

## Exploring the negative space: evaluating reasons for the failure of pro-poor targeting in urban sanitation projects

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### ABSTRACT

In many types of development project, direct provision of benefit to 'the poor' is a central goal. But how effectively is pro-poorness achieved? We report an independent ex-post evaluation of the pro-poorness of the World Bank-financed Programme d'assainissement des quartiers périurbains de Dakar (PAQPUD) sewerage project in Dakar, Senegal; we also review ex-post evaluations of previous donor-funded sewerage projects in African cities. We conclude that Dakar was a questionable location for major donor funding, given that this city's sanitation status is already much better than that of most African cities. If we accept the location, the Dakar PAQPUD project was more genuinely pro-poor in intention than most similar previous projects; however, many difficulties arose at implementation, and within the intervention areas, many of the poorest households did not benefit. In view of these results and our review findings, we argue that planners need to pay greater attention to household-level targeting: i.e. to ensuring that the poorest households will actually connect to the system. There is also a clear need for independent assessment of pro-poorness at ex-post evaluation. It is important to evaluate outcome through consultation not only with beneficiaries, but also with *non-beneficiaries* within the project's universe of intervention, and to investigate *why* non-beneficiaries have not benefited.

**Key words** | pro-poorness, Senegal, sewerage, targeting, World Bank

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### INTRODUCTION

Many types of development intervention aim to preferentially benefit poorer members of the community receiving the intervention, whether through direct targeting of subsidy at poorer communities, households or individuals, or some sort of indirect strategy designed to benefit the poor. There is an extensive literature on pro-poor targeting. [Coady et al. \(2004\)](#) report a major review of 122 targeted antipov-erty interventions in 48 countries, finding that the median intervention transferred 25% more to poor individuals (those in the bottom two quintiles) than would universal allocation, though a quarter of the interventions were regressive. Targeting was better in richer countries, in countries where governments are more likely to be held accountable and in countries where inequality is higher. Interventions that used means testing, geographic targeting and self-

selection based on a work requirement were all associated with an increased share of benefits going to poor people. Proxy means testing, community-based selection and demographic targeting to children showed good results on average but with wide variation. Self-selection based on consumption, demographic targeting to the elderly and community bidding showed limited potential for good targeting. [Ravallion \(2009\)](#) offers a very useful review of statistical measures of pro-poor targeting; he also argues that targeting, as assessed by standard statistical measures, is of limited value for reducing economic poverty. Note though that Ravallion focuses on the impacts of pro-poor targeting on economic poverty; however, in many contexts (including the present context) economic poverty reduction is not the fundamental aim. Rather, the aim of a pro-poor

water and sanitation investment is to achieve improved health status and quality of life among the poor, not primarily to reduce economic poverty. Where the aim is simply to target investment directly at the poorest households, we can expect conventional measures of targeting to be more useful.

Pro-poor impact is a fundamental aim of the major international financial institutions including the International Development Association, the African Development Bank and the European Investment Bank, and pro-poorness is invariably cited as an explicit or implicit goal in the project appraisals for major water and sanitation projects. But how effectively is pro-poorness achieved? This article sets out to explore this question in the particular context of large-scale donor-funded sewerage projects in sub-Saharan Africa. We report an independent ex-post evaluation of the relevance and pro-poorness of the World Bank-financed PAQPUD sewerage project in Dakar, Senegal; we also briefly review ex-post evaluations of previous large-scale donor-funded sewerage projects in African cities.

## THE PAQPUD PROJECT

The PAQPUD project (*Programme d'amélioration de l'assainissement des quartiers périurbains de Dakar*) was a major urban sanitation intervention that ran over the period 2001–2009. The characteristics and outcome of this project have been described in detail elsewhere (Norman 2009a; Guène *et al.* 2010; Norman *et al.* 2011). Briefly, PAQPUD was funded by the World Bank, designed and overseen by the Senegalese sanitation authority ONAS (*Office National d'Assainissement du Sénégal*), and implemented by the semi-governmental public-works contracting agency AGETIP (*Agence d'Exécution des Travaux d'Intérêt Public contre le sous-emploi*). The project specifically focused on lower-income urban residential districts of Dakar proper, together with lower-income urban and semi-urban residential districts forming part of Greater Dakar (*départements* of Guédiawaye, Pikine and Rufisque). Project targets included 60,000 onsite sanitation facilities (mostly septic tanks) serving 270,000 people, public and school latrines serving 30,000 people, and settled sewerage systems serving 127,000 people in 11 low-income districts. The total project budget was about US\$ 43 million.

## Basic project characteristics

About two-thirds of the project budget was allocated to onsite sanitation improvements in 33 districts (*communes*) throughout Greater Dakar: practically all *communes* in Greater Dakar except those of central Dakar. Householders were offered a wide range of sanitation improvements, including outdoor sinks-plus-soakaway, flush toilet and shower units, small twin-pit septic tanks and large septic tanks. About 75% of the construction cost was subsidised by the project; the cost-to-householder of the most frequently chosen sanitation option (twin-pit pour-flush latrine plus shower) was about US\$185 (Guène *et al.* 2010).

The remaining third of the project was allocated to the settled sewerage component. Unlike most cities in sub-Saharan Africa, Dakar already has an extensive and functional existing sewerage system serving about 625,000 people in the business centre and extensive residential areas (mostly wealthy and middle-income areas) of Dakar proper (Hoang-Gia *et al.* 2004). The systems installed under the PAQPUD project are settled sewerage systems (*assainissement semicollectif*): settled sewerage (i.e. solids-free sewerage) basically involves the sewerage of septic tanks, such that solids settle and remain on-site, and only the liquid fraction is piped away (for schematic diagram, see Norman *et al.* 2011). This system is well adapted to Dakar, where most households, even in low-income areas, already have a pour-flush toilet discharging to a septic tank. Over 95% of the construction cost was subsidized by the project, with householders paying only 7,000–22,000 fCFA (about US\$14–44) for connection and often for construction of a new septic tank. The 11 settled sewerage schemes were located throughout Greater Dakar (see map in Norman *et al.* 2011), with targeted coverage for each scheme ranging from about 100 to about 1,400 households. The initial total targeted coverage of 11,200 households was reduced to about 7,200 households during the detailed planning stage. The four schemes in Dakar proper are designed to connect to the existing central sewerage network (with treatment at Cambérène); one scheme is designed to discharge to the existing stabilization pond in Rufisque; the remaining five schemes include new-built local treatment plants (either anaerobic filters or, in one case, stabilization ponds). In all cases final discharge is to the sea. As at

April 2010 only of the 11 settled sewerage schemes were operational, serving an estimated 2,355–3,246 households (33–45% of the revised target of 7,200) (see Norman *et al.* 2011).

It should be noted that the onsite interventions were diffuse interventions over large areas (whole *communes*), whereas the settled sewerage interventions were much more focused interventions nominally targeting the whole population within relatively small areas.

