Think Piece 3

THROUGH THE DANGER ZONE:
Rates of change in the expansion of water and sanitation coverage

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1 ABSTRACT

According to the United Nations, the Millennium Development Goal target for water supply was reached in 2010, five years ahead of deadline. Nonetheless, over 780 million people worldwide lack access to a safe water supply. Progress towards the achievement of the sanitation target lags far behind, and predictions show that it is not likely to be reached by 2015.

This paper examines the rates of change in coverage of different groups (rural and urban) and in different services (water and sanitation). The analysis attempts to identify those populations most at risk of not getting access to service in the future, as well as those for whom progress seems more certain. We have tried to identify certain coverage levels at which growth is high, and others where stagnation seems to happen, an area we have called the danger zone. In addition, we attempt to go beyond a basic analysis of served/unserved to look at trends in moving from the most basic to higher service levels, posing the question: does improved services for some lead to stagnation in access to the most basic services for others.

The data do not reveal unequivocally that a danger zone exists. JMP data is not finely detailed enough to test the concept with full confidence. If such a zone does exist, some countries can and do manage to traverse it and approach full coverage. That said, the analysis does provide insight into where shifts take place in a country's growth trajectory from basic to higher levels of water services, or from open defecation to improved sanitation. And for the many countries that have not achieved 100% coverage, the analysis raises the question of the appropriate balance of investment between expanding coverage and sustaining services or, put another way, the dilemma of some for all or more for some.

2 INTRODUCTION

The UN recently announced that the Millennium Development Goal (MDG) target for water supply was met in 2010, five years ahead of the 2015 deadline (WHO/UNICEF, 2012). Between 1990 and 2010 over 2 billion people gained access to (nominally) improved water services. Despite this, 780 million people remain without access. Sanitation has shown much less progress, with growth in coverage lagging far behind that of water. Some 2.5 billion people still lack access to basic sanitation and the sanitation target is unlikely to be achieved by 2015.

The 2012 JMP report provides an analysis of progress that differentiates between countries, regions, rural and urban areas, and wealth quintiles. The same report also recognizes that the MDG target is not particularly fair to those countries – mostly Least Developed Countries (LDCs) in Africa – that already had the lowest coverage and therefore, in absolute terms, the most work to do to meet the MDG target. To remedy this, and to provide an alternative measure of progress, the JMP report also includes the increase in access as a percentage of the 2010 population. This indicator results in a very different progress report for countries – giving prominence to countries that, while starting from a low level and still having a way to go, have nevertheless made rapid progress in expanding coverage.

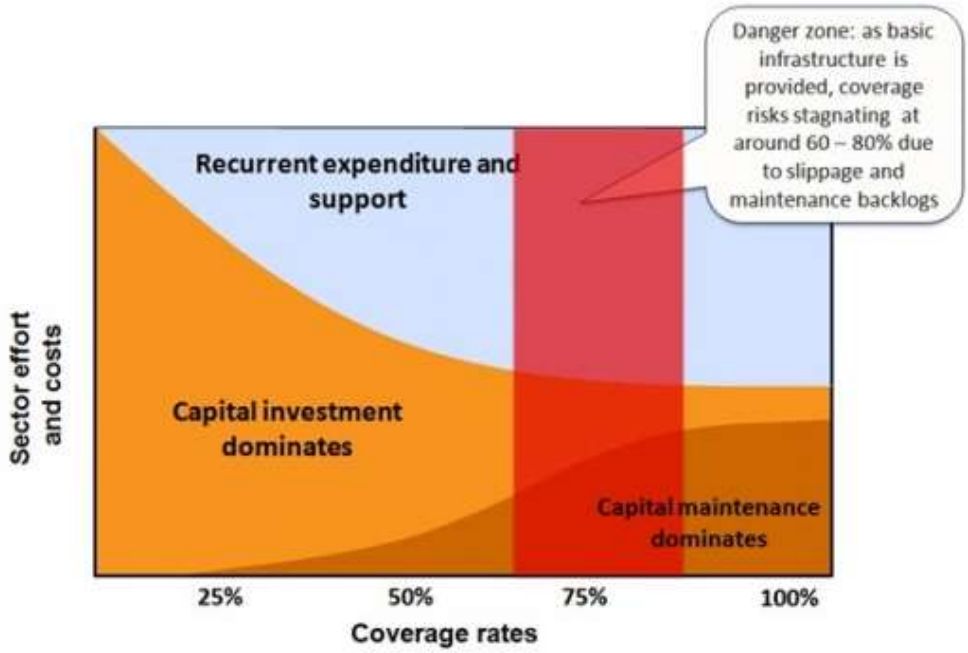
In this short paper, we take the work (and the data set) of the JMP and analyse it for different countries and population segments to identify under what conditions rates of improvement in coverage have been highest – and what this implies for those still not served. We did this analysis for all the main categories identified by the JMP: urban and rural, and water and sanitation.

