Safe Drinking Water Coverage and Poverty

This chapter explores the links between safe drinking water coverage and poverty at the subcounty level. A short introduction defines safe drinking water coverage and summarizes targets and trends for urban and rural coverage at the national level. Maps in this section provide an overview of the national pattern of safe drinking water coverage, highlight the rural areas that have not kept pace with national average progress toward 2015 targets, and examine the poverty rate and density in these lagging subcounties. These overlays are meant to illustrate how poverty maps can help identify geographic areas with a particular set of poverty characteristics—information which can be used to make future investments in safe drinking water infrastructure more pro-poor.

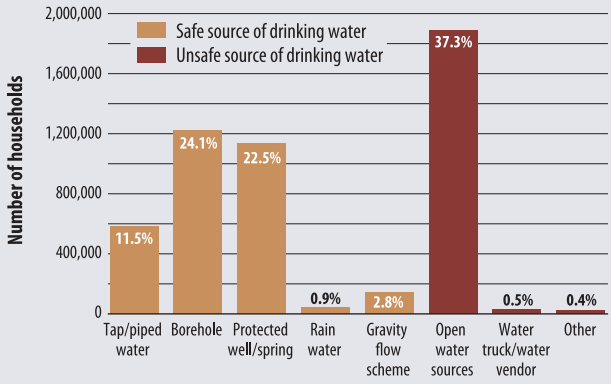
The maps focus on rural areas because map overlays at a national scale can be carried out more meaningfully for rural areas covering large contiguous zones. Overlay analysis of urban areas, in contrast, would require more detailed maps of urban centers such as Kampala and Jinja. In addition, a large number of rural subcounties are still greatly underserved with safe drinking water infrastructure and experience high levels of poverty.

DEFINITION AND TRENDS

Safe drinking water is water that is free from disease-causing organisms, toxic chemicals, color, smell, and unpleasant taste. In Uganda, safe drinking water is defined as water from a tap and piped water system, borehole, protected well or spring, rain water, or gravity flow schemes. Open water sources including ponds, streams, rivers, lakes, swamps, water holes, unprotected springs, shallow wells, and water trucks are considered unsafe (Figure 1).

As mentioned previously, Uganda has set different 2015 targets for safe drinking water coverage in rural and urban areas. It also applies different distance thresholds to define urban and rural coverage rates. A rural household is considered to have safe drinking water coverage if there is a safe water source within 1.5 kilometers from the household. The distance requirement for an urban household is less than 0.2 kilometers. In addition, the investment costs differ between rural and urban areas. The following section, therefore, presents targets and trends for rural and urban areas separately.

Figure 1 **SOURCES OF DRINKING WATER AGGREGATED FROM 2002 CENSUS**

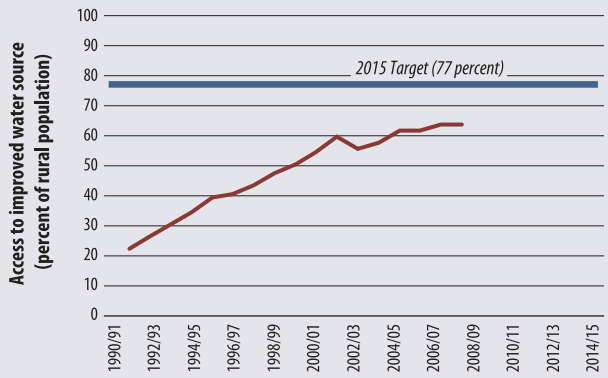


Source: UBOS, 2002b.

It is the Government's mandate to provide sustainable safe drinking water to the population. In line with this, the country has developed sector investment plans for urban and rural water supply. The supply of most urban water is managed on a commercial basis. The Central Government has established performance contracts with the National Water and Sewerage Corporation (NWSC), a government-owned utility parastatal. NWSC provides water and sewerage services in the largest urban areas such as Kampala. It has established lease and management contracts for private companies to cover a large portion of NWSC's core operations and water supplies in smaller towns (Gutierrez and Musaazi, 2003; Richards et al., 2008).

Within the sector investments plans, Central Government has assumed responsibility for most of the costs of rural water supply. Local governments are responsible for implementing these plans and improving rural water supplies. To achieve this, the central government has been allocating funds to enable every district to reach the same level of safe drinking water coverage in 2015 (MWE, 2007; MWE, 2008). Trend data compiled by the Directorate of Water Development (DWD) from District Local Government reports, show that the large investments in water supply infrastructure have translated into dramatic gains in safe drinking water coverage for Uganda's rural areas, from about

Figure 2 CHANGES IN RURAL SAFE DRINKING WATER ACCESS



Sources: MWE, 2008 and MWE, 2007.

25 percent in the early 1990s to 63 percent in 2007/2008 (MWE, 2008) (Figure 2). In recent years, however, the annual construction of new water infrastructure has barely outpaced population growth, slowing down improvements in rural safe drinking water coverage (MWE, 2008). Only if investment levels keep pace with population growth and with the higher unit costs associated with serving the remaining rural households that do not have safe drinking water, can Uganda reach its national goal for 2015.

Uganda's annual water performance report separates safe drinking water access for urban areas into large towns and small towns (MWE, 2008). In 2008, about 4.39 million people lived in 23 large towns and 160 small towns, and 2.69 million Ugandans in these urban areas had access to safe drinking water sources. Coverage differed between large and small towns (see Table 1).

As reported by the National Water and Sewerage Corporation responsible for servicing large towns, the percentage of the population in large towns with access to safe drinking water has increased from 60 percent in 2002 to 72 percent in 2008. Of these large towns, Masindi, Mubende, Soroti, Bushenyi/Ishaka, and Hoima had the lowest 2008 coverage rates, all below 50 percent (MWE, 2008).

Small towns, as reported by District and Town Boards, achieved safe drinking water coverage of 46 percent serving about 0.79 million people in 2008. Of the 160 small towns, 113 have functional piped water supply schemes and 47 are served by other improved water supplies. As a consequence, safe drinking water coverage in Uganda's small towns ranges from as low as zero percent to 95 percent, and is on average higher in towns with a town council (MWE, 2008).