### Pro-poorness strategy

Project planning documents explicitly stated that the project would be targeted at the poor, but did not explicitly define 'poor' in any quantitative or indeed qualitative way. Project staff within ONAS and AGETIP, and higher-level stakeholders in the World Bank and PEPAM (*Programme d'eau potable et d'assainissement du Millénaire*, the Senegalese water and sanitation strategy coordination group), repeatedly expressed the view that targeting of poor districts (i.e. geographical targeting) was sufficient, and that within-district targeting of poorer households would not have been cost-effective. Diverse institutional stakeholders also expressed the view that the low connection fee (22,000 fCFA ≈ US\$44) was within the ability to pay of practically all householders (though, as discussed below, our results indicate that this was probably not the case). Guène *et al.* (2010) state that several targeting methods were evaluated at the design stage, and it was deemed that geographical targeting would be most cost effective given the costs of alternative methods; this was confirmed by our own interviews with project management staff and higher-level decision-makers. This meant that the subsidy was available to everyone within the project area, as long as they were willing and able to pay their up-front contributions. Guène *et al.* (2010) state that inclusion error with such methods is minimized when the selected areas are poor in a homogeneous manner, such as 'urban slums with no sewer connections (as in Senegal)'.

Notwithstanding this stated policy of geographical targeting only, project staff involved in social marketing and community liaison – both within AGETIP and within the local community-based organizations – indicated that deliberate efforts were made to target poorer households within

each district. It seems likely that there was marked variation among districts in this regard, depending on the personal commitment of the local community liaison staff to pro-poor provision. In Sam Notaire, for example, we saw individual cases in which local staff had clearly made a special effort to ensure service provision to very poor households. In Rufisque, the local community liaison worker (*coordinateur social*) reported that he had tried to negotiate a microcredit scheme with the local council (*la mairie*) and the local branch of the Senegalese microcredit agency PAMECAS, in order to obtain credit for maybe 100 poorer households; a grant payment was obtained for about 10 households, but no grant or microcredit was obtained for the remainder. In other districts – for example Mbao – interviews with local staff and representatives of the local council suggested that there had been little or no serious effort to target poorer households, as is supported by our survey results presented in Box 1.

## METHODS

### Survey design

The results reported here are largely derived from household surveys carried out over the period September–November 2009 in three of the five PAQPUD districts with operational settled sewerage interventions (Ngor, Ouakam and Mbao), and three of the 33 PAQPUD districts that received onsite sanitation interventions (Grand Yoff, Guinaw Rails Nord, Sam Notaire). Details of questionnaire design and of sampling and survey procedure have been reported previously (Norman *et al.* 2011). Briefly, the six districts were selected for representativity, not randomly; within each district, two samples were obtained, of nominal project beneficiary households and of non-beneficiary households; households within each district were selected randomly. Interviews were carried out in Wolof or French, by trained local interviewers. The questionnaire included basic sociodemographic questions (including reported monthly household income, and ownership of assets including TV, fridge and car); questions about water supply and associated costs; questions about sanitation status before the project; questions about exactly what was supplied by

### Box 1 | Definition of terms

**ability to pay** – A measure (often simply a yes/no assessment) of an individual's or household's objective ability to pay for a given product or service.

**exclusion error** – A measure of targeting deficiency: here, the proportion of poor households who did not benefit from the intervention. The central focus of the present study.

**geographical targeting** – Pro-poor targeting achieved by carrying out interventions in poor districts/communities; cf within-district targeting, household targeting.

**household targeting** – In the present context, a synonym of within-district targeting.

**inclusion error** – A measure of targeting deficiency: here, the proportion of non-poor households who benefited from the intervention.

**poor** – There is of course no single definition of 'poor'. Definitions used in the present study include 'household per-capita income in the bottom quintile (i.e. bottom 20%) for that district'; see Methods, 'Poverty evaluation and cut-offs'.

**self-selection** – Describes a system for distribution of benefit under which potential beneficiaries select themselves. For example, a pro-poor sanitation project could offer 100% subsidy of a sanitation solution (e.g. improved pot latrine) on the understanding that only the poorest members of the community will be interested in this solution.

**stepped subsidy** – Here used in reference to a system of subsidy reflecting householder income: for example, very poor households receive 100% subsidy; middle-income households receive 25% subsidy and credit facilities for the remaining 75%; wealthy households receive no subsidy.

**targeting** – Procedures to ensure that the benefits of a given investment are enjoyed by the target group, here poor households.<sup>a</sup> This can include direct measures to ensure that subsidies to households are taken up by the poorest households, and/or indirect measures to ensure that the poorest households benefit (for example, ensuring that project design is such that poorest households will be able and willing to participate).

**type 1 error** – In the present context, inclusion error.

**type 2 error** – In the present context, exclusion error.

**willingness to pay** – A measure (often simply a yes/no assessment) of an individual's or household's willingness to pay for a given product or service.

**within-district targeting** – Pro-poor targeting achieved by targeting at the poorest households within the intervention district/community; cf geographical targeting.

*<sup>a</sup>Throughout this box, definitions refer to pro-poor targeting. But note that this is a shorthand: the relevant target groups considered in the present study include poor districts and poor households defined in different ways; but also districts/households with high sanitation need (notably districts with frequent flooding, and households without a toilet) and tenant households. These indicators of need (poorness, no toilet, tenancy) are often but not always coincident.*

the project and associated costs; questions for beneficiaries about satisfaction with the installations, and about blockages and similar problems; questions for non-beneficiaries about why they had not benefited; questions about who the householder judged to be responsible for system maintenance; and questions about how the householder had heard about the project (if at all). The full questionnaire is available from the corresponding author on request.

### Poverty evaluation and cut-offs

For the purposes of this study, poverty was defined as income poverty: this was measured as reported per-capita monthly income, calculated as monthly household income as reported by the respondent, divided by number of people in the household (including children), again as reported by the respondent. Financial income is of course only a partial

measure of poverty in the broader sense (which may be considered to include asset poverty and sociocultural poverty, e.g. lack of education); however, in the present context income poverty can be considered centrally important, as we are interested in whether low disposable income was a factor impeding access to a sanitation programme that required monetary contribution from the householder.

Given our data on reported monthly per-capita income for each household, we then applied three sets of poverty cut-off, to answer specific questions. First, to assess the effectiveness of pro-poor targeting on the macro-scale (i.e. were the project districts poor?), we used: (a) the Senegalese national income poverty thresholds (<10,738 fCFA/capita/month = 'extreme poverty'; 10,738–20,714 fCFA/capita/month = 'moderate poverty'; Fall 2008); and (b) income poverty thresholds for Dakar (<14,712 fCFA/capita/month = bottom quintile; 14,712–25,477 fCFA/capita/month = middle three quintiles; > 25,477 fCFA/capita/month = top quintile; ESPS 2005/2006; note that the ESPS data are in fact monthly expenditure estimates, not monthly income estimates, but these can be considered closely equivalent). Second, to assess the effectiveness of targeting at the community level (i.e. within each project district, were poorer households served?), we used (c) income thresholds derived from our own income data for each district (bottom quintile, middle three quintiles, top quintile within each district). (fCFA = CFA francs; 1,000 fCFA  $\approx$  2 US\$.)

