} & & \text{Average Social} & & \text{Relative Importance of} & & \text{Elasticity of} \\
 \text{effect of} & = & \text{rate of return of} & \times & \text{infrastructure} & \times & \text{poverty} \\
 \text{infrastructure} & & \text{infrastructure} & & \text{(Infra. Investment/} & & \text{reduction to} \\
 \text{(in \%)} & & & & \text{total GDP)} & & \text{growth} \\
 & & \text{(in \%)} & & \text{(in \%)} & &
 \end{array}$$

29. Considering the full set of infrastructure projects used to generate Table 2.1, the average social rate of return on infrastructure projects in Africa is in the 30-40% range, with a mid-point of 35%. On average, infrastructure investments need to increase by 2-4% of GDP. The final variable needed, the elasticity of poverty to growth, is subject to much debates and unfortunately, the most recent papers suggest that the poverty reduction payoff of growth in Africa is lower than in other regions.³⁴ Two recent estimates offer elasticities in the range of 0.5-0.75. This implies that by increasing infrastructure investments by 3-4% percentage point of GDP, poverty reduction effects increased 0.6% to 1% annually. This is a significant contribution which was underestimated by the international community during most of the 1990s.

How should Africa's infrastructure needs be financed?

30. There are two ways of looking at the financing issue: ex-ante and ex-post. Most of the sector specific literature and policy discussion tends to take an ex-post perspective. This ex-post approach focuses on how the providers recover their costs, i.e. the distribution of financing responsibilities between users (i.e. direct cost recovery) and today's tax payers (subsidies from the state) or tomorrow's taxpayers (if the government contracts loans). The ex-ante approach looks at financing from a more macroeconomic perspective. The debate is on the distribution of financing between the taxpayers and the operator. When the operator is public, in general, the financing takes place through a budget transfer--hence today' taxpayers pre-finance the users—or through loans—from donors or private sources. When the operator is private, it pre-finances the user mostly from equity or borrowing/bonds—which is of course recovered through tariff and subsidies ex-post. In this chapter, we focus on the ex-ante concerns of macro-policymakers—we address the ex-post view, including the importance of cost recovery from a financing as well as from an efficiency and equity viewpoint, later in the discussion of the affordability of the service.³⁵

31. ***Nothing beats concessional sources of funds?*** Multilateral development banks lend money at a margin over the 6 month LIBOR (London Interbank Offer Rate). As of July 15,

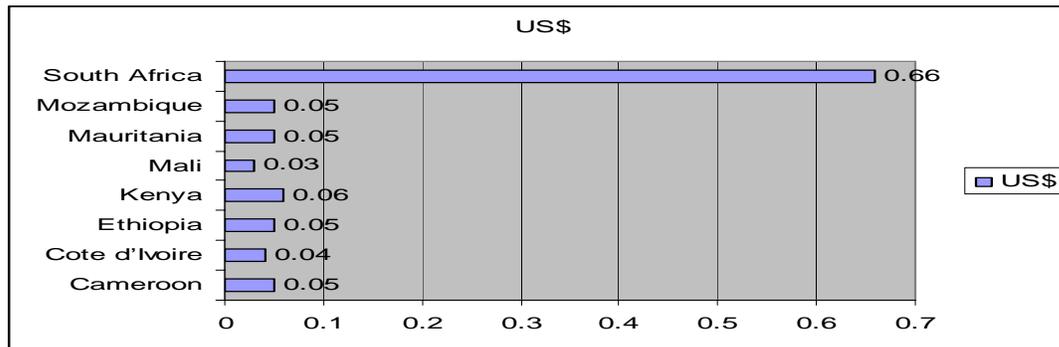
³⁴ See Besley and Burgess (2003) and Kalwij and Verschoor (2004)

³⁵ The section draws on some of the calculations prepared by Warlters (2005) in his background paper.

2004, taking account of commitment fees and front-end fees, the equivalent interest spreads varied from 35 basis points (ADB) to 154 basis points (EBRD). The World Bank and the African Development Bank, the main sources of funding for Africa, were in the range of 44 to 57 basis points. At that time the 6-month LIBOR for US dollar loans stood at 1.86%. So, for example, the effective interest rate for a US dollar variable spread loan from IBRD was 2.3% (=1.86% + 0.44%)

32. Using illustrative Bank lending terms, Walters (2005) calculates the social cost of borrowing from the Bank Group at a concessional rate. The results are summarized in Figure 2.4. Each repayment is calculated under the terms of the loan, and then converted into a social cost by multiplying by the country's average marginal cost of public funds—these estimates are discussed later. The present value of each of these repayments is then calculated using country specific market interest rates as Government's discount rate. The result is the sum of the present values of all the repayments. The Table indicates for example, that by borrowing \$1 from IDA, the Government of Kenya imposes a social cost on the country of 6 cents. This is a very low social cost. It is low because IDA countries do not pay interest and have a long grace period, and Kenya's government has a high discount rate. The social cost of South Africa's borrowing is higher than the other countries because it pays interest, has a shorter grace period and has a lower discount rate than the other African governments.

Figure 2.4
Multilateral borrowing is often the next best thing to grants in term of social costs
Evidence from the social cost of borrowing \$1 from the World Bank



Source: Walters (2005)

33. The point is that, for most countries, as expected, if concessional loans are available, they are, in general, likely to be the cheapest source of funds available. Hence, and ignoring for a moment the debt sustainability and the sector specific and total absorption capacity issues, when looking at this specific sector, it is in the interests of most African countries to borrow as much as possible from donors offering concessional rates. In most African countries, the difference in the public cost of capital from donor funding is likely --on average, under current country and sector risk levels and under current levels of tax systems distortions -- to be larger than any cost reductions that private financing can offer by reducing the volume of investment funds required.³⁶

³⁶ There are of course specific projects and specific activities for which the private sector will be an ideal partner, but this statement must also be weighted against the possibility that these private project are associated with cream-skimming problems in which a profit center is amputated from a public sector business at a higher net fiscal cost. There is significant evidence of this in Latin America, see for instance Campos et al (2003).

34. *Concessional financing may be cheap...but it has dropped for infrastructure.* If concessional sources are so cheap, it would make sense to assume that borrowers would try to maximize its use in the financing of infrastructure services. It did not happen that way during the 1990s. The excess international supply of capital gave many governments the hope that private sector financing would become the main source of financing for the infrastructure sector. Under that assumption, it made sense to try to use the concessional sources of funding for other sectors instead—and the optimistic that prevailed at the time was such that few were contesting this assumption.

35. It seems indeed that donors and borrowers both agreed on the need to make the most of concessional money for sector for which alternative financing sources were unavailable. The upshot of this agreement is that during the 1990s, the sum of resources allocated by donors offering concessional terms to infrastructure fell dramatically. By the end of the decade, it was far from adding up to anything close to the needs. During the 1990s, it is estimated that they represented at most 8% of the financing of the sector.³⁷ This share has in fact been declining as a result of the drop in the interest of donors in allocating ODA for infrastructure in SSA. Although infrastructure ODA continues to be quite widely disseminated throughout the continent with 40 countries receiving some of it, infrastructure share in ODA in SSA has dropped and steadily so. During the 1990s, it dropped from 25% of total ODA to SSA to roughly 10% in recent years.³⁸ In absolute terms, the volume of ODA commitments—not disbursements and we have no estimate of the size of the difference—for infrastructure in SSA peaked during the 1980s at around US\$4 billion per year (in 2002 prices). The highest share of ODA goes to transport (over 50%), which is also where the largest investment needs have been identified. The water and sanitation sector has come next with about 25%.

36. *Why would donors be pulling out of a sector with a rationed demand?* In retrospect, the fact that the retraction from the sector was not reversed sooner may also seem to be a puzzle. Indeed, as it was becoming clearer towards the later part of the 1990s that the private sector was not going to replace the public sector in infrastructure, demand was becoming obviously rationed. Why was ODA not coming back? The main explanatory factors are probably the following. First, the donors have total as well as de facto sector specific caps in their total lending programs to developing countries—most developed countries have continuously failed to meet their commitment to allocate 0.7% of their GDP to aid. As total resources allocated to aid by developed economies were limited and often shrinking and as priorities had moved towards social sectors, the inertia associated with resources allocation processes impeded a quick adjustment towards a more balanced allocation of resources, implying a continued penalization of the infrastructure activities. Second, this inertia and rigidity in ODA bureaucratic processes has a parallel in host countries. Indeed, some donors have strengthened their matching funding requirements since the mid-1980s—i.e. they want more local resources to match aid contributions and they also tend to impose more non-cash conditionality which reduces actual disbursement when compliance becomes a problem. Earlier commitments to other sectors, reduced the scope for reallocation to meet commitments required by possible new infrastructure international financing options.

³⁷ See Briceno et al (2004)

³⁸ This is from the OECD data base which only provides data on commitments and moreover has some problems in the classification of infrastructure expenditures because donors do not classify strictly similarly. The “big picture” of what this data means for infrastructure is however fairly reliable.

37. *A more quantitative appreciation of infrastructure financing costs in Africa?* The decline in the availability of ODA funding for infrastructure forced a much closer look at the relative merits of public and private ownership and operation of infrastructure. Indeed, if the cost of private funds is not significantly higher than the cost of public funds, the reduction in ODA would not be a major issue. This means that to compare public and private financing options, it is useful to start by comparing the cost of public vs. the cost of private funds. While this may seem to be reducing the discussion to a simple fiscal calculus, it provides a useful more quantitative perspective to a debate that often tends to appear to be ideological — and it is clear that there are many more dimensions to this choice, including governance related concerns.

38. *The costs of private funds.* The way to approximate the cost of private funds is widely viewed among modern regulatory economists as a relatively standard approach for PPI transactions, including in Africa where public consultation have taken place on its assessment in Kenya, South Africa or Uganda for instance.³⁹ The cost of private funds is usually a weighted average cost of capital (WACC) which, adjusting for the financing structure adopted, gives the returns that private investors would require to just make normal returns on their capital, adjusted for sectoral and country risks. While the implementation of the approach is not trivial, it is relatively simple in comparison to the calculation of the cost of public funds.

39. *The costs of public funds.* The cost of public funds is best approximated by estimates of the marginal cost of public funds (MCF). The MCF measures the ratio of the additional welfare cost imposed on society as a result of a small change of tax rates, to the amount of additional tax revenue raised. Say that the MCF associated with a small simultaneous increase of several tax rates is 1.30. This means that if the government raises an additional dollar of tax revenue, consumers are worse off by not only the additional \$1 they have just paid in taxes, but also by 30 cents of welfare that is destroyed by the additional distortions of the economy. If the government simply gave the \$1 back to consumers as a transfer, consumers would be 30 cents worse off than they were before the tax and spend operation. So economically justified public expenditure in this country should have a minimum social rate of return of 30%. For a sample of 38 African countries, Warlters and Auriol (2005) find an average minimum social rate of return requirement for tax financed expenditures of 17% (with a spread going from 5% to 37%).

40. *Revisiting the comparison of public and private financing options in Africa.* A quick look at the social rates of return covered earlier in Table 2.1 suggests that, on average, infrastructure investments with which the World Bank was associated, generated returns higher than the average costs of public funds. But this conclusion does not imply that public funding is necessarily the optimal solution for the countries of the region. The real question is how the cost of public funds compares to the cost of private funds to achieve these rates of return. Table 2.3 provides this comparison for the few African countries for which data is available.⁴⁰

41. Ignoring the differences between public and private returns is likely to bias the choice in favor of public financing, the cost comparison shows that only in Ethiopia, Mali and South

³⁹ See Estache and Pinglo (2004) for recent estimates of the cost of private capital in developing countries.

⁴⁰ Direct comparison between MCF and WACC rates of return is only possible if infrastructure projects yield no externalities, whereas in general we would expect the social benefit of infrastructure to exceed the private returns to the investor.

Africa does public financing require a higher rate of return than private financing for all sectors. This is mostly driven by the very large distortions caused by the tax systems of these countries. For Cameroon, Côte d'Ivoire, Kenya, Mauritania, and Mozambique, the preferred financing choice should be public financing because it requires a lower rate of return for all sectors and would be preferred to private financing unless private involvement generates offsetting costs reductions in the amount of finance required.⁴¹

Table 2.3: A basic fiscal calculus comparing the cost of public and private funds in Africa -

	Cost of private capital (in %)						Implicit country specific cost of public sector financing (in %)
	roads	ports	water	telecom	electricity	Railways	
Cameroon	14.90	15.35	15.28	16.11	15.53	17.09	14.27
Cote d'Ivoire	16.56	16.98	16.90	17.77	17.14	18.69	11.62
Ethiopia	17.22	17.51	17.43	18.37	17.63	19.05	31.30
Kenya	18.03	18.35	18.28	19.21	18.49	19.95	8.43
Mali	16.56	16.98	16.90	17.77	17.14	18.69	20.57
Mauritania	16.62	16.73	16.66	17.68	16.80	18.05	10.47
Mozambique	14.17	14.77	14.69	15.44	14.99	16.69	10.72
South Africa	7.85	7.76	7.69	8.75	7.75	8.73	12.26

Source: Warters (2005)

42. *The political economy limits to fiscal calculus.* While it is tempting to have the simple comparison of costs rank the preferred pre-financing of the sector—public vs private sector financing—, it is important to recognize that there are limits to this somewhat mechanical approach. First, these estimates of the cost of public and private funds are rough approximations. While reasonably reliable when the wedge between public and private costs is high, they require much more analysis when this wedge is modest. Second, and probably even more important among these are the limits, is how much government can tax without hurting the economy or the social stability. There is thus, and maybe surprisingly so under the current political environment, some role for the reliance on a partnership with the private sector as a way to reduce the social pressure of taxation—ignoring for now the efficiency savings that the private operations can bring to some sectors.

43. *So what is the best financing model for most African countries?* The relevant policy message is that there is a lot of value in the fiscal case made for reforms but not only from a fiscal viewpoint—i.e. reducing the deficit—but also from a social viewpoint. If there are limits on concessional borrowing options, increasing the role of the private sector could reduce the social costs of relying on tax financing...if implemented carefully with all the appropriate safeguards to ensure that short term payoff are not trade-off for longer term fiscal costs resulting from renegotiations of arrangements with the private operators. But the main message of this simple fiscal calculus is that the current desire to promote concessional financing of the sector as much as possible seems to be rational. Similarly, once the limits to concessional borrowing have been reached, it will make sense to try to go for private sector financing as long as tax financing will continue to suffer from the current distortions that characterize most of today' African tax systems.

⁴¹ Although it did not occur in any of these seven countries, it could also occur that within a single country public financing is cheaper than private financing in some sectors but not in others. And if a different measure of the MCF were used (i.e. the MCF of a particular tax), different comparative results would occur.

What drives Africa absorptive capacity for infrastructure aid?

Although there is a lot of talk about Africa's needs, little concrete evidence is available on Africa's capacity to absorb any new massive inflow of aid in a specific sector—e.g. the doubling of resources to be allocated to infrastructure argued for by the Commission for Africa report. While the the relevance of this concern will clearly vary across countries, any country specific assessment will have to look into two decision margins: (i) the macroeconomic limits—both short run and long run--; and (ii) institutional constraints. They may be more margins of relevance—including more political aspects or even distributional aspects as discussed by Bevan (2005)-- but these two are clearly likely to be in anyone's checklist to assess the absorptive capacity of any given country under any scenario scaling up donor contributions to pre-finance investment requirements.⁴²

44. ***The macro limits to absorptive capacity.*** One of the first things Ministers of Finance and macroeconomists of the IFIs are likely to do when specific commitment figures and associated disbursement and repayments patterns will be known for every country, is to assess the fiscal sustainability of the new financial commitments associated with any increase in aid to the public sector for infrastructure. This assessment is crucial and in the interest of the countries. However current rules may be contributing to distortions that penalize growth as well as the poor by discriminating across sectors.

45. Under current fiscal rules adopted to assess the fiscal sustainability of significant additional borrowing, sectors such as infrastructure tended to be penalized. Indeed, under such rules, the limits are driven by short term fiscal considerations. These concerns distort the desirable allocation of resources in three ways.

- First, they favor sectors which generate quick positive cash flows or a least minimize short term negative cash flows, without any regard to any other consideration, including growth effects or bottlenecks. This penalizes many infrastructure investments which take 18 to 24 months before they generate any cash flow at all; moreover, because they tend to be build to address demand forecast 15-10 years ahead of time because is it is often the most cost effective solution with lumpy investments such as roads, electricity generators or water treatment stations, the positive cash flows they tend to generate tend to grow much slower than hoped for by analysts concerned with short term fiscal performance indicators. When the absorptive capacity is driven by these cash considerations, infrastructure aid will thus often look poor and certainly much worse than if accrual accounting rules were adopted rather than the current cash accounting rules.⁴³
- Second, these rules assume that growth is exogenous. By ignoring the fact that growth is endogenous--i.e. the fact that growth levels are driven by the composition of public expenditure--, these rules fuel an absorption capacity problem. Indeed, by underestimating the growth pay-off of major scale up of aid in some sectors, they overestimate the absorption capacity problem. Consider the case of investments on road projects. There is a plethora of evidence showing that road investments can be

⁴² For a very useful overview, see Bevan (2005)

⁴³ Note that the debate on grant vs loan financing of this scaling up effort is actually irrelevant to the assessment of the fiscal absorptive capacity since it turns out that conventional fiscal accounting generally does not distinguish between borrowing and external grant financing. This bias against accessing grant finance hurts infrastructure asset accumulation, growth and long term solvency.

critical to improve incentives to increase agricultural supply. This means that roads can contribute to improvements in exports but also to the ability to meet the local demand at prices more consistent with the ability of pay. Both of these effects imply that when aid is rejected on the basis of a cash flow driven rule, growth and demand are both rationed.⁴⁴

- Third, these rules ignore that the sequencing of resource allocation across sectors or within sectors matter, in particular when there are bottlenecks. Indeed, in many countries, it is often the case that education expenditures have the highest social rate of return. The implementation of the policies required to capture the benefits of investment in education will however start with investment in transport. Similarly, even when the returns on improvements in health are seen to be the highest, it is not uncommon to find out that improvements in sanitation is the most cost effective solution and the most effective solution to alleviate any possible absorption capacity in the health sector is to work on sanitation first. Within sectors, sequencing also matters. For instance, focusing all effort on improving access to electricity from large utilities, will not help if transmission capacity is not sufficient.

46. The main point is that the assessment of the absorptive capacity has many dimensions and many of these tend to be underestimated. There are short term and long term dimensions. There are sector specific and cross-sectoral dimensions. There are also sequencing issues across sectors and within sectors. Failing to account for these dimensions tends to postpone growth. Postponing growth means failing the poor in addition to reducing the solvency of the country, a critical dimension of a minimum absorption capacity assessment.

47. *The institutional limits to absorptive capacity.* Among many observers, there is a concern with the managerial ability of the public sector administrations of many countries to deliver significantly higher levels of service at equal or improved levels of service quality. A related element is the concern with the risks associated with the impact of dramatic aid levels on the government capacity and incentive to generate domestic resources needed for the long run sustainability of the operation and maintenance of the sector. First, there is indeed a clear concern with the need to ensure that governments have a stronger incentive to rely on improved cost recovery, not only as financing instrument but also as a demand management instrument. Mismanaged aid in this respect would be institutionally damaging since it would create more dependence in the sector instead of more independence in the long run.

48. There are other more complex institutional elements that limit the full value of the usual fiscal calculus associated with the debates on absorption. These include the many incentives problems—political interference, corruption and other governance concerns—which contributed to the deterioration of the public provisions of infrastructure services since the mid-1970s. It is quite important not to forget that these incentive and fiscal problems were the main catalyzers of the search for alternative sectoral organizations and other reforms, including the search for more collaboration with the private sector—as discussed later in the paper in more details. The next wave of reforms cannot afford to ignore that a return to the pre-reform situation is likely to be an undesirable situation.

⁴⁴ Even after accounting for the common real exchange rate appreciation that tend to be associated with export booms. The Dutch disease problem resulting from the distribution of gains from infrastructure investments between tradables and non-tradables need not appear as indicated by Adam and Bevan (2004).

49. These institutional limits are also relevant to the assessment of the idea suggested by many participants in the debate on the financing of Africa's needs that aid in loans or grants may be the more cost effective solution to help Africa. Indeed, it is quite crucial to recognize at this stage that any scaled-up ODA flows and long term commitment will be require major changes in the ways the public sector does its business in infrastructure. The new environment requires an exceptional commitment to institutional changes by African countries and by the donors. It also requires a very concrete workable game plan to achieve improved governance, capacity and institutions. Indeed, there is a fundamental dilemma to address as part of the debate on how to meet Africa's financing needs. Once it is accepted that the public sector will be the main actor and that donors will have to scale up their commitments, everyone needs to accept that the dramatic scale-up in aid risks overwhelming fragile institutions. The ideal would that the efficiency and effectiveness of use of greater aid flows will improve the delivery of public services and be coordinated with the development of good institutions that increase the accountability of all the parties involved.

Main messages of Chapter 2

The main messages of the chapter can be summarized as follows:

- *Most African countries are still at the development stage where infrastructure and growth dramatically need each other:*
 - *Rough estimates of the average elasticity of GDP to infrastructure over the last 40 years range from 0.4 to 1.5 depending on the sector.*
 - *During the 1980s and 1990s, fiscal adjustments cut average government expenditures on infrastructure from 4-5% to about 1.5% of GDP (while health expenditure increased and education expenditures were maintained);*
 - *PRSPs and MDGs offered partial corrections but tended to underestimate the importance of transport revealed by both macroeconomic and microeconomic analytical evidence on Africa ;*
 - *If Africa is to meet the 7% annual growth rate built in the MDGs, it needs to more than double its total expenditures on infrastructure (government + public and private enterprises) to reach about 9% of GDP :*
 - *Africa needs to spend (and recover) about US\$30-35/year/capita or 8-10 US cents/day/capita (ignoring irrigation).*
 - *A commitment to support infrastructure institutional building is an essential complement to any monetary commitment;*
 - *Realism and pragmatism should dominate the financing decisions;*
 - *Concessional donor financing and private sector pre-financing will help but the bulk will continue to come from today or tomorrow's taxpayers:*
 - *During the 1990s, 85 to 90% of the needs were pre- financed by the public sector from taxes or loans.*
 - *Macroeconomic fiscal capacity and institutional capacity will drive the assessment of the absorptive capacity for any major increase in donor contributions to Africa's investment requirements.*
 - *Unfortunately, there is a serious risk that the assessments will be based on short term cash driven instruments which tend to underestimate the absorptive capacity of aid to infrastructure.*
- *The overall accountability of the international and national communities for their collective effectiveness in meeting Africa is limited:*
 - *Data available on ODA is on commitments, not disbursements;*
 - *Data on government finance is at best approximative;*
 - *Data on infrastructure monopolies expenditures and costs, whether public or private, is generally weak.*

3. Where do we stand on service coverage & affordability?

1. This chapter focuses on the evidence available on the extent to which the residential and the non-residential demands are being met in Africa. The overview focuses on quantitative cross countries comparisons and hence leaves out a very large volume of anecdotal or country specific case studies on the evolution of access rates. This is because the emphasis in this paper is on data which can reasonably be compared across countries and very little of the country specific information meets reasonable quality standards for cross-comparisons.

2. The baseline information on the extent to which infrastructure is meeting the non-residential demand is mainly defined by the information collected from the investment climate assessments. Since the sample size is however not very large so far (it is only available for a total of 8 African countries for now), the discussion is complemented by a survey of the academic literature on the relative importance of infrastructure as an impediment to foreign investment. The residential demand is however the main focus of this chapter—and of the paper to a large extent. The information on access rates by households is derived from various international databases.⁴⁵ Whenever possible, in addition to a snapshot of the latest observations, the chapter documents the evolution of access rates during the 1990s. The chapter concludes with a discussion of the distributional concerns in the context of infrastructure often raised by critics of current reforms.

Is the non-residential demand being met?

3. In this section, the focus is on the information available on the investors' satisfaction with their access to infrastructure. Somewhat unsurprisingly, most of the evidence available comes from assessments of infrastructure as an impediment to foreign investment in the sector. As in the case of the growth literature, there are unfortunately very few published or at least, widely disseminated results on the importance of infrastructure for Africa specifically. Two main approaches were followed to assess the needs of investors: econometric analysis and survey-based analysis. The econometric literature has tended to focus on the lessons from the past while survey-based analysis has tended to assess the needs with a view to evaluate potential for future investments. Both viewpoints provide useful lessons.