For all urban areas in Uganda, the average access to safe drinking water (61 percent) is ahead of its interim 2008 target of 58 percent (MWE, 2008). Table 1 reveals,

Table 1 URBAN SAFE DRINKING WATER ACCESS

	2002 Safe Drinking Water Coverage		2008 Safe Drinking Water Coverage		2008 Population
	(million)	(percent)	(million)	(percent)	(million)
Town Boards	—	—	0.14	36	0.40
Town Councils	—	—	0.65	49	1.33
Total Small Towns	—	—	*0.79*	*46*	*1.73*
Large Towns	—	60	1.90	72	2.66
Total Urban	**—**	**—**	**2.69**	**61**	**4.39**

Source: MWE, 2008.

however, that this average masks the lack of access to safe drinking water sources in many small towns. Increased attention and resources need to be allocated to smaller urban areas to ensure that intermediate targets are met and Uganda's national target for 2015 is not being jeopardized.

SAFE DRINKING WATER COVERAGE AND POVERTY PATTERNS

Trend data using a national average for safe drinking water coverage mask how individual districts and subcounties are performing. Planners require more location-specific information. At the central government level, they need to know how uniformly national progress is distributed throughout Uganda's districts and which areas have been underserved and need special attention to reach the 2015 target. At local government levels, they need to know the performance differences between subcounties within a district, both to understand how specific investment amounts have translated into safe drinking water coverage rates and how to address distributional equity issues.

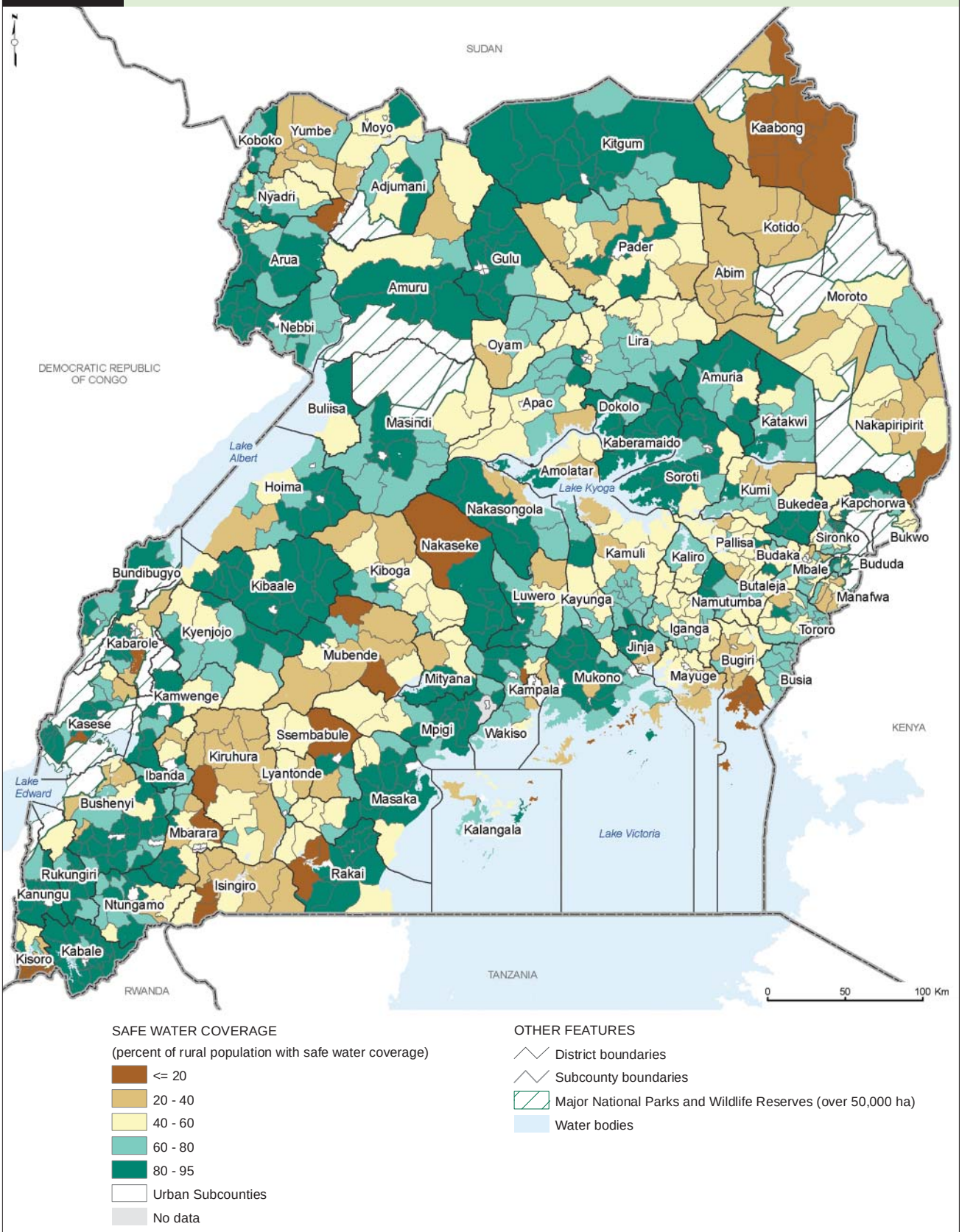
Map 3 shows the proportion of the rural subcounty population with safe drinking water coverage. The brown areas in Map 3 represent low percentages of safe drinking water coverage (less than or equal to 20 percent of the rural subcounty population), while subcounties in shades of turquoise have the highest share of safe drinking water coverage.

There is no clear spatial pattern in Map 3. For example, there are not consistently low values in the north or very high coverage rates in the central parts of the country.

Nevertheless, a number of observations can be drawn from this map to guide future investments in safe drinking water infrastructure in rural areas.