### Targeting measures

Within a given population and using a given set of poverty cut-offs, the effectiveness of pro-poor targeting (i.e. the degree to which the project successfully served poor households as defined by that cut-off set) was assessed by calculation of exclusion error (type 2 error): in other words, what proportion of poor households within the target population were *not* served by the project. This was calculated as  $100 - CR_p$ , where  $CR_p$  = percentage coverage rate among poor households, i.e. proportion of poor households that were served. We also used these measures to assess targeting: (a) of tenants and (b) of households without a toilet. For some analyses we also calculated inclusion error (type 1 error) as  $CR_{np}$  = percentage coverage rate among non-poor households, or targeting differential  $TD = CR_p - CR_{np}$ ; TD gives equal weight to exclusion and inclusion errors; a TD value of 100% means that all

poor households and no non-poor households have benefited; a TD value of -100% means that all non-poor households and no poor households have benefited (see Ravallion 2009).

## RESULTS

### Relevance

The relevance of PAQPUD must be judged with regard to: (a) the overall goals of the principal funder, the International Development Association (the World Bank's low-cost lending arm for the world's poorest countries) and (b) progress towards the Millennium Development Goals for sanitation, under which this project was justified. Certainly Senegal is a poor country: with gross domestic product (GDP) per capita of US\$1,600 (2009 estimate, CIA World Factbook), it ranks 195 of 227 countries worldwide. However, it is currently classified by the World Bank as low middle income, not low income.

In terms of sanitation coverage, Senegal is in fact one of the best-performing African countries: the most recent Joint Monitoring Programme estimate (WHO/UNICEF 2010) is that 51% of the population has access to improved sanitation, with Senegal ranking 10th among the 44 countries in sub-Saharan Africa; considering the urban population only (as relevant here), 69% of the population has access to improved sanitation, with Senegal ranking 4th among the 44 countries, behind Angola, South Africa and Botswana (with GDPs per capita 5- to 8-fold higher than Senegal). Senegal can thus be considered a model of urban sanitation among the poorest African countries, and the capital Dakar is a particularly striking case, with 82% of the population estimated to have improved sanitation as of 2004 (ESAM-II census, DPS 2007). Unlike most African cities, Dakar has an extensive and well-functioning sewerage system serving about 25% of the population, and most remaining households, even in poorer districts, have pour-flush toilets discharging to septic tanks. By contrast, other cities in Senegal have much lower improved sanitation coverage (43% according to ESAM-II): major secondary cities such as Ziguinchor and Kaolack have notoriously poor sanitation.

Thus it is questionable whether Dakar can be considered a priority recipient for scarce sanitation funding:

there are many cities within Senegal and elsewhere in Africa with much more pressing sanitation problems. This situation is confirmed by our own results, which indicate that the great majority of households in the PAQPUD project districts (90–100%) already had access to improved sanitation, i.e. pour-flush toilet discharging to septic tank; and conversely, as discussed in more detail below, a high proportion of the minority *without* toilets did not benefit from the project. Most notably, Dakar has several districts – particularly in the *département* of Pikine – which suffer severe flooding for several months of the year. One such district is Guinaw Rails Nord (one of the districts considered in the present report): flooding leads to widespread overflow of septic tanks, so that people frequently contract portable diesel pump operators, who pump the contents of overflowing septic tanks directly to open drains in the street. In these districts, it makes little sense to invest in sanitation improvements before resolving the severe problems of flooding and drainage.

An outcome evaluation of the settled sewerage component of PAQPUD has been reported previously (Norman *et al.* 2011): this component showed rather poor outcome overall, due especially to contract management problems which have meant all money has been spent but that only five of the projected 11 schemes are operational. In what follows we focus specifically on pro-poor targeting in three districts in which the sewerage scheme *did* become operational. For comparative purposes, we also assess pro-poor targeting in another three districts covered by the onsite sanitation component of PAQPUD.

### How well did the project target districts?

Was geographical targeting effective: did the project indeed serve poorer districts of Dakar, as was the aim at project appraisal? According to unpublished ONAS data, the onsite sanitation component served a total of about 51,000 households, and we estimate that about 90% of these households were in districts (*communes d'arrondissement*) classified by Minvielle *et al.* (2005) as very poor, while the remainder were in districts classified as poor; none were in the mostly central districts classified as middle-income or wealthy. Likewise the sewerage component of the project aimed to serve areas within districts classified as poor or

very poor, including some of Dakar's poorest communities (although as we have detailed previously (Norman *et al.* 2011), only five of the 11 local sewerage networks constructed under PAQPUD are currently operational; those that are not operational are clearly not pro-poor, but this can be considered a failing of implementation, not of targeting). Thus we consider that the intervention was well targeted at the district scale, and this is one of the most important lessons to be drawn from this project: as will be discussed below, most previous African sewerage projects have served only relatively wealthy districts. In drawing lessons from PAQPUD, however, it is important to note that Dakar does not have extensive extreme-poor informal settlements as seen in many other African cities, and that (as detailed above) the existing water and sanitation situation is much better in Dakar than in most African cities.

### Within districts, did the project serve the poorest households?

This section considers targeting within each district, with respect to wealth cut-offs defined for each district (bottom quartile and median), and with respect to other key indicators of need (tenant status and absence of toilet before the project).

Table 1 summarises for each district reported-income distributions, and exclusion errors considering various definitions of 'target'. Estimated exclusion of the poorest households in each district (bottom 20%, reported per-capita income) was very high in the sewerage districts of Ouakam and Mbao (81% in both cases), and high in the onsite sanitation districts of Guinaw Rails Nord and Grand Yoff (61% and 43%). It is important to note that the sewerage and onsite exclusion errors are not directly comparable, because the sewerage interventions basically aspired to serve everyone within a relatively small area, whereas the onsite interventions aspired to partially improve coverage over a much larger area. Nevertheless, it is clear that in both sewerage and onsite districts, there were high exclusion errors. As noted below (*Reasons for non-benefit*), we consider that this problem could have been reduced by strategies including more accurate within-district targeting, more flexible payment options, and development of better strategies for encouraging landlords and tenants to participate.