4. *How much do investors really care about infrastructure?* A large share of the recent literature on Africa has tried to assess why Africa has been so much less successful than other regions in attracting private investment. Professor Asiedu has been one of the most systematic analysts of the topic and has tested most of the plausible assumptions in her research. In a recent analysis covering the 1988-1997 period (Asiedu (2002)), she tests the extent to which infrastructure may matter differently to Africa and other regions—she approximates infrastructure by access to telecoms services. She finds that while infrastructure development promoted FDI to non-SSA countries, it had no significant impact on FDI flows to SSA—*ceteris paribus*. Morisset (2000) or Naudé and Krugell (2003) find a similar result—when they account properly for the institutional and geographical

⁴⁵ For details see Estache and Goicoechea (2005)

characteristics of Africa. None of these authors believe their own results. All agree that the relevance of infrastructure in Africa may come about in ways that do not match the norm observed for other regions. In other words, Africa and the way infrastructure matters to investors in Africa may be different from other regions.

5. *Are Africa and African infrastructures different?* The impression of irrelevance of infrastructure sometimes covered in the literature has three explanations. First, the proportion of FDI going to natural resources—mainly extractive—industries—is much larger in Africa than in other regions. These investments tend to require fairly specialized transport infrastructure—i.e. pipelines for oil, rail for many minerals—which are not picked up by the proxies used by these authors—and very little of the services traditionally offered by utilities. This is not recognized by the above studies. Second, many of these investors have long given up on the provision of services by the public network providers and have tended to rely on autonomous infrastructures—own generators, satellites, etc These are usually not accounted for by cross country statistics available and are hence not reflected in the cross-country assessments of needs. Third, what investors want is more of an infrastructure platform which bundles together a package of services consistent with the needs of modern production. This is certainly true for investors concerned with exports where the logistic chain includes all components of the platform to ensure services of quality delivered just in time. Focusing on the telecoms sector only is thus bound to be misleading.

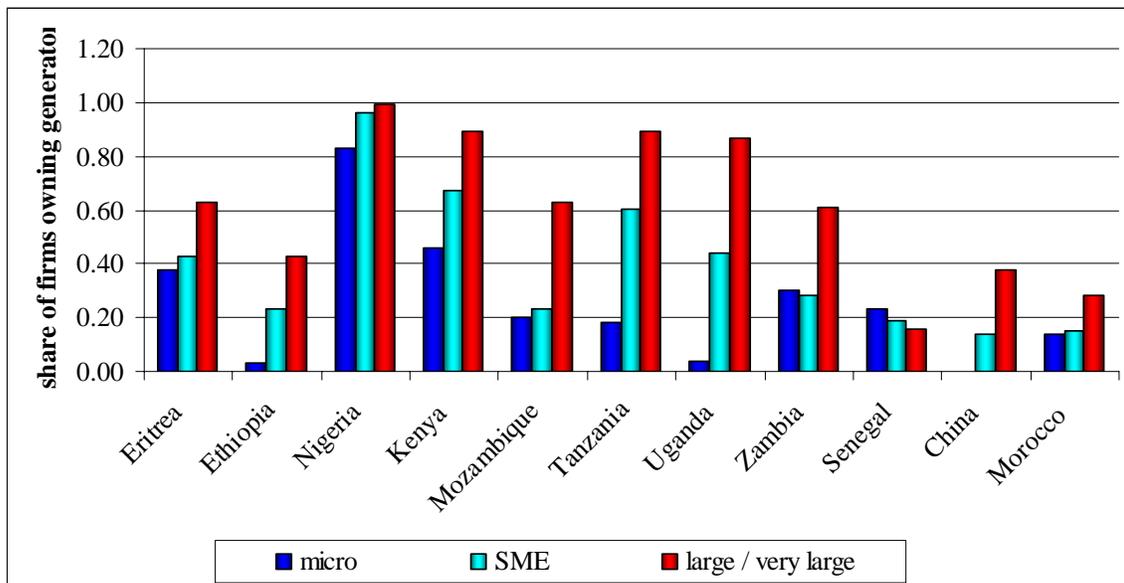
6. In spite of the doubts raised by the lack of precision with which infrastructure has to be modeled, the main policy implication of this research may be that Africa may indeed be different, but so is infrastructure in the region compared to other regions. Indeed, the African infrastructure market structure tends to differ from the one observed in other regions –e.g self reliance as a way of life to avoid rationing by unreliable public providers; areas too large to hope for dense networks, over 70% of rural clients, about 50% of poor clients. This complexity may hide the existence of an effective but frustrated demand and certainly hides the very high costs to the economy of forcing investors to aim at self reliance. This rationed demand and the high associated costs are better revealed by the forward looking surveys of actual and potential investors.

7. *The investor's demand is for a critical initial infrastructure mass.* In the most recent study on the topic, Lumbila (2005) contributes to a settlement of the earlier debates with an improved statistical analysis. He shows that African countries with larger infrastructure stocks—unfortunately still only approximated by telephone connections—see significantly more FDI and domestic investment than countries with low stock levels. From his results, an important new insight emerges. Countries with more developed infrastructure see a disproportionately greater impact of infrastructure on FDI and domestic investment on growth. However, countries with lower, underdeveloped infrastructure see no statistically significant impact of infrastructure of investment on growth. This suggests that not only can a lack of infrastructure be an impediment to more investment, but it can also be one of the dimensions of the poverty trap argument since it seems that a critical mass of infrastructure is needed to convince investors to make the decisions leading to growth. In a nutshell, all this implies is that infrastructure meets the investors' demand in Africa, as anywhere else, *but only after a threshold has been reached*. Because the majority of African countries have not yet accumulated a critical mass of infrastructure or a sufficient infrastructure platform, costly self sufficiency seems to be the norm to meet the demand of investors for infrastructure services.

8. *What investors tell us about the future.* The econometric lessons from the past seem to be confirmed by investors surveys collected as part of the Investment Climate Assessments (ICAs). While the data collection effort is still in its infancy—only 6 African countries (Eritrea, Ethiopia, Kenya, Mozambique, Tanzania and Uganda) have their data posted on the web and the data is being processed for only 3 more countries (Mali, Senegal and South Africa) so far, it is starting to allow validations of the information on demand generated from econometric studies. One the questionnaires sent to investors asks for their assessment of the general constraints to operation. In the 6 cases available, electricity appears in the top 5 among 19 possible constraints. Transport and telecommunications tend to be ranked in the bottom third of the priorities. When asked which factors are major or very severe obstacles for the operation and growth of their business, 22% of the establishments surveyed responded telecoms, 25% transportation and 48% electricity. To put things in perspective, 40% of the establishments surveyed list corruption as a major or very severe obstacle.

9. An additional sense of the fact that investors' needs are not being met is the information available on the share of establishments that need to rely on alternative sources of supply. The best indicator of this issue may be in the power sector forced to rely on their own sources when networks do not have enough coverage or are not reliable enough. Figure 3.1 shows the extent of the problem for African countries where data is available from the Investment Climate Assessments (ICAs). First, it shows that in general, the larger the establishment, the larger the odds that it owns a generator to offset the risks associated with network provision. Second it shows that except Senegal, few countries in the sample compare favorably with countries such as Morocco or even China. Why are producers so keen on increasing their autonomy? Simply because the costs of having unreliable services can be quite significant. The ICA data suggests that the costs of power losses are equivalent to losses in sales ranging from about 2% of total sales to close to 6% (in the case of Kenya).

Figure 3.1
How many energy users have to rely on own sources of generation?
(simply because the networks are not reliable)
Evidence from the Investment Climate Assessments



10. ***Do foreign investors care more about infrastructure than domestic ones?*** A recent paper by Moss et al (2005) analyzes the data collected on the difference between foreign and domestic investors in three East African countries (Uganda, Tanzania and Kenya). It reveals that foreign investors are systematically more concerned with electricity and transport than domestic investors. This is only anecdotal evidence but it is consistent with the traditional vision built-in the design of policies aimed at attracting foreign investors. More recent evidence should be available on the differences in demand from the large number of additional surveys to be conducted over the next 2-3 years.

11. ***Summing up: not all infrastructure matter equally at all time to all investors!*** From a strict policy viewpoint, three main lessons for Africa seem to emerge jointly from the econometric and survey evidence: (i) non-residential demand is not being met and energy seems to be at the top of the list of investor's concerns; (ii) there is an infrastructure stock level threshold required for foreign investors to start investing in non-natural resources related activities; (iii) while foreign and domestic investors share some concern with respect to infrastructure, their demand can be different and hence designing an infrastructure to cater to the foreign demand may leave some of the domestic demand unmet. *In other words, if the policy is to promote domestic investment—i.e. promoting small and medium corporations--, it may be worth conducting a differentiated assessment of infrastructure needs per investors' type to assess the level and sources of differences.*

Is the household demand being met?

12. The best approximation of the household demand for infrastructure is given by the access rate. For some indicators like water, sanitation and electricity, when access is not 100%, it seems reasonable to presume that the policy target is to eventually get it as close as possible to 100%. For telecoms it would be ideal to get a sense of the share of the population with access to a fixed or mobile phone. While that information is however not collected by household surveys on a systematic basis, there are reasonable alternatives. For transport the matter is much more complex. There are many debates as to what the appropriate policy approximation should be. Most of it is about how best to define the role of transport. Transport is a displacement between two standardized points in space—i.e. between home and school, the market or a clinic. The time it takes to move between these two locations in the most common transportation mode—i.e. walking--should be a reasonable approximation to access. It is however available for only very few countries and hence does not generate a good enough sense of access rates in the continent. The alternative is to rely instead on the very rough—and contested—approximation of the access to transport by a snapshot of the size of the road network.⁴⁶ The paper presents later some of the better indicators available for a smaller set of countries and, in some instances, for the various income classes. For now, Table 3.1 provides an overview of the best information available on Africa for the largest possible country coverage.

13. ***The weakness of the data available to design policies.*** A recurring theme throughout the paper is that data gaps are currently exceptionally large in Africa. These gaps boil down to asking sector policymakers in Africa to make *blind* decisions much more often

⁴⁶ The main problem with this indicator is that there is not objective sense of how much road coverage is ideal; the only thing that can be said is that there is too much or too little based on a benchmarking exercise but while this information has some policy value—in particular when a country is far from having reached a critical mass of road stocks-- , it cannot be used to drive specific investment decisions.

than in other parts of the world. The details on the data sources and quality are too long to be given here but they are provided in a background paper.⁴⁷

Table 3.1: Access rates to the main infrastructure services in Africa

	2002 unweighted averages (sample sizes are given in parenthesis)			
	Africa (48)	Low income (65)	Low middle income (52)	Upper middle income (38)
Electricity access rates				
% of total population ^(a)	14.9 (40)	30.7 (59)	81.8 (38)	87.2 (24)
% of rural households ^(b)	8.3 (25)	19.1 (34)	59.1 (11)	n.a.
% of urban households ^(b)	54.0 (25)	63.4 (34)	95.3 (10)	n.a.
Water access rates				
% of total population	64.1 (47)	64.8 (65)	85.4 (48)	92.8 (26)
% of rural population	53.9 (47)	55.9 (65)	76.0 (49)	85.3 (26)
% of urban population	82.6 (47)	82.9 (65)	94.3 (48)	95.6 (29)
Sanitation access rates				
% of total population	36.5 (46)	40.1 (65)	71.7 (48)	85.6 (23)
% of rural population	27.9 (47)	40.4 (65)	57.8 (49)	76.1 (25)
% of urban population	54.3 (46)	60.4 (65)	85.2 (48)	90.5 (26)
Telecoms access rates				
Telephone Subscribers/1000 people	89.7 (48)	50.9 (65)	250.3 (52)	578.3 (36)
Rural ownership of phones (% of households) ^(c)	0.7 (21)	2.4 (29)	9.4 (11)	n.a.
Urban ownership of phones (% of households) ^(c)	9.7 (21)	14.4 (29)	44.8 (11)	n.a.
Transport access rates				
Road km/1000 people ^(d)	3.5 (47)	3.0 (64)	4.96 (50)	9.2 (34)
Road km/1000 square km ^(d)	166 (47)	189 (64)	326.8 (50)	1083 (34)

Source: Based on data presented in Estache and Goicoechea (2004)

Notes: averages figures correspond to unweighted averages of data available.

(a) Data in 2000.

(b) Africa averages include 4 observations in 1997, 6 in 1998, 6 in 1999, 4 in 2000, 4 in 2001, and 1 in 2002.

(c) Africa averages include 1 observation in 1997, 4 in 1998, 5 in 1999, 2 in 2000, 4 in 2001, and 5 in 2002.

(d) Africa averages include 1 observation in 1997, 1 in 1998, 35 in 1999, 5 in 2000, and 5 in 2001.

14. Four points emerge from the preparation of this table. First, there is some disparity across sectors in country coverage. Electricity is the least well covered for all indicators. Second, there is disparity in the quality of the indicators available. All of them, however, have their own set of problems. Transport is the weakest in terms of information available to approximate access—Box 3.1 describes an alternative measure better tailored to Africa's needs but available for fewer countries than the indicators in Table 3.1. Water and electricity

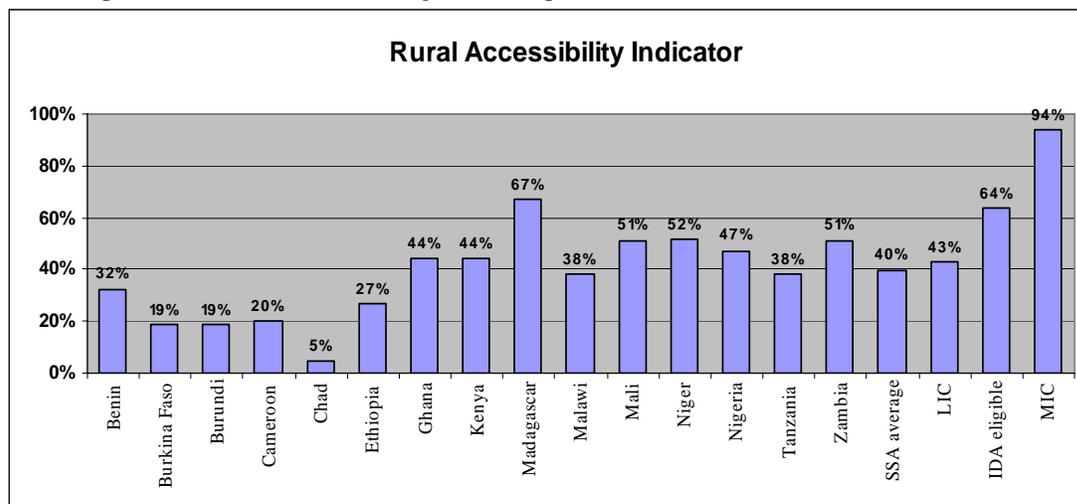
⁴⁷ Estache and Goicoechea (2005)

are equally problematic in terms of reliability. Its definition fails to recognize that water access 24 hours a day, 7 days a week is different from anything less. This means that the ideal indicator should have been adjusted for comparable service qualities. The electricity indicator is an estimate for some countries. The most reliable information comes from the household surveys discussed later but they are not available for enough countries. Third, except for water and sanitation where the data is actually for a single year (2002), for all other sectors, the data covered are for the latest year for every country. The details are provided in the footnote to Table 3.1. The data on total population and the data distinguishing urban and rural population is not strictly comparable because it comes from difference sources—in the case of electricity and telecoms. The total data comes from various sources while the unbundled data comes from DHS in general which have a much lower coverage and focus on the low and some lower middle income groups only.

Box 3.1: The core access problem in transport

The issue of access in the transport sector in the African context is essentially a question of access to the passable road network with the expectation that access to such a network opens access to low-cost and efficient transport services. This issue is of course limited to rural areas and this is not addressed properly by the approximation provided in Table 3.1.

The indicator used for IDA-14 provides a useful alternative. It relies on the percentage of rural people who live within 2 km of an all-season passable road as a proportion of the 'total rural population. It has been computed for 19 countries. The Figure below provides the detailed information.



Although these indicators are still at their early stages, they clearly show that SSA countries suffer unquestionably from low rural accessibility since two thirds of the rural population is not in a walking distance of the all-season motorable network. The consequences are straightforward: the rural poor (which represent the vast majority of the total poor in Africa) are unable to join the market economy and therefore are stuck into subsistence farming and are unable to get the cash required to initiate productive investments as well as reaching the level of consumption that could jumpstart self-centered economic development. Social impacts are also huge since such lack of accessibility put basic social services such as education and health facilities further away or decrease the quality of services provided.

Source: Desmarchelier (2005)

15. ***What does the data tell us?*** To facilitate the assessment that can be derived from Africa's data, Table 3.1 also provides a comparative benchmarking on simple—i.e. un-weighted for population--averages of various groupings of basic access indicators for the various sectors. The most interesting one is the comparison of Africa with its peers, the lowest income country groups—relying on the World Bank definition of low income countries. The gaps with higher income groups are however useful because they give a sense of achievements in other developing countries.

16. The main lessons that can be drawn from this very “bird-eye” snapshot can be summarized as follows:

- To state the obvious: *Africa's demand for infrastructure is not being met*; but this is not just about water or telecoms and other information services as implied by the MDGs; it is not just about rural electricity as implied by the Johannesburg supplement to the MDGs, it's a much wider problem that cuts across sectors and concerns all populations and all sectors;
- *Africa's worst sectoral performance is in terms of electricity access rates*, both in absolute terms and in comparison to its peer group; this is true for the total population but also for rural and urban populations
- *Africa's worse off population in terms of access to modern infrastructure services is rural*; the gap between rural and urban infrastructure access rates is quite significant across sectors and tends to be larger in Africa than in other low income groups. It is largest for electricity and telecoms services.

Of course, these conclusions hide a very wide diversity of country specific experiences. But the purpose here is not to provide country specific assessments but to give a bird eye view of the collective challenge to be addressed by the global community of stakeholders in Africa's future.

How fast are access rates improving?

17. The snapshot of the 2002 situation does not yield a very happy picture. To put things in perspective, it is useful to try to get a sense of the dynamics of the sector. Once more the data limits the quality of the possible assessment. One option is to compare the situation described in Table 3.1 for 2002 with the equivalent information around 1990.⁴⁸ This is what Figure 3.2 does for up to 32 countries at two points in time. Even if it is not very precise, it gives a good visual sense of the changes that have taken place in Africa during the 1990s.

⁴⁸ To make it as transparent as possible, it is useful to note that for electricity, the 1990, averages include 1 observation in 1991, 5 in 1992, 4 in 1993, 2 in 1994, 3 in 1995, and 5 in 1996. For 2002, averages include 4 observations in 1997, 6 in 1998, 6 in 1999, 4 in 2000, 4 in 2001, and 1 in 2002.

For water, for 1990, averages include 1 observation in 1995, 5 in 1996. For 2002, averages include 1 observation in 1997, 4 in 1998, 5 in 1999, 2 in 2000, 4 in 2001, and 5 in 2002.

For sanitation, for 1990, averages include 1 observation in 1992, 2 in 1994, 6 in 1995, and 35 in 1996. For 2002, averages include 2 observations in 1997, 6 in 1998, 5 in 1999, 4 in 2000, 5 in 2001, and 21 in 2002.

For telecoms, for 1990, averages include 46 observations in 1996. For 2002, averages include 1 observation in 1997, 1 in 1998, 35 in 1999, 5 in 2000, and 5 in 2001.

(f) For transport, for 1990, averages include 46 observations in 1996. For 2002, averages include 1 observation in 1997, 36 in 1999, 5 in 2000, and 4 in 2001.

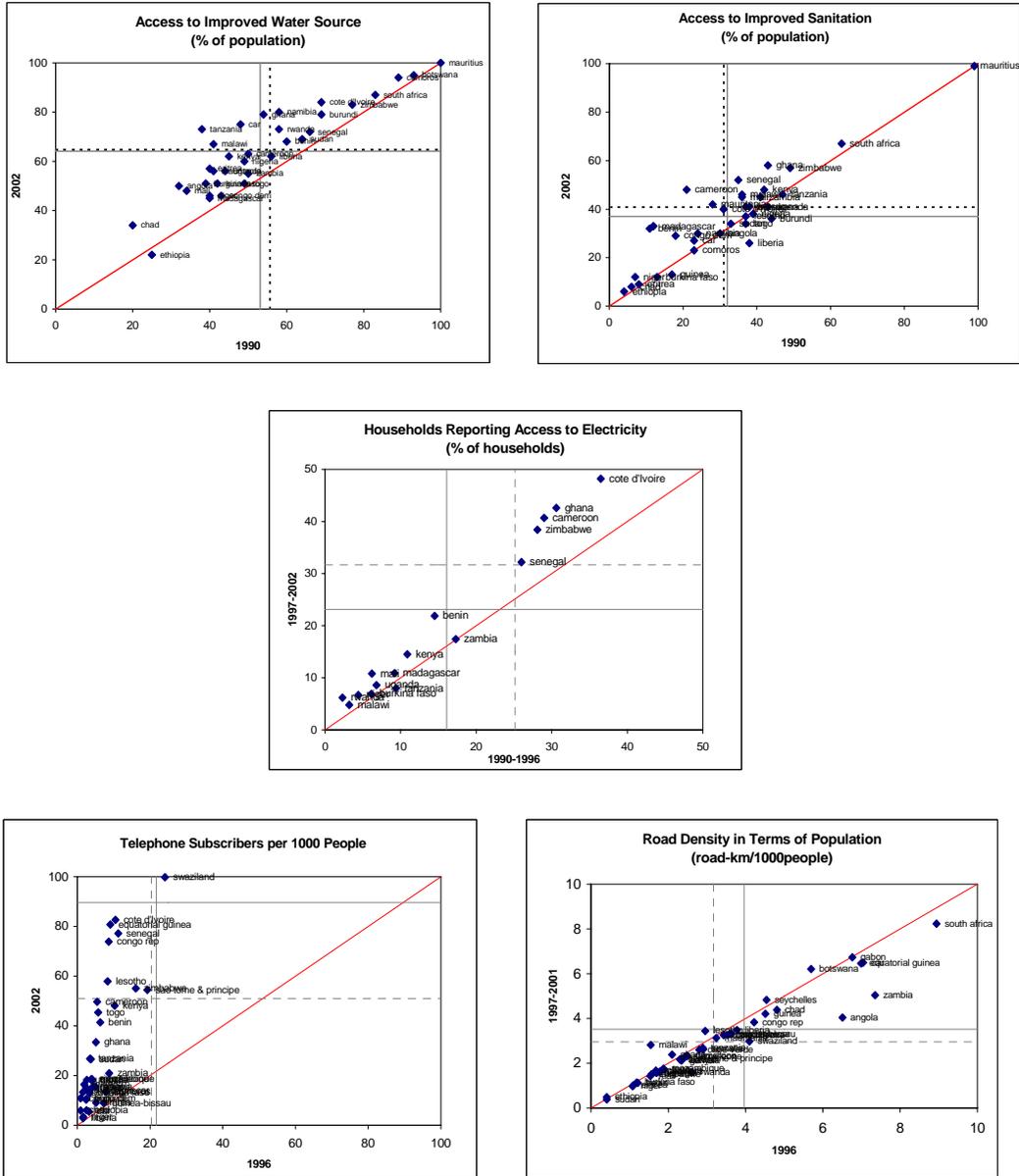
18. ***Assessing country specific performance.*** The principle built-in these figures is quite simple. The specific position of a country in a sector box gives the access rate at the beginning of the period (around 1990 for most countries). This can be read from the horizontal axis and the access rate at the end of the period (around 2002 for most countries). If a country is exactly on the diagonal, it means that access rates have been increasing at exactly the same rate as population. If a country is above the diagonal, it means that the access rate is higher at the end the observation period (2002) than at the beginning (1990) and hence that access rates have increased faster than population. This is the case for Chad in terms of access to improved water sources. Any country located below the diagonal is a country in which investment in the services has not allowed access rates to grow as fast as population growth, which is the case for Ethiopia in the same sector for instance.

19. ***Learning also from regional benchmarking.*** To provide some benchmarking, Figure 3.1 also reproduces for each sector the African averages—the continuous vertical line for 1990 and the continuous horizontal line for 2002-- and the average for low income countries—the equivalent discontinuous lines. These two sets of lines give a visual sense of how Africa is catching up with its closest group of peers. Indeed, if the distance between the continuous and discontinuous is smaller for the horizontal than for the vertical lines, the gap between Africa and its peers has shrunk. Africa has done better than its peers in telecoms; significantly so, in roads, water and sanitation - although to a very modest extent for these two last sectors. Africa has done worse than its peers in electricity.

20. ***The evidence on progress is a mixed bag.*** Besides showing that the averages provided in Table 3.1 hide a very large variance in the country specific performances quite obvious in Figure 3.2, two main basic lessons on progress in access rates achieved during the 1990s can be derived from Figure 3.2. The first is a sectoral ranking of winners and losers of the 1990s. The second is a country ranking of winners and losers.