Subcounties with safe drinking water coverage of 60 to 80 percent are close to the interim national rural target set for 2008 by the Directorate of Water Development and are on track to make the 2015 target, though they still require additional capital investments to boost coverage in the next eight years. Subcounties with safe drinking water coverage of more than 80 percent have already achieved the

Map 3 PROPORTION OF RURAL SUBCOUNTY POPULATION WITH SAFE DRINKING WATER COVERAGE, 2008



Sources: International boundaries (NIMA, 1997), district administrative boundaries (UBOS, 2006b), subcounty administrative boundaries (UBOS, 2002a), water bodies (NFA, 1996; NIMA, 1997; Brakenridge et al., 2006), and rural safe drinking water coverage rate (DWD, 2008).

Box 6 ESTIMATING ACCESS TO SAFE DRINKING WATER SUPPLIES IN UGANDA

The Directorate of Water Development (DWD) is using proxy measures to estimate access to safe drinking water supplies in Uganda. The existing data collection and monitoring efforts do not permit DWD to physically measure for the whole country the percentage of people within 1.5 kilometers (rural areas) and 0.2 kilometers (urban areas) of an improved water source.

For rural areas, DWD assumes a fixed number of users per source as follows: protected spring (200 persons), shallow well with hand pump (300 persons), deep borehole with hand pump (300 persons), gravity flow scheme or other piped water supply tap (150 persons), and rain water harvesting tank (3 persons for a tank of less than 10,000 liters and 6 persons for a tank greater than 10,000 liters). DWD relies on an inventory of existing safe drinking water sources (based on a national survey and annual reporting) to calculate for each subcounty the total number of people served by all the improved sources. This number is then divided by the total subcounty population (as projected by the Uganda Bureau of Statistics) to obtain the share of the subcounty population with access to an improved water source. DWD caps each subcounty share at a maximum coverage rate of 95 percent to ensure that no subcounty is serving more people than its total population. Coverage rates shown in this publication assume that all sources are fully functional.

The calculation for urban areas uses a similar approach assuming a fixed number of users per water source (e.g., house connection, yard taps, public taps, hand pumps, and protected springs). The number of users varies for small, medium, and large towns.

The current method of estimating access to improved rural water supplies at subcounty level--assuming a fixed number of users per source and fully functional sources – results in a best case scenario of safe drinking water access. It is a useful approach to gauge national and district progress, especially when coverage rates are low and improve rapidly from year to year (as was the case in the 1990s). This approach becomes more problematic, however, once administrative areas have achieved higher coverage rates and planners are in need of more precise information.

For example, although access is capped at 95 percent, the subcounty average may still be an overestimate for parts of a subcounty because well-served areas within a subcounty can compensate for poorly served areas. The results would be more accurate and better reflect the situation on the ground if the analysis were undertaken at parish or even village level. Estimating safe drinking water coverage for these very small administrative areas, however, is costly—it requires a complete inventory of water sources, their exact location, and robust population projections. Making these information investments at more local scales may only be warranted for selected parts of the country, such as subcounties with the highest population or administrative areas that have reached coverage rates of greater than 95 percent, to ensure that the last pockets of underserved households are targeted with greater precision.

Source: MWE, 2008.

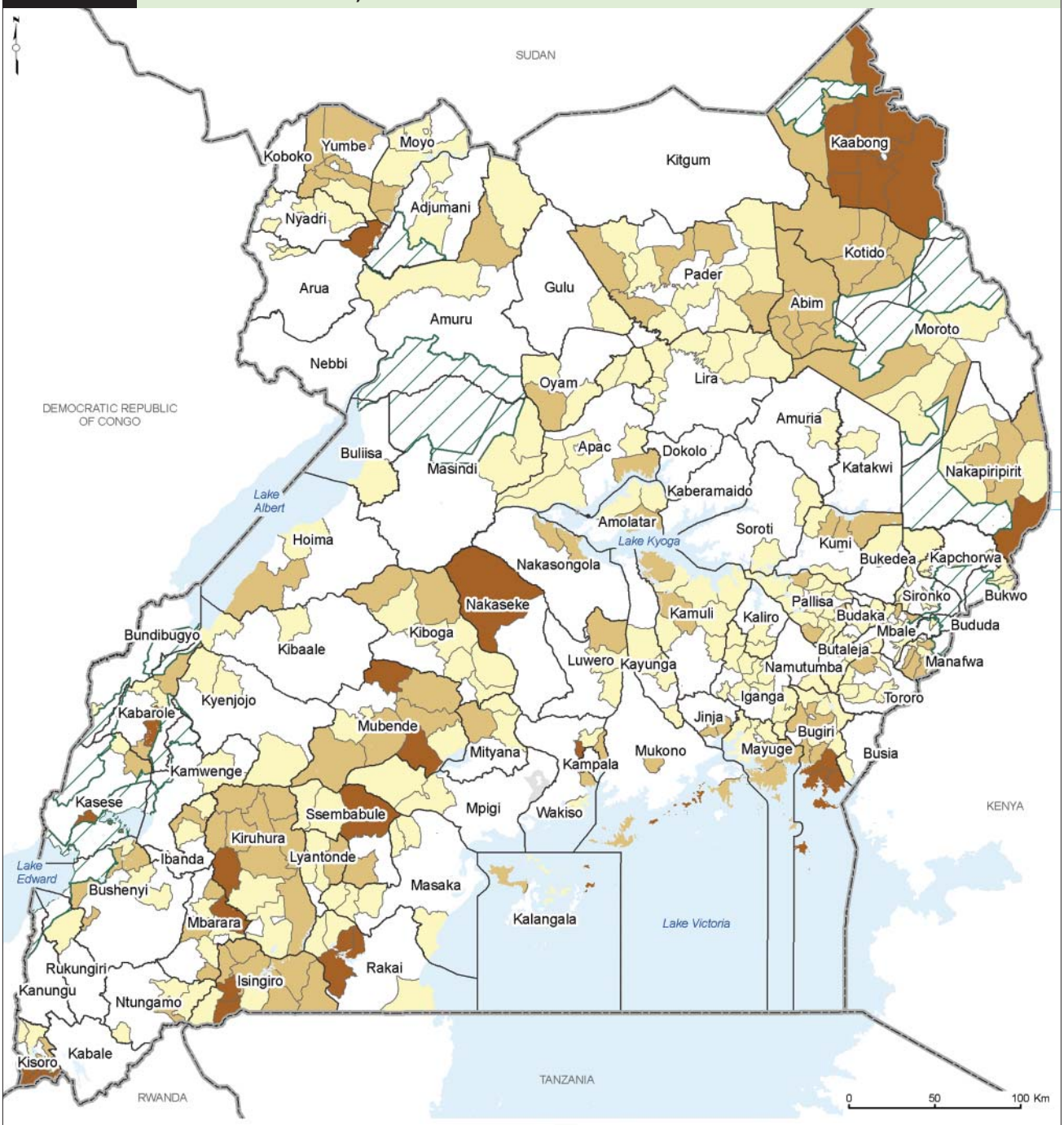
2015 target in 2008. These areas will require maintenance funds, but not necessarily resources for new water infrastructure, unless factors such as large population increases arise (e.g., resulting from migration).