**Table 1** | Summary data on coverage rates, reported income and targeting errors in these study districts

	<b>Ngor</b>	<b>Ouakam</b>	<b>Mbao</b>	<b>Guinaw Rail</b>	<b>Grande Yoff</b>	<b>Sam Notaire</b>
<b>Target-district population TP</b>	630 <sup>a</sup>	1,878	1,400 <sup>a</sup>	40,687	115,856	105,858
<b>Coverage target CT</b>	443	1,000	668	n.a.	n.a.	n.a.
<b>No. full bens<sup>b</sup></b>	341	540	441	253 <sup>b</sup>	408 <sup>b</sup>	458 <sup>b</sup>
(% of TP)	(54% of TP)	(29% of TP)	(32% of TP)	(0.5% of TP)	(0.3% of TP)	(0.4% of TP)
(% of CT)	(77% of CT)	(54% of CT)	(66% of CT)	(n.a.)	(n.a.)	(n.a.)
<b>No. potential bens<sup>b</sup></b>	0	330	200	n.a.	n.a.	n.a.
(% of CT)	(0%)	(33% of CT)	(30% of CT)			
<b>Hhold income, 1,000 CFA/month</b>	150	200	200	150	163	175
median (mean $\pm$ SEM, <i>n</i> )	(165 $\pm$ 10, <i>n</i> = 64)	(225 $\pm$ 10, <i>n</i> = 129)	(226 $\pm$ 10, <i>n</i> = 125)	(179 $\pm$ 11, <i>n</i> = 93)	(169 $\pm$ 17, <i>n</i> = 36)	(197 $\pm$ 12, <i>n</i> = 66)
1,000 fCFA $\approx$ 2 US\$						
<b>Per-capita income, 1,000 CFA/month</b>	14.3	21.4	20.0	13.8	9.1	17.5
median (mean $\pm$ SEM, <i>n</i> )	(17.1 $\pm$ 1.3, <i>n</i> = 60)	(24.2 $\pm$ 1.4, <i>n</i> = 129)	(26.0 $\pm$ 2.2, <i>n</i> = 124)	(16.0 $\pm$ 1.2, <i>n</i> = 92)	(11.0 $\pm$ 1.2, <i>n</i> = 36)	(20.1 $\pm$ 1.8, <i>n</i> = 63)
<b>% of hholds with at least one TV</b>	100%	92%	93%	92%	92%	93%
( <i>n</i> = sample size)	( <i>n</i> = 78)	( <i>n</i> = 173)	( <i>n</i> = 169)	( <i>n</i> = 100)	( <i>n</i> = 83)	( <i>n</i> = 91)
<b>% of hholds with at least one fridge</b>	79%	63%	59%	39%	45%	40%
( <i>n</i> = sample size)	( <i>n</i> = 77)	( <i>n</i> = 174)	( <i>n</i> = 169)	( <i>n</i> = 100)	( <i>n</i> = 83)	( <i>n</i> = 91)
<b>% of households with a car</b>	9%	10%	18%	5%	6%	13%
( <i>n</i> = sample size)	( <i>n</i> = 78)	( <i>n</i> = 176)	( <i>n</i> = 172)	( <i>n</i> = 101)	( <i>n</i> = 83)	( <i>n</i> = 92)
<b>Senegal extreme/moderate poor (A)<sup>d,e</sup></b>	~73% of TP	~48% of TP	~52% of TP	~78% of TP	~83% of TP	~65% of TP
<i>Exclusion of A</i>	23%	68%	73%	63%	63%	54%
<b>Dakar bottom quintile (B1)<sup>f</sup></b>	~53% of TP	~27% of TP	~32% of TP	~58% of TP	~72% of TP	~27% of TP
<i>Exclusion of B1</i>	25%	63%	78%	64%	62%	35%
<b>Dakar below-median (B2)<sup>f</sup></b>	~83% of TP	~67% of TP	~64% of TP	~86% of TP	~100% of TP	~78% of TP
<i>Exclusion of B2</i>	22%	75%	65%	62%	61%	55%
<i>Inclusion of not-B2</i>	100%	45%	62%	38%	0%	43%
<i>Targeting differential</i>	-22%	-20%	-27%	0%	39%	2%
<b>District bottom quintile (C1)<sup>f</sup></b>	20% of TP	20% of TP	20% of TP	20% of TP	20% of TP	20% of TP
<i>Exclusion of C1</i>	9%	81%	81%	61%	43%	17%
<b>District below-median (C2)<sup>f</sup></b>	50% of TP	50% of TP	50% of TP	50% of TP	50% of TP	50% of TP
<i>Exclusion of C2</i>	25%	80%	73%	65%	59%	47%
<i>Inclusion of not-C2</i>	89%	67%	52%	43%	42%	35%
<i>Targeting differential</i>	-14%	-47%	-25%	-8%	-1%	18%

<b>District tenants (D)<sup>f</sup></b>	~0% of TP	~16% of TP	~7% of TP	~13% of TP	~23% of TP	~24% of TP
<i>Exclusion of D</i>	0%	100%	69%	86%	71%	62%
<b>District no toilet (E)<sup>f</sup></b>	~10% of TP	~5% of TP	~5% of TP	~0% of TP	~3% of TP	~8% of TP
<i>Exclusion of E</i>	25%	78%	100%	0%	0%	0%

<sup>a</sup>The estimates of total target-district population size for Ngor and Mbao are approximate estimates based on best information available.

<sup>b</sup>Full beneficiary households are defined as those that received an external connection from their plot boundary to a functioning network, and also had an internal connection from their septic tank (existing or project-built) to the connection point at the plot boundary; this internal connection may have been paid for by the householder or by the project. Potential beneficiary households had an external connection to a functioning network, but did not have a complete internal connection at the time of survey.

<sup>c</sup>The estimate of number of full beneficiaries in the onsite sanitation districts is based on the ONAS-reported number of people who received a sanitation intervention (toilet and/or septic tank), corrected for our survey observations. For example, in Guinaw Rail, ONAS reports 1054 beneficiary households, but most of these households received greywater drainage systems only; 408 households were reported to have benefited from a toilet and/or septic tank. However, our survey found that only 42 (79%) of our Guinaw Rail sample of 53 nominal sanitation beneficiaries had in fact benefited: so the final estimate of 0.5% of TP is given by  $100 \times (253 \times 0.79) / 40,687$ . Likewise in Grande Yoff and Sam Notaire the number of true beneficiaries was lower than the nominal number (83% and 91% respectively).

<sup>d</sup>This row shows the estimated proportion of the target population in each district with per-capita monthly income below the Senegalese national definition of moderate poverty. This then allows estimation of exclusion error for this poverty threshold: so if we suppose that the project should have targeted households with per-capita monthly income below the Senegalese moderate poverty threshold, then in Ngor an estimated 23% of this group were excluded, i.e. did not benefit. (Here we consider beneficiaries to be full beneficiaries; potential beneficiaries as defined in footnote b above are considered as non-beneficiaries for this calculation.)

<sup>e</sup>Estimates of inclusion and exclusion error for settled sewerage districts refer to the whole population within the seweraged district; estimates for the onsite sanitation districts refer to that proportion of the population served by the project.

<sup>f</sup>These rows show other possible definitions of target, and calculations of exclusion error for each target: calculations are as described in footnotes d and e above.

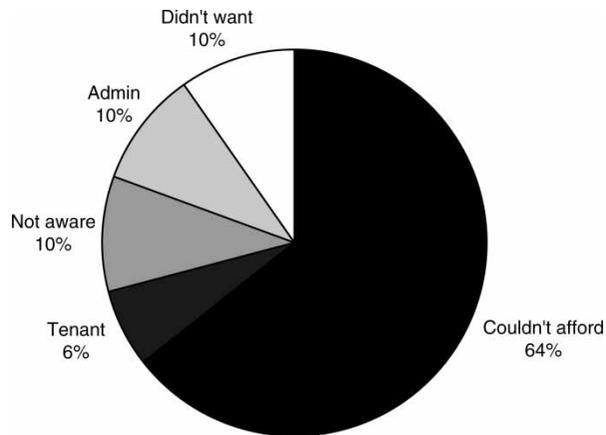
We have so far considered exclusion error (exclusion of the poorest) as opposed to inclusion error (inclusion of the less poor), as our central concern is poor-poor targeting: in terms of cost-effectiveness, however, inclusion error may also be relevant (see Discussion). Table 1 shows inclusion errors estimated for each district considering the target to be households with per-capita income at or below the Dakar median, and non-target to be households with per-capita income above the Dakar median. Inclusion errors thus defined were high (between 40 and 100%) in all districts except Sam Notaire.