21. ***Progress varies significantly across sectors.*** The evidence confirms the common wisdom that infrastructure is a very heterogeneous sector. It is often dealt with by different ministries and operators in the countries and sometimes within donor agencies. The sectors are also treated differently by the international community considered collectively. The 1990s were the water decade, the next 15 years are likely to extent that decade into a quarter of a century of high profiling of the sector. At the other extreme, the transport sector is only enjoying a very high profile on NEPAD's agenda for now—even if most multilaterals have an equally full transport portfolio. The telecoms sector has continued to enjoy a high profile but has been mostly supported by its own technological revolution.

Figure 3.2 Evolution of access rates to infrastructure services 1990 vs 2002



Source: Estache and Goicoechea (2005)

Notes:

* Electricity access data comes from DHS

* In some graphs outliers were not represented for scale purposes

22. *So what are the main conclusions?* The following conclusions provide a synthesis of the main lessons of the 1990s:

- Africa's water access rates as measured by WHO appear to have achieved a good progress during the 1990s: the region average has caught up with the low income country average; however, many of the countries have only hardly done better than population growth (i.e. those very close to the diagonal); as discussed later, there is some concern with this conclusion due to the fact that for countries where DHS data is available on access rates, the emerging story on progress is not as optimistic—see Box 3.2 for a comparative assessment of WHO and DHS data as well as the policy implications of WHO data revisions over time.
- Africa's sanitation access rates did not progress as successfully: many countries are in fact worse off now than they were 12 years earlier; Africa has in fact progressed worse on average than its peer group.
- Africa's electricity access rates are the poorest performers with a significant deterioration in electrification rates relative to its peer group where access rates have grown much faster and a very high concentration of poor performers—and this conclusion is much more in tune when compared to the conclusion derived from DHS data.
- Africa's telecoms sector has achieved the most impressive progress, although the bulk of the countries are still lagging the performance of lower and upper middle income countries.
- Africa's transport access has deteriorated somewhat in absolute terms even if it has improved when compared to its peers—according to the weak approximation available.⁴⁹

23. **Top performing countries vs. bottom performers.** A few countries are top performers—i.e. above average at the beginning and at the end of the period-- across sectors; a few others, including some who have improved significantly, continue to be bottom performers—below average at the beginning and at the end of the period according to this benchmarking exercise:

- The top performers across sectors in our sample include Botswana and South Africa. However, Ghana, Mauritius, Namibia, Senegal and Zimbabwe are very close to belong to this group.
- The bottom performers defined as countries that have been able to be above the regional average in only one of the 4 sectors tracked down here include 20 countries!
- There is no single sector in which all poor performing countries tend to perform better collectively—although telecoms seem to enjoy the highest share.

⁴⁹ The approximation is weak because being within 30 minutes of a school does not imply that children are actually going to school or that the transport infrastructure allows easy access to a clinic in case of emergency.

Box 3.2
Are water access rates improving as fast as we think?
Comparing WHO (2000) vs WHO (2002) vs DHS data stories

Background. The most “official” data source available on access to water services is the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. It regularly updates coverage estimates for improved drinking water. An “improved” source is one that is likely to provide “safe” water. These improved sources can be a household connection, a public standpipe, a borehole, a protected dug well, a protected spring and a rainwater collector. The information is collected for both rural and urban populations from the best possible sources: DHS (Demographic and Health Surveys) in various points in time, various Reviews of National Baselines Data conducted in the context of the International Drinking Water Supply and Sanitation Decade, Form 6 sent by countries to WHO in the context of the Global Water Supply and Sanitation Assessment conducted in 2000, the MICs (Multiple Indicators Cluster Survey) and other sources as appropriate. Some or all of the information is then collected to estimate access rates. The estimates are based on a regression run across some of the points in time available from the various sources of data to generate an estimated trend. The access rates at different points in time are then assessed from the estimated trend line. As new data becomes available, the regressions and hence the trend lines are re-estimated.

What’s the problem? Consider the case of Mali. Information is available on the following years: 1980, 1983, 1985, 1987, 1988, 1990, 1991, 1994, 1996, 1999 and 2001. In the July 2004 update, only the data for 1987, 1996 and 2001 is used in the regression to generate the estimates available. This generates an access rate of 34% in 1990 and 48% in 2002. Now compare this to the previous update which relied on a different set of observations. The data available on the web from the JMP program provided an access rate for 2000 of 65% which is well above the rate now being used for 2002. Moreover, it listed the access rate for 1990 at 55%. This suggests that access rates for a same year can have a different estimated value depending on when they were published. For Mali, the baseline of 1990 has dropped from 55% to 34%. With this lower baseline, any absolute gain level represents a higher relative gain. The data published in 2004 for 2002 implies a 41% improvement over 1990, while the previous improvement on record implied an 18% change between 1990 and 2000.

For a sample of 17 countries for which data can be compared with DHS information—see below—the initial average estimated for 1990 was 56% and this was revised down to 51% the following time access rates were estimated for 1990. Also, the estimates for 2000 were 64% while for 2002 the access rate was estimated at 65%. What does this mean? Is it that, based on the comparison of 1990 and 2000, access rates have increased by only 1.4% per year or, based on the comparison of the revised 1990 and 2002, they have increased by 2.3%?

What does this imply? First, it casts some doubts on the gains achieved from relying on a uniformized approach to general cross country databases. Second, and most importantly, it raises some questions on the assessments of the extent to which the MDGs are being met. Finally, it raises some questions on the appropriate course of action donors should be following; i.e. did the reformers do better than the non-reformers is an impossible question to answer without any decent data on the evolution of access rates.

A reality check from DHS data. For the 17 DHS countries for which data is available on two points in time, the emerging story is the following one. For the base year access rate, data is available for a range of years ranging from 1991 to 1996 (1993 as the average year). For the end period, the data point range between 1998 to 2002 (1999 as the average year). The shortest spread between the 2 points is for Nigeria (3 years), the largest is for Zambia (10 years). The average spread is 6 years. The average initial access rate is 55.7% while the average access rate in the final period is 60.4%. The implied average annual growth rate is 1.4%. Just a little bit higher than the WHO earliest estimate and well below the current estimate. In 4 of the countries, the growth rate has been negative. For 3 of the countries, the growth rate is below 1% and for 10 of the 17 countries; the access growth rate estimated from the DHS data only is below the 2.3% average estimate currently being used by WHO.

So...are access rates really growing as fast as we are all hoping for?

Is access fairly distributed across income groups?

24. Given the extreme poverty level observed in Africa, a fair concern is if the infrastructure needs of the poor and those of the higher income classes are addressed equally well. As in many other instances, this is not a policy area that tends to be addressed systematically by international databases. One option available to policymakers interested in cross-country comparisons is to rely on comparable household surveys. The best source of information based on these criteria is the Demographic and Health Surveys (DHS) for utilities and Living Standard Measurement Surveys (LSMSs) for transport. The DHSs provide information on access rates per quintiles to electricity and piped water in 26 Sub-Saharan African countries.⁵⁰ The LSMSs provide information on the time it takes to get to a school or to a hospital but only for a smaller set of countries (12). The data available is reported in Figures 3.2 *a* to *d* for respectively access to clean water sources, access to electricity, the time it takes to reach a primary school and time to reach a health center.⁵¹

25. *The poor are left out of networked service delivery.* Once more, this is a very visual assessment of the performance and it needs to be complemented by more analytical work, but as a first impression, the main lesson that can be drawn is that access rates to networked water and electricity very obviously exclude the poorest 40% of the population, except in 3 countries (SA, Cote d'Ivoire and Nigeria). For utilities, in a third of the sample, access in fact only concerns the richest 20% of the population. An explanation is that utilities tend to serve the capital city and the largest urban centers where the richest are likely to concentrate. Relying on the WHO definition of water access, the story is less dramatic for the water sector since all income groups enjoy some access—although difference across income classes are still large. For transport, there are also significant differences between income classes but not as dramatic, in particular, for access to primary schools. Moreover, the dispersion of experiences across countries is much narrower than for utilities. To make it easier to compare to Table 3.1, Table 3.2 summarizes the information available.

Table 3.2: Summary of DHS information on average access rates in Africa

	Quintiles				
	First	Second	Third	Fourth	Fifth
Improved water sources (% of population)	34%	49%	54%	67%	85%
Piped Water (% of population)	0%	1%	3%	11%	40%
Network Electricity (% of population)	0%	4%	12%	28%	71%
Transport in terms of access to School (% of population within 30 minutes of school)	62%	65%	66%	68%	72%
Transport in terms of access to Health (% of population within 30 minutes of a clinic)	56%	60%	70%	73%	79%

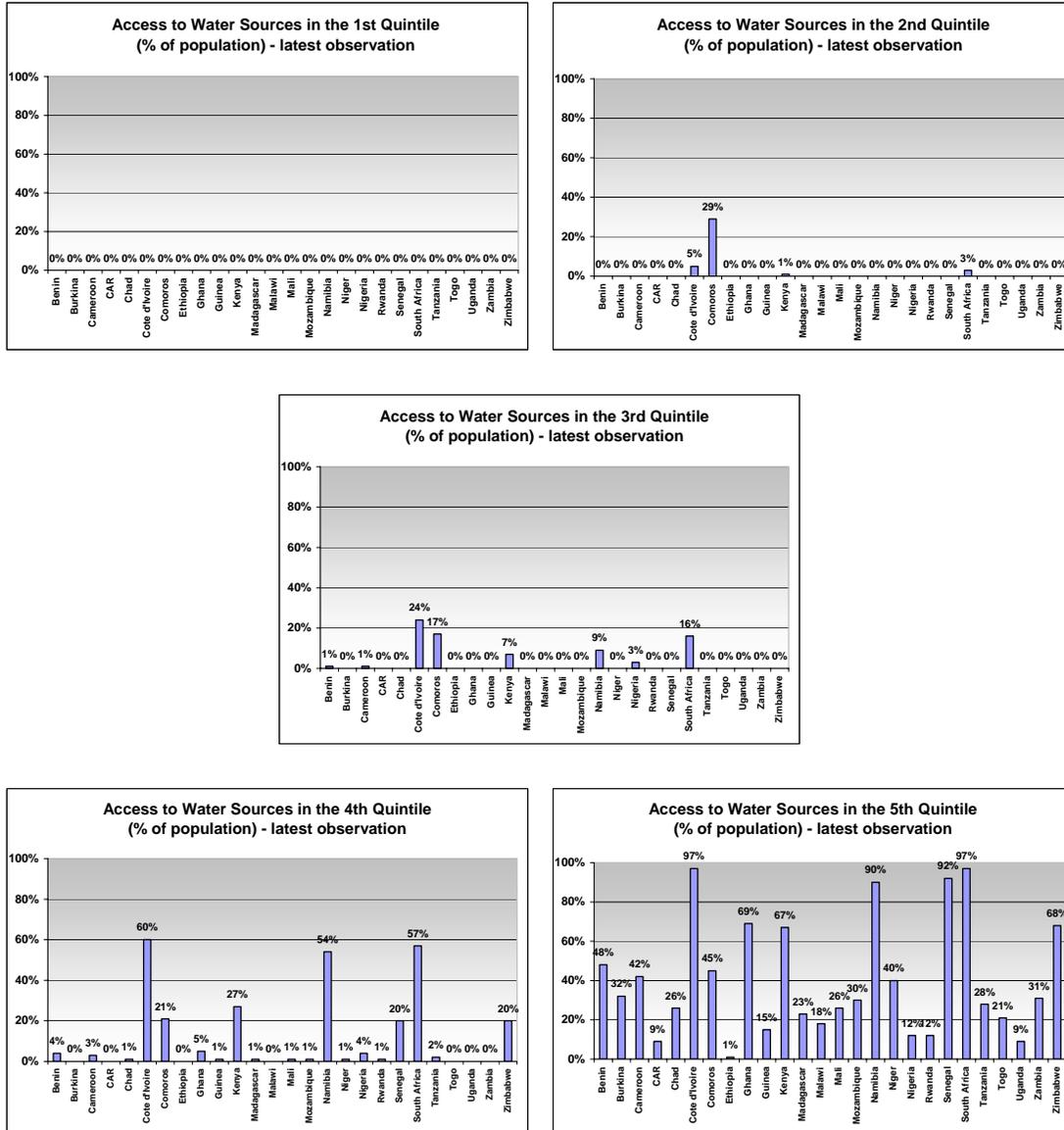
Source: Based on a sample of 26 countries for which data is provided by Diallo and Wodon (2004)

⁵⁰ The raw data needs to be subjected to a manipulation to generate a full welfare assessment. Indeed, since DHS data do not include information on consumption or income, the level of well being of each household is assessed from an index of wealth. The approach is described in Diallo and Wodon (2004)

⁵¹ A glance at the averages (the bottom right graph in each one of the figures) makes it clear that the DHS based access data is not strictly comparable to the WHO data reported in Table 3.1. WHO tends to generate data from multiple sources, including but not exclusively DHS and thanks to its approach can estimate access rates even for countries without DHS data in a consistent way across countries. This makes for significant differences. For countries for which DHS data is available, the WHO estimates tend to be higher than DHS average access rates.

26. The policy implications of Table 3.2 are somewhat unusual. Table 3.2 implies that every effort made to improve the quality of service caters significantly to the poorest group but also upper and upper middle income classes who seem to have a high share of access through non-piped water. This does not seem to be an irrelevant consideration when assessing the returns to public expenditure allocations. It is also important, bearing in mind that in most countries, reforms do not become successful until they address the needs of the middle class. Figure 3.3a to 3.3d show that the story is very consistent across countries and that the averages covered in Table 3.2. are fairly representative.

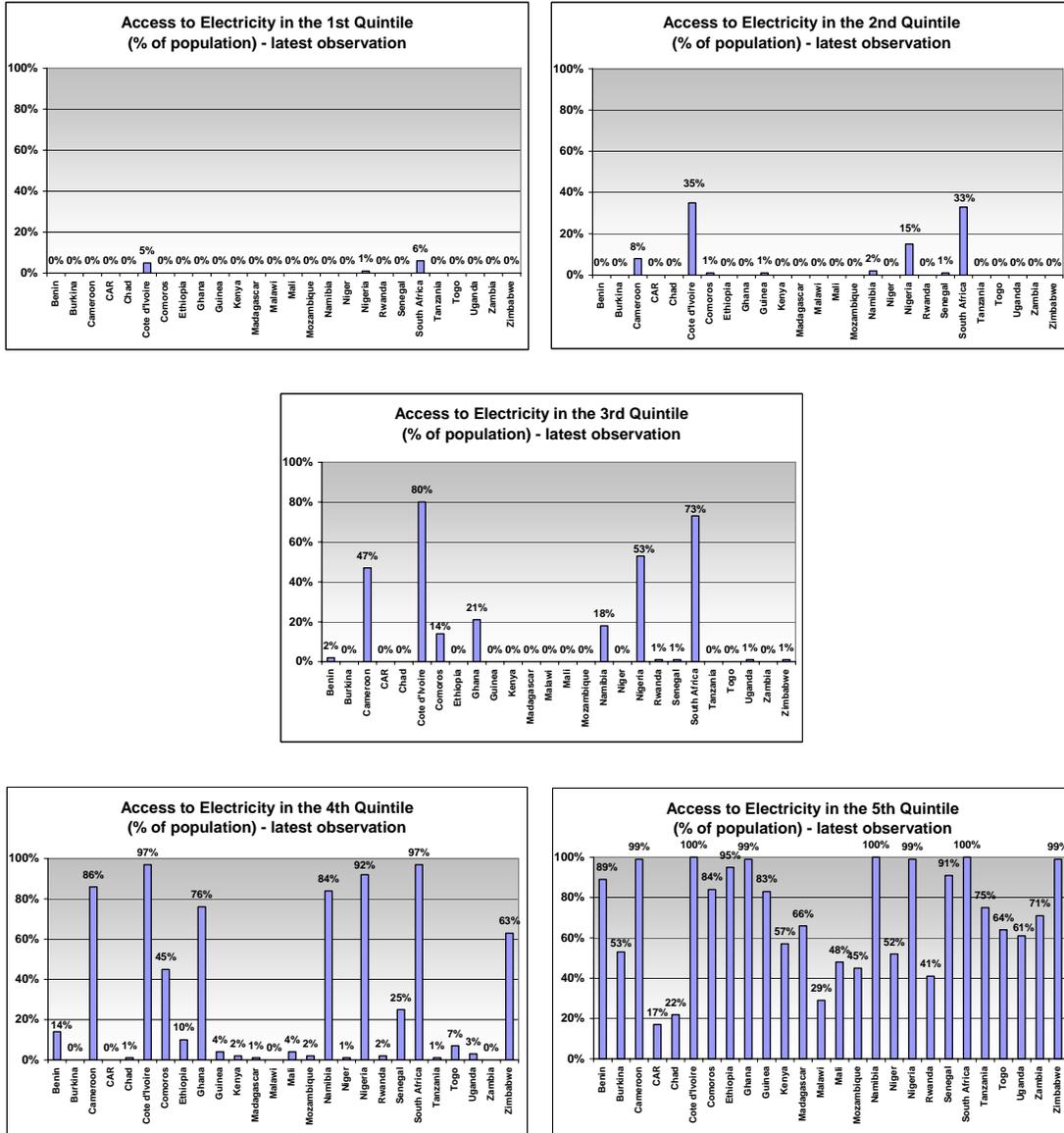
Figure 3.3a: Access rates to piped water by income group



Source: Own calculations based on data published in Diallo and Wodon (2004).

Notes: (i) Latest observation available for each country within 1994-2002; (ii) Quintiles were defined by using an "index of wealth" that assesses the well-being of each household. The index encompasses housing variables, access to different infrastructure services, and assets ownership variables.

Figure 3.3b: Access rates to network electricity by income group



Source: Own calculations based on data published in Diallo and Wodon (2004).

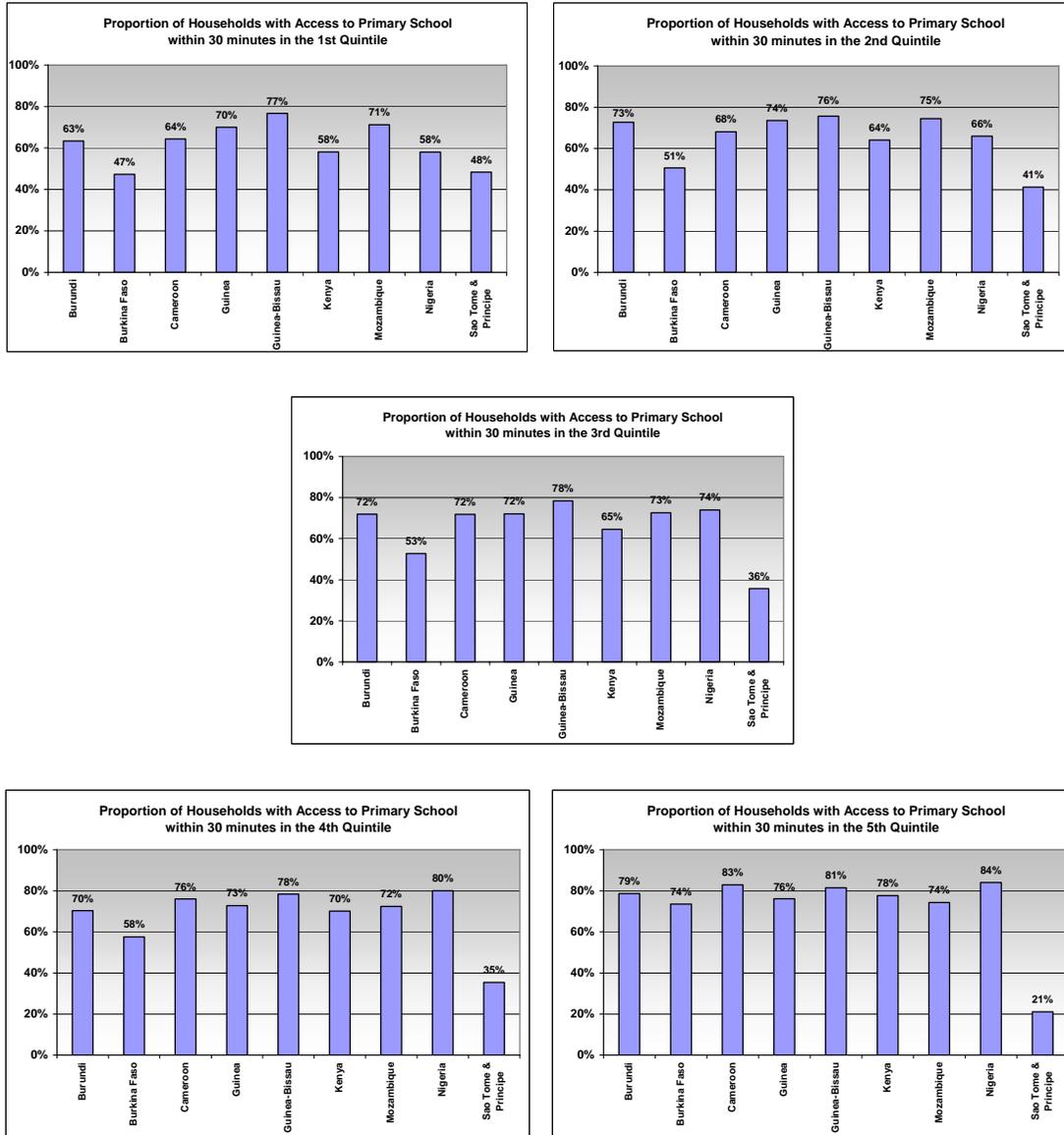
Notes:

* Latest observation available for each country within 1994-2002.

* Access to electricity refers to the percentage of households who answered “yes” to the question “does your household have electricity?”, weighted by population.

* Quintiles were defined by using an “index of wealth” that assesses the well-being of each household. The index encompasses housing variables, access to different infrastructure services, and assets ownership variables.

Figure 3.3c: Access to transport in terms of time to get to a primary school by income group



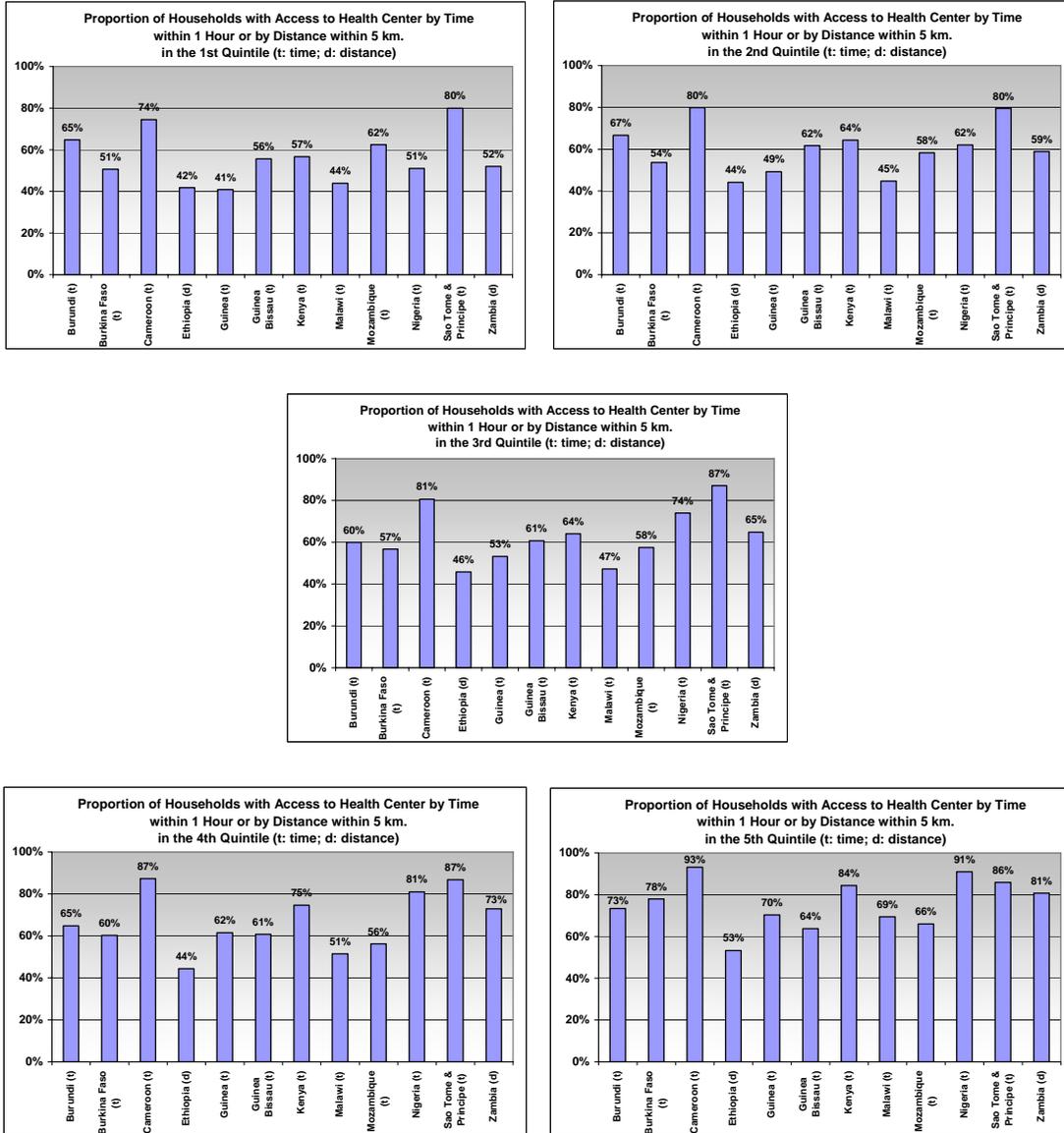
Source: Own calculations based on data from Living Standard Measurement Surveys (LSMS) provided by Q. Wodon.