Almost all districts had at least one rural subcounty shaded in turquoise (coverage rates of greater than 60 percent), with the exception of Kaabong, Kotido, Abim, Mayuge, and Isingiro Districts. Slightly more than half of the rural subcounties shown in Map 3 have safe drinking water coverage of greater than 60 percent. Southwestern districts of Kabale, Kanungu, and Rukungiri, and the districts of Dokolo, Kaberamaido, and Nebbi are among the top performers: all of their subcounties have coverage rates above 60 percent. There are several reasons why these areas would be top performers, but one is that many subcounties in the more mountainous region of the south and southwest can rely on protected springs and tap stands fed by small gravity flow schemes—all technologies with low unit costs. This means that a large number of people can be granted access to safe drinking water per shilling invested.

Map 4 highlights the rural subcounties with safe drinking water coverage rates below 60 percent, which means they did not meet the interim national rural target set by the Directorate of Water Development and are not on track to make the 2015 target. All rural subcounties in Kaabong, Kotido, Abim, Mayuge, and Isingiro Districts have safe drinking water coverage rates below 60 percent. So do almost all rural subcounties in the districts of Yumbe, Pallisa, Bugiri, and Ssembabule Districts, and the majority of rural subcounties in the districts of Mbarara, Kiruhura, Lyantonde, Mubende, and Kiboga Districts. Kampala District borders a few rural subcounties in Wakiso District with very low safe drinking water coverage rates.[2] All of these areas will require special attention and additional investments to catch up with progress at the national level. In comparison to high-performing regions, many subcounties with the lowest coverage rates (e.g., in Kitgum, Yumbe, Kaabong, and Kotido Districts) are facing two major challenges—greater dependence on costly deep boreholes and generally very poor groundwater potential (MWE, 2007).

2. Current reporting distorts the coverage rates for some peri-urban areas. For example, the Kampala safe drinking water coverage is an overestimate because it includes connections in neighboring rural subcounties of Wakiso District as part of Kampala municipality. Coverage in the same rural subcounties in Wakiso District is an underestimate because it does not consider the piped water supply extending into the District from Kampala (MWE, 2008).

Map 4 LAGGING BEHIND: RURAL SUBCOUNTIES WITH SAFE DRINKING WATER COVERAGE BELOW 60 PERCENT, 2008



Sources: International boundaries (NIMA, 1997), district administrative boundaries (UBOS, 2006b), subcounty administrative boundaries (UBOS, 2002a), water bodies (NFA, 1996; NIMA, 1997; Brakenridge et al., 2006), and rural safe drinking water coverage rate (DWD, 2008).

Mapping Investment

A critical question for water infrastructure planners is how to prioritize investments over the next eight years: should they invest first in those subcounties with the lowest coverage rates (less than 20 percent) or those with higher coverage rates? If planners only consider a single criterion—the gap between current coverage rate and a target of 77 percent for rural subcounties—then investment would go first to subcounties with the smallest gap, because it would require the least amount of resources to achieve the target. Planners could rely solely on Map 4 and focus on subcounties with safe drinking water coverage of 40 to 60 percent.

However, planners also have to take into consideration other criteria, such as relative unit costs to reach additional households in each subcounty and equity in coverage rates among subcounties. As reflected in the maps, one factor behind varying coverage rates is the varying cost of water resource development across the country. In this case, planners would compare the coverage rates of Map 4 with other maps showing resource allocations, number of safe drinking water points constructed, unit costs, and indicators measuring the equity of coverage rates within districts. (The Directorate of Water Development compiles most of this information in their annual water performance reviews.)

In addition to criteria such as distance to national targets, costs, efficiency, and equity, water infrastructure planners are also facing the challenge of making their investment priorities more pro-poor. This requires further analysis of how water investments would benefit communities with high poverty rates or high poverty density. Table 2 presents a simple demographic and poverty profile for subcounties falling into five different categories of safe drinking water coverage.

Over half of Uganda's rural subcounties and about half of the population living in these areas have achieved safe drinking water coverage rates over 60 percent. In those subcounties where coverage rates are below 60 percent, safe drinking water coverage is not evenly distributed: the majority of subcounties (which in this case also equates to the majority of the population) have coverage between 40 and 60 percent. For the 26 subcounties with the lowest safe drinking water coverage (below 20 percent), investments in facilities that serve approximately 800,000 people are needed to bring these subcounties to a 100 percent level. For subcounties in the next two categories of safe drinking water coverage the number of people requiring new facilities would be more than three to four times as many (2.4 and 3.2 million, respectively) than the number in the bottom category.

Considering data on the number of poor and the poverty rate along with the percentage of access to safe drinking water can help planners focus investments. For example, a look at the total number of poor and the average poverty rate by safe drinking water coverage category in Table 2 reveals that these two indicators have their highest value for subcounties falling into the 40 to 60 percent class.