### Reasons for non-benefit

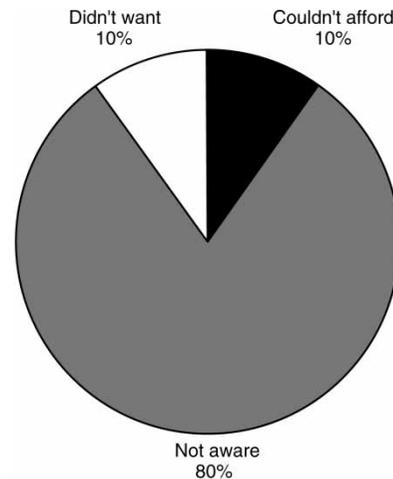
Around 50% of households in the settled sewerage districts did not receive a sewerage connection; in the onsite sanitation districts, over 99% of households did not receive any sanitation benefit (though certainly the figures for sewerage and onsite districts are not directly comparable, as the onsite sanitation interventions were spatially diffuse interventions over much larger areas). Why did these households not benefit?

In the sewerage districts, about 70–75% of non-beneficiary households stated that they would have liked to participate but had not been able to, while about 25–30% stated that they had not wanted to participate (Figure 1). By far the most common reported reasons for not being able to participate were inability to afford the fee and/or lack of a toilet, though in Ouakam another important reason was that the householder was a tenant (and thus had not been consulted by the landlord or the landlord had refused). Among non-beneficiary households in the bottom quintile of per-capita income, the proportion reporting either 'wanted to but could not afford it' or 'no toilet' was markedly higher than in the middle and top quintiles (Mbao, 83% versus 42 and 0%; Ouakam, 43% versus 26 and 100%); these differences among reported income quintiles were not statistically significant at the 5% level, but this is probably attributable to the small sample sizes (resulting from division of the full sample into income quintiles).

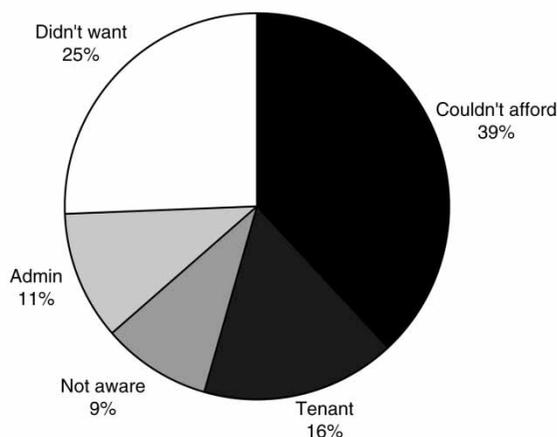
In the onsite districts, over 95% of non-beneficiary households stated that they would have liked to participate but had not been able to; very few households reported that they were not interested in participating (Figure 2). By



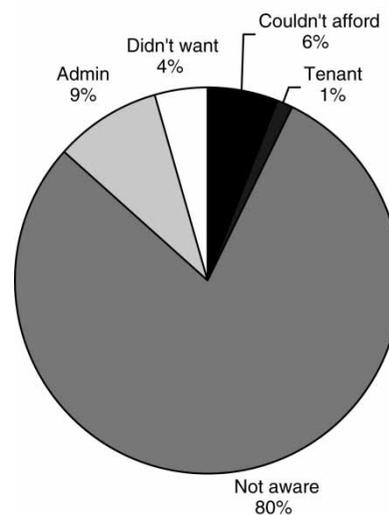
**A: Sewerage districts, bottom income quintile**



**A: Onsite districts, bottom income quintile**



**B: Sewerage districts, all income groups**



**B: Onsite districts, all income groups**

**Figure 1** | Reasons for non-benefit in the sewerage districts (Ouakam and Mbao).

**Figure 2** | Reasons for non-benefit in the onsite sanitation districts (Guinaw Rail, Sam Notaire, Grand Yoff).

far the most common reported reason for non-participation was lack of knowledge of the project. The number of households reporting that they did not participate because they could not afford it was very low in all districts, even among households in the bottom income quintile; however, we consider that this is probably because in these districts the number of households who were unaware of the project far outweighed the number of households who were aware of the project but could not afford to participate.

Thus in the sewerage districts inability or unwillingness to pay was apparently a major cause of non-benefit, despite the very heavy subsidy. It is important to note that the householder in most cases had to pay not only the connection fee but also cover the costs of internal connection

from their toilet to the new septic tank; and also that we are dealing here with a householder report of inability-to-pay, not an objective measure. Nonetheless, the high proportion of reported inability-to-pay in the bottom income quintile suggests that this is a significant problem that should have been addressed in this project, and that needs to be addressed in ongoing interventions in Dakar and in similar projects elsewhere. Furthermore, the presence of a small but non-negligible number of households who were unable to participate because they did not have a toilet is a clear concern, as this means that the project was tending to exclude precisely those in greatest need. How then

might this problem (exclusion of the poorest households and households without existing toilet) have been avoided? This question is explored in the DISCUSSION.

## DISCUSSION

### Pro-poorness of the PAQPUD settled sewerage project

The only World Bank publication to date on the PAQPUD sanitation project (Guène *et al.* 2010) states that the geographical targeting used in this project generally reached the intended recipients, and that inclusion error was low, i.e. few comparatively richer households benefited. Our results indicate that this positive assessment needs to be qualified. It is certainly true that the PAQPUD settled sewerage project achieved better pro-poor impact than most previous African sewerage projects (see next section). However, there are some concerns about inclusion of richer households, and substantial concerns about exclusion of the poorest households: in both Ouakam and Mbaou over 80% of households in the bottom 20% of the reported-income distribution did *not* benefit from the project. PAQPUD's specific geographical targeting of poorer districts and explicit exclusion of wealthier city-centre districts was very unusual for an African sewerage project, and is clearly a model to be followed; but equally clearly, the very high exclusion error (i.e. non-accrual of benefit to the poorest households and to households without an existing toilet) is a serious concern for a project with explicit pro-poor goals and very high levels of subsidy.

The inclusion of richer households is a less serious concern. In view of the nature of sanitation provision in general and sewerage provision in particular, it is reasonable to suppose that individuals will derive a health benefit not only from their own connection to a sewerage network, but also from their neighbours' connections; as a result, the more connections the better, even if this does mean inclusion of less needy households. Independently of this public health argument in favour of maximal inclusion, however, there is an economic argument in favour of minimizing inclusion of the non-poor: this was a highly subsidised programme, so that subsidy of households that could probably pay for their own connection is inefficient. Inclusion

errors (calculated as described in Results) were high (between 40 and 100%) in most districts; this ties in with the conclusion of Guène *et al.* (2010) that this was not a cost-effective programme.