Notes:

* Latest observation available for each country within 1997-2002.

* Quintiles were defined by using an "index of wealth" that assesses the well-being of each household. The index encompasses housing variables, access to different infrastructure services, and assets ownership variables.

Figure 3.3d: Access to transport in terms of time (or distance) to get to a health center by income group



Source: Own calculations based on data from Living Standard Measurement Surveys (LSMS) provided by Q. Wodon.

Notes:

* Latest observation available for each country within 1997-2002.

* Quintiles were defined by using an "index of wealth" that assesses the well-being of each household. The index encompasses housing variables, access to different infrastructure services, and assets ownership variables.

Is there an affordability problem?

27. ***What does affordability mean?*** There is a wide disparity of views on what affordability means and ultimately the concept is quite subjective. There are however a few rules of thumbs which can be used to assess whether a service imposes a reasonable burden or not on the users. These are usually defined as a maximum proportion of income a household should have to pay to meet its basic needs for a specific public service. Some of these rules of thumbs have been suggested in the literature, others are more formal statements by international organizations and others yet belong to the “tool kits” of field experts and belong to a long oral tradition.

28. ***Rules of thumb to assess affordability.*** The most formal rule of thumb is for water supply and sanitation, the World Health Organization has long estimated that 5% of income should be the maximum the poor should spend on their water and sanitation needs—3.5 for water alone. In the case of electricity, there is no such widely accepted ‘rule of thumb’. A forthcoming book by Komives et al (2005) suggests that households in Latin America, Eastern Europe and South Asia all spend around 4% of income on electricity (and 1-2% of income on water supply). In their experience, the percentage of income spent on water supply and electricity decreases across quintiles as average household income rises. For the poorest households, electricity represents 4-6% of income, while water supply represents 1-3% of income. The most informal rule is the one that suggests that poor households should not have to spend more than 15% of their income on infrastructure services.

29. ***The evidence is only available for a sample of African countries.*** Table 3.3 summarizes the evidence available on these various affordability guidelines⁵² for a sample of 15 African countries. The data has some limitations. It focuses on the expenditure on water and electricity of household connected to a network. Since in general, unit costs for non-network provisions tend to be higher, it may be reasonable to assume that these figures are lower bound for water and electricity expenditures—although because unit costs are higher for the non-connected users, consumption may also be lower.

30. ***Africa’s poor spend more on infrastructure than other regions’ poor.*** Table 3.3 suggests that Africa is somewhat different from other regions. The poorest spend more on water and electricity than the benchmarks provided by the Komives et al. book (2005). Indeed, while none of the income classes spend more on water than the WHO guidelines, the poorest African income class tends to spend more than the ranges identified in other regions. For electricity, the difference is even larger since the maximum in the range from other regions is 6% while the poorest African connected to a network actually spend on average over 7.5% of their income. This suggests that tariff structures may not have paid enough attention to the ability to pay of the users—but more on this later. There is unfortunately no benchmark for transport but these numbers seem to be quite small in comparison to expenditure patterns observed in other regions where the poor may end up paying up to 20% of their income on transport services. This also reflects the very low rate of motorization, the use of alternative vehicles in the region or the very low mobility of the average African. Overall, accounting for the fact that there is no information on expenditures on telecoms services, the total expenditures covered are roughly consistent with the 15% rule of thumb, all of the income categories spend around 10% or less.

⁵² These are the 15 countries for which the household consumptions survey have already been processed as part of the poverty diagnostics being conducted by Q. Wodon and his team at the World Bank.

Table 3.3: How do household in the various income groups spend their money?⁵³
 (% of income spent on a service)

Income quintile	Water & sanitation	Elect.	Transport	Infrastructure sub-total	Education	Health	Food
First (poorest)	3.3%	4.9%	1.4%	9.6%	2.2%	2.9%	63.7%
Second	2.8%	5.4%	1.8%	9.9%	2.3%	3.2%	64.2%
Third	2.6%	4.5%	2.2%	9.2%	2.5%	3.4%	62.2%
Fourth	2.5%	4.3%	2.4%	9.3%	2.8%	3.6%	59.5%
Fifth	2.3%	4.1%	4.1%	10.6%	3.0%	4.0%	50.5%

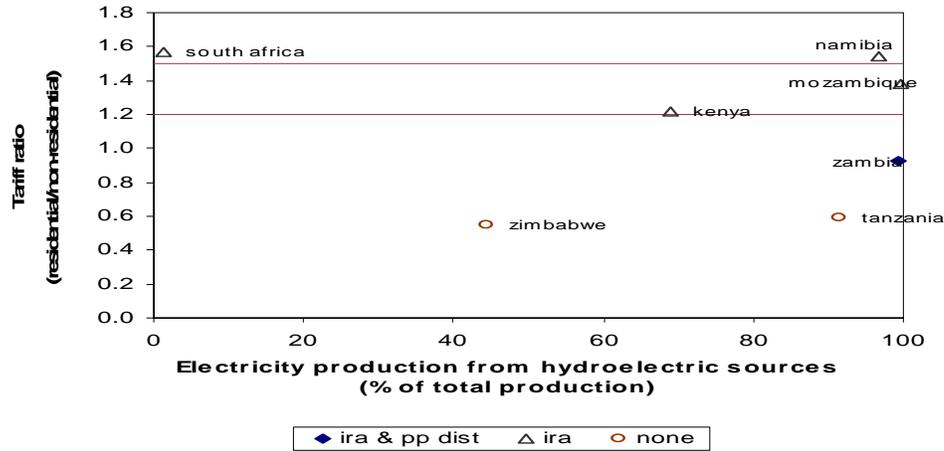
Source: Own calculations based on African household survey data for 15 countries

31. *Cross-subsidies are certainly not what they used to be.* Historically, one of the most common ways of financing expansion was to have cross subsidies from industrial users to the residential users. This has perverse incentive effects which have been widely documented and criticized for quite a while. The ideal solution would clearly be have targeted subsidies financed from tax revenue. Unfortunately, as discussed in chapter 2, Africa's tax systems tend to be highly distorted and in many instances it may be preferable to give up a little bit of efficiency to achieve equity objectives by relying on cross-subsidies to keep tariff affordable. Not all regulators or policymakers chose the same side of this efficiency-equity trade-off as seen in Figure 3.4. The Figure presents the ratio of residential tariffs to industrial tariffs. The figure accounts for the differences in costs to serve the types of clients—i.e. residential vs. non residential. It costs roughly 1.2 to 1.5 times more to serve a residential client than it does to serve a non-residential client. If the tariff ratio is in that range, not much can be said of the extent to which there are cross subsidies. If the tariff ratio is higher than that the 1.4 limit, there is clearly no cross-subsidy since the tariff ratio is higher than the cost ratio. Countries in that group have chosen efficiency over equity. If it is below, it is very likely that there is a cross subsidy, since the ratio is lower than the ratio of the costs needed to serve the two types of clients. Countries in that group have chosen equity over efficiency. Because costs are also driven by the source of energy—i.e. hydro, vs. others--, Figure 3.4 classifies the country according to the share of hydro in the total of energy sources, simply to check if there is some pattern in the behavior towards the efficiency-equity trade-off bases on the cost driver. .

32. Accounting for these two dimensions, South Africa and Namibia appear to have chosen efficiency over equity since. This may reflect their better ability to rely on the tax system to redistribute if needed. Zambia, Tanzania and Zimbabwe tend to favor equity. The choice is unclear for the other two countries because too little information is available on the cost structures. There is no clear pattern on the impact of the sources of energy on the choice in the trade-off between efficiency and equity. The Figure provides an interesting additional insight by showing that in this sample, the only countries that still rely on cross subsidies are those which have not reformed yet.

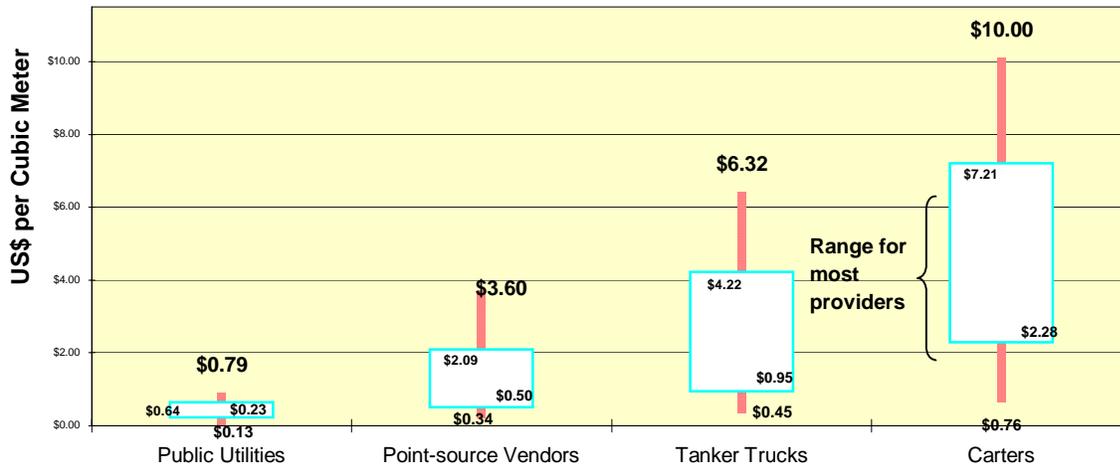
⁵³ Averages correspond to unweighted average for Kenya 1997, Malawi 1997, Zambia 1998, Cape Verde 2002, Burundi 1998, Ghana 1998, Uganda 1999, Nigeria 2001, Sao Tome and Principe 2000, Guinea 2002, Mozambique 2002, Gambia 2001, Cameroon 2001, Cote d'Ivoire 2002, and Senegal 2001.; Burundi was excluded from water average and Niger from electricity average due to data problems. Note also that * Calculation of water (electricity) expenditure was done among those who actually spend a positive amount in water (electricity). For the rest of the services, the calculation was done for total population

Figure 3.4: Cross-Subsidies in Africa's electricity



33. *What happens to people who are not connected to networks?* It is however useful to remember at this stage that only a very small proportion of the bottom 60% population classified in terms of income is actually connected to a network as seen in Figure 3.3a and b presented earlier. So it would be useful to get a sense of how affordable services are for those not connected to network and have to rely on alternative providers instead. Unfortunately, there is not much information available on the affordability of water services for the poor not connected to networks and this represents a very large proportion of the population according to the data covered in Figure 3.3a and b—at least 60% of the population. A recent study by Kariuki and Schwartz (2004) provides however a useful sense of the differences in water prices charged by a wide range of providers. This gives a sense of the differences in water service affordability between users connected and users not connected. The result of their survey of prices according to supply types is summarized in Figure 3.5.

Figure 3.5: Price of Water by Type of Service Provider



Source: Based on Kariuki and Schwartz (2004)

34. Figure 3.5 shows the wide variation in prices between different small scale providers, and within each category for different locations. While prices charged by small piped network operators are not dissimilar to those charged by the utility, unit prices for non networked services can increase several fold with the highest prices being recorded for mobile distributors (tankers and carters). For example, in Ghana, the price of water increased several fold as it moved along the supply chain (e.g. the water utility sells water to a tanker who sells it to a private individual with storage tank that in turn sells to a carter who delivers water to households in jerricans).

35. *The less “formal” the access, the higher the cost?* The evidence provided by Kariuki and Schwartz (2004) implies that the less “formal” the system on which a household needs to rely, the more likely it is that the higher the odds that the service is likely to become unaffordable and that rationing of consumption of improved water sources will be the norm. The main point is however that the evidence reviewed here confirms that the limitations to access discussed in this chapter can have very dramatic social consequences. At the policy level, as discussed later, this begs for a much more decentralized monitoring of the behavior of infrastructure suppliers. Since a close monitoring of all micro-scale providers is unlikely to happen, one of the most effective policy instruments is likely to be the promotion of competition at all levels in the supply chain. The larger the number of small actors, the closer the price charged by the resellers is likely to be close to the price these resellers pay their own suppliers.

36. *Sorting out the mixed evidence on affordability.* The message on affordability may seem a bit confusing but this is because it is a complex one and the discussion provided here may not have provided enough background on the context. Putting the numbers together should make it crisper:

- The users who are connected to a network do not have a major affordability problem
- The users who are not connected often do however have a major affordability problem, although they address it by rationing the services they consume
- Around 50-60% of the population is not connected to a utilities network and about 34% has only limited access to transport services to attend to local needs (education or health)
- The population not connected tends to be among the poorest income groups.

This implies that 50-60% of Africa’s population has a potential affordability problem for utilities services and at least about a third in terms of the affordability of its transport services. Even if these are very rough orders of magnitude, these figures hint at a major problem with the idea of relying on private operators concerned with full cost recovery without any subsidy component in the region. The usual argument that consumers are already paying unit costs for most of the services does not hold once one of the objectives is to remove the very drastic degree of demand rationing that tends to prevail in the sector, in particular among the poor— i.e. an equivalent water bill buys a much lower volume of water. Very close to the top, if not at the top of the challenges of the next wave of infrastructure reforms for Africa is the need to recognize that current levels of rationing are not sustainable. Addressing the problem will however raise complex financing issues that many policymakers in Africa and among donors are not yet willing to address.

Main messages of Chapter 3

The main messages of the chapter can be summarized as follows:

- *Africa's infrastructure market structure is "different":*
 - *More poor to serve;*
 - *More rural people;*
 - *Larger spread of population and production hubs;*
 - *Foreign and domestic investors do not always agree on infrastructure priorities;*
 - *Different priorities for investors' and households.*
- *Many African countries will need a critical infrastructure supply mass before the investment climate is considered to be favorable by investors.*
- *Progress in meeting investors' needs has been slow and unpredictable:*
 - *Measured in terms of the percentage of establishments for which the following factors are major or very severe obstacles for the operation and growth of their business, the average is 22% for telecoms, 25% for transportation and 48% for electricity. To put things in perspective, 40% of the establishments surveyed list corruption as a major or very severe obstacle;*
 - *This is also why costly self reliance continues to be widespread among commercial and industrial users.*
- *Progress in meeting households demand has varied across sectors*
 - *In telecoms, water and transport, Africa has done better than its peers, but in electricity and sanitation it did worse;*
 - *In sanitation, electricity and transport, access rates are not doing significantly more than catching up with population growth;*
 - *Progress has also favored the very rich much more than the poor and the middle class (access rates to networks attend at most to the 40% richest).*
- *Affordability is an issue for the large number of poor—over 50% of the population--and may have worsen in some sectors during the 1990s;*

Small scale providers are closing the infrastructure gaps for households but often at high production costs and at high profit margins, collected mostly from the poorest households who are those left out of the services provided by low cost producers.

4. How much of an issue are service quality and efficiency?

1. This chapter gives a rough sense of the current level of infrastructure services' quality in Africa. An assessment of quality is indeed an essential complement to the discussion of access provided in chapter 3. Access to water or electricity 4 hours a day is very different from access 24 hours a day for the investment climate. Access to well-maintained roads implies very different vehicle operating costs than having to rely on poorly maintained roads. Quality should thus be part of any assessment of the state of infrastructure in Africa. The chapter also looks at the evidence available of the cost efficiency with which services are delivered. If financing needs are to be minimized and tariffs aligned with the ability to pay, cost minimization should be a top concern for policymakers.

2. The rest of this chapter presents all the information available from comparable sources on the various dimensions of quality for each sector. It starts with a snapshot of the latest information and continues with a discussion of the evolution of some of the quality dimensions during the 1990s. The last section summarizes the evidence available on the economic and cost efficiency of the sector.

3. It may be worth pointing out that what this chapter does not show may be as important as what it does show. Indeed, it is unfortunate that very little of the data used in this chapter (except maybe for telecoms) seems to be reliable simply because quality is not measured properly and if it is, its measurement is not reported, thereby reducing the accountability of providers and regulators. The conclusions that can be drawn from the data available must thus be taken with a significant degree of caution. The only robust conclusion is that poor accountability for (poor) quality is an undeniable trademark of this sector.

The dimensions of quality and of efficiency

4. ***Quality indicators: technical vs. service orientation.*** Quality has several dimensions. The most widely reported measure is technical quality. It includes partial productivity indicators (i.e. output/employees or per connection), water or energy losses or outages or phone faults. This is a fairly objective measure which raises few issues—although their measurement is often quite uncertain. But there is also a second, much more subjective, measure of quality. It deals with the client orientation of service delivery. This can focus on relatively objective information such as number of clients per employee but it is often much more subjective. Indeed, the quality of service orientation is usually generated from perception surveys—e.g. the global competitiveness report or the investment climate assessments.

5. ***Because the cost of quality matters, economic efficiency matters.*** While these quality concepts are useful, they do not address the crucial importance of costs minimization in a sector in which cost padding is known to be quite common--and not just in developing countries.⁵⁴ Cost padding hurts the poor because it contributes to the mismatch between ability to pay and tariff required to recover costs. They usually also hurt the taxpayers because the financing gaps the operators can't recover from users tend to be recovered from taxpayers—who finance subsidies given to operators. This assessment of costs is thus not independent of the assessment of quality since quality has a cost. In an ideal situation,

⁵⁴ See Flyvbjerg et al. (2003)

quality choices would internalize the necessity to deliver services that meet the ability and willingness to pay of the users. Indeed, quality costs can hurt any users when there is an excess supply of quality just as much as lack of quality can hurt them. Not too long ago, everybody wanted to enjoy the transport speed of the Concorde, but few were able or even willing to pay for it; as a result, demand never reached the level needed to maintain the airplane financial viability. Similarly, providing a service quality associated with costs that would result in tariff levels inconsistent with the ability to pay would keep many of the poorest looking for alternative solutions to their infrastructure needs—and in the process hurt the operators. The policy solution to this problem boils down to a match between the technology choices, the ability to pay of the users, the willingness to pay and the design of the tariff structure. This goes beyond the discussion covered in this paper.⁵⁵

6. There is a second way in which quality defined broadly can result in excessive costs to the users. This is when the service providers pad costs for a given level of quality by charging tariffs which represent very high profit margins for the delivery of the service.⁵⁶ Such cost padding hurts the poor proportionately more. Controlling the risks of costs padding and ensuring that quality and overall service delivery are consistent with the willingness and ability of users to pay is one of the main purposes of the introduction of economic regulation when operators enjoy long term residual monopoly powers. The main instrument available in that context is to measure the extent to which for a given quality level, the services are delivered at the lowest possible costs throughout the duration of the contract—and recognizing that technology and know-how can improve to allow steady flows cost savings opportunities.⁵⁷ This is what estimates of cost efficiency can help monitor. To see how these measure can indeed help in performance monitoring under a wide set of regulatory arrangements, this chapter also provides a brief survey on the evidence on Africa's infrastructure performance in terms of these economic measures of cost efficiency.

A snapshot of the latest on quality

7. Table 4.1 summarizes all the information available for Africa and benchmarks it against the performance of three country groupings: low income, low middle income and upper middle income. Without even looking at the actual performance, three things stand out. First, data on technical quality is much more common than data on service quality. Service quality data on water and electricity is from the World Bank Business Environment Reports and covers 16 African countries. But data on transport and telecoms is from the Global Competitiveness Report covering only 6 countries (Botswana, Mauritius, Namibia, Nigeria, South Africa and Zimbabwe). Second, sample sizes for data on quality tend to be much smaller than for access indicators—this is true for Africa but also for all income groups. In

⁵⁵ A longer discussion of this issue is available in Estache, Foster and Wodon (2002)

⁵⁶ Although it could be argued that in developing countries, cost padding provides operators to collect a risk premium that needs to be paid to attract private capital, there is ample evidence in both developed and developing countries (Flijvberg or Guasch) suggesting that there are governance issues associated with this practice. Poor transparency in costs not only leads to inequity and short run inefficiency, it also tends to reduce competition when it allows for opaque cross-subsidies or when unscheduled cost hikes appear shortly after contracts have been awarded, raising concerns that bids are strategic rather than revealers of fair commitments by bidders. Linking tariffs to the costs of capital revised recurrently in a transparent way tends to generate fairer and more efficiency outcomes for all parties involved. But as in many matters relating to regulation, unwritten debates point to disagreements on the extent to which this conceptually more desirable approach can actually be implemented when institutions are weak.

⁵⁷ One of the main purposes of tariff revisions in regulated industries is to ensure that these cost savings are eventually shared with the users in such a way that they do not become simply a pure monopoly profit for operators, while recognizing that the sharing mechanism must maintain some degree of incentives for the operator to continue searching for cost savings opportunities.

other words, the international commitment to measure quality is essentially non-existent!—except maybe in telecoms. Third, the approximations required to get a sense of quality are even more dramatic than those that had to be made to assess access. For instance, in a sector as crucial and with such a high profile as water, there is no reasonable objective data on the technical quality of the services—i.e. water losses, chemical quality of the water delivered. The atomistic nature of the sector is a common explanation for the lack of data on quality—or on prices for that matter. The efforts to generate international benchmarks have not paid off yet. This is why the quality indicator presented here is a rough indication of the overall technical quality. Similarly, in the case of transport, the only indicator available widely is the share of roads paved. This is far from an ideal indicator since it is not necessarily the case that higher pavement rates are in the interest of all countries—since traffic should be the determinant of pavement decision. Additional approximations are in the process of being developed for the sector and covered as well.

8. ***Technical quality is poor but in par with LIC standards.*** Table 4.1 shows that Africa’s technical performance is quite poor across sectors when benchmarked against the performance of middle and high income groups. When benchmarked against its closest peer group, low income countries, the assessment is somewhat more positive. While Africa is roughly at par with the comparator for water, it seems to be doing technically somewhat better in electricity, telecoms and transport. Unfortunately, these can only be a very rough assessment in light of the limitations of the data and of the indicator availability mentioned earlier.

9. ***A very heterogeneous perception of service quality.*** It is useful to distinguish the reliability according to sample sizes. When the sample size is representative as in water and electricity, the conclusion is similar to the one made from the technical indicators. Africa does worse than the higher income countries but compares favorably to its peers. Overall, Africa’s image with respect to quality should continue to be a matter of concern to policymakers concerned with the image that their core utilities services are giving to investors and users.

10. For transport and telecoms, the data available only covers 6 countries. The emerging story is thus not very representative of the continent from a strict statistical viewpoint. It is however interesting because it concerns the few countries viewed today as “high potential host countries” by foreign investors. These countries are likely to define the image of Africa for these foreign investors and the evolution of their performance will serve as an indicator of the perception that investors are likely to have of other countries in the region.

11. Two observations emerge from these very partial statistics on perception. First, except for mobiles, Africa’s telecoms performance is still perceived as a problem even in high profile countries. While progress in access has been significant, it has thus not been matched by a perceived improvement in quality. For transport, however, except in roads, the six countries covered by the sample compare to the best performers in all income groups. This implies that Africa can deliver quality as well as anyone else in this sector. In other words, Africa can be no different from the rest of the world under the right policy and business environment.