2.1 BACKGROUND

Our work is informed the idea put forward by Lockwood and Smits (2011), in their review of trends in rural water supplies in 13 countries, that countries can be grouped into three broad categories based on the current status of development of their rural water and sanitation sectors: 1) countries with low coverage, where all the focus is on rapidly increasing coverage – these tend to be least developed countries; 2) countries that experience a tension between high (and increasing) coverage and "slippage" – the failure of infrastructure and services due to poor management and maintenance, and 3) countries with a more service-oriented approach to rural water, where coverage levels are generally high (although not necessarily yet 100%) and maintained – these tend to be middle income countries.

Our work is also informed by thinking around sustainability in general, and in particular the concept of a danger zone in which further progress is stymied by poor management and maintenance (see figure 1). The danger zone concept points to the need for countries approaching medium to high levels of coverage to make a phase change in sector financing: from capital intensive creation of new infrastructure, to a broader range of expenditure on operating and maintaining that infrastructure to provide a service. To grow and eventually achieve full coverage, countries – particularly those in the second group – need to successfully pass through this danger zone. Based on anecdotal evidence and informed guesswork our hypothesis was that the danger zone would be most acute for levels of coverage in the 60-80% range.

FIGURE 1 DANGER ZONE CAUSED BY IMBALANCE IN INVESTMENTS IN CAPITAL AND CAPITAL MAINTENANCE



SOURCE: MORIARTY 2011

The most likely reason for the existence of this danger zone is the failure to achieve a good balance across different elements of effort and financing for service delivery. However, other possible reasons exist for stagnating service coverage. One is that easier to reach populations are covered first, before those in more remote and dispersed rural areas, where service provision is expensive. So as coverage grows, so does the cost to cover those remaining. In Western countries, like France and the United States of America, it took well into the 1980s before rural water coverage rose to over 95% (Pezon, 1999; Gasteyer, 2011); in both countries about 2% of the rural population still lack connections to piped supplies.

A second possible reason for stagnation in coverage is prioritisation of financing away from new coverage and towards increasing the service levels of those already served. Given the heavy biasing of finance – at least for water – to urban areas, this latter hypothesis seems realistic.

It is important to underline that we see nothing inevitable about countries becoming stuck in the danger zone – many countries have achieved full coverage, in water and also sanitation services. Where overall wealth levels are sufficiently high, countries are able to raise sufficient funds, both from taxes and tariffs, to be able to provide services to all, while maintaining and replacing existing services.

As a final word of background, it is important to underline that the MDGs give a very broad-brush measure of 'coverage' – based entirely on the type of infrastructure (improved or unimproved) that people report using. The measure takes no account of actual service levels accessed by users. In our experience, when actual service accessed is examined, coverage is considerably lower than headline rates. For example, Onda et al. (2012) estimate that when correcting for water quality, the world's unserved population would be 28%, as opposed to the current estimate of 11%, and when correcting for sanitary risks as well, it would be 46%. In another example, Adank et al. (2013) show how in three districts of Ghana the percentage of water points that provided a basic level of service ranged from

about 30% to as low as 3% against national norms. From the point of view of coverage statistics these populations, who are in practice accessing a completely sub-standard service, already count as being 'served': any investment in raising the service level would, therefore, be invisible in coverage data.

2.2 DATA

We used JMP data from the 2012 report to analyse the rate of growth in coverage for water and sanitation for different types of countries. Specific data that were used are:

- Coverage levels (in both percentage and absolute numbers) for urban and rural water and sanitation at five-year intervals: 1990, 1995, 2000, 2005 and 2010.
- Data were used for countries from all regions (as defined by the JMP) with three main exceptions: developed Regions; small island states; and countries for which more than two years of data were missing. The full list of countries included in this analysis is found in Annex 1.