As noted, though, exclusion error is a more serious concern. How might the PAQPUD settled sewerage programme have reduced exclusion error? There are several possible solutions here: (1) the project could have maintained the existing connection fee for all households (22,000 fCFA  $\approx$  US\$44) but with improved social marketing to better reach the poorest households; (2) household-level targeting could have been applied on the basis of means assessment, with some sort of stepped subsidy system (e.g. free connection for the poorest households, connection fees for less poor households); or (3) the project could have offered free connection for all households in the project areas (i.e. 100% subsidy). Our findings certainly suggest that Solution 1 is unlikely to have worked: by far the most common reported reasons for non-benefit were inability to afford the fee and/or lack of a toilet, or tenancy status, and 22,000 fCFA is more than median per-capita income in all three sewerage districts. Whether Solution 2 or 3 would have been more effective depends on the trade-off between the costs of household-level targeting and the costs of 100% subsidy. (Detailed analysis of the projected and actual costs of the PAQPUD settled sewerage scheme is beyond the scope of the present paper, and will be published separately. It should be stressed that per-household and per-capita capital costs have been much higher than was estimated at project appraisal, and much higher than previously published estimates of the capital cost of sewerage; considering the four operational schemes only around US\$2,000–3,000 per household, equivalent to about US\$190–260 per capita.)

Solution 3 (removing the household connection fee entirely, i.e. 100% subsidy for all) would have increased total infrastructure investment costs of the PAQPUD settled sewerage project by only about 5% (a direct consequence of the *very* high percentage subsidy offered to householders in this project; see Guène *et al.* 2010). There are certainly disadvantages to doing this: all else being equal, a 5% increase in costs implies a 5% reduction in coverage; furthermore, 100% subsidy is likely to minimize any sense of ownership, and leads householders in other city districts to expect 100% subsidy in

future. Perhaps the most serious concern is that, without a genuine commitment to serving pro-poor households, and in the absence of better planning to ensure inclusion of poor households, this approach would very probably have led simply to more subsidy take-up by non-poor households: in other words, offering 100% subsidy does not by itself ensure pro-poorness. For example: as noted in RESULTS, some non-beneficiary households did not have a toilet before the project, and offering a fully subsidised septic tank and sewer connection would not have helped them.

It is difficult to precisely assess the costs of improving targeting, i.e. of Solution 2. However, the PAQPUD project as a whole had a very substantial budget for communications and social marketing (about 10% of the total, i.e. US\$4.1 million; ONAS 2009); we do not have specific data on allocation of this budget to the settled sewerage component, but if we assume that this was pro-rata to the infrastructure investment, this was a very significant expenditure of around US\$190 per targeted household (700 households). In line with this, the implementing agency AGETIP contracted large social marketing teams during the construction period: in Ouakam, for example, 10 people were employed full-time over a period of about a year, with the sole role of mediating between the implementing agency and the local community (informing people about the project and the possibility of connection, through both community meetings and household visits; collecting connection fees from people who decided they wanted to connect; assisting in the negotiation of sewer placements; and assisting in the resolution of disputes between householders and contractors). With this extent of investment in community liaison, it seems likely that it would have been possible to implement much more effective targeting measures (e.g. full subsidy for the poorest households and households without toilets) within the existing budget, given well-designed procedures. In other words, we think this would have been fully achievable within the existing budget.

In fact, we suggest that a more appropriate system would have involved a combination of stepped subsidy levels and microcredit, offering full subsidy to very poor households and households without toilet, and partial subsidy plus option of delayed payment for other households. If we suppose that the full subsidy should be available to the poorest 20% of households, and if we assume for the

purpose of this analysis that the cost of this additional subsidy should be borne by the remaining households, this implies that the remaining households would have paid US\$55 rather than US\$44. This system is not without difficulties: definition of the most needy 20% of households is not straightforward, and requires both clearly defined procedures and community-level staff who are genuinely committed to pro-poor provision. Nevertheless, we consider that an approach of this type would have been the most appropriate for achieving both high levels of coverage and minimising exclusion error.

We also consider that there should have been better-defined strategies for ensuring that landlords participated in the scheme, so that tenants are not excluded. Such strategies would have to take into account the risk that landlords who invest in sanitation will then raise their rents, driving out the poorest tenants.

The above has considered the settled sewerage component of PAQPUD, the central focus of this study. However, it is worth noting that in the onsite districts, project marketing seems not to have reached many potential beneficiaries. If funding is insufficient to meet demand throughout the project area, it is clearly important to aim to disseminate widely and identify those in greatest need.

### Pro-poorness of previous African sewerage projects

How does the PAQPUD settled sewerage project compare with previous African sewerage projects in terms of pro-poorness? We have assessed this through a review of published ex-post evaluations of major interventions with a sewerage component (World Bank, African Development Bank, KfW Entwicklungsbank, EU); results are summarized in Table 2. (Unpublished work by GN indicates that these four institutions have been the major concessionary funders of sewerage projects in Africa.)

Some (7/22) of these evaluation reports are insufficiently detailed to provide even a basic understanding of the nature of the sewerage component and/or of sewerage component outcome in terms of pro-poorness. Beyond this, no general conclusions can be drawn: some evaluations are highly professional, others poorly detailed and clearly lacking in critical rigour. Certainly we consider that projects of this magnitude should be subject to detailed mid-term and