Table 4.1: Quality ratings of the main infrastructure services in Africa

	2002 averages (sample sizes in parenthesis)			
	Africa	Low income	Lower-middle income	Upper-middle income
Electricity				
<i>Technical</i>				
Transmission and distribution losses (% of total output) ^(a)	22 (17)	24 (33)	15 (31)	14 (23)
<i>Perceived (1=worst 7=best)</i>				
Commercial perception of electricity service	4.3 (6)	2.8 (9)	4.2 (25)	5.2 (20)
Commercial perception of public agency electricity Provider ^(b)	4.3 (16)	4.0 (27)	5.0 (24)	5.3 (17)
Water and Sanitation				
<i>Technical</i>				
Piped to other sources of drinking water ratio ^(c)	0.34 (25)	0.34 (34)	0.71 (12)	0.73 (1)
<i>Perceived (1=worst 7=best)</i>				
Commercial perception of water service ^(b)	4.2 (16)	4.0 (27)	4.8 (24)	5.0 (18)
Telecom				
<i>Technical</i>				
Phone faults (reported faults per 100 mainlines) ^(d)	63 (40)	67 (49)	32 (39)	22 (27)
<i>Perceived (1=worst 7=best)</i>				
Commercial perception of telephone/fax infrastructure	4.3 (6)	3.4 (9)	4.9 (25)	5.6 (20)
Commercial perception of availability of mobile	5.7 (6)	5.0 (9)	5.8 (25)	6.0 (20)
Commercial perception of internet access in schools	2.8 (6)	2.1 (9)	3.0 (25)	3.8 (20)
Commercial perception of postal efficiency	3.7 (6)	3.1 (9)	3.5 (25)	4.4 (20)
Transport				
<i>Technical</i>				
Paved roads (% of total road network) ^(e)	25 (44)	29 (61)	48 (47)	55 (33)
<i>Perceived (1=worst 7=best)</i>				
Commercial perception of services delivered by road department ^(b)	3.7 (16)	3.4 (27)	4.2 (24)	4.1 (18)
Commercial perception of port facilities	3.8 (6)	2.6 (9)	3.5 (25)	3.8 (20)
Commercial perception of railway services	3.2 (6)	2.7 (9)	2.6 (25)	2.9 (20)
Commercial perception of air transport services	4.5 (6)	3.6 (9)	4.2 (25)	4.5 (20)

Source: Based on data presented in Estache and Goicoechea (2005)

Notes: averages figures correspond to unweighted averages of data available. The universes of countries by group are: Africa 48 countries, low income 65, lower-middle income 52, and upper-middle income 38

(a) Africa average includes 1 observation in 2000, and 16 in 2001

(b) Data available in 2000

(c) Africa average includes 4 observations in 1997, 6 in 1998, 6 in 1999, 4 in 2000, 4 in 2001, and 1 in 2002

(d) Africa average includes 5 observations in 1997, 6 in 1998, 5 in 1999, 2 in 2000, 6 in 2001, and 16 in 2002

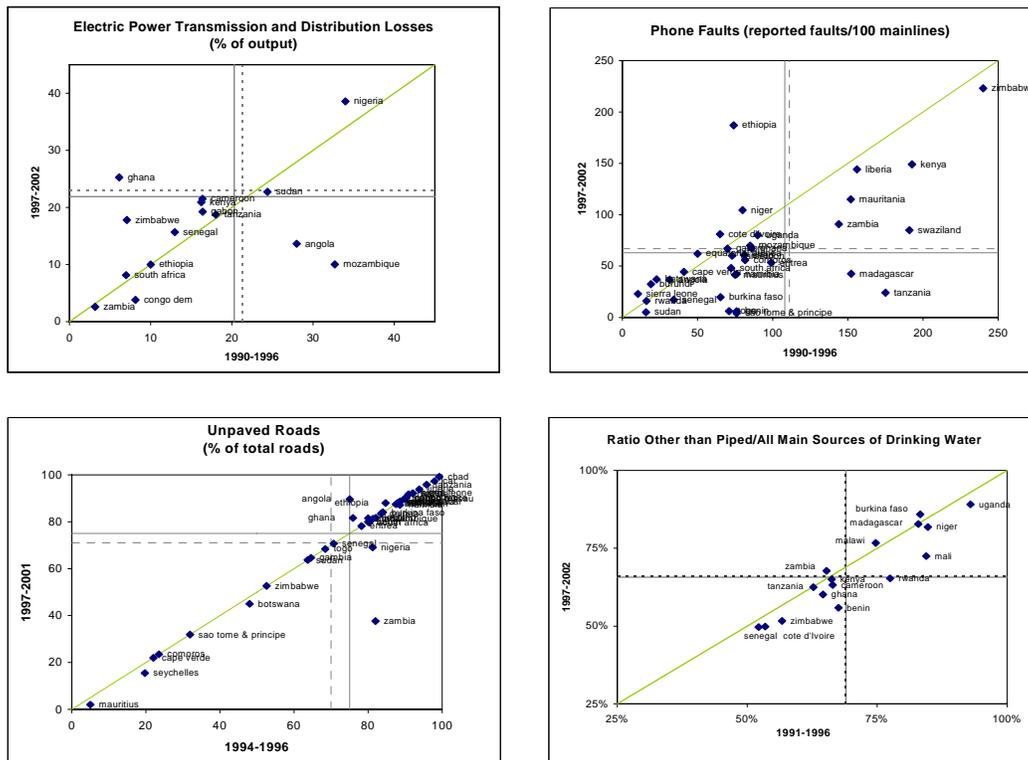
(e) Africa average includes 1 observation in 1997, 1 in 1998, 32 in 1999, 6 in 2000, and 4 in 2001

Is quality getting better?

12. Figure 4.1 provides a very visual comparison of the quality performance for each of the four sectors in two points in time. The principle built in these figures is similar to the one used in the previous chapter when comparing the evolution of access rates. The specific position of a country in a sector box gives the level of quality along the horizontal axis for the initial period and its level in the final period of observation in each country. If a country is exactly on the diagonal, it means that quality has not changed between the two time periods as in the case of the access rates. However, the rest of the interpretation has to change when compared to the use of this visual gimmick in the case of access rates because quality is measured “negatively”; i.e. energy losses, phone faults, unpiped water or unpaved roads. If a country is above the diagonal, it means that the quality measured is worse at the end of the period than at the beginning and vice-versa if a country is below the diagonal. Note that the countries which have the largest improvements are those which were in conflict at the beginning of the period and were in peace at the end of the period. As for the countries which have seen the worse deterioration, they cover most of the countries in which there were frustrated attempts to reform or in which reforms lead to better measurement of problems. The apparent generalized deterioration in the telecoms sector is widely believed to be a measurement problem: the reforms have resulted in better measurements and this improved measurement does a better job at identifying problems.

Figure 4.1: Evolution of Africa’s infrastructure services quality in the 1990s

(above the diagonal means a deterioration in quality rates, below means an improvement, on the diagonal means no changes)



Source: Estache and Goicoechea (2005). Electricity and transport data are from World Bank World Development Indicators. ICT data are from International Telecommunications Union. Water data are from Demographic and Health Surveys.

Notes: (i) Figures for ICT, transport and water correspond to the most recent observation available for the period. For electricity, the figures represented are the averages for the period; (ii) In some graphs outliers were not represented for scale purposes, (iii) The quality indicator for water refers to the ratio between households using well, surface, rain, tanker truck, or bottled water (other than piped) to households using piped, well, surface, rain, tanker truck, or bottled (all) water as main source of drinking water.

13. As in the assessment of the evolution of the access rates, Figure 4.1 also reproduces for each sector, the African and the low income group average performance in the two periods—the continuous vertical line for 1990 and the continuous horizontal line for 2002 for Africa and the equivalent discontinuous lines for LICs. These two sets of lines allow getting a visual sense of the extent to which Africa is performing in comparison with its peers. Except in electricity where the performance has somewhat deteriorated, very little change in the relative performance with respect to peers has occurred during the 1990s.

14. *Main lessons of the evolution during the 1990s.* The main lessons that can be derived from Figure 4.1 and the other information presented so far can be summarized as follows:

- Africa's quality performance has been and continues to be very comparable to that of its peers; this also means that Africa's quality performance continues to lag significantly best international practice and that very little catching up is taking place; the only exception is for the roads sector—according to the weak measure covered here--;
- In electricity, the general sense is a poor and deteriorating average performance but the story is a more complex one; the data on quality reported here reflects an assessment at the country level which is not totally compatible with what emerges from an assessment at the operator level. Comparable data is available for a sample of 9 countries. According to that sample, the story in terms of the signs of the changes in performance for Ethiopia, Ghana, Kenya, Mozambique, Tanzania, and Zimbabwe is the same at the country and the operator level. In terms of performance levels, the story is comparable for Ethiopia, Kenya, and Tanzania. In Ghana and Zimbabwe, however, the increment of losses at the country level was much higher than the increment of losses observed at the utility level; while in Mozambique, the reduction in losses at the country level was bigger than the one at the utility level. In Senegal and South Africa losses have fallen at the utility level and increased at the country level. In contrast, Zambia presents an increase in losses at the utility level and a reduction in losses at the country level. Once more, this raises serious data concerns;
- In water, the average quality performance has not evolved significantly; most importantly, very few of the poor performers are managing to catch up with the top performers (Mali and Rwanda seem to stand out on this front), also quite notable is the very wide diversity of experiences since the observations are spread across the two extremes of the diagonal. More recent information collected by the Water Utility Partnership for Africa on other performance indicators during the 1997-2003 period suggests that Africa is still far from meeting service quality expectations. In a sample of 98 utilities representing 28 African countries, water services are available 17 hours per day (on average). But the standard deviation is 7 hours. Moreover, 25% of the 98 utilities provide water services for less than 12 hours.
- The overall telecoms quality performance has significantly improved—as it has in most parts of the world but as in the case of water, little catching up has taken place between the African laggards and the African leaders although most countries continue to be good performers as indicated by the strong concentration in the bottom left quadrant; the technical lag with the higher income countries continues to be significant however;
- For the road sector, the quality indicator measured here has been characterized by a status-quo—most countries are almost exactly on the diagonal.

15. ***Relying on the engineers' wisdom to refine the assessment.*** Many sector specialists, in particular the engineers who spend most of their life on the field, are likely to be irritated by these very aggregate bird-eye views of the evolution of the sector. This is with some reason since they tend to be much more familiar with these technical measures than anyone else. Indeed, the “macro” figures reported here hide much more complex quality situations in the field and country specific knowledge to which this brief overview does not do justice. Once more the lack of commitment to serious accountability and the related lack of data are to blame for this situation.

16. Although they are not always strictly comparable across countries, the data generated within the sector often provide very useful complementary information which allows refining the “big picture” policy assessment. They deliver very good reality checks on what is happening in the sector because they rely on more precise indicators. For the roads sector for instance, in one of the background papers to this paper, Desmarchelier (2005) provides more recent and more precise evidence on the state of roads collected in the field recently (2003-2004). He suggests that quality is indeed an issue. To do so, he shows for a sample of 14 African countries that only 52% of the classified networks in these countries are in good or fair condition, with a performance spreading from the 20-30% in countries such as Cameroon, DR Congo, Guinea, Mali or Senegal to over 70% of the roads in good condition in Burundi, Gabon or Uganda.⁵⁸ In the background note on Water and Sanitation, Estache and Tracz (2004) synthesizing country notes produced by the sanitary engineers of the World Bank provide information on water network losses, a more precise measure of quality. For that sector also, they show that quality is indeed an issue and a much bigger issue than suggested by the approximation covered in figure 4.1 suggests. Indeed, they show that during the 1990s, water utilities achieved levels of water losses averaging 31%. A figure roughly confirmed for the 1999-2000 period for a sample of 98 African utilities operators based on data is collected by the Water Utility Partnership for Africa (<http://www.wupafrica.org/spbnet/>)—with an average of 35% unaccounted for water with a standard deviation of 0.19-- This data is however not reported on a systematic basis by any international sector specific watchdog and cannot be compared across regions or income groups.

17. ***Summing up on quality.*** The main overall lesson for Africa from this overview is that quality continues to be an issue in the region. The correlation with access rates is however striking. The top performers in access tend to also be the top performers in quality—although there are exemptions. This suggests that when a country has a sector policy problem, it is likely to be multidimensional rather than simply about access or quality. It also suggests that the ideal indicator for access rates should be a quality adjusted access rate, whatever the sector analyzed.

Are costs levels an issue?

18. A common impression not unique to Africa is that in many instances, policymakers with a budget constraint tend to react to that constraint by asking for more money from the taxpayers. A common more desirable alternative response is often to improve cost recovery. This is very clearly likely to be a top priority in the reform agenda for most sectors in most countries. Cost recovery achieves financing objectives but also signal objectives for both users and operators. Operators inform their investment decisions on their willingness to pay and on the commercial losses revealed by the total level of cost recovery. Users also adjust

⁵⁸ Very often the size of the classified network has been voluntarily limited to better fit the maintenance budgetary constraints. The rest of the network, sometimes larger than the classified network is not maintained and almost entirely in poor condition

their consumption levels and their waste of resources to the cost it represents to them. When access to services is scarce as it is in Africa, demand management is an important policy dimension. It is not an easy one however as seen for one of the few sectors for which information is available. Based on the information from a sample for 27 water utilities collected by IBNET, the average recovery rate for operational expenditures between 1997 and 2002 was around 18.5%. The fact that cost recovery is a major issue does not make it the only issue. Indeed, one of the most successful areas of improvement widely recognized—and clearly documented in the 1994 World Bank WDR—is the need to look for cost savings to reduce the financing requirements and close the gap between ability to pay and the demands of cost recovery.

19. While quite intuitive, the search for cost savings seems to be just as difficult to implement as improved cost recovery, in particular in regulated industries owned by the government. Political pressures and other constraint can make the option just as politically unrealistic in some instances as the quest for improved cost recovery. It is however useful to try to get a sense of what these potential savings are. This quantifies the financial cost associated with political constraint which impede cost minimization or cost recovery. Equivalently, when reforms which may be designed to improve the cost and the recovery performances, including increased private sector participation, are considered, it provides an estimate of the possible gains from reform. Being able to assess correctly the potential for cost savings is however not an easy task. Data once more is an issue. Few African countries enjoy a good tradition of public sector accounting or accountability, whether the operator is public or private. This is why approximate solutions need to be relied on. The following is an overview of the rough approximations available on costs padding in infrastructure services in Africa.

20. ***How to roughly assess if costs are excessive?*** There are two major approaches to assess the extent to which cost can be excessive. The first is based on detailed information available at the project level for each individual project. The second approach to assess the scope for cost savings is based on analytical assessments of performance at the sector level, ideally in terms of costs, but if that data is not available, it can be approached from data on the production performance

21. ***What project level information can teach us about costs.*** Project level information is not too hard to come by, including for Africa. Aid agencies are indeed a useful source of information on project level data. The projects they finance tend to be approved by boards which generate a de facto ex-ante audit of costs. Many of the aid agencies also have evaluation departments which generate ex-post audits. For any given project, the comparison of the ex-ante and ex-post performances provides information on the level of costs over-runs but also on costs under-runs—which tend to reflect disbursement problems. While a cost overrun may simply reflect changes in the environment in which a project is being implemented, it could also reflect a tendency of operators—sometimes in collusion with governments—to pad costs once they have won the contract. Contract renegotiations which result in higher costs for equivalent commitments appear indeed to have become the norm in transport and water and sanitation around the world—much less so in telecoms and electricity though. The detailed study of infrastructure concessions experiences in Latin America by Guasch (2003) shows how common renegotiation in infrastructure can be. For Latin America, 75% of the water and transport concession contracts were renegotiated with cost increases as one of the most common outcomes. The world wide assessment of transport projects conducted by Flyvbjerg and colleagues (2002, 2003(a), 2003(b)) in over 30 countries, including developing countries, provides ample evidence on the linkages between renegotiation and cost levels. Both groups of researchers imply that these renegotiations take

place because governments tend to trade-off the transaction costs associated with re-bidding the contracts vs those associated with renegotiating in favor of renegotiation.

22. ***Project level cost overruns vs. cost under-runs in Africa at the World Bank.*** Table 4.2 summarizes the results of a survey of ex-post audits conducted on World Bank infrastructure projects with significant cost over- or under-runs between 2001 and 2004. The table benchmarks Africa's performance against performance against the performance of the rest of the World Bank's borrowers and does so for every sector. The first observation is that few projects are exactly on target—which is not surprising given the high level of uncertainty that tends to be associated with most infrastructure projects in any country of the world—and that projects without the relevant data are more common in Africa than in other regions. The second observation is that Africa has a larger share of under-runs than the rest of the developing countries. The ideal explanation would be that projection implementation reveals costs savings. This is not the case unfortunately. The large number of under-runs is the result of major disbursement problems in the region. Indeed, many commitments endorsed by the board do not get disbursed—often for very good reasons, but these go beyond our scope here.

23. Focusing on over-runs, the data provides useful insights as well. First, the World Bank experience suggests that Africa is doing, on average, better than other regions. Indeed, its cost overruns in recent years were roughly 20% vs 22% for the rest of the borrowers—again there are some explanations, including the composition of loans, i.e. works vs. technical assistance. This good news is however only relative. It does suggest that when costs overruns exist, they increase costs by about 20%. Second, the sector specific information is to be taken with significant caution for Africa in view of the small sample sizes. It suggests a wide range of experiences across the sectors and not only in Africa. For Africa, as in the rest of the world, cost overruns tend to be the highest for transport and lowest in the telecoms sector (5%). A final point of relevance is not reported in the table. World Bank projects tend to have three main components: financing of works, purchases of goods and purchases of services. The works component tends to be the largest one. While it is not possible to decompose the information for the database used to estimate the 20%, a smaller sample size suggests that in Africa the overruns tend to come much more from the purchases of goods and services than from works. In that case, the cost of overrun may not simply be about with cost padding. For goods and services, cost overruns may also reflect exchange rate fluctuations since large share of goods and services used in infrastructure can be imported.

24. ***Estimating potential costs savings from efficiency studies.*** The second approach available to assess the potential for cost savings in a sector is an extrapolation from estimates of the economic efficiency performance of the sector. The concept of economic efficiency is however much more popular among economists—in particular modern regulatory economists--than among other sector specialists. Many engineers and financial analysts working on utilities or transport have their preferred set of partial performance indicators—output per worker or per machine, number of employees per type of equipment, output or input losses, clients per employee, etc..... These are useful for day to day monitoring but can be misleading when dealing with many regulated decisions on costs--and hence for tariff design. By focusing on specific inputs only or ignoring the multi-output nature of many businesses, it is difficult to get a good sense of the potential for cost savings that can be achieved from a reform of the sector that deals with all inputs and outputs jointly.

Table 4.2. Cost over-runs and under-runs in World Bank Infrastructure Projects in Africa

	Average project cost as % of initial cost		Number of projects	
	Africa	Rest of WB clients	Africa	Rest of WB clients
Energy and Mining				
Overrun	17%	14%	3	9
Underrun	-33%	-25%	14	32
On target			0	2
Total projects with data	-24%	-16%	17	43
Water and Sanitation				
Overrun		23%	0	9
Underrun	-25%	-29%	7	28
On target			0	0
Total projects with data	-25%	-16%	7	37
Global Information/Communications Technology				
Overrun	5%	11%	1	1
Underrun	-15%	28%	1	4
On target			0	0
Total projects with data	-5%	-20%	2	5
Transport				
Overrun	30%	27%	3	23
Underrun	-20%	-25%	13	39
On target			2	2
Total projects with data	-10%	-5%	18	64
Urban Development				
Overrun	13%	12%	1	4
Underrun	-21%	-36%	11	25
On target			0	0
Total projects with data	-18%	-29%	12	29
All sectors				
Overrun	20%	22%	8	46
Underrun	-25%		46	128
On target		-28%	2	4
Total projects with data	-17%	-14%	56	178
Total projects without data			10	20

25. Regulators who need a more balanced view of performance generally rely on a synthetic indicator of efficiency changes over the specific period of observation. This synthetic indicator accounts jointly for all inputs—or as many as data allows--and all outputs into a total factor productivity indicator (TFP). This approach is now the most common among modern regulatory agencies. Regulators can also rely on techniques to separate the TFP changes into its sources. This allows an assessment of the extent to which changes in costs are due to changes in scale, changes in technology or simply changes in the effectiveness with which the operators run their business.

26. While the measure of economic efficiency and of its components has been the subject of many academic publications, few of those studies generate information on Africa—fewer than 10 over the last 15 years. Table 4.3 offers a survey of the most recent cross-country evidence available on the efficiency levels and productivity gains for four infrastructure sub-sectors in Africa (railways, water, electricity and telecommunications). Some of the studies focused on efficiency levels, some on their changes and others on both. Some of the studies relied on a linear programming technique (Data Envelopment Analysis or DEA) and some on econometric techniques to assess the minimum cost or maximum production that an operator should be able to reach. The various efficiency measures of interest are derived from a comparison of the actual cost or production performance with the estimated “optimal” performance accounting for all inputs available and the diversity of outputs to deliver. The method matters when very specific assessments are needed but for our purpose here, the diversity in approaches does not influence.⁵⁹

27. **...so what do these efficiency studies tell about potential cost savings?** Overall, they suggest that production costs are excessive in almost all sectors (i.e. with averages excesses ranging from 15% to 45% according to the sectors), with the exemption maybe of the telecoms sector where the technological revolution has guaranteed the right incentives to maintain cost cutting efforts.⁶⁰ For a number of reasons, these are very rough conclusions. Besides a number of conceptual problems, only two of the studies provide all the required information simply because they were the only one to have all the data needed to do so. Despite these limitations, these studies provide some unique insights on the costs savings potential in Africa that no other type of analytical assessment has so far generated.

28. The first full study is on the performance of the 10 African railways operators over a 21 year period by Mbangala (2004). It shows that cost reductions are likely to have been very modest given that railways efficiency has only improved at 1.1% between 1980 and 2001 and this accounts for both improvements in management and improvements in technology. The average efficiency level is also relatively low with 77.1%. Also, since this covers a long period, it is actually an overestimate because the average performance has deteriorated over time. Perelman and Mbangala (1997) found an average efficiency level of 86.4% for the 1975-1990 period for roughly the same sample of operators and with the same methodology. Ignoring this evolution for now, this efficiency level implies—very roughly—a minimum average excess cost of over 20% in the sector. The second full diagnostic is for electricity generation by Tovar and Trujillo (2005). It covers 13 countries—mostly East African—between 1998 and 2001. It suggests that potential efficiency gains that can be controlled by the operators—i.e. the best assessment of the upper bound for cost padding-- are in the order of 15% of the performance. It also shows however that the level of demand is a much bigger source of concern. Inefficiencies of scale are in the order of 24% for the sample. More

⁵⁹ For more details, see Coelli et al. (2003)

⁶⁰ This extrapolation from partial data on production and on inputs is a very far stretch conceptually since it uses information on efficiency levels in production to imply cost efficiency levels. It is only done to provide a very rough order of magnitude. Not a precise measurement.

disappointing is the fact that the demand shocks that hit the world, including Africa after the Asia crisis seems to have contributed to the decline in demand. This, in turn probably explains the annual decline in average efficiency levels between 1998 and 2001 of 7.7%.

Table 4.3: A survey of cross-country studies on economic efficiency in infrastructure in Africa

	Method	Variables for performance indicators (outputs) and explanatory variables (inputs)	Efficiency story available
Electricity			
Tovar and Trujillo (2005)	Data Envelopment Analysis (DEA) 13 countries 1998-2001	Output: water production Inputs: capital, labor, energy costs, material, other input costs	Average efficiency level Technical: 85.5% Scale: 76.1% Average efficiency change: -7.7%/year
Water			
Estache and Kouassi (2002)	Econometric model 21 utilities 1995-1997	Output: electricity production Inputs: labor and capital	Average efficiency level: 54% Change in efficiency: n.a.
Tynan and Kingdom (2005)	Econometric model 33 countries 270 world water and sanitation providers (83 in Africa)	Output: O&M costs Inputs: population served, connections/customers, volume of water produced, size of network	Significant scales efficiency effects: a doubling of population served only increases O&M costs by 61% Much lower economies if size is measured in terms of volume of water produced or network size
Telecoms			
Colson and Mbangala (2003)	DEA 12 countries 1980-2001	Outputs: international traffic (minutes) Inputs: main lines, full time staff	Average efficiency level: n.a. Change in efficiency: 3.1%/year (of which 2.7%/year is from innovation)
Railways			
Perelman and Mbangala (1997)	DEA 9 railway companies 1975-1990	Output: Tons-km and Passengers-km Inputs: rolling stock + labor	Average efficiency level 86.4%
Mbangala (2004)	DEA and Malmquist index 10 railways companies 1980-2001	Output: Tons-km and Passengers-km Inputs: rolling stock + labour	Average efficiency level 77.1% Change in efficiency: 1.1%/year

29. For the other sectors, the information is only partial. As expected the telecoms sector has seen major improvements in efficiency. Colson and Mbangala (2003) show that it was 3.1% on average a year, over the last 21 years but most of it has come from innovation (2.7%). For the water sector, much less information is available. One of the papers however suggests enormous potential cost savings based on the very weak average performance of sector with an average efficiency level in the mid 1990s of about 54% in a sample of 21 countries, with only 12% of the firms in the sample operating at or close to their optimal level. The Tynan-Kingdom (2005) study is noteworthy in that it generates useful quantitative indicators on the potential sources of savings from scale economies in Africa.