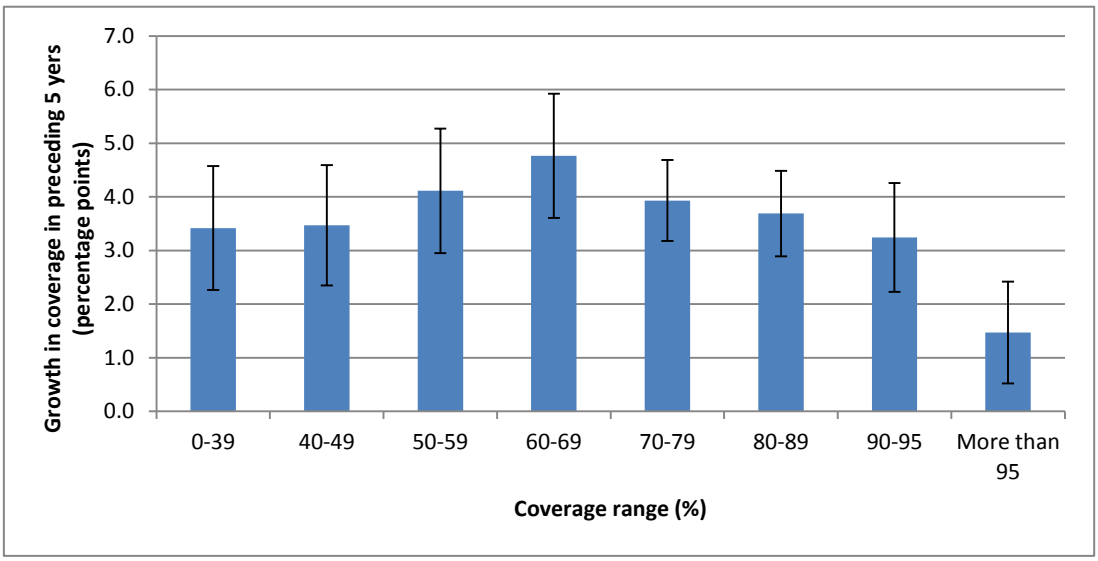
We calculated growth rates as expressed in percentage points over a five year interval, rather than as percentage, to avoid comparing countries with different baselines.

3 RURAL WATER SUPPLY

3.1 RATE OF GROWTH IN COVERAGE

As a first step in the analysis, we plotted average growth in coverage over the preceding five years against overall coverage at the end of the period, allowing us to examine average growth in the five years immediately prior to achieving a certain level of coverage. Even this simple analysis reveals the first indications of a potentially interesting (although not statistically significant, as indicated by the error bars in Figure 2 for a 95% confidence interval) trend. Looking at the graph below, countries with less than 50% coverage experienced growth of roughly 3.5 percentage points in the five year period, whilst those in the 50-70% coverage range showed stronger growth of between 4-5 percentage points. Subsequently, this dropped back to 3-4 percentage points for countries over 70% growth – falling to 1-2 percentage points for those over 95% coverage. Based on this, we conclude that there is an indication of a danger zone, though not very marked. Moreover, it is in the 70-95% coverage range, rather than the 60-80% coverage range that we had expected.

FIGURE 2 AVERAGE GROWTH IN COVERAGE IN RURAL WATER SUPPLY IN PRECEDING FIVE-YEAR PERIOD FOR DIFFERENT COVERAGE RANGES



In a second piece of analysis (see Table 1) we grouped countries according to whether or not (taking the perspective of 2010) they had experienced 'growth', defined as more than a 5 percentage point increase in coverage in the previous decade, or 'stagnation', defined as less than a 5 percentage point increase in coverage in the previous decade. We also mapped reversals, defined as more than a 2 percentage point decrease in coverage. For this analysis, a time period of a decade was taken, in order to assess whether trends in growth or stagnation were enduring for a longer term.

TABLE 1 NUMBER OF COUNTRIES IN DIFFERENT CATEGORIES OF COVERAGE AND GROWTH IN COVERAGE FOR RURAL WATER SUPPLY

COVERAGE RANGE	GROWTH (> 5 PERCENTAGE POINT INCREASE IN COVERAGE OVER DECADE)	STAGNANT (< 5 PERCENTAGE POINT INCREASE IN COVERAGE OVER DECADE)	REVERSE (> 2 PERCENTAGE POINT DECREASE IN COVERAGE OVER DECADE)	% OF COUNTRIES STAGNANT/REVERSED	TOTAL
Full coverage (>95%)	7	7		50	14
Danger zone (70-95%)	35	16	3	35	54
Middle range (50-70%)	18	7	2	33	27
Low coverage (<50%)	8	7	4	58	19
Total	68	37	9	40	114

In the total sample of countries, 40% showed either stagnant or reversed growth – a telling finding showing that a significant number of countries experience limitations in expansion of coverage.

Approximately half of the countries were in the danger zone by the end of 2010. Of the approximately 50% of countries that were already in, or had entered the danger zone (70 – 95% coverage) during the decade, 35% showed either stagnant or reversed growth in coverage in the previous decade. While care should be taken in over-interpreting these figures, it clearly gives cause for concern that a third of countries being monitored are showing stagnant or negative growth in coverage, despite efforts related to achieving the MDGs.

3.2 IDENTIFYING COUNTRIES WITH UNSERVED POPULATIONS

To try to further tease out the general characteristics of those countries that showed growth on the one hand, and those that were stagnant or experiencing a reversal on the other, we further subdivided the countries by using income categories derived from OECD-DAC (OECD, 2012). In doing so, we hypothesised that wealthier countries are in a better position to finance rural water services, and users may also be better able to pay for them. At this point we also took into consideration the total size of the unserved population in countries, so as to move beyond simple counting of countries to actually getting an idea of where the most at-risk (in terms of slow growth in coverage) populations lived.