Table 2 relies on averages derived from a large number of subcounties spread over a broad geographic region. It can provide only some general guidance on which subcounties would result in, on average, greater pro-poor benefits. Poverty rates and poverty densities are not uniformly distributed throughout the five categories of subcounties. Planners need to map individual subcounties and examine the underlying data to more precisely identify locations with greater poverty levels.

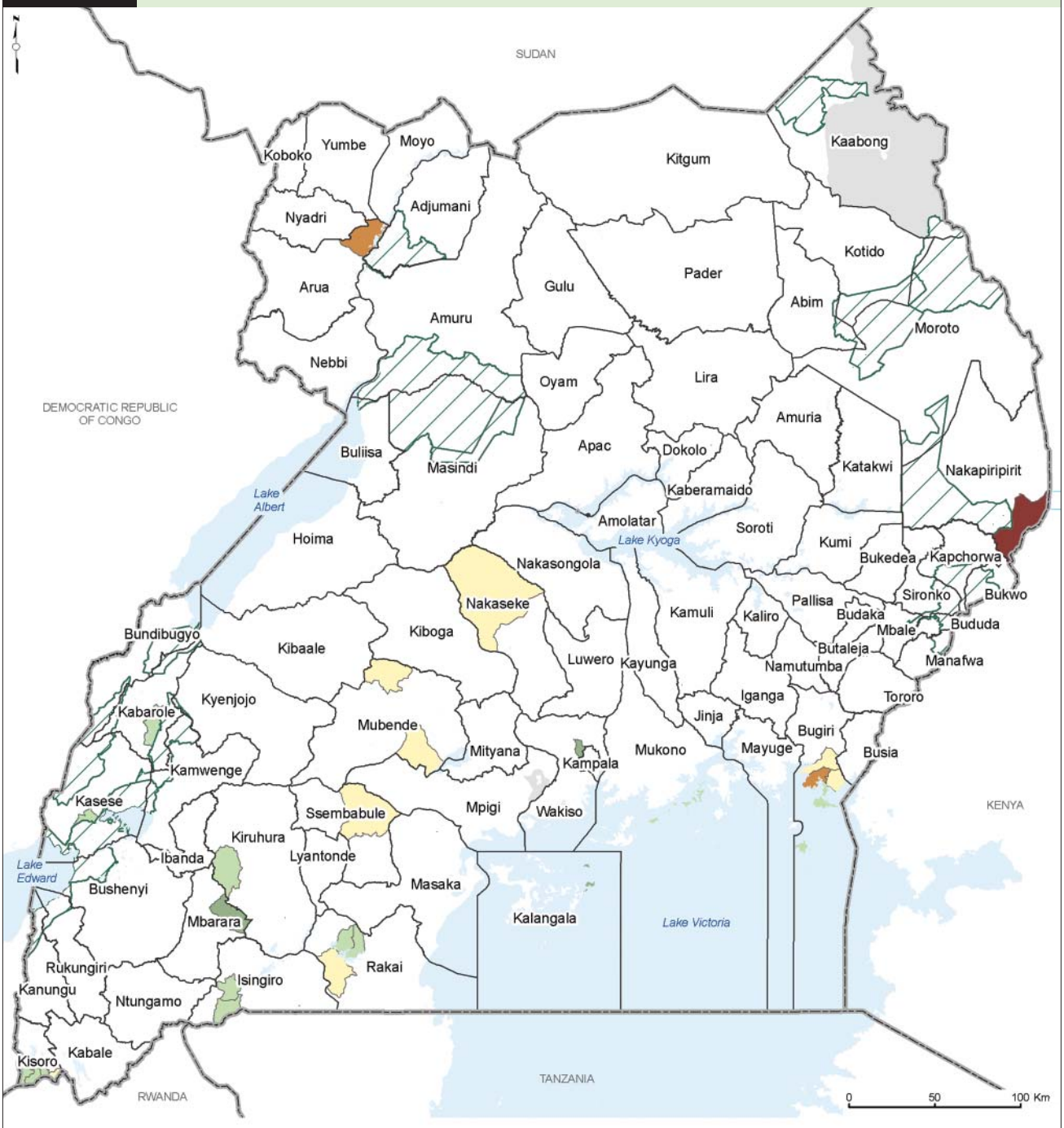
The following analysis provides an example of how to identify geographic areas where new investments in water

Table 2 DEMOGRAPHIC AND POVERTY PROFILE FOR RURAL SUBCOUNTIES WITH DIFFERENT SAFE DRINKING WATER COVERAGE

2008 Safe Drinking Water Coverage (percent)	Number of Rural Subcounties	Total Settled Area for All Rural Subcounties (square km)	2008 Total Population in All Rural Subcounties (million)	2005 Estimated Number of People Requiring Safe Drinking Water (million)	2005 Average Population Density (number of persons per square km)	2005 Average Poverty Rate for All Rural Subcounties (percent)	2005 Total Number of Poor in All Rural Subcounties (million)	2005 Average Poverty Density for All Rural Subcounties (number of poor per square km)
<= 20	26	6,696	0.9	0.8	113	27	0.2	31
20 < x <= 40	92	25,650	3.5	2.4	110	33	0.9	37
40 < x <= 60	205	46,700	6.6	3.2	114	39	2.1	44
60 < x <= 80	201	36,591	6.3	1.9	140	36	1.8	50
80 > x <= 95	305	58,492	7.8	0.6	111	30	1.9	33
TOTAL	**829**	**174,129**	**25.1**	**8.9**	**118**	**34**	**7.0**	**40**

Notes: Only 829 rural subcounties had both poverty and water coverage data. Seven subcounties in Kaabong District, all with safe drinking water coverage below 20 percent, are not included in this table because reliable poverty estimates were not available for 2005. Data are rounded to nearest thousand, million, or percent.
Sources: Authors' calculation based on UBOS and ILRI (2008), and DWD (2008).