30. **Other ways of looking at costs.** Once more, the economic approaches are not the only ones to generate information on potentially excessive costs in the sector. Engineering data could help also identify cost related policy issues. This is the case for the road sector for instance. Table 4.4 gives the percentage of the classified network, which carries less traffic than the usual threshold used for each technical type. In other words, it shows the percentage of the network that could have been “over-designed”. Taking these data with all necessary precautions, they nevertheless identify a potential issue. Indeed, the data suggest that some of the investments in the road sector may not be the most cost-efficient given Africa’s traffic

level. This is quite surprising in a situation where budget constraints are tight and investment needs to address a wide variety of demand are limited. Indeed, “over-engineering” might make sense if it prepares for a soon-to-come increase in traffic or if it allows for better resistance to improper maintenance. Yet, for the first case, due to lack of maintenance, the increase in traffic has not time to materialize before the road condition deteriorates massively. For the second case, over-engineering is currently not aimed at this goal and therefore fails to compensate for lack of maintenance. This mis-placed over-engineering is therefore done at the expense of the absolute size of the network in the short to medium run when resources are limited. A larger network which provides a lower level of service may have much larger long term growth pay-off than a small network providing a disproportionately high level of service, if the large network gets Africa on a higher or faster growth path.

Table 4.4: Road network standards appropriateness

	Percentage of paved road carrying less traffic than 250 vpd		Percentage of gravel road carrying less traffic than 50 vpd	
Burkina Faso	24.60%	2003	na	
Burundi	27.60%	1999	na	
DR Congo	53.12%	2004	92.50%	2004
Ethiopia	17.00%	2003	na	
Gabon	na		39.00%	2003
Guinea	46.02%	2003	na	
Mali	18.46%		na	
Mozambique	14.25%		56.90%	
Rwanda	6.00%		na	
Uganda	5.00%		na	
Averages	23.56%		62.80%	

Source: Desmarchelier (2005)

Main messages of Chapter 4

The main messages of the chapter can be summarized as follows:

- *The quality of Africa's infrastructure can only be approximated because the quality of data on Africa's infrastructure is exceptionally poor;*
- *The average quality of Africa's infrastructure is poor but based on the data available, it is consistent with the quality of infrastructure of its income peers;*
- *The technical quality performance varies significantly across sectors:*
 - *Except in telecoms, catching up with best practice is very slow.*
- *The perception of quality is poor for water and energy—there is not enough data on transport and telecoms to have a full picture for the region;*
- *The top performers in terms of quality also tend to be the top performers in terms of access;*
- *Assessments of the 1990s performance for a large sample of countries hints at the need to assess cost much more carefully:*
 - *Recent studies find excess costs ranging from 15% in energy to as much as 45% in water;*
 - *Over-engineering of projects when budget constraints are tight may push Africa into lower or slower growth path;*
 - *Lower costs will also contribute to reduce the financing requirements of the sector;*
 - *The focus on the need to minimize cost should however not distract from the importance of cost recovery to ensure the long term viability of the sector in terms of its fiscal costs, its efficiency as well as its equity.*

5. Market Structures, Institutions and their Reforms

1. This final descriptive chapter provides a partial view of the evolution in the market structures and in the institutions of the various sectors. The description is partial because it only focuses on only two dimensions of market structures and institutions: (i) the extent to which there is some degree of private sector participation in the sector (PPI) and (ii) the extent to which governments have decided to signal their commitment to transparent and accountable regulation by creating an “independent” regulatory agency (IRA) for the sector.⁶¹

2. The two dimensions were chosen because they are among the most controversial of the 1990s. Specific new data were generated for this paper to identify their actual importance in Africa. As it turns out, quite consistent with the fact that only 10% of Africa’s investment needs were financed by the private sector, these data show that these two dimensions are not the central organizational or institutional issues for many sectors.

3. Many other dimensions have been considered during the 1990s reforms which have influenced the infrastructure markets and their institutions—i.e. decentralization, separation of rural and urban agencies, restructuring to promote competition, etc. These will not be addressed here, even though they are obviously critical determinants of the effectiveness of Africa’s governments to meet the needs of their populations, in particular their rural poor.

4. Even within the two dimensions analyzed here the information is partial. There are many ways to introduce the private sector—sales, concessions, services or management contracts, outsourcing, etc.--and to develop an accountable regulatory capacity—sector specific vs. multi-sector, contract based vs. discretionary regulation, etc. It is however beyond the scope of this paper to generate data at that level of detail for all countries of the regions and all sectors. When the information is available, it will be discussed appropriately.

5. The chapter is organized as follows. First, it provides an overview of Africa’s experience in adopting PPI options and in introducing independent regulators. It does so, as in earlier chapters, comparing Africa with other regions. Next, the chapter provides a systematic assessment of the correlation between the performance of each sector and the adoption of either one of these two policies or both. The idea is to simply present the stylized facts without much of technical assessments of what explains these facts. This is done in the last section which provides a brief overview of the econometric evidence available on the impact of these reforms--so as to provide a better assessment of the impact of the reforms in terms of the main policy dimensions for the sectors and the dimensions for which the data is available. In that context, there is an explicit discussion of the importance of corruption for infrastructure in Africa since it seems to be one of the emerging issues in policy circles, catalyzed by the recent Transparency International Global Corruption Report (2005).

6. Table 5.1, presented later, provides a quantitative snapshot of PPI and IRA in Africa as of mid 2004—the country specific data is available in the statistical appendix.⁶² The utilities and transport surveys were conducted in very different ways. For utilities, the survey was

⁶¹ There is quite a widespread interest in assessing these reforms but most rely on country specific case studies or on small samples of countries. See for instance, Clark et al. (2005), Eberhard et al. (2005), Bhagavan (1999) or Karekezi and MacKenzie (2002) or Karekezi et al (2001)

⁶² For utilities, the methodological details on the survey are described in Estache and Goicoechea (2005). For transport, the details are provided in Ouedraogo (2005).

designed to provide only a very global view of the situation. Indeed, when sending questionnaires or interviewing individuals the two specific questions asked were as follows:

(a) Has a regulatory body that is separate from the utility and from the Ministry started to work?

(b) Is there any (significant) private participation in the financing of the sector?

The idea was to get a binary answer (yes or no) to these two questions. On the second one, the information revealed by the replies reveals the extent of foreign private investment rather than the extent of any private participation—i.e. including domestic investment. This is the focus we also have in Table 5.1.

7. The information provided in Table 5.1 also reflects the differences in the approaches followed for the two groups of sectors. The main advantage of the approach followed for utilities is that it proved to be relatively easy to benchmark Africa against other countries through a wide dissemination of the questionnaire. The main limitation on the utilities side is that the information collected does not say anything about the intensity or the share of the private sector contribution to the sector. Yet it is well known that the relative importance of the private sector in a given infrastructure activity varies significantly across countries but also across services within a sector. The generation of information at this level of details is one of the main advantages of the transport questionnaire. Indeed, for transport, a much more detailed questionnaire was sent first and a consultant followed up with one on one interviews of sector specialists for each country. The information reported here is only a small part of the information collected for transport. That survey, shows, for instance, that while 28% of the African ports rely on private warehousing, only 1% rely on private pilotage. This level of detail of this approach made it impossible to benchmark Africa against other experiences in the context of this paper.⁶³

8. On the regulatory agency, it is also important to note that the information collected only reflects the existence of the regulatory agency but it does not capture the extent to which the agency is de facto independent. It does not either capture the extent to which an agency covers multiple sectors or is sector specific. Some respondents volunteered this information but it was not sufficient to be able to have wide enough coverage.

Africa's experience with PPI

9. *So ...how strong is the presence of the private sector in Africa, really?* The strongest private sector presence is for ports with 57% of the countries with ports working with some type of PPI. Next is in the telecoms sector with 51%. However, even there—and this is for the fixed line business only--, it may seem to be low in comparison to common wisdom on PPI in the sector. This is because a somewhat surprisingly large share of the operators has actually been corporatized but not privatized. Next in line in terms of the PPI performance are rail and electricity generation--over 40% of the cases for these three infrastructure business lines. Note that this does not mean that all of these activities are privatized. It simply means that these sectors have been unbundled enough to allow some parts to be operated by the private sector. In many instances, the segments in which the private sector is present are not essential to the operation of the infrastructure service. In airports for instance, only 26% have some form of PPI deal—in airport management--, but when accounting for private sector participation in commercial services the share increases to 46%. Considering aeronautical services, it drops to 21% and for air traffic control to 8%. In electricity generation, it simply

⁶³ See the background paper by Ouedraogo, F. (2005) for details.

means that there is at least 1 private generator. In a sense, this data tells more about the degree of opening of the infrastructure business to competition for or in the market in at least some segments.

10. The sectors the least successful in attracting private sector interest are water and electricity distribution for utilities and airport infrastructure, where fewer than 30% of the countries count on PPI, with the lowest performance for the water sector with only 1 country in 5. All in all, Africa's performance on this front is consistent with that of its peers. It is however well below the performance of lower-middle and upper-middle income.

Table 5.1: Extent of reforms in Africa's infrastructure sectors as of 2004

	shares of sample (% of total sample size for each country grouping given in parenthesis)			
	Africa	Low income	Lower- middle income	Upper- middle income
Electricity				
Existence of Independent Regulatory Agency	36% (44)	38% (61)	63% (43)	63% (32)
Existence of Private Capital in Electricity Generation	41% (46)	41% (59)	48% (42)	58% (33)
Existence of Private Capital in Electricity Distribution	28% (46)	29% (62)	37% (43)	48% (33)
Water and Sanitation				
Existence of Independent Regulatory Agency	12% (42)	11% (55)	32% (38)	28% (29)
Existence of Private Capital	20% (44)	18% (55)	50% (40)	47% (32)
Telecoms				
Existence of Independent Regulatory Agency	77% (48)	69% (65)	60% (52)	71% (38)
Existence of Private Capital	51% (47)	50% (64)	62% (50)	72% (32)
Transport – railways				
Existence of Independent Regulatory Agency	3% (31)	2% (41)	8% (38)	19% (21)
Existence of Private Participation	48% (31)	34% (41)	26% (38)	60% (20)
Transport – ports				
Existence of Independent Regulatory Agency	22% (23)	n.a.	n.a.	n.a.
Existence of Private Participation	57% (26)	n.a.	n.a.	n.a.
Transport – airports				
Existence of Independent Regulatory Agency	11% (27)	n.a.	n.a.	n.a.
Existence of Private Participation	26% (27)	n.a.	n.a.	n.a.

Sources: Estache and Goicoechea (2005) and Jane's World Railways 2003-04.

Notes:

* Independent agency refers to a body that is separate from the Ministry and from the operator in terms of financing, decision-making, and structure.

* Private participation refers to the existence of any kind of private participation including management and service contracts. Private capital refers to private participation that requires capital investment from private parties, includes only concessions, divestitures, and built-operate-transfer (BOT) contracts.

* Rail data was published in 2004, but there is a lag of about 2 years in the data. Thus, it would be more accurate to say that rail data is a snapshot of 2002.

* Ports and airport data is based on a survey of World Bank task managers conducted in the fall of 2004

11. *Which sector made the most of PPI in the 1990s?* To keep things in perspective, it may be useful to point out that considered jointly; it is this level of private sector presence that financed no more than 10% of Africa's investment needs during the 1990s. Latin America, the best performer on this front, managed to generate private financing of about 35% at most for its needs. Table 5.2 provides some insights on the sectoral distribution of the private sector commitments to Africa since the early 1990s. Roughly 70% of those went to the telecoms sector and about 20% to the electricity sector. Neither transport nor water and sanitation were very effective at attracting the private sector. Table 5.2 also shows that average project sizes confirm the total volume bias in favor of telecoms and electricity.

Table 5.2: Nature of Private Participation in Africa's Infrastructure (1990-2003)

	Concessions	Greenfield	Divestiture	Management	Total
Electricity					
Total investment (US\$ millions)	1,682	3,377	1,104	13	6,175
Number of projects	12	21	5	10	48
Average project size (US\$ millions)	140	161	221	1	523
Water & Sanitation					
Total investment (US\$ millions)	197	13	..	21	230
Number of projects	2	2	..	10	14
Average project size (US\$ millions)	98	6	..	2	107
Transport					
Total investment (US\$ millions)	1,709	871	169	0	2,749
Number of projects	18	12	3	11	44
Average project size (US\$ millions)	95	73	56	0	224
ICT					
Total investment (US\$ millions)	..	11,960	9,375	388	21,724
Number of projects	..	95	15	2	112
Average project size (US\$ millions)	..	126	625	194	945

Notes:* Total investment adds investment in government assets and investment in facilities and is based on commitments.

12. *Which contract types are the most popular for PPI in Africa?* In total, greenfield contracts are the most popular but this is driven by the experience of the two most attractive sectors for investors where greenfield projects tend to dominate all other contract forms. The electricity sector has also seen a fair volume of concession and management contract while for the telecoms sector, the second most common type of PPI arrangements are divestitures or sales—but way behind “Greenfield projects”. For Water, the preferred instrument is a management contract. For transport, concessions dominate but are followed closely by concession

13. *...By the way, how diversified is the private sector supply?* In many of the restructuring countries which managed to attract private operators, one of the main associated policy changes that took place was the adoption of competition policies. These were intended to stimulate cost efficiency gains which would eventually have to be shared with the users.

Across sectors, changes were designed to increase the number of actors in infrastructure service delivery. Because of economies of scale and scope and, in many African countries because of the high commercial risks faced by private operators, limits to the achievable degree of competition in the market continued to prevail in most cases. In small economies, monopolies are indeed hard to avoid in water and energy distribution and in bigger countries, national monopolies are replaced by regional or local monopolies. This is why competition for the market has become so popular during the 1990s. Residual monopolies were auctioned --rather than awarded through beauty contests or negotiations--because auction theory promised to deliver many of the gains that competition in the market would have delivered.

14. One of the assumptions implicit in this promise was that the number of potential providers in the sector would be large enough to allow competition for the market to be effective. This did not happen for all sectors. In some sectors, the number of players is simply too small to be able to expect very competitive markets for the business. Moreover, in most infrastructure sectors, when risks are high, the few potential players tend to hedge by competing as members of consortia rather than as individual providers. This can cause a problem in any infrastructure sector, in any region. A recent study assesses the degree of concentration of infrastructure sectors across regions. The study measures the impact on the potential supranational control of a regional market by a limited number of suppliers.⁶⁴ As seen in Table 5.3, for Africa, it only finds a clear problem in the water sector and somewhat surprisingly a possible problem in the mobile phone industry. This means that in any given country, in most sectors, there are enough potential suppliers to ensure that competition for the market works in all sectors, except water and maybe mobile phones services where a limited numbers of operators control multiple national markets in the region.⁶⁵

Table 5.3: Which infrastructure markets seem to be too concentrated?

	Electricity		Telecoms		Water & Sanitation	
	Generation	Distribution	Fixed	Mobile	Water	Sanitation
Global	Inconclusive towards No	Inconclusive towards Yes	Inconclusive towards Yes	Inconclusive towards No	Inconclusive towards Yes	Inconclusive towards No
Africa	Inconclusive towards No	Inconclusive towards No	Inconclusive towards No	Inconclusive towards Yes	Yes...but...	Inconclusive towards No
Asia & Oceania	Inconclusive towards No	Inconclusive towards Yes	Inconclusive towards Yes	Inconclusive towards No	Inconclusive towards No	Inconclusive towards No
Latin America	Yes	Inconclusive towards Yes	Yes	Inconclusive towards Yes	Inconclusive towards No	Inconclusive towards No
North America	No	-	Inconclusive towards No	Inconclusive towards No	Yes	Inconclusive towards Yes
Eastern Europe	No	Yes	Yes	Inconclusive towards Yes	Inconclusive towards No	Inconclusive towards Yes
Western Europe	Yes	Yes	Yes	Inconclusive towards Yes	Inconclusive towards No	Inconclusive towards Yes

Source: Benitez and Estache (2005)

⁶⁴ Benitez and Estache (2005)

⁶⁵ Of course, in some countries, PPI where tied-up to domestic political incumbents or similar considerations, may be discouraged in sectors traditionally seen as the domain of ruling politicians and hence limiting competition. In some cases, if domestic PPI is tied up these power centers, it may also distort the competition is limit the payoffs of reforms..

15. ***What about small scale PPI?*** What this discussion suggests is that a lot more precise information is needed to assess the level of competition in the sector. Matters are more subtle than the very simple factual discussions made here suggest and the water sector is a good illustration. The most basic fact is that only 20% of the countries have any significant private sector participation in the form of major contracts with international operators. The four main international actors in Africa are Veolia, Ondeo, Saur and RWE, present in the 20% of the countries with significant PPI. In most of these countries, they also focus mostly-- and dominate--the urban market in these countries. This means that 80% of the water markets are catered for by other providers. In Africa as in other regions, there is indeed a plethora of small scale providers, sometimes financed from foreign capital, sometimes by domestic firms which are taking over an increasing share of the contracts, often procurement controls for firms nominally operated by the public sector.⁶⁶

16. A similar story could be told for the energy sector in complementing large public and private providers. Indeed, there are cases of small scale providers contributing to rural electrification in more than 21 African countries.⁶⁷ They play a significant role in rural electrification in Kenya, Mali, Somalia, Mozambique and Ethiopia, and account for as much as 21% of rural households with access to solar powered electricity in Kenya (entrepreneurs); 20% with generator powered electricity in Somalia (entrepreneurs) and 12% with generator powered electricity in Mali (community organizations).

17. The main lesson from this overview is probably that it may be a mistake to continue emphasizing the debate on the ideal way of meeting Africa's need on the role of large scale private supply. The public sector continues to play a major role and the small scale operators are taking a slowly increasing, yet generally underestimated role in catering to the needs of the populations not supplied by the actors with higher visibility. This segment of the market supply has its own quality, affordability and sustainability issues which are too seldom addressed as part of the high profile policy debate. This is an issue because in many countries, these suppliers cater to the needs of shares of the population at least as large as those being served by public and private utilities.

Africa's experience with IRA

18. ***What about the actual importance of the spread of IRAs in Africa?*** A second common dimension mentioned by analysts of infrastructure reform is the commitment to independent regulation. Table 5.1 provides a better handle on what is known about the extent to which IRAs have spread in the region and Box 5.1 provides some insights on the context in which governments have decided to adopt regulatory agencies. The first point to observe is that as in the case of PPI, the spread of IRAs in the region is consistent with the level of commitment to the creation of separate regulatory agencies observed in the peer group—LICs. In almost all sectors—although the information is not available for ports and airports--, the commitment is however much weaker than it has been in richer developing countries. The only exception is the telecoms sector. Africa has the highest share of countries with an independent regulation of the sector—77% vs. 71% for upper middle income countries and 60% for lower middle income countries. While a third of the higher income countries have an IRA for electricity, only one in three African countries has an IRA in that sector. The lowest share of countries with IRAs are for transport and water with a share of 22% or less—as low as 3% in railways and 11% in airports.

⁶⁶ This point is very well documented in Kariuki and Schwartz (2004)

⁶⁷ Kariuki and Schwartz (2004)

Box 5.1.**What's the big deal about IRA in Africa? Lessons from forthcoming History...**

To appreciate the strong push for the creation of IRAs in Africa during the 1990s, it helps to remember the origins of the debate. About 15 years ago, when the privatization and related reforms wave started world-wide, a main concern was to reduce the degree of political capture and/or the control of the sectors by corrupt politicians. Infrastructure was one of the favorite sectors to create jobs for friends, family, supporters and voters. Infrastructure prices charged by public enterprises to recover costs were among the least likely to be increased to adjust to cost increases and the upper and upper middle income classes were the main beneficiaries of subsidies in the sectors since the others were not connected and where hence no eligible. The fact that infrastructure quality was a constant source of concern was often mellowed by some high profile, highly mediatized, new investment which would be used to calm the spirits. This lasted until the fiscal costs of this approach had become unbearable.

The solution to deal with the fiscal cost while improving access rates and quality was then to restructure to increase competition and to open up to the private sector. Conceptually, the sustainability of the new model required a commitment to a strong regulatory regime which would address fairly the concerns of the operators, of the users and of the government/taxpayers. Because there was then a genuine concern with the risk of capture of weak governments by much better legally and technically equipped operators, most reformers were advised to develop a regulatory capacity which would enjoy institutional and financial independence from the corresponding sector ministry. This independence was going to allow more transparency and more transparency was going to allow better accountability and more accountability would minimize the risk of distorted price, quality and financing issues that the previous model had allowed. Of course, independence was not a sufficient condition to achieve accountability but it was widely viewed then as a necessary condition. Most important was the adoption of instruments which would further guarantee accountability. These included regulatory accounting and performance measurement guidelines which would allow the regulators to assess the extent to which costs were minimized and the adoption of economic models which, for instance, would come up with average tariffs which would be able to generate a fair return to investors while ensuring tariff structures which would ensure the ability and willingness of users to pay, in particular the poorest.

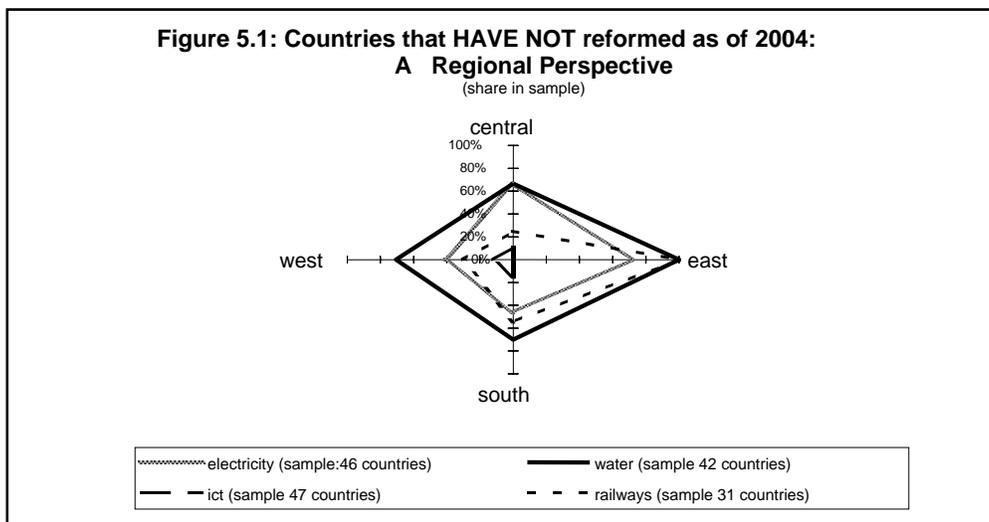
The model was clearly inherited from a new Anglo-Saxon tradition championed by the UK, Australia and New Zealand since the early 1980s. In continental Europe, until various collective decisions catalyzed the adoption of this very same model as a requirement in network industries, the preference tended to be for politically controlled regulation. Indeed, until the early 1990s, in most European countries, regulatory issues would be dealt with directly between operators and ministers, largely ignoring the huge empirical literature which had demonstrated for years the adverse effects of these opaque regulatory transactions.

While the adoption of independent regulatory agencies only became an issue in Latin America in recent years when the public opinion expressed concern with the actual degree of independence of the regulators, this model seems to have always been a source of conflict in Africa. The evidence seems to suggest that the two main sectors of interest tend to have adapted differently to the changes. For electricity, 36% of the African countries have created an IRA while only 28% have a private operator in their distribution business. For water and sanitation, it's the opposite; more countries (20%) have a private operator involved in its distribution while only 12% have created an IRA. Electricity has "gone Anglo-Saxon" while water has adopted the model now largely defunct model from continental Europe in which regulation is a bilateral transaction between the operator and the government, without a role for an independent third party. Note that even where an IRA has been created, it does not mean that it is enthusiastically supported by all the actors. There are several instances today in which water operators have entered into unhappy contracts with governments in countries which have chosen the adoption of IRAs. It seems that the water operators have entered very tense relations with the IRAs, much tenser than the relation between operators specialized in electricity distribution and their own regulators.

Two main line of explanations seem to emerge from the debates on the necessity or not to have IRAs. The first is against the IRAs in all sectors because: (i) Some sectors are different: i.e. water is different from other sectors, in particular if services are delivered under an affermage contract and does not require an agency; (ii) the creation of IRA does not address the governance issues it claims to be addressing. In favor of IRAs are the facts that: (i) when operators are monopolies, for as long as analysts have documented their performance, they have tended to abuse their monopoly power when not controlled effectively; since the odds of capture of ministers are high, IRAs can help reduce the risks of monopoly abuses more effectively than the traditional continental regulatory model if the commitment to the IRA model is serious—i.e. reliable regulatory instruments are developed to ensure fair, efficiency and accountable decisions and (ii) IRA are part of a wider institutional reform agenda and that it is a small realistic step towards improvements in the institutional performance of a sector which is likely to take much longer to change than it will take to build a decent regulatory capacity.

The jury on which one of the two positions will prevail is still out!