TABLE 2 RURAL POPULATIONS WITHOUT ACCESS TO WATER SUPPLY IN DIFFERENT COUNTRY CATEGORIES

	UNSERVED RURAL POPULATION (MILLIONS)					
CHARACTERISATION OF COUNTRIES	HIGH INCOME COUNTRIES	UPPER MIDDLE INCOME COUNTRIES	LOWER MIDDLE INCOME COUNTRIES	LEAST DEVELOPED COUNTRIES & OTHER LOW INCOME COUNTRIES	TOTAL	EXAMPLES OF COUNTRIES IN THIS CATEGORY
Full coverage						
Full coverage sustained (> 95% for last decade)				0.4	0.4	Gulf States, North Korea
Full coverage recently achieved (achieved > 95% in last decade)		0.3	0.6		0.9	Malaysia, Egypt
Growth						
Traversing danger zone (70-95% without stagnation)	1.0	123.8	137.2	16.36	278.2	Brazil, China, India, Mexico, South Africa, Burkina Faso, Ghana
Approaching danger zone with growth (50-70%, without stagnation)		2.3	11.1	44.3	57.7	Cambodia, Kenya, Mali
Low coverage with growth (< 50%, no stagnation)			45.3	77.2	122.5	Afghanistan, Nigeria, Ethiopia
Stagnating						
Stagnant in danger zone (70-95% with stagnation)	0.2	4.9	12.3	23.6	40.9	Bangladesh, Colombia, Pakistan
Stagnated before danger zone (50-70%, with stagnation)			8.3	9.9	18.2	Morocco, Rwanda
Low coverage, stagnated (< 50%, with stagnation)				79.3	79.3	Mozambique, Tanzania, Haiti
Negative growth						
Negative growth (> 2 percentage point reversal in coverage)		2.6	4.6	27.2	34.4	Somalia, Sudan, Yemen
Grand Total	1.2	133.9	219.4	278.0	632.5	

The positive news from this analysis, is that 40% of the currently unserved live in countries that have already achieved reasonably high (>70%) levels of service and are experiencing no signs of slowdown. Another 28% live in countries that, while showing lower levels of coverage, are still experiencing rapid growth such as, for example, Nigeria and Ethiopia. These are countries whose growth rates will likely continue to be high.

Of more concern are the 22% of people who live in countries that are, for one reason or another, experiencing stagnation in growth. Many of these (especially those with negative growth) are fragile states such as Somalia or Haiti. However, they also include stable low income countries such as Tanzania and Mozambique. Unless these countries make drastic changes, coverage in their rural areas is unlikely to increase.

Around 317 million unserved rural people live in countries that are in the danger zone. Middle income countries with large populations such as China, India and Brazil seem to be traversing the danger zone with no obvious signs of slow-down or stagnation. Although these are countries to watch, there is a reasonable likelihood that their progress will continue, since they have the resources to break through the danger zone.

Overall, only some 40 million people live in countries that experience the traps of the danger zone and seen their growth in coverage stagnate. There is no obvious commonality between the countries in this category. All in all, this lack of commonality suggests that the danger zone is less of an urgent problem than we had expected. Yet, it is worth noting the existence of an important group of lower and lower-middle income (largely African) countries that, having made good progress in recent years, are approaching or have just entered the danger zone. These include Burkina Faso, Ghana, Malawi, Kenya and Mali. Given these countries' relatively less well-off status and their reliance on donor funding, they may find avoiding the risks of the danger zone more difficult than large emerging economies such as Brazil, Indian and China. Out of the 23 countries that just entered or are approaching the danger zone many are aid dependent, with 16 receiving ODA (Official Development Assistance) of greater than 5% of the Gross National Income in 2010 (World Bank, 2012). Though reliable data are lacking on aid dependency in the water sector, in many countries much of the capital investment – particularly for the rural sector – comes from aid in one form or another. As aid rarely covers the cost for capital maintenance or other recurrent costs, these aid dependent countries will face a growing challenge in mobilising resources for recurrent costs from domestic taxes and tariffs to avoid slippage.