**Table 2** | Summary findings of published ex-post evaluations of previous sewerage projects in African cities

Project title <sup>a</sup>	Country (income) <sup>b</sup>	Approval-closure <sup>c</sup>	Eval detail? <sup>d</sup>	Reported outcome <sup>e</sup>	Hhold connection problems? <sup>f</sup>	Sustainability/O&M concerns? <sup>g</sup>	Onsite components? <sup>h</sup>
<b>Port Louis Sewerage Project</b> Stage III AfDB: PPER (19.10.87)	Mauritius (\$\$\$)	1977–1983	Yes	Network satisfactory	Yes	Yes: not self-financing	No
<b>Addis Ababa Sewerage II Project</b> AfDB: PCR (Mar 95)	Ethiopia (\$)	1979–1993	Yes	Network satisfactory	Yes?	Unclear	No
<b>Mindelo Water Supply &amp; Sewerage Power Project</b> AfDB: PPER (07.08.90)	Cape Verde (\$\$)	1981–1988	Yes	Network satisfactory	Yes	Yes, lack of personnel	No
<b>Niamey Sewerage Project</b> AfDB: PPER (09.06.91)	Niger (\$)	1982–1989	Yes	Network satisfactory	Yes	Yes, operation already defective	No
<b>Five Urban Centres WSS Project</b> AfDB: PPER (09.03.00)	Uganda (\$)	1983–2003	Yes	Poor	Yes	Yes, concerns about both cost recovery and O&M	No
<b>Water Supply &amp; Sanitation Fort Portal &amp; Kasese</b> KfW: ex-post eval (2004)	Uganda (\$)	1988–1997	No	Unclear	Yes, probably	No, reportedly not	No
<b>Second Mindelo Water Supply &amp; Sewerage Power Project</b> AfDB: PCR (Mar 99)	Cape Verde (\$\$)	1990–1994	No	?Network satisfactory	Unclear	No?	No
<b>Small Towns Water &amp; Sanitation Project</b> WB: ICR27529 (2003)	Uganda (\$)	1994–2003	No	‘Satisfactory’ (?)	Unclear	Unclear	Unclear
<b>Eldoret Sewerage Project</b> KfW: ex-post eval (2008)	Kenya (\$)	1994–2005	Yes	Satisfactory	Yes	No, reportedly not	No
<b>Urban Development Project</b> WB: ICR33497 (2005)	Swaziland (\$\$)	1994–2005	Yes	Moderately unsatisfactory	Yes, probably	Yes, concerns about both cost recovery and O&M	No
<b>Urban Water Supply Project</b> WB: ICR26510 (2003)	Sierra Leone (\$)	1995–2003	No <sup>a</sup>	Satisfactory?	No, but few connections, all in business centre	Yes, concerns about management sustainability	No
<b>Water Sector Project</b> WB: ICR30800 (2004)	Senegal (\$\$)	1995–2004	Yes	Satisfactory	No: deliberate effort to target poorer districts	No, reportedly not	No
<b>Baie du Tombeau Sewerage Project</b> KfW: ex-post eval (2007)	Mauritius (\$\$)	1996–2003	Yes	Network satisfactory	No, over 50% coverage	No, reportedly not	No

*(continued)*

Table 2 | continued

Project title <sup>a</sup>	Country (income) <sup>b</sup>	Approval-closure <sup>c</sup>	Eval detail? <sup>d</sup>	Reported outcome <sup>e</sup>	Hhold connection problems? <sup>f</sup>	Sustainability/O&M concerns? <sup>g</sup>	Onsite components? <sup>h</sup>
<b>Urban Environmental Sanitation Project</b> WB: ICR29368 (2004), PPAR36597 (2006)	Ghana (\$)	1996–2003	No <sup>a</sup>	Poor: construction not completed, poor quality	Unclear	Yes, concerns about management sustainability	Yes, including septage treatment
<b>Urban Sector Rehabilitation Project</b> WB: ICR32225 (2005), PPAR43736 (2008)	Tanzania (\$)	1996–2004	Yes	Highly satisfactory	Yes, probably	No, reportedly not	Yes, FSM and septage treatment <sup>i</sup>
<b>Third Water Supply &amp; Sanitation Project</b> WB: ICR36083 (2006)	Guinea (\$)	1997–2005	Yes	Satisfactory	No, reportedly good coverage	Yes, concerns about cost recovery and institutional sustainability	Yes, including septage treatment
<b>Environmental Sewerage &amp; Sanitation Project</b> WB: ICR547 (2007)	Mauritius (\$\$\$)	1998–2006	Yes	Satisfactory	Unclear: some concerns with slow rate of connections	Reportedly not	No
<b>Mine Township Services Project</b> WB: ICR35722 (2006)	Zambia (\$)	2000–2005	No	'Satisfactory' (?)	Unclear	Unclear	Probably not
<b>Mid Western Towns Water Supply</b> EC: MR-01048.04	Uganda (\$)	2001–2007	No <sup>b</sup>	Satisfactory	Unclear	Unclear	Unclear
<b>Rural Towns Waterborne Sewerage Schemes</b> EC: ex-post evaluation report	Namibia (\$\$\$)	2001–2007	Yes	Satisfactory	No, though new informal settlements unserved	Some concerns about technical capacity for O&M	No
<b>Rural Town Sewerage Scheme, Karasburg</b> EC: MR-01246.01	Namibia (\$\$\$)	2003–2006	Yes	Satisfactory	Yes: tariffs too high for poor households	Reportedly not	No
<b>Rural Town Sewerage Scheme, Luderitz</b> EC: MR-01457.01	Namibia (\$\$\$)	2004–2011	Yes	Satisfactory	Unclear	Yes, concerns about both cost recovery and O&M	No

<sup>a</sup>This column references the funding institution and the evaluation report consulted (in almost all cases downloadable from the funding institution's website): AfDB: African Development Bank, KfW: KfW Entwicklungsbank, WB: World Bank, EC: European Community; PCR (AfDB): Project Completion Report, PPAR (AfDB): Project Performance Evaluation Report; ICR (WB): Implementation Completion Report; PPAR (WB): Project Performance Assessment Report; MR (EC): Monitoring Report.

<sup>b</sup>Current World Bank income-group classification of countries (2010): \$ = low income, \$\$ = low middle income, \$\$\$ = middle income.

<sup>c</sup>Project approval and closure dates.

<sup>d</sup>Do we judge the evaluation to be adequately detailed as regards the sewerage component of the project?

<sup>e</sup>How does the evaluation rate outcome of the sewerage component? Generally, this evaluation relates to network and/or treatment plant construction, rather than household connections.

<sup>f</sup>Was the 'connections problem' observed: i.e. fewer households connected than was hoped?

<sup>g</sup>Does the evaluation report concerns about financial/maintenance sustainability?

<sup>h</sup>Did the project include components integrating the sewerage system with onsite sanitation (e.g. septage treatment facilities)?

<sup>i</sup>FSM = faecal sludge management.

ex-post evaluation, and that evaluations should be carried out promptly before information is lost. KfW Entwicklungsbank and the European Community are interesting models here: the brief mid-term evaluations commissioned by these agencies are detailed and professional, show clear critical independence and are perhaps more useful than ex-post evaluations carried out several years after project termination.

Most evaluations (18/22) reported that infrastructure construction (networks, treatment plants, etc.) had been satisfactorily achieved. However, 10/22 evaluations reported significant concerns about sustainability in terms of cost recovery and O&M (operations and maintenance), and several others were unclear on this point: of the evaluations 15 we classified as sufficiently detailed, only six judged financial/O&M sustainability to be likely.

The great majority of evaluations reported concerns about low connection rates: in other words, in most projects sewerage infrastructure construction was judged satisfactory, but insufficient households connected to the system. Very commonly, evaluations note that few poor households connected. The 1987 AfDB evaluation of the Port Louis Sewerage Project Stage III (Mauritius) states that 'the sewerage system is underutilized due to the high costs of connecting to residential houses' a scheme aimed at providing loans for sewerage connections 'proved unsuccessful due to the fact that the terms of the loan are very hard' the evaluation concludes that 'most residents in the project area would like to be hooked onto the sewer system but cannot afford the necessary financial outlay'. The 2008 World Bank evaluation of the Urban Sector Rehabilitation Project (Tanzania) states that little investment was made by the project (or others) to extend sewerage networks in the eight towns of this project, so that there was little increase in coverage ('from about 10 percent of the population in 1996 to about 14 percent in 2006'); the evaluation explicitly reports that the sewerage investment did not serve low-income households in Dar es Salaam, and indeed reports that 'community consultations' for this project were carried out exclusively among householders already connected to the sewerage network. The 2005 KfW evaluation of the Eldoret Sewerage Project (Kenya) states that most connections were in the city centre, and only about 5% of households in poor districts were connected in 2008, despite expansion of the network into these areas; connection costs were reported to be very high.