19. *Is the IRA story the same in the various regions of Africa?* At this stage in the report, it may be useful to start revisiting some of the factors that may explain the differences in performance across Africa. One of the dimensions is the geographical location. Anglophone countries have tended to reform more than francophone in all sectors except in telecoms where francophone Africa has been more aggressive and in electricity where there is no significant difference. Landlocked countries have in general also been more aggressive reformers than coastal countries but not significantly so except in telecoms where the difference is strong. Another very visual way of getting a sense of differences across regions is by unbundling the continent into 4 regions: East, West, South and Central Africa. Figure 5.1 identifies the share of countries which have **not** reformed in each region. It makes it quite clear that East Africa has been a much slower reformer than any other region. It also makes it very clear that West Africa is the leader in all sectors except water—a sector in which Southern Africa’s reform effort have been the highest. More striking maybe in the Figure is the extent to which the water sector lags all sectors in all regions.



20. *Opening an IRA does not guarantee PPI in Africa.* A simple comparison for each sector of the shares for IRA and PPI provides some insights on the interactions between these two dimensions of reform. From the energy experience, it should be clear that the commitment to institutional reform has not yet generated the expected private investment payoffs. More African countries now have an IRA than there are countries with private operators in electricity distribution. The experience of the telecoms sector is misleading. There are indeed many more cases of IRAs than cases of private fixed operators. This is related to the facts that: (i) many African countries have favored corporatization over privatization and (ii) the mobile business has been the main entry point for private operators in most countries.

21. *... and PPI does not always require an IRA!* The various sectors experiences, and in particular water, suggest that IRAs are not necessary to attract the private sector in all cases since a larger share of countries enjoy private operators than IRAs. The risks are not the same. The need for regulation is lower for transport activities than for water since intermodal or intramodal competition tends to be important in transport while the residual monopoly power continues to be strong in water, in particular urban, where alternatives tend to be much more costly.

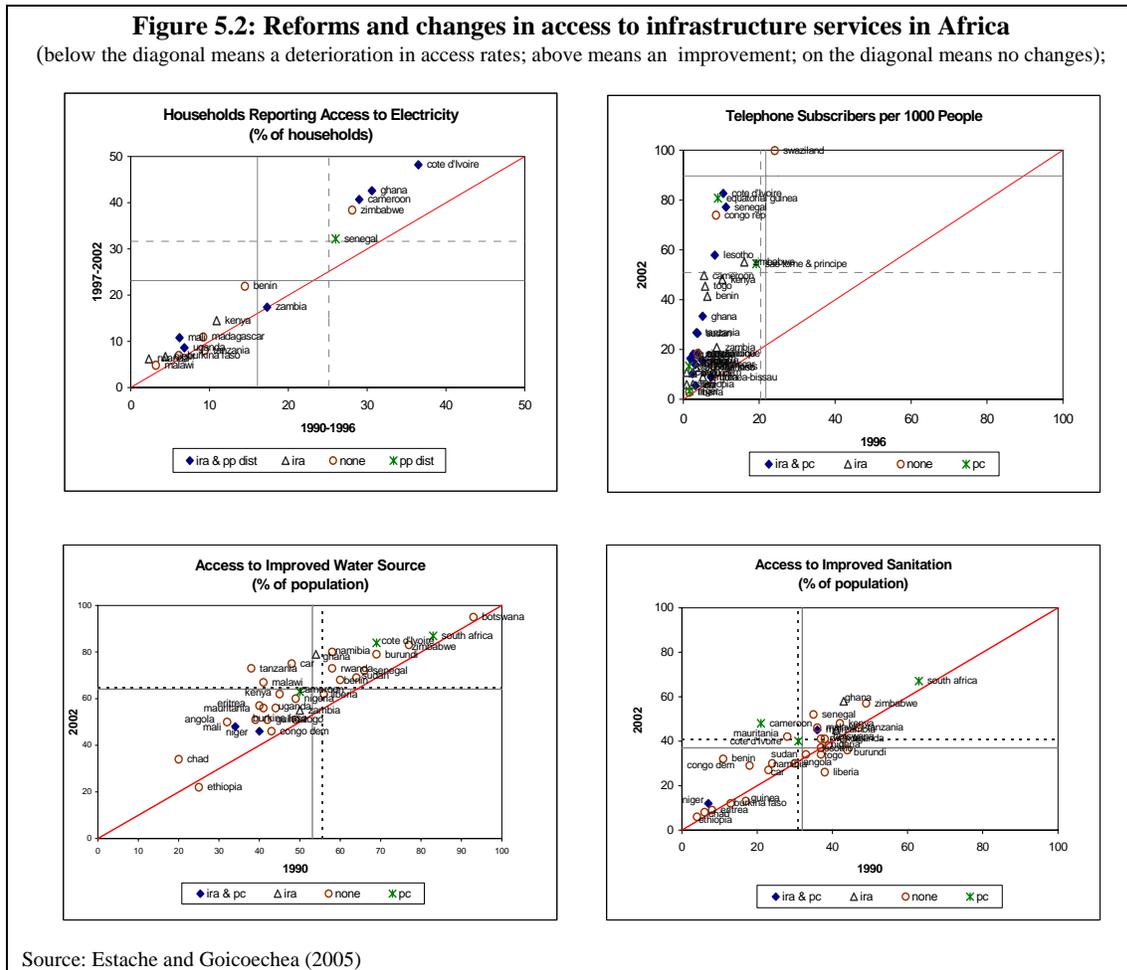
22. *What does reform do to access, quality and income distribution?* The next few sections are intended to provide a very first impressionistic version of the impact of reforms on three of the main policy concerns of most policy-makers. The approach is not scientific—i.e. there are no econometrics or advanced statistical tests, but more on this at the end of the chapter. The idea is to provide a very simple visual sense of the distribution of countries in a mapping of country performances according to their choices of PPI and IRA to draw some preliminary conclusions on the impact of PPI and IRA and any combination of these two policy instruments on specific infrastructure performance indicators. A country with a diamond has engaged in both PPI and IRA, one with a triangle only has an IRA, one with a star, only has PPI and a circle means no reform has taken place. Because the analysis requires two points in time, the discussion below only draws on a more limited sample of information in some of the sectors—this is particularly the case of the electricity sector. As a rule of thumb, the sectoral “winners” of the 1990s, with or without reforms are those above the diagonal while the losers are below the diagonal. The higher above the diagonal, the higher the gain achieved.

Are reforms associated with better access rates in Africa?

23. Figure 5.2 provides a few impressions. First, in any sector, all the countries who have engaged in both reforms have done better. Second, all of the deteriorating countries are countries that have not adopted any of the reforms. Third, if only one reform is to be chosen, there is no obvious superiority of one over the other and more detailed analysis is required to get a more precise answer. But these conclusions have to be considered as impressions only. Although they have little analytical value, they match many preconceptions.

24. A simple tabulation of the data provided in the statistical appendix provides a somewhat more precise quantitative overview. The main messages from such a simple statistical assessment of the correlation between the existence of reforms with rate of change in access rates can be summarized as follows.

25. *For electricity*, information is only available on a small sample of countries which represents a third of the total number of countries. The main lessons from the partial information available is that on average, access rates have increased almost twice as fast in countries which have adopted at least one of the two reforms. The highest increases in access rates have been observed in Anglophone countries which have adopted either or both the reforms. It is also interesting to note that access rates have been lower in countries which have adopted one of the two reforms rather than the two reforms. While changes in reforming Non-Anglophone countries have been lower than in Anglophone countries, Non-Anglophone countries which have adopted either or both of the reforms have seen their access rates increase faster than Anglophone and Non-Anglophone countries who have not reformed. Turning to the differences associated with geography, the main observations that can be derived from a simple correlation analysis is that average access rates have increased faster in landlocked than in coastal countries. In coastal countries, the reforms are correlated with faster increases in access rates while in landlocked countries; IRA has a positive correlation while PPI has a negative one. While causality cannot be derived from this sort of analysis, the apparent relevance of the legal and geographical context for the effectiveness of IRA and PPI in electricity should be noteworthy for policymakers and certainly deserves much more analytical scrutiny.



26. **For water**, the sample size is much more significant than for electricity since data is available for a sample of 34 countries. The main conclusions of the correlation analysis are that on average, the difference in access rates growth between countries who have reformed and those who have not has been very small (although in favor of reforming countries). The fastest increase has been observed in the only francophone country which had reformed along the two dimensions during the period for which data is available. Considering differences along legal and linguistic characteristics of the countries, Anglophone countries have performed on average better but only marginally so as well. Moreover, the 13 Anglophone which have not adopted PPI have higher access rates growth than the 2 who did; there is however no significant for the equivalent differentiation for francophone countries. Turning to geographical differences, the main observation is that for landlocked countries, reforms are associated with lower improvements in access rates; there is no significant difference for coastal countries. The results are thus very different for those identified for electricity.

27. **For sanitation**, also based on a large sample (35 countries), the main conclusions may be that on average, Non-Anglophone countries have seen much higher increases in access rates to sanitation than Anglophone countries (more than twice faster). Coastal countries have enjoyed much better growth than landlocked countries. Note that for both country groupings (linguistic or geographical), performance has also been better when either or both reforms have been adopted.

28. *For telecoms*, the main conclusions are based on a sample of 35 countries. They suggest that Non-Anglophone and coastal countries have performed on average better than their comparator but only marginally so as well. Similarly, reforming countries have done better in general than non reforming countries in general but not significantly so.

29. *For roads*, even if the access indicator may not be the ideal one, it is available for all African countries. The main conclusions here are that on average, access rates (measured as road density in terms of population) have less deteriorated in Anglophone countries and in landlocked countries. In Anglophone and landlocked countries which have adopted road funds—a proxy for IRA in roads—, they have actually improved very significantly—although with very small sample sizes. In Non-Anglophone countries and in coastal countries, the adoption of a road fund is correlated with a marginally worse performance than the comparator.

Are reforms associated with better quality?

30. Figure 5.3 provides a visual assessment of the association of reform with the evolution of quality equivalent to the one conducted for the evolution of the access rate. The only difference in the interpretation is that an improvement in quality between the early 1990s and the early 2000s can now be identified by a position below the diagonal in the Figure while deterioration places a country above the diagonal. Any country on the diagonal has seen no change in its performance. The main message emerging from a visual inspection of the data trying to match performance with reform is not a clear one. Indeed, for the two sectors for which quality can be approximated by a reasonable indicator, that is electricity and telecoms, the emerging story is a mixed one.

31. **For electricity**, as indicated in chapter 4, the average performance measured in terms of transmission and distribution losses has not improved significantly for many countries, except those which have escaped a conflict situation (as some of the largest Lusophone countries). The most surprising fact however is that the countries with a deteriorating performance—i.e. above the diagonal—includes not only countries which have not reformed but also countries which have adopted an IRA, PPI or both. In fact, the improvements in performance have been higher for ending a conflict than for introducing a reform! Two facts are worth keeping in mind. First, country levels losses tend to be measured poorly in Africa and hence the results presented here need to be considered with a touch of caution. Second, it is not unusual that the introduction of an IRA is associated with a deteriorating performance, simply because performance and in particular, faults tend to be measured better by an independent regulator than by government agencies which tend to regulate themselves.

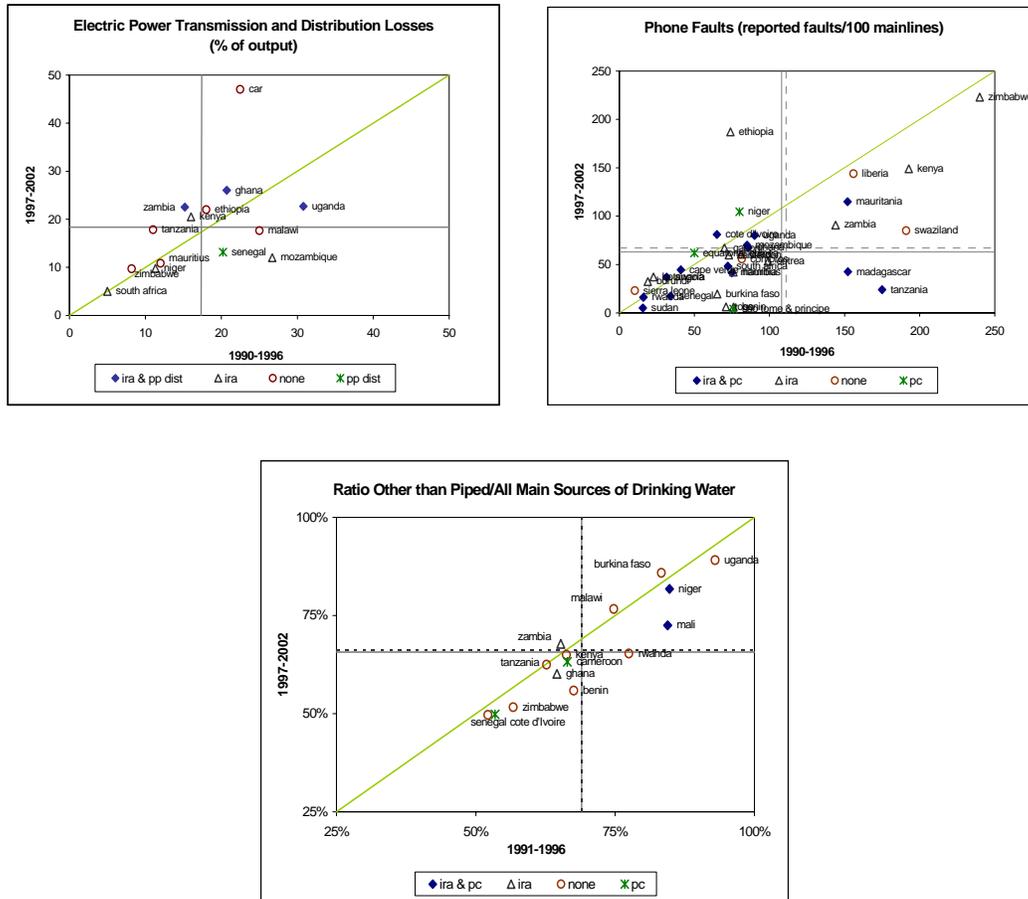
32. **For telecoms**, the story seems to be even stronger. Indeed, all of the points above the diagonal are for countries where quality has deteriorated and which have adopted at least one of the two reforms. The fact that the worse performing is a country in which the only reform adopted is the creation of the IRA hints at a further issue with data quality. Indeed, anecdotal evidence for this sector also suggests that one of the major potential benefits of the introduction of a regulator is that things are better measured. For most sectors, the easiest performance indicator to improve is the one that deals with quality. There are thus two possible interpretations to the few cases in which quality has deteriorated in spite of the adoption of reform in this sector pulled by an exceptional technological revolution. Either reforms hurt or institutions take their monitoring job more seriously!

33. The proxy used **for the water sector** is not a great one. In order to be able to track down the evolution of at least some quality dimension, the focus has to be on the share of people with access to water who have no choice but to rely on non-piped sources. Any

increase in that share is considered to be a deterioration of quality. Once more, a mixed story emerges. While most of the countries with deteriorating quality have not adopted any reform, one of the deteriorating countries is one which has created a regulatory agency. Also, the best performing country in terms of improvement in quality is one which had adopted neither one of the two most common reforms of the 1990s during the period of assessment. So once more, no clear story emerges on this front for this sector.

Figure 5.3: Reforms and changes in quality of infrastructure services in Africa

(above the diagonal means a deterioration in quality rates, below means an improvement, on the diagonal means no changes)



Source: Estache and Goicoechea (2005). Transport data are from World Bank World Development Indicators. ICT data are from International Telecommunications Union. Water data are from Demographic and Health Surveys. Electricity data are from PPIAF "An empirical assessment of PSP in the delivery of certain infrastructure services: electricity, water and sanitation".

Notes:

- * Figures for ICT, transport and water correspond to the most recent observation available for the period at the country level.
- * Electricity figures are at the utility level. Solid horizontal and vertical lines represent the average of the represented sample, as opposed to region and low income level benchmarks.
- * In some graphs outliers were not represented for scale purposes
- * The quality indicator for water services refers to the ratio between households using well, surface, rain, tanker truck, or bottled water (other than piped) to households using piped, well, surface, rain, tanker truck, or bottled (all) water as main source of drinking water

Were reforms associated with changes in access across income groups?

34. The distributional impact of the reforms is not an easy issue. A precise assessment of the issue requires a lot more data than available. This section provides a rough assessment based on a tabulation of the data available from DHS survey for 17 countries for which two points in time are available. Thanks to that information, Table 5.4 can provide a very rough snapshot comparing the access rates across income quintiles for networked water and electricity as well as for the WHO definition of water access with focuses on access to improved water sources. The focus on networked access measures reflects the fact that in most cases, the perception of what reforms were expected to bring was better access to piped water and to electrical wires bringing electricity to the comfort of people's home.

35. ***Water and electricity evolved differently across income groups.*** Considering the average for the 17 countries for which data is available, the picture is very different for water and electricity in terms of access to networked sources.⁶⁸ For water, things did not change for the 40% bottom of the population, got worse for the 40% richest income groups and improved only for the third income quintile. In other words, the nineties improved matters in terms of access to piped water only for the middle income class during the 1990s. The story is somewhat more positive when looking at access to improved water sources. Access of lower and middle income classes have tended to improve. This suggests that the gains in access have not come from utilities in the water sector. For electricity, the story is a much more positive one. Except for the lowest income classes, matters have improved for all income groups. The largest gains have also been achieved by the middle income class.

Table 5.4: Evolution of access rates to networked water and electricity across income classes

		Average Access Rates per Quintiles				
		First	Second	Third	Fourth	Fifth
Piped Water	Early 1990s	0%	0%	0%	13%	53%
	Late 90s-early 00's	0%	0%	3%	10%	43%
Improved Water	Early 1990s	35%	41%	51%	70%	88%
	Late 90s-early 00's	39%	53%	57%	70%	85%
Electricity	Early 1990s	0%	1%	4%	22%	68%
	Late 90s-early 00's	0%	4%	12%	32%	75%

Source: Based on provided by Diallo and Wodon (2004)

Sample only includes the 17 countries for which 2 points in time are available.

36. ***How much can reforms be credited/blamed for changes across income groups?*** For each sub sector, the sample is separated into a series of binary dimensions according to the following criteria:

- (i) does a country have an IRA or not;
- (ii) does a country have PPI or not;
- (iii) does a country have both an IRA and PPI, or
- (iv) does a country have neither. The changes in access rates per quintile are then compared for each one of these classifications.

⁶⁸ These countries are Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Madagascar, Malawi, Mali, Namibia, Niger, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia and Zimbabwe.

37. The main results of this tabulation can be summarized as follows:

- **For electricity**, IRAs appear to be associated with improvements for the middle income class, even if globally they are associated with lower improvements in performance across income groups than for countries who have chosen not to introduce IRAs. In contrast, PPI can be associated with increases in access rates for all income classes while countries without PPI only saw increases in access rates for the 60% richest; the largest increases for both groups of countries tend to favor the middle income class, although when no PP is present, the richest have seen much higher increases in access rates. Having both PPI and IRA tends to favor the middle income class; the poorest and the richest are better off in countries in which government have adopted only one of the two reforms. Countries which have adopted neither one of the reforms are associated essentially, with no impact at all on the bottom 60% of the population, most of the increases observed in these countries accrued to the top 20% richest. However, countries which have adopted at least one of the two reforms have tended to favor the middle income class.
- **For water**, the introduction of IRAs has had no significant impact on the bottom 60% of the population. While countries with and without IRA have seen the access rate drop for the 40% richest, those with an IRA have seen the access rates drop faster—i.e. investments have started to trail population growth. PPI is associated with no obvious impact on the bottom 40% of the population and helped only minimally the middle income group. Countries with and without PPI equally suffered a drop in access rate for the top 20% richest. The joint introduction of IRAs and PPI had no significant impact for the bottom 60% of the population; it has hurt the top 40% of the population. Countries which have introduced no reform have been the worse performers for the top 20% richest. There is not significant difference without reform or with at least one reform for the other income groups.

What's the analytical evidence on the impact of reforms?

38. While the above analysis provides a good idea of the average impact of reforms, it does so in a very partial way. Indeed, it does not account for complex interactions that take place between policy reforms and various country or time specific characteristics. This more precise analytical assessment is one of the most dynamic areas of research today. Indeed, 10-15 years of reform experience in a relatively large number of countries provides enough distance and generates enough information to undertake econometric work to measure the relative importance of the various factors and their interactions. This research is a useful complement to the much more detailed country specific studies that need to be conducted to undertake country specific evaluations. The rest of this section is a very brief overview of what the economic literature offers on the impact of reforms in Africa. There is unfortunately very little quantitative work to paper. Moreover, the coverage is very uneven across sectors. The telecoms sector has enjoyed the largest number of cross countries studies while the electricity sector has enjoyed the fewest. Moreover, most of these studies tend to focus on very different outcome variables. Some focus on access or quality. Others focus on the financial or employment performance of the operators.

39. ***Evidence of the impact of reform in telecoms.*** Thanks to the good ITU database with a good country coverage (we only focus here on papers which include Africa in their coverage), the performance drivers of the telecoms sector are fairly well known. They cover the two policy instruments emphasized in this paper (regulation and PPI) but they also address other issues such as the relevance of the degree of urbanization, the importance of political commitment or the impact of corruption.

40. For Africa, the most relevant research on the impact of the main reforms can be summarized as follows: (i) privatization tends to speed up coverage and cut average prices, (ii) the effect of competition is however much more important; (iii) good regulation matters to affordability; (iv) quality problems get better identified after reform and (v) the introduction of IRA offsets some of the effects of corruption and of investment risks. More specifically, there are six contributions covering Africa worth noting:

- Ros (1999) analyzes the engines of network deployment and telecommunications efficiency for a sample of 110 countries, including African countries. He finds that ownership is an engine of faster deployment but cannot demonstrate if competition matters or not to network expansion with the proxy he relies on to assess competition does not matter.
- Wallsten (2001, 2002, 2003) has generated more quantitative analytical research relevant to Africa than anyone else has and has provided the largest number of insights on what matters and what doesn't in Africa. His most interesting point may be his disagreement with Ros on the relative importance of ownership and competition. Relying on better techniques to separate the various effects, Wallsten find that competition matters a lot more than ownership. He shows that competition speeds up access rates increases and decreases call prices in Africa. On the importance of IRAs, his research shows that countries that established separate regulatory authorities prior to privatization saw increased telecoms investments, fixed phone penetration and cellular penetration compared to countries that did not. He also finds that investors are willing to pay for more firms in countries that have established an IRA.
- Fink et al (2002), covering a somewhat more recent period (1985-1999) find that both ownership and competition matter.
- Hamilton (2001) shows the importance of open markets for a faster increase in access in a study of the African experience. She also shows that a strong institutional framework can enhance investment in basic telecommunications.
- Hamilton's result on the importance of institutional governance is reinforced in a study of 147 countries during 196-1994 by Henisz and Zelner (2001). They find that long run political commitment to accountability, through the development of systems of check and balance has a strong positive relationship with growth of main lines per habitants. It also appears to be important to promote incentives to private sector where the facts that competition if often limited through restructuring arrangements offers many opportunities for opportunistic behavior.
- Li and Xu (2004), working with a panel of 177 countries during 1990-2001 find that full privatization improved access and network penetration while partial privatization in the sector shows no such impact during that period. They also find that competition reinforces the positive effects of privatization in the sector.
- Estache et al (2004), working with 48 African countries during the 1990-2002 find that while there is no significant individual impact of a change in ownership or of the creation of an IRA, applying jointly both policies, significantly contributed to increase access rates. They did however also increase residential tariffs significantly in the region. Somewhat surprisingly, they find that the number of faults increased with the adoption of an IRA but this may simply reflect the fact that things are better measured. When combined with PPI, the creation of an IRA does improve quality. However, corruption and investment risks offset some of the impacts of IRA and vice versa.