3.3 HIGHER LEVELS OF SERVICE

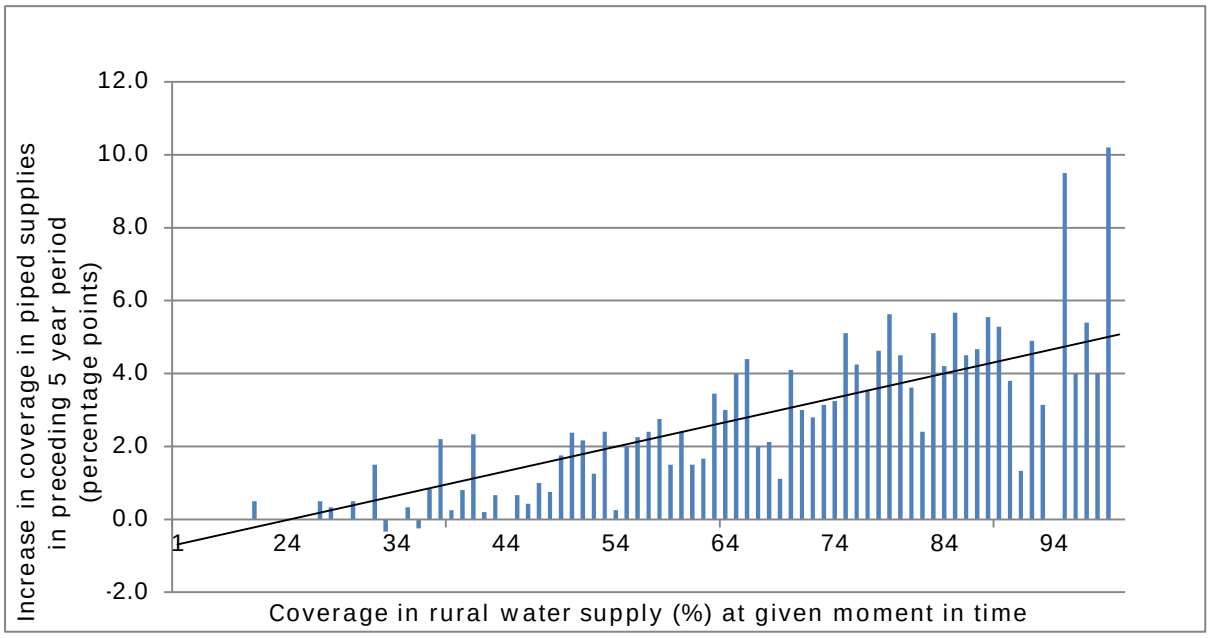
An important part of our analysis was related to understanding the choices that countries were taking with regard to increasing service levels to those already served versus expanding basic coverage to the unserved. How do countries deal with the demand for higher levels of service, while at the same time trying to reach the last 10 or 15% of the unserved.

While JMP data doesn't currently address the level of service directly, it does make a difference between "piped water on premises" (either inside the house or in the yard) and "other improved sources", with the latter including, for example, communal wells and boreholes with handpumps or piped systems with standpipes (see WHO/UNICEF 2012 for detailed descriptions of improved and unimproved sources).

The graph below shows the increase of piped supplies in a country over the previous five years, plotted against overall rural coverage. The graphs shows that significant growth in piped supplies only starts to occur at around the 50% coverage mark. It also shows that piped supplies only start being put in place

from coverage levels of around 50% onwards, showing fairly steady (though by no means uniform) acceleration in growth from there.

FIGURE 3 INCREASE IN COVERAGE WITH PIPED SUPPLIES ON PREMISES IN RURAL AREAS FOR DIFFERENT LEVELS OF OVERALL RURAL WATER SUPPLY COVERAGE



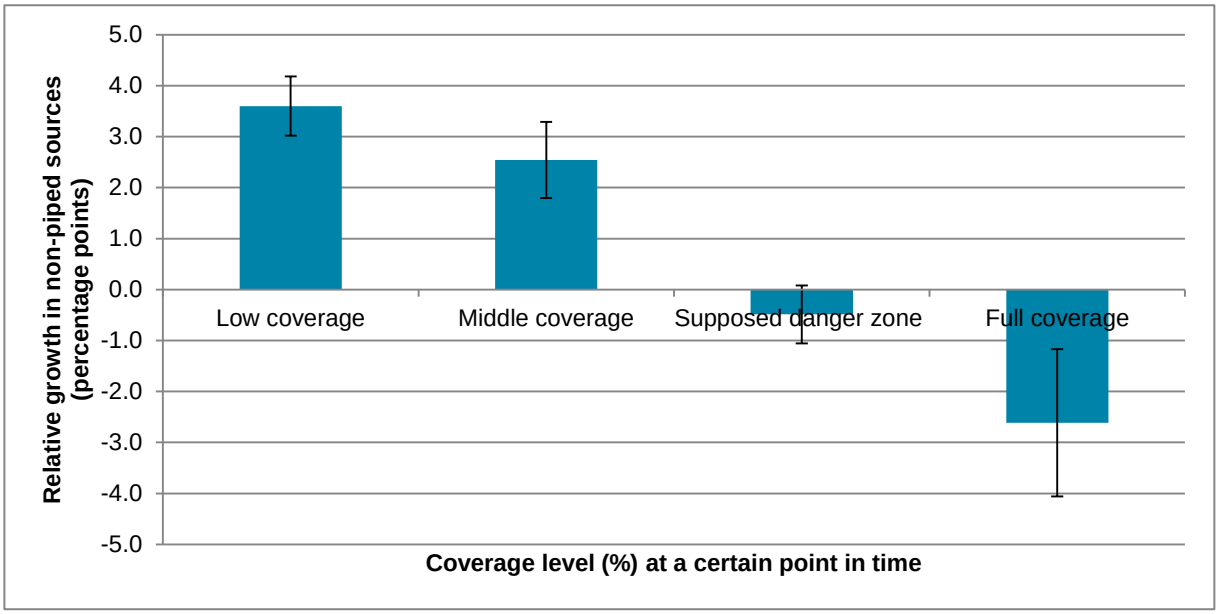
Examining this data further, we looked at whether growth in piped supplies contributed to overall growth in access, or whether it simply contributed to an increase in the service level of those already served. This analysis is shown in figure 4 below. Positive values indicate that growth in piped supplies contributes to overall growth in coverage, while negative values show that the rate of growth in piped supplies is higher than the general coverage growth rate, and thus that existing systems are being replaced by piped supplies. We retained the four coverage categories used in earlier analysis.