Map 5 POVERTY RATE IN RURAL SUBCOUNTIES WITH SAFE DRINKING WATER COVERAGE BELOW 20 PERCENT



POVERTY RATE
(percent of the population below the poverty line)

- <= 15
- 15 - 30
- 30 - 40
- 40 - 60
- > 60
- No data
- Urban Subcounties or Rural Subcounties where safe drinking water coverage is over 20 percent

OTHER FEATURES

- District boundaries
- Subcounty boundaries
- Major National Parks and Wildlife Reserves (over 50,000 ha)
- Water bodies

Note: Seven subcounties in Kaabong District, all with safe drinking water coverage below 20 percent, are not shown in this map because reliable poverty estimates were not available for 2005.

Sources: International boundaries (NIMA, 1997), district administrative boundaries (UBOS, 2006b), subcounty administrative boundaries (UBOS, 2002a), water bodies (NFA, 1996; NIMA, 1997; Brakenridge et al., 2006), rural safe drinking water coverage rate (DWD, 2008), and rural poverty rate (UBOS and ILRI, 2008).

infrastructure would reach the greatest number of poor. It overlays information from the earlier poverty maps (Maps 1 and 2) with data from Maps 3 and 4. Combining maps permits the creation of new statistics which can help prioritize safe drinking water investments. It focuses on rural subcounties with the lowest safe drinking water coverage—below 20 percent. Similar systematic analyses need to be carried out for other types of subcounties, such as those nearest to the 2006 milestone of safe drinking water coverage (i.e., those with coverage rates of 40 to 60 percent).

Targeting the Poor in Rural Subcounties with the Lowest Safe Drinking Water Coverage

About 200,000 poor persons live in the 26 rural subcounties with the lowest safe drinking water coverage rates. Targeting these subcounties would seek to improve the situation for areas that are having the greatest difficulty in providing safe drinking water to their inhabitants. By focusing on high poverty areas, planners could try to improve the well-being of communities with multiple deprivations: high levels of monetary poverty and high dependence on unsafe drinking water sources. Map 5 and Map 6 display the poverty rate and the poverty density respectively for these subcounties.

Map 5 shows that poverty rates for the 26 subcounties include all five classes of poverty rates, a fact that is masked by the average poverty rate (27 percent) in Table 2. Subcounties with the highest poverty rate (shaded in dark brown) are located in Nakapiripirit, Bugiri, and Arua Districts. Map 6 displays a similarly diverse spread in the poverty density values. Rural subcounties in Bugiri District have high poverty densities (shaded in light brown), as do subcounties in Kisoro District.

Selecting poor subcounties based on Map 5 and Map 6 is not a straightforward choice. Only a few subcounties fall in similar classes such as one subcounty in Bugiri District (high poverty rate and high poverty density) and in Mbarara, Kiruhura, Kabarole, and Kasese Districts (low poverty rates and low poverty densities). Other subcounties have contrasting profiles: in Nakapiripirit District (high poverty rate and low poverty density); in Kisoro District (high poverty density and low poverty rate), and in Arua District (high poverty rate and medium poverty density). Moreover, simply selecting subcounties with the highest poverty rate or highest poverty density may not always be the optimal way to reach a great number of the poor (see example in Box 5).

Mapping Investment

Planners will need to examine the poverty and demographic data behind the two maps to guide their selection process. Three poverty indicators can help them to identify the most promising subcounties where new drinking water infrastructure would have the greatest potential for pro-poor benefits:

- *Poverty Rate*. Poverty rate determines the precision and cost required to identify and target poor households. If planners seek to maximize the number of poor per new drinking water facility proportional to non-poor households also benefiting, they should target areas with high poverty rates. A new safe drinking water source will enhance the well-being of all community members being served—poor as well as non-poor. Placing a new facility in a subcounty where more than 70 percent of the households are poor requires less precise targeting than placing a facility in an area where only 20 percent are poor.
- *Poverty Density*. Poverty density is of relevance if planners want to minimize the delivery costs of water from the source to a family's home. Low density areas are associated with higher costs to connect dwellings to a piped water system or with greater average distances walked to a single community source.
- *Total Number of Poor*. Poverty rate and poverty density measures alone are not sufficient to identify the most promising subcounties for pro-poor targeting. A subcounty may have a high poverty rate or a high poverty density but still have a low count of poor persons because the subcounty is small and its overall population is comparatively low.

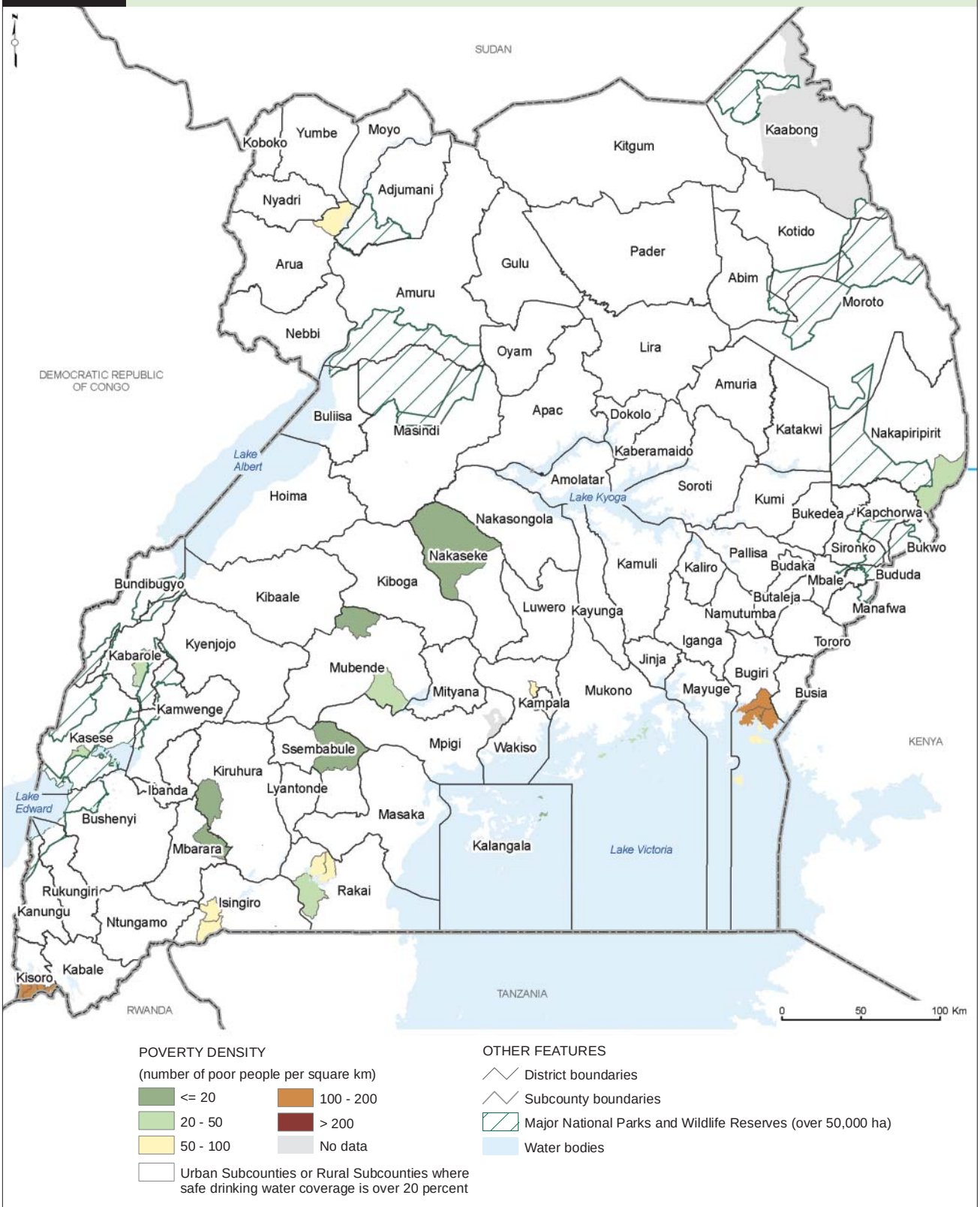
Generally, planners will need to examine all three indicators and decide whether to use one or a combination of all three to determine their priority subcounties. The analysis that follows will examine these poverty metrics for a subset of subcounties whose safe drinking water coverage rates are below 20 percent. The analysis is based on three different rankings in Table 3. Section A lists the 10 subcounties (out of 26 subcounties with safe drinking water coverage rates below 20 percent) with the highest poverty rates. Section B and Section C rank the same 26 subcounties, but this time showing the 10 subcounties with the highest poverty densities and the highest total number of poor, respectively.

Sample Findings

The three sections reveal that targeting subcounties solely by poverty rate, poverty density, or total number of poor results in a different selection of subcounties. As expected, the average poverty rate, average poverty density, and the pool of poor households that could be reached, differ for the respective ten subcounties:

- The top ten subcounties ranked by poverty rates (Section A) achieve an average poverty rate of 44 percent. In contrast, the average poverty rate is 38 percent for the top ten subcounties ranked by poverty count (Section C) and only 24 percent for the top ten subcounties ranked by poverty density (Section B). Section A includes

Map 6 POVERTY DENSITY IN RURAL SUBCOUNTIES WITH SAFE DRINKING WATER COVERAGE BELOW 20 PERCENT



Note: Seven subcounties in Kaabong District, all with safe drinking water coverage below 20 percent, are not shown in this map because reliable poverty estimates were not available for 2005.

Sources: International boundaries (NIMA, 1997), district administrative boundaries (UBOS, 2006b), subcounty administrative boundaries (UBOS, 2002a), water bodies (NFA, 1996; NIMA, 1997; Brakenridge et al., 2006), rural safe drinking water coverage rate (DWD, 2008), and rural poverty density (UBOS and ILRI, 2008).

Table 3 SUBCOUNTIES WITH LOWEST SAFE DRINKING WATER COVERAGE: RANKING BY POVERTY INDICATOR

Rank	Subcounty	District	Settled area (square km)	2005 Total number of people (000)	2005 Poverty rate (percent)	2005 Poverty density (number of poor per square km)	2005 Total number of poor (000)	2005 Estimated number of people requiring safe drinking water (000)
Section A	HIGHEST POVERTY RATE							
1	KARITA	NAKAPIRIPIRIT	571	27	87	41	23	22
2	RIGBO	ARUA	318	28	56	50	16	23
3	MUTUMBA	BUGIRI	101	29	40	114	11	26
4	BANDA	BUGIRI	99	32	40	129	13	30
5	BUTOLOOGO	MUBENDE	355	16	38	17	6	13
6	NGOMA	NAKASEKE	1,824	17	37	3	6	14
7	BUYINJA	BUGIRI	141	43	36	110	16	35
8	LUGUSULU	SSEMBABULE	738	21	33	9	7	17
9	MURORA	KISORO	35	16	32	147	5	14
10	KYALULANGIRA	RAKAI	325	28	31	28	9	25
		TOTAL TOP 10	**4,507**	**257**	**44**	**25**	**112**	**219**
Section B	HIGHEST POVERTY DENSITY							
1	MURORA	KISORO	35	16	32	147	5	14
2	BANDA	BUGIRI	99	32	40	129	13	30
3	MURAMBA	KISORO	62	30	26	126	8	24
4	CHAHI	KISORO	28	15	23	121	3	13
5	MUTUMBA	BUGIRI	101	29	40	114	11	26
6	BUYINJA	BUGIRI	141	43	36	110	16	35
7	NYARUSIZA	KISORO	57	23	25	101	6	19
8	NABWERU	WAKISO	41	102	3	87	4	88
9	NYAKITUNDA	ISINGIRO	129	32	28	69	9	28
10	KAGAMBA (BUYAMBA)	RAKAI	120	28	29	69	8	25
		TOTAL TOP 10	**814**	**352**	**24**	**102**	**83**	**302**
Section C	HIGHEST POVERTY NUMBER							
1	KARITA	NAKAPIRIPIRIT	571	27	87	41	23	22
2	RIGBO	ARUA	318	28	56	50	16	23
3	BUYINJA	BUGIRI	141	43	36	110	16	35
4	BANDA	BUGIRI	99	32	40	129	13	30
5	KIGANDA	MUBENDE	444	39	30	26	12	32
6	MUTUMBA	BUGIRI	101	29	40	114	11	26
7	KYALULANGIRA	RAKAI	325	28	31	28	9	25
8	NYAKITUNDA	ISINGIRO	129	32	28	69	9	28
9	KIKAGATE	ISINGIRO	161	44	20	54	9	37
10	KAGAMBA (BUYAMBA)	RAKAI	120	28	29	69	8	25
		TOTAL TOP 10	**2,410**	**331**	**38**	**52**	**126**	**283**

Notes: Seven subcounties in Kaabong District, all with safe drinking water coverage below 20 percent, are not included in this table because reliable poverty estimates were not available for 2005. The number of persons requiring safe drinking water sources is an estimate based on 2008 coverage applied to 2005 subcounty population. Subcounties highlighted are ranked among the top ten subcounties for all three indicators.
Source: Authors' calculation based on UBOS and ILRI (2008), and DWD (2008).

the second highest total number of poor. Six out of ten subcounties in Section A have low poverty densities.

- The average poverty density in Section B (subcounties ranked by poverty density) is more than four times the average density for the top ten subcounties with the highest poverty rates (Section A). Targeting poor households in the selected subcounties listed in Section B requires great precision, since these subcounties only have an average poverty rate of 24 percent (ranging from 3 to 40 percent at subcounty level). Overall, the fewest number of poor would be reached with the selection criteria of Section B.
- The top ten subcounties ranked by the total poverty number (Section C) would reach about 126,000 poor persons, which is relatively close in number to the 112,000 poor persons in Section A (subcounties ranked by poverty rates). The average poverty rate in Section C is not quite as high as in Section A (38 versus 44 percent). Average poverty densities in Section C are half that in Section B.

As presented, selecting subcounties by a single poverty indicator results in a trade-off in performance regarding the other two poverty metrics. Depending on whether the targeting of new water infrastructure seeks to reach the highest number of poor, tries to target poor households most efficiently and reduce identification costs, or wants to reach a high density of poor within the perimeter of a water source, decision-makers can pick one of these indicators (and accept a large trade-off) or try to optimize the performance of all three poverty indicators (and accept smaller trade-offs for all three poverty indicators).

They could focus, for example, on subcounties that are ranked among the top ten subcounties for all three indicators. Three subcounties in the presented sections fall into this category. All are in southeastern Uganda in Bugiri District and include the subcounties of Banda, Buyina, and Mutumba. As expected, selecting subcounties based on all three poverty indicators results in different aggregate averages: The average poverty rate for these three subcounties is 38 percent (not quite as high as in Section A, but the same as the average rate in Section C), and their average poverty density of 117 persons per square kilometer is higher than the highest average density in Section B (102 persons per square kilometer). Targeting these three subcounties would represent a compromise. It would reach a very high number of poor within the perimeter of a new water facility but would achieve mid-level performance of reaching poor versus non-poor households.

Spatial Analysis and Safe Water Coverage: Conclusions

Several maps, figures, and data tables were developed throughout this section to illustrate how spatial analysis can inform Uganda's efforts to promote safe drinking water coverage. Based on the data presented here, the following conclusions can be drawn:

- About 11 million people live in the 323 rural subcounties that have not kept pace with national progress on safe drinking water rates. These subcounties will require special attention in the future to catch up with the remaining 506 subcounties that are leading the country in coverage rates.
- Technology and associated costs are an important factor for explaining low and high safe drinking water coverage rates in selected locations of Uganda. A comparison of poverty levels (poverty rates and poverty densities) with the levels of safe drinking water coverage reveals no strong correlation or clear spatial pattern (e.g., consistently low values in the north, or very high coverage rates in the central part of the country). This means that planners need to examine maps of poverty rates and poverty densities and the underlying data in more detail to identify subcounties for pro-poor targeting.
- Poverty maps can be combined with maps of safe drinking water coverage to identify areas that are most promising for pro-poor geographic targeting. However, pro-poor targeting of subcounties requires careful examination of these maps and the underlying data (poverty rates, poverty densities, and total number of poor) to identify optimal locations.
- In general, subcounties with high poverty rates and a high total number of poor are prime candidates for pro-poor targeting of future drinking water investments. In the example presented, prioritizing subcounties by poverty density resulted in an overall lower pool of poor persons and a low average poverty rate. However, for another subset of subcounties, poverty densities may be a more relevant indicator, especially if delivery costs to provide drinking water are of high importance to decision-makers.

As indicated earlier, this initial analysis is meant to be illustrative and therefore brings to the forefront other issues for research and follow-up analyses:

- While this analysis focused on subcounties with less than 20 percent coverage, a similar systematic analysis for all the other subcounties below safe drinking water coverage rates of 60 percent would be useful.
- For some district planning efforts, a more fine-grained analysis at parish level would also be useful. Such an analysis could, for example, compare maps of safe drinking water coverage rates to maps of human well-being using census data on basic necessities such as clothing, blankets, shoes, soap, and sugar.[3]

3. UBOS does not provide poverty data at parish level.

- While maps of safe drinking water coverage rates and poverty can help to identify broad geographic priorities, other factors need to be incorporated in prioritizing future water infrastructure investments—notably costs and equity issues. Follow-up analyses should therefore also include data and maps of government resource allocation (conditional grant allocation to districts), investment amounts in water infrastructure (total and per capita), efficiency of investments (shillings invested versus gains in coverage rates), and an indicator capturing distributional equity in coverage rates. This would provide national and local planners and representatives of local communities with information to discuss the pros and cons of different prioritization criteria. It would also provide decision-makers with more data to justify their selected priorities for new water infrastructure investments.