41. *Evidence of the impact of reform in the water sector.* The econometric literature is much less generous in its coverage of the water sector in Africa. Only three papers focus on the impact of the PPI related reforms in the water sector in Africa. However, all have something to say about a few other institutional and market structure variables. The main messages are that: (i) there is no clear sense that ownership matters to costs—the most recent estimates suggests that costs may in fact be higher under private operations; (ii) institutional variable such as political instability or corruption are significant costs drivers. The specific contributions of each paper can be summarized as follows:

- Estache and Kouassi (2002) use a database of 21 African water utilities covering the period 1995 to 1997. They find that the three private operators of that sample have higher production efficiency than the 18 public operators. They also find that corruption and the quality of institutions were far more powerful at explaining differences in efficiency levels and water costs. A more surprising result is that constant returns to scale prevail in the sample, which means that there should be not efficiency cost to the community-driven development approach. There is some concern that their results are biased by the sample size and composition.
- Kirkpatrick, Parker, and Zhang (2004) show that indeed the earlier research may have been influenced by the timing and the small size of the sample. They rely on a data set of 76 water utilities—of which 10 were private—covering the period 1998 to 2001. They use various statistical and econometrics treatments of the data to assess the cost drivers in that sample and fail to find evidence of a better operative efficiency performance in private utilities compared to state-owned utilities. They also find that regulation has no statistically significant effect. They did however find that privatization combined with other institutional reforms such as competition or regulation has the desired effects—in terms of penetration, capacity expansion and labor efficiency. Privatization will be effectively supported by regulation, provided the regulatory regime supports investors' confidence. Privatization with or without regulation has no statistically significant impact on prices.
- Estache and Rossi (2005) rely on the same data set as Kirpatrick et al (2004) to first analyze the labor requirements of the sector as a proxy for efficiency. Their main findings are that private and public firms are not significantly different in terms of labor productivity. They also find increasing returns to scale in the African water industry although very modest ones. Finally they find that the quality of political institutions of the country in which the firm operates appear to be significant driving factors of firms' performance. For every point of increase in the political risk index, the number of employees decreases by 5.1%, on average. They complement their assessment of the labor productivity case by an analysis of costs. Surprisingly, however, the cost of producing a given bundle of output is now higher for private firms, and the institutions of the country in which the firm operates are not as significant driving factors of firms' performance as in the labor productivity case.

42. *Evidence of the impact of reform in the electricity sector.* Somewhat surprisingly the power sector is the least well covered of the three utilities—there is in fact even less econometric work on the impact of institutional changes in transport! The first most complete paper which covers Africa—but does so relying on a panel of 51 countries from 1985 to 2000—is by Zhang et al (2002). It shows that competition increases service coverage, capacity expansion and labor productivity. However, the effect of privatization alone is not statistically significant—except for capacity utilization. In a background paper prepared for this paper, Estache et al (2005) complement the earlier results focusing on a database of 48

countries during the 1990-2000 period. They find that the adoption of an IRA improved significantly the quality of service in Africa—i.e. electricity transmission and distribution losses dropped-- but it did not have a statistically significant impact on access rates by itself. However, when considered jointly PPI and IRA significantly improved access rates. Corruption did however reduce the effectiveness of the IRA in improving quality. Moreover, corruption on its own reduced access rates in electricity—independently of the existence of an IRA or of PPI. Ultimately, the main message of this research is that: (i) competition helps, (ii) regulation helps; (iii) privatization alone does not go very far.

43. **Reconciling the assessment of the stylized facts with the econometric evidence.** Table 5.5 summarizes the information presented so far in the chapter. Its main purpose is to draw from the lessons on Africa's experience in terms of the experience with PPI and IRA provided by the two sources of information provided so far. The first is assessment of basic correlation of the existence of reforms in countries and the performance in these countries. The second is the econometric analysis provided by more academic research. It does so in terms of the impact on investment, quality, costs and prices. When reading the table, it is essential to remember that there are limits to the way in which performance indicators are measured. They may in some instances focus on capacity, in others on access and in others yet on some indicator of density.

Table 5.5:
Comparing the impact of PPI and IRA from a simple statistical assessment of facts
with an econometric assessment of the evidence
 (++, very positive; + = positive/increase; - = negative/decline;
 ? = undetermined; n.a. no good information available)

		Investment/ access rates	Quality	Average Costs or inefficiency	Average Prices	Comments
Electricity	Simple Statistical assessment	++	++	n.a.	+	IRA and PPI work <u>better</u> jointly
	Econometrics	++	++	None	none	IRA and PPI work <u>only</u> jointly Risks matter
Water	Simple Statistical assessment	?	+	n.a.	n.a.	IRA by itself works PPI by itself does not work Overall picture much more complex than in other sectors
	Econometrics	?	+	0/-	n.a.	Corruption and institutions matter
Sanitation	Simple Statistical assessment	++		n.a.	n.a.	
Telecoms.	Simple Statistical assessment	+	+	n.a.	-	IRA matters more than PPI
	Econometrics	++	?	-	-	IRA and PPI work better jointly Competition is what matters Politics matter
Roads	Simple Statistical assessment	+	+	n.a.	n.a.	Impact on road density is positive only in Anglophone countries and for landlocked countries; negative in other instances

44. *Summarizing the main lessons of the 1990s.* The main lessons from this overview of the statistical and econometric evidence are quite simple and generally predictable:

- (i) in all sectors, these reforms tend to have a stronger impact—and sometime any at all—when implemented jointly; regulation or competition tends to be much more important than ownership
- (ii) in all sectors but in the water sector, PPI and IRA, have been associated on average with increases in investment, access rates and quality;
- (iii) in all sectors for which some measure is available, these reforms have also been associated with improvements in quality,
- (iv) the impact on average tariffs has generally been not statistically significant in energy but has been associated with a decline in telecoms and
- (v) very little is known about the impact of these reforms on costs, except in water where PPI has been associated with either no impact or with an increase in costs.

Main messages of Chapter 5

The main messages of the chapter can be summarized as follows:

- *The analytical evidence suggests that in general, the joint introduction of PPI and IRAs has helped improve investment and quality of service--and sometimes access rates at the country level--but there are significant differences across sectors and the total absolute effect has generally been modest;*
 - *The adoption of both reforms jointly helped in electricity, telecoms and sanitation more than any other alternative; including partial reforms;*
 - *The adoption of both reforms or either one did not make a significant difference in water;*
 - *Note that, as expected, impacts at the project level are often clearer and more positive than at the country level.*
- *The introduction of an independent regulators will often help offset the negative effects of corruption;*
- *The reforms were not neutral with respect to income classes:*
 - *The winners of the introduction of PPI and IRA in electricity have tended to be the middle income classes;*
 - *The introduction of PPI and IRA in the piped water have hardly had any impact on the 60% poorest; it has generally been associated with a drop in access rates but has tended to protect the top 20% of the population;*
 - *The access rates to improved water sources of the lower and middle income classes increased during the 1990s but the gains in access have not come from utilities since most of the gains come from access to improved water sources other than piped water;*
- *Geography and legal tradition matters:*
 - *Landlocked and coastal countries do not see the same effects from reform; the difference vary across sectors;*
 - *Anglophone countries have generally done better in electricity, roads and water while non-Anglophone have done relatively better in telecoms and sanitation;*
 - *Anglophone countries have generally benefited more PPI and IRA in all sectors except water in which no country groups has done better and in which there is not significant difference between the countries with and without reforms;*
- *While these preliminary results are interesting and important, they reflect young, recent reforms and hence, not enough time may have elapsed to be able to draw a definitive conclusion.*

6. Where should Africa's infrastructure go from here?

1. The main purpose of this last chapter is to suggest a road map for the future steps to consider when designing the next wave of reforms for Africa's infrastructure sectors. It is indeed clear that the reforms of the 1990s have not delivered a big enough bang for the buck. More and better is needed. More and possibly better institutional changes are in fact already taking place in infrastructure to address the needs not covered by the introduction of large scale PPI and of IRA. This is particularly true in terms of the needs of the rural populations and of the poor. It is also true in terms of cross country coordination of reforms aiming at improving infrastructure synergies across borders. These institutional changes are briefly reviewed in the first part of this chapter. But there are many more areas in the design of the market structure of the sector, including the type of PPI and of the associated contracts that can be fine tuned and sometimes significantly improved. Similarly, there are many areas in the design of the regulation of the residual monopolies that need to be addressed which have not been covered here. Their exclusion in the discussion is due to the fact that they have not really been widely addressed in depth in Africa so far—although probably everything has been said with respect to the regulatory needs of the residual infrastructure monopolies, not that much has been accomplished so far. This chapter provides some insights on the related issues reformers will have to address in the near future. The chapter concludes with some preliminary thoughts on what the future is likely to bring to Africa's infrastructure sector as a way to suggest ideas for the definition of a fast, fair and cost effectively new service delivery model that will cater to the needs of both users and taxpayers in Africa.

Africa's others infrastructure ongoing reforms

2. While this paper emphasizes the assessment of the impact of the introduction of PPI and of IRAs, it is important to recognize that there have been many more institutional reforms in the various infrastructure sectors. While it is impossible to do justice to the full spectrum of such reforms, it may be useful to highlight a few of the major ones complementing or sometimes substituting for those analyzed so far in this document.

3. **Decentralization.** According to a recent survey (Ndgewa, 2002), during the 1990s, decentralization has spread throughout Africa although it has done so slowly. Moreover, it did so at different speeds in different regions—i.e. Francophone countries have decentralized less than the others. In that context, many countries are now moving to decentralize the responsibility for local infrastructure and services. In most cases, the policies aimed at decentralizing financing, planning and implementation to make policymakers more accountable and policies more transparent.⁶⁹ While most local authorities still face capacity constraints, the perception is that potential for sustainable local operations is significant. There are however some concerns associated with the effectiveness of increased decentralization. Karekezi et al. (2001), for instance, note that increased local participation has often also involved the politically connected rent-seeking classes which contributed to the failure of the previous model of service delivery to begin with. The specific impact of decentralization on the effectiveness of the sector is however largely under-analyzed.⁷⁰ Most

⁶⁹ Fishbein (2001), gives a good sense of what and how local governments can take charge of their infrastructure needs in Africa.

⁷⁰ One exception is Winter, M. (2003)

of the information available tends to be anecdotal and documents as many success stories as failures stories. A common message that emerges from these experiences however is that capacity building matters and that a lot of learning by doing is taking place. For this policy instrument also, it may be useful to consider the development performance indicators to guarantee that accountability will work and ensure that short term mismatches between the assignment of responsibilities for expenditure and revenue across sectors does not lead to long term fiscal and service level and quality problems.

4. ***Supranational initiatives.*** At the opposite of the spectrum of the assignment of sovereignty over infrastructure decisions is the increasing importance given to supranational projects. The recent report by the Economic Commission for Africa on the specific demands of regional integration in Africa is quite significant. The fact that it identifies infrastructure as a key component of this integration effort is just as significant. It implies that economies of scale and externalities will be assessed collectively for some key infrastructures. It endorses the NEPAD short term action plan and various commitments made since 2002 by transport ministers. It endorses the West Africa power pool, the Zambia-Tanzania-Kenya Power interconnector, the West Africa gas pipeline as well as the Kenya-Uganda Oil pipeline. It also endorses a much more coordinated management of river basins with clear implications for water uses. It also promotes the harmonization of standards in the various sectors where differences have proven to be costly in terms of growth as in the case of railways or maritime transport. A lot expected from this initiative, but a lot of challenges still need to be addressed. It takes time to implement supranational policies as suggested by the almost 4 years spent to come up with regulatory designs for the West Africa power pool agreeable to all parties. Once more at the core of the self assessed requirements for success is the need to generate comparable information across countries to ensure accountability for commitments made to the common good of Africa.

5. ***The rural initiatives.*** The evidence presented in this paper shows persistent low access to electricity, water, telecoms or transport in SSA countries, and corresponding low consumption levels in rural areas. In these areas, access rates to networks are at most in single-digit figures. Clearly, their exclusion from the service obligations imposed on utilities have stimulated the creativity of suppliers and governments alike in Africa. The solutions adopted across the continent to deal with the issues not addressed in the context of utilities reform offer indeed a very wide variety of models. It includes a significant effort to promote the role of alternative small scale local suppliers, particularly documented for in East Africa.⁷¹ It includes also the establishment of a regulatory framework encouraging private entry into the sectors and based on competitive tendering for rural licenses by independent suppliers. In other cases, explicit supply (least cost) subsidies for non-profitable extensions have also sometimes been agreed between operators and the government when these governments were viewed as credible debtors in the sector. All of these solutions have allowed progress in increasing access rates and often quality of service but they have raised their share of issues. Indeed, the fiscal costs of these solutions are often not minor. First, rural infrastructure development would often require expensive investment in network extension simply because the population is so scattered. Second, small scale providers reduce costs but still represent significant demands on the public sector balance sheets at all government levels, given the limited capability to pay of the rural population. Indeed, the financial viability of infrastructure supply in rural areas is hard to guarantee, *at least in the short to medium run*, and some way to subsidize the new customers, at least for the initial connection cost, will be necessary in order to achieve access rates to modern or at least more reliable

⁷¹ Kariuki (2005), background paper to this paper

sources of supply.⁷² Until these assessments are made, will it be possible to evaluate how a major scaling up of the current small scale reforms is a viable alternative to reforms that try to make the most of an expansion of the large scale utility model.

6. ***The identified but unmet peri-urban challenge.*** In view of the rapid urbanization of Africa, the issue of an exploding number of urban poor with no or very limited access to essential infrastructure services belongs without question to some of the most pressing aspects any development policy needs to tackle. The problem of increased access rates for the urban poor appears smaller than the rural poverty issue because possible solutions include the possibility of relying on the existing infrastructure and thus expanding at lower costs.⁷³ In most cases, the main concern of the reforms is not the cost, it is instead to generate the resources necessary to subsidize poor urban dwellers because of their insufficient ability to pay. The scale of the subsidy is, however, arguably less per new connection than in the rural case. A more serious problem to tackle may be the semi-legal or illegal condition of many dwellings in urban and peri-urban areas, which often precludes dwellers from getting connected to utility networks. While there is a significant amount of talk about these issues, there are very little concrete assessments of current experiences, in particular assessments comparing cost effectiveness of rural vs. peri-urban interventions.

7. ***The sector specific creativity: Road funds.*** The transport sector has been working quite intensively at reforms designed to ensure the long run sustainability of any progress achieved. An interesting illustration is the Road Management Initiative (RMI). The RMI was the first component of the SSATP aimed at promoting an appropriate road management institutional framework in the SSATP member countries. This same task is now performed in the SSATP through its expanded theme of action "Road Management & Financing." Beyond the design of a sector-wide strategy/policy now almost universally used in SSA, the first step is the implementation of second generation road fund, aimed at channeling funds directly from road users to road maintenance (i.e. shortcutting the government budget) under the management of a board in which users are heavily represented. Road funds have now been established in 86% of those countries. Yet, their second generation features (direct channeling of funds and board with private majority) are not widespread. This is nevertheless necessary if the road funds are to deliver what is expected from them.

8. A second important improvement in the road management framework is the transfer of road management from the ministry in charge to a road agency, significantly autonomous from the ministry, with quick contracting capacity and free from political interference. Such a road agency if well managed should deliver much better road management than ill-staffed and ill-equipped ministries. Only 38% of the countries members of the SSATP program have so far shifted toward road agencies. This suggests that road network management might not fulfilled the requirements of expanding networks while limiting the absorption capacities in the road sub-sector.⁷⁴ The financial situation is however not yet ideal. Only 1 out of 9 countries contributes enough to the sector and another 1 out of 9 do audit the use of user charges and other levies. In other words, the trend is toward more result oriented road management but financial issues still require to be addressed more consistently with the objective of delivering the level of road infrastructures users are expecting.

⁷² It can be argued that technological progress, notably in generation technology, has made it possible for small independent supply networks to achieve cost recovery. However, the issue of mismatched timing between initial capital expenses and insufficient demand development remains and implies that subsidies appear unavoidable, at least in the initial period where upfront investments are needed.

⁷³ The concept of low cost expansion of network can be easily challenged with it requires major works in dense peri-urban locations.

⁷⁴ For more details, see Desmarchelier (2005), background paper to this paper.

9. ***Summing up on other reform initiatives.*** The main lesson of this brief overview of the “other reforms” is that Africa’s infrastructure sector has been very creative at coming up with solutions which do not wait for large utilities or government agencies to deliver the good. Local public–private partnerships already work, often almost independently of central government agencies—sometimes in spite of them. The main challenge looking ahead is to do a better job at learning more systematically from these experiences. Most of what is known is too anecdotal to provide a good sense of the sort of macroeconomic fiscal commitments their scaling up would entail. It is not very clear either that scaling up is the solution. While the decentralizations experiences have had their fair share of challenges, they have also allowed an explosion of solutions and certainly a better match of solutions with local constraints. The main general lessons for Africa may be that one size does not fit all. It is true when considering the regulatory or institutional issues that need to be addressed at the country level. It is also true within countries at the local level, in particular when the need to meet minimum global standards or economies of scale is not a major concern.

Adjustments needed on existing modes of operations in the sector

10. Besides the very basic and general discussions the paper has so far offered on institutional reforms, market structures and regulation, there is scope for a much more in depth and technical review of these dimensions as a first step towards a full assessment of the achievements and failures of the 1990s. This technical assessment is needed to define the challenges of the near and longer term future. It is also needed to increase the transparency of many of the commitments that are needed to develop the infrastructure needed to allow Africa to grow sustainably.

11. ***What kind of market structure for Africa’s infrastructure?*** While the international community has generally been quite focused on the potential role of large international OECD based operators in financing the sector, the evidence seems to suggest that the scope for such a large role is at best modest. This opens two main roads to adjust the current model. The first adjustment is to look for non-OECD operators, the second is to look for different types of collaboration with these operators. Under the first proposed adjustment, there are also two options. The first is to try to promote local operators and in general this will consist of small scale operators as discussed in chapter 2 and earlier in this chapter. The fast growing adoption of this solution and the initial evidence of its effectiveness in East Africa point in that direction. The alternative is to try to promote South-South FDI. The growing presence of South African, Chinese or Malaysian operators everywhere in Africa suggests that there is scope for this kind of approach as well. Most of the evidence available on these new forms of PPI is however anecdotal and very little is known on their effectiveness in delivering service levels consistent with Africa’s needs.

12. ***What kind of economic regulation and regulatory institutions?*** The experience of the 1990s has also revealed a surprising wide range of views on what constitutes good economic regulation. The same diversity characterizes the views on the necessity and on the ideal design of a regulatory institution. Experts and others have provided a plethora of ideas to governments, sometimes contradictory, on both of these themes. It is thus essential to try to improve the coordination of policy advice given to Africa and to do so to generate evidence that allows government to distinguish between dogma and substance. This will show that one size does not fit all but it will also identify a minimum set of principles common to all reforms but more consistent with the region’s needs and constraints. This set of principles will have to be matched by the identification of a common set of instruments that will allow and ensure their implementation. Box 5.1 in chapter 5 already raised some of the basic questions that need to be addressed but a more systematic assessment is needed to ensure that

the mistakes of the past are not repeated. Quality, costs, fiscal, efficiency and equity concerns will only be addressed if a regulator, independent or not, is given the mandate and the power to do so and if the operators who enjoy a monopoly over service and information are mandated to contribute enough information to ensure that the government's objectives are met. Similarly, once governments have made transparent commitments to operators, it is essential to ensure that the country has a regulator capable of enforcing these commitments and that this regulator, once more independent or not, can be made accountable for its decisions. All these concerns imply a commitment not only to set up that regulatory capacity but it also means a commitment to support it as needed until the capacity has actually been built, trained and coached appropriately.

13. ***What kind of pricing and subsidies for Africa's infrastructure?*** The standard message to reformers will continue to emphasize the need to improve the recovery of the costs incurred in delivering the services—assuming that these costs have been minimized. The social situation in most of Africa however is such that cost recovery for operators is often likely to imply direct subsidies or cross subsidies. It is quite essential for the international community and for Africa to not only recognize this basic fact but to start generating the information that will allow a quantification of what these direct and indirect subsidies will cost. Today we know little about costs and we actually know little collectively about tariffs and hence about subsidies and cross-subsidy levels. For cross subsidies built in common tariff design options, it is essential to document their design because they can induce dramatic distortions in efficiency and are not always as progressive as expected. For countries that favor efficiency and want to avoid cross subsidies or complex tariff structures, the decision to subsidize roads adds to the need to assess the fiscal cost of that subsidy. This more transparent and less distorting approach may in fact end up being a preferred model for donors interested in providing grants to support effort to improve cost recovery. Whatever the preferred model, once more, little is known of what is happening and how much improvement could be brought by reforms in Africa.

14. ***What kind of contracts for Africa's private sector collaboration in infrastructure?*** One of the emerging debates is the apparent incompatibility of certain contract types with the historical heritage of some countries. Concession contracts have a clear anglo-saxon twist while affermage have a clear Francophile flavor. The domination of concession contracts throughout Africa where PPI has been implemented is a possible explanation for the apparent higher effectiveness of PPI and IRA oriented reforms in Anglophone Africa in comparison to non-Anglophone Africa. The sample sizes available to assess the equivalent impact of the adoption of affermage contracts are however very small. But there is a clear need to revisit this issue as part of the design of the next wave of reform. Not all legal frameworks are comparable and these will not be changed by infrastructure reforms. The challenge is to figure out how infrastructure contracts can be designed to fit the legal frameworks while still improving the performance of the sectors along a wide array of criteria. A lot more work is also needed in this area.

15. ***What kind of ODA for Africa's infrastructure?*** Finally, given its tremendous role in the financing of the sector in Africa, it is important to conclude this list of areas of research of direct relevance to the future of Africa's infrastructure with a discussion of the characteristics of ODA and of its idiosyncrasies. ODA, indeed, has its own biases which matter to the performance of Africa's infrastructure. The main lessons from the 1990s on this front can be summarized as follows. The large scale suppliers have tended to get a large share of the attention of the international community and of the donors even if as mentioned in chapter 3 they cater to only a small share of the population and most typically the rich. More recently, alternative technologies have started to become the focus of many agencies, shifting

resources away from more traditional businesses with a view to help the rural poor. There is however, some concern with the fact that however important these technologies may be, they may not be the solution that will cater to the majority of today's and tomorrow's poor (the rural and the urban poor). In some instance, the resource allocation and the focus of the advice of bilateral donors has also continued to tend to be associated with activities that support the interest of their national companies. This is rational and consistent with any definition of sovereignty in the allocation of national resources but it can make and has occasionally made aid coordination difficult. In other instances, agencies have both a private sector development branch and a policy branches which in principle function with Chinese walls to avoid conflicts of interests. These walls do not however function as effectively as generally hoped, creating difficulties in relations between governments and beneficiaries of aid. Finally, there is often a diversity of views across donors and sometimes within governments or within donor agencies which tend to increase the difficulty of building institutions. Different units in government talk to different units in donor agencies or to different donors working on similar projects and consensus is sometimes difficult to reach. The OECD-POVNET effort on infrastructure represents a significant first political step towards better coordination, but it is not sufficient. Additional effort is needed to document the sources of (often legitimate) differences across donors, and within donors but more transparency is needed to avoid inconsistent messages and if Africa's interests are to be at the top of donor priorities in this sector.

16. **Summing up.** The challenges are clearly not small but they are not insurmountable. Africa has demonstrated an impressive creativity in the face of adversity in general and in this sector in particular. A lot can be learned from this creativity just as a lot can be learned from the mistakes of the past. The real challenge is the willingness to take the necessary steps to learn and to do so collectively. This will require patience. It will also require humility since so many of today's actors are part of the mistakes of the past. This humility is essential because of all these actors of the past are likely to be the actors of the future as well.

17. Africa's leaders and Africa's people have to be central to the solution. This solution will however demand increased accountability from Africa's leaders for the effectiveness with which reforms are implemented. It will also require an increased role for the users. Users should have a stronger voice in the assessment of service delivery but they should also have a stronger obligation to contribute to the financing and to the other costs of ensuring the long run sustainability of reforms—recognizing that not everyone has the same ability to contribute.

18. The donors will also have to be part of the solution. First, because the odds of Africa's achieving service levels equivalent to those achieved by higher income countries from African funding alone are limited for most countries. Africa needs ODA to catch up—even if in the long run, Africa should aim at increasing the financial independence of its infrastructures. Second, the donors including the NGOs, also often have the ability to share the lessons of cross regional experiences faster than Africa could do on its own for most countries.

19. Finally, the private sector will continue to be part of the solution. Under the right policy environment—and the identification of this environment may be the biggest challenge—, in most sectors, both the foreign and the local private sector have already demonstrated their ability to contribute to Africa's effort to meet its needs. The private sector often brings a know-how which the public sector may no longer have in some countries. The private sector also can bring resources which reduce the need to rely on distortionary taxes, unfortunately still a major issue in Africa. Making the most of these opportunities has been and will continue to be key to Africa's infrastructure prospects.

Main messages of Chapter 6

The main messages of the chapter can be summarized as follows:

- *There is more to reform than PPI and IRA;*
- *One size reform does not fit all sectors or all countries;*
- *The solution to Africa's infrastructure challenges must look much beyond the PPI and independent agencies debate and recognize that:*
 - ODA is unavoidable;
 - The private sector is unavoidable;
 - Improved cost recovery is unavoidable;
 - Domestic capital needs to be tapped;
 - Differences in legal and cultural traditions need to be addressed in the design of future institutional and contractual arrangements;
 - Incentives of all actors to deliver on commitments need to be improved;
 - Governance and accountability needs to be improved to allow incentive to work:
 - Institutional designs and basic accounting practices are at the core of this improvement in particular when dealing with regulated monopolies and the decentralization of responsibilities for service delivery;
 - Users are also crucial actors to improved accountability.

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