The graph shows clearly that for both low and medium levels of coverage (0-70%), growth rates in overall coverage are higher than those of piped supplies. This suggests that the growth in piped supplies in these countries does not come at the cost of – and may well contribute to – growth in overall coverage.

However, moving into the danger zone (70-95%) the rate of overall coverage growth is the same as the rate of growth in piped supplies, suggesting that most new growth is through piped supplies, or that old, non-piped supplies are being replaced by piped systems. Further analysis within the danger zone, shows that from about 80% coverage onwards piped supplies are indeed largely being used to replace non-piped supplies: a shift towards higher levels of service. This is most marked above 95% coverage.

Although these differences are statistically significant at a 95% confidence interval, the variability is still relatively high, showing that certain countries grow towards high levels of coverage, without making the switch to piped supplies. As the populations of these countries get richer, they will undoubtedly aspire to having household connections. These countries will then have a major task ahead to make that shift.

FIGURE 4 AVERAGE RELATIVE GROWTH IN NON-PIPED SUPPLIES ON PREMISES IN RURAL AREAS FOR DIFFERENT OVERALL RURAL WATER SUPPLY COVERAGE LEVELS



The final step in our analysis was to look at whether relative growth in piped supplies could be related to stagnation: are any countries abandoning the goal of universal access to focus on providing higher service levels to some? To do this, we looked at how different growth rates in the different categories of water services related to countries overall coverage.

Table 3 shows that 46 out of 114 countries experience a situation in which the growth in piped supplies outpaced overall coverage growth, i.e. piped supplies replaced non-piped supplies. This happens in countries in all phases of water services development. However, it is suggestive that two thirds of the countries stuck in the danger zone are replacing non-piped supplies with piped supplies. The countries where piped supplies replace point sources are mostly smaller countries, mainly in Latin America and the Middle East, and mainly middle income. Despite this, there are other countries that are also rapidly increasing service levels without stagnation in their overall coverage, for example China. The move towards higher levels of services does not, therefore, necessarily lead to stagnation.

This table also shows that countries that grow primarily through non-piped supplies are also the star performers in terms of expanding coverage. This reflects a common practice in the sector where, at lower levels of coverage, point-source based supplies are the preferred option to quickly reach growth in coverage. But it also shows that as coverage levels approach the 70% mark, a balance is sought between growth through piped and non-piped supplies. This may in some cases lead to stagnation in overall coverage, but not necessarily so.

TABLE 3 NUMBER OF COUNTRIES WITH DIFFERENT BALANCE OF GROWTH BETWEEN PIPED SUPPLIES AND POINT SOURCES IN RURAL AREAS AND THEIR PHASE IN THE GROWTH TRAJECTORY

	GROWTH MAINLY THROUGH NON-PIPED SUPPLIES	BALANCED GROWTH BETWEEN PIPED AND NON-PIPED	GROWTH MAINLY THROUGH PIPED SUPPLIES	PIPED SUPPLIES REPLACE NON-PIPED	TOTAL
Full coverage					
Full coverage sustained (> 95% for last decade)		4		1	5
Full coverage recently achieved (achieved > 95% in last decade)		2	1	6	9
Growth					
Traversing danger zone (70-95% without stagnation)	11	6	5	13	35
Approaching danger zone with growth (50-70%, without stagnation)	12	2	2	2	18
Low coverage with growth (< 50%, no stagnation)	7	1			8
Stagnating					
Stagnant in danger zone (70-95% with stagnation)	1	4		10	15
Stagnated before danger zone (50-70%, with stagnation)		3		4	7
Low coverage, stagnated (< 50%, with stagnation)		4		3	7
Negative growth					
Negative growth (> 2 percentage point reversal in coverage)	2	1		7	10
Grand Total	33	27	8	46	114

3.4 CONCLUSIONS FOR RURAL WATER SUPPLY

- More than 70% (~460 million) of the unserved live in countries that are experiencing rapid growth in coverage, giving strong grounds for optimism.
- However, of these, some 200 million live in countries with less than 70% coverage, many of which are highly aid dependent. Attention is therefore needed to ensure that they are able to pass through the danger zone to achieve full coverage.
- Some 174 million people live in countries where growth in the last ten years has stagnated – of whom 40 million live in countries that are in the danger zone. About 110 million live in some of the poorest and most fragile countries in the world.

- In countries with higher levels of total coverage (70%), a trend can be identified in which growth in coverage comes to rely increasingly on higher levels of service provided by piped systems into homes.

4 URBAN WATER SUPPLY

Some 1.2 billion people in urban areas gained access to an improved water supply service between 1990 and 2010, an impressive achievement. Reflecting the rapid rate of urbanisation, the unserved population has remained static in absolute terms at some 130 million people – implying a slight reduction in the percentage of unserved people from 5 to 4%.

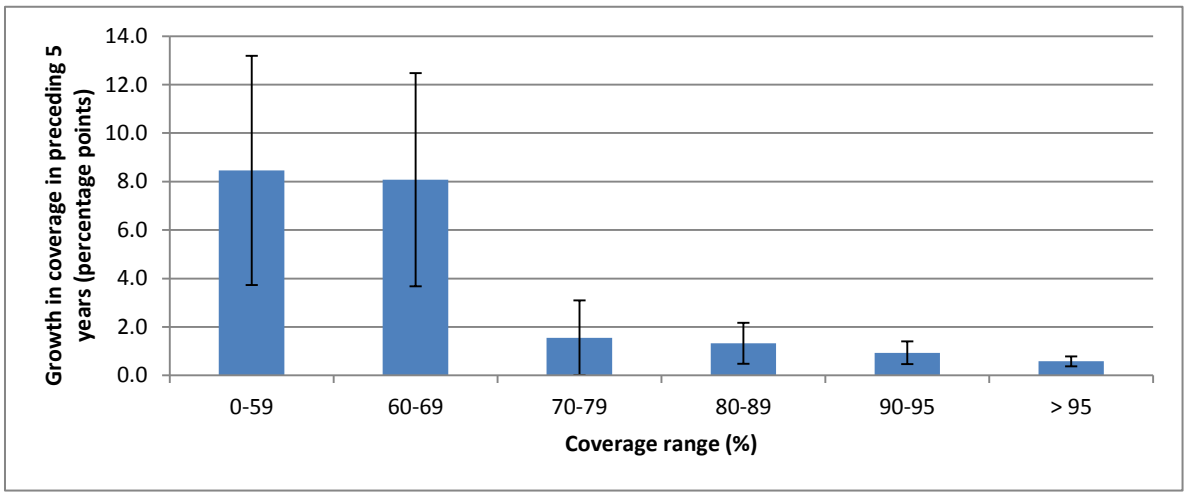
4.1 RATE OF GROWTH IN COVERAGE

In this section we apply the same analytic steps already set out for rural water in the previous section, to urban water supply.

The pattern is rather different to that found for rural water, with high growth rates in countries with previously low urban coverage – less than 70%, but limited growth where original coverage was high – indeed in these settings growth in coverage has barely kept up with population growth. This pattern could reflect a policy of reaching first for the 'low hanging fruit' by rapidly expanding urban coverage to the previously unserved. The aggregate data is also influenced by some outliers, countries which reported growth in coverage of 30 percentage points over five years, likely due, at least partially, to different baseline data and changes in definitions. As a result, the 95% confidence intervals are extremely high for these categories.

Beyond the 70% coverage level, coverage growth rates drop rapidly to less than 2.5 percentage points over a five year period, without statistically significant differences in the rate of growth for different levels of coverage. Such is to be expected of countries where coverage was above 95%, but it also happens in the coverage range of 70-95%.

FIGURE 5 AVERAGE GROWTH IN URBAN WATER COVERAGE IN FIVE YEAR PERIOD, PRECEDING THE ACHIEVEMENT OF A CERTAIN COVERAGE LEVEL



4.2 IDENTIFYING COUNTRIES WITH UNSERVED POPULATIONS

Currently, there are still some 130 million people unserved by water in urban areas. In this section, we analyse, where these people live. For the sake of further analysis, we use three categories of coverage:

- below 70% we refer to as low urban coverage - where growth may be expected,
- between 70 and 90% is middle coverage with some, but slower growth, to be expected, and
- between 90 and 95% is considered high coverage.

Above 95 is considered full coverage.

We use the same definitions to differentiate between growth, stagnation and reversal as we used for rural water.

TABLE 4 UNSERVED URBAN POPULATIOS IN DIFERENT COUNTRIES

TYPE OF COUNTRY	HIGH INCOME	UPPER MIDDLE INCOME	LOWER MIDDLE INCOME	LDC	TOTAL	EXAMPLE COUNTRIES INCLUDED IN THIS CATEGORY
Full coverage						
Full coverage sustained (> 95% for last decade)	0.0	16.8	2.7	0.4	20.0	China, Pakistan
Full coverage recently achieved (reached > 95% in last decade)	0.0	3.4	12.2	0.4	16.0	India, Mexico
Growth						
High coverage with growth (> 90% coverage, without stagnation)	0.1		0.6	1.8	2.5	
Medium coverage with growth (70-90% without stagnation)				5.0	5.0	
Low coverage with growth (< 70%, without stagnation)				6.3	6.3	Angola
Stagnating						
Slowing down in high coverage, ranged (>90%, with stagnation		2.1	15.1	1.4	18.7	Philippines, Indonesia, Ghana, Peru
Stalled at medium coverage (70-90%, with stagnation)		0.6		11.8	12.4	Bangladesh, Mozambique
Negative growth						
Negative (> 2% reduction in coverage)		4.4	22.8	17.6	44.8	Sudan, Tanzania, Nigeria, DRC, Kenya
Grand Total	0.2	27.3	53.4	44.8	125.7	

A first observation is that this is a much smaller group than the unserved in rural areas. The JMP shows that those people still unserved in urban areas are predominantly the urban poor (WHO/UNICEF, 2012). Table 4 allows further specification of this group. Of the 130 million unserved people in urban areas, around one third live in countries that have urban coverage levels of above 95%, i.e. what we

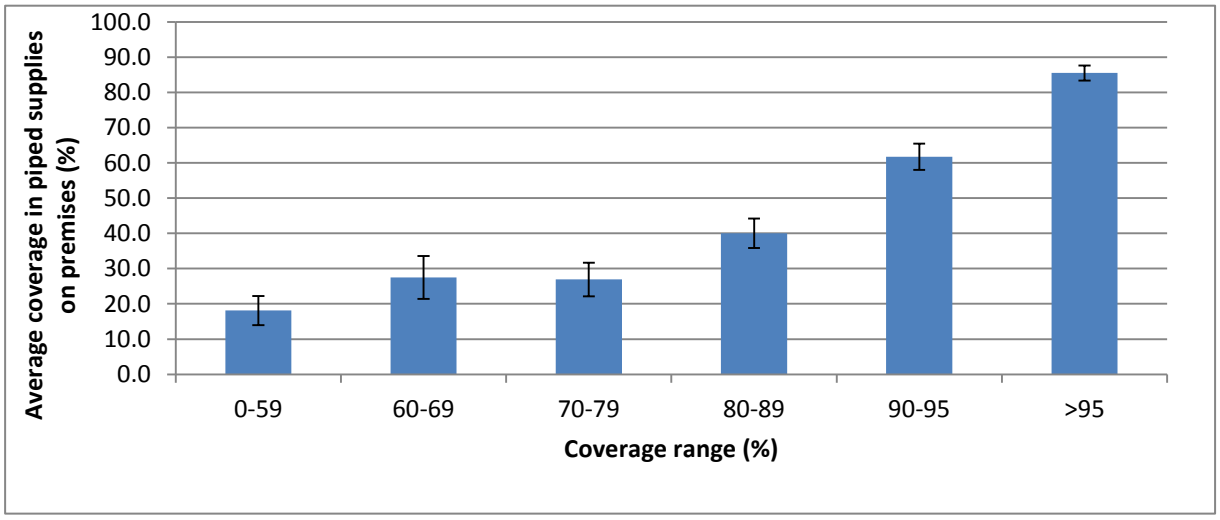
refer to as full coverage. This group includes (lower) middle income countries such as India, China, and Mexico. Since in a country like India about 21% of the urban population lives below the poverty line (World Bank, 2012) and coverage is above 95%, it implies that many urban poor in these countries are actually covered. Whereas the remaining unserved population of these countries is undoubtedly poor, it is likely to be a floating population, most likely in newly erected slums. Further inroads may be made in these countries to extend services to this population, but it is probable that there will always remain a small percentage of urban dwellers without improved water sources, which in big countries may still amount to a significant number of people.

More worrying is that another third of the unserved lives in countries where urban coverage has gone down over the last years. This includes urban populations in lower-middle income and least developed countries – Nigeria, Sudan, DRC and Tanzania amongst others. Finally, slightly less than a third live in other countries that have stagnated in the extension of services to the urban population.

4.3 HIGHER LEVELS OF SERVICE