Also relevant to pro-poorness is whether a sewerage project also has components relating to onsite sanitation. In particular, it will often make sense for a sewerage project to include provision for the management and treatment of nightsoil and sludge from non-sewered sanitation facilities: examples include sewered or non-sewered sludge collection tanks for dumping of nightsoil/sludge from desludging tankers; designed and managed dumping points for dumping of sludge directly to a sewer main; and treatment plants designed for both sewerage and tanker-transported sludge. Properly conceived and substantially funded, we consider that such components can be of great value; though of course there is a danger that components of this type will be included as token justifications of a sewerage project that is otherwise not significantly pro-poor. In fact only three of the projects reviewed by us included components of this type: all three were relatively recent projects, and we consider that integrated implementation of sewered and non-sewered sanitation interventions should and will increasingly become the norm.

It is therefore clear that few previous sewerage projects in African cities have served poor communities effectively. Nonetheless, some projects – including the Dakar project – have had some pro-poor impact. The next section discusses ways in which future sewerage projects might achieve genuine pro-poorness.

### Recommendations for increasing pro-poorness

Drawing on this specific analysis of the PAQPUD project, and on the wider review of previous sewerage projects in African cities, a number of lessons can be drawn.

First, though, we note that it is outside the scope of the present report to discuss when sewerage can be an appropriate and pro-poor sanitation solution for African cities: we have discussed this in more depth in previous publications (see e.g. Norman & Chenoweth 2009). Certainly, in many contexts sewerage is *not* an appropriate solution: health will often be more cost-effectively impacted though improvements in non-piped facilities and systems. Sewerage is most likely to be cost effective in high-density urban habitats, and particularly in cities with an existing and reasonably well-functioning sewerage system (e.g. Dakar, Nairobi), such that network extension to serve poor settlements may be achievable at relatively low cost.

This report focuses on pro-poorness. Project appraisals of sewerage projects typically cite pro-poorness as a goal, but without detailed consideration of how this will be achieved. For example, the 2006 AfDB project appraisal for the Accra Sewerage Improvement Project states that ‘the immediate beneficiaries will be the urban and peri-urban population in Accra of about 1,467,839 (49.5% of the 2020 Accra population), majority of whom are poor’; but in fact this project will provide sewers only for wealthy and institutional districts, with no parallel investment in collection and treatment of faecal sludge (Norman 2009b).

If a sewerage project is being considered, the appraisal stage should assess very carefully whether it can be genuinely made pro-poor. We would suggest that international financing institutions (including major donors and the concessionary arms of the development banks) should only finance sewerage projects if they are genuinely, substantially and *primarily* pro-poor: they should not be subsidising sewerage network construction in wealthy/institutional city-centre districts, and should be financing wastewater treatment plants only if these are genuinely and substantially beneficial to the city’s poorest communities.

We suggest that ways of achieving pro-poorness are as follows:

- (1) Better geographical targeting at the macro level (i.e. deciding which countries/cities to target). Donors and international financing institutions often choose locations on the basis of likelihood of ‘success’ rather than degree of need; the World Bank in particular has a policy of targeting aid at countries judged to have a sufficiently strong institutional framework to support aid spending (for a useful review, see Riddell 2007 pp. 231–235). There are certainly arguments for this approach, in general and in the particular context of urban sanitation; but also contra-arguments (again see Riddell 2007). In our view, Dakar was not an appropriate location for major donor funding for sanitation: this money could have been more effectively spent elsewhere in Senegal or elsewhere in Africa.
- (2) Good geographical targeting at the within-city level (district-level targeting), as seen in the PAQPUD project. Despite within-district variation in wealth levels, most

cities have well-defined socioeconomic zoning, with wealthier and institutional districts typically much better served than poorer districts and especially informal settlements. It is worth noting that sewerage will rarely be appropriate for low-density peri-urban districts; it will generally be a candidate solution only for districts with high population density, whether city centre or peri-urban.

- (3) Well designed household-level targeting. We do not agree with the judgement of PAQPUD’s planners that household-level targeting was unnecessary and non-cost-effective: our results clearly show that, despite the high overall coverage levels achieved by PAQPUD, coverage among the bottom income quintile was poor. This programme was massively subsidised (beneficiaries of the settled sewerage programme bore only about 5% of the total investment cost): poor coverage among the lowest income groups might be justifiable in a marketing-based programme in which the aim is to leverage household finance and catalyse a self-sustaining and aspirational sanitation market; but it is not justifiable in a programme with heavy subsidy of household investment. In our opinion, projects like PAQPUD require careful planning to ensure that the neediest households will benefit (notably very poor households, households with particularly inadequate existing sanitation, and poor tenants).
- (4) Low-cost network connection solutions, including sewerage from condominiums and related strategies for reducing the cost of local connections to a sewer main, as summarised by Norman & Chenoweth (2009). The technical solution adopted in the PAQPUD project was settled (solids-free) sewerage, which is certainly a lower-cost solution than conventional solids-transporting sewerage if septic tanks are already widely installed (as in Dakar). Low-cost connection solutions *may* significantly reduce the cost of connection, making connection more affordable to householders. However, it is important to stress that short-term cost-reduction strategies (such as use of cheaper construction materials or community construction) may be false economies; see Norman & Chenoweth (2009).

A desire to target poorer households should not over-ride other relevant targeting concerns: in the PAQPUD project a small minority of households had no toilet at the start of the

project, and very few of these households benefited. Tenancy status and other social indicators of need (e.g. single-mother households, the elderly) may also be relevant.

As suggested previously (Norman 2009a), sanitation planners may wish to consider an interesting hybrid solution, namely sewer connection of public toilets with associated sewer holding tanks, allowing for deposition of locally collected nightsoil/sludge. If properly planned and managed, this approach can potentially offer an effective and financially self-sustaining model for sanitation improvement in very poor settlements, at the same time allowing for future household connections to the sewer line. An approach of this type is currently being implemented by the Nairobi Water and Sewerage Company in areas of the Kibera slum in Nairobi.

Finally, we stress that it is important for there to be detailed and independent evaluation of the pro-poorness of sewerage projects, with the particular goal of avoiding the 'connections problem'. Properly designed mid-term evaluations will perhaps be more useful than ex-post evaluations: these provide rapid feedback within a short enough timescale to allow modification of programme implementation, and this may allow problems to be corrected, not merely reported. It is important to independently assess how many people benefited, not just accept nominal connection rates supplied by the project agencies; and it is important to consider the complexities of each particular project: for example, in the present evaluation it was essential to take into account not just whether each household had received a sewer-connected interceptor tank, but also whether the household had made the within-plot connection from their septic tank to the sewer intercept tank. Finally, it is important to sample from the whole target population, not just nominal beneficiaries, and it is of particular interest to assess reasons for non-benefit.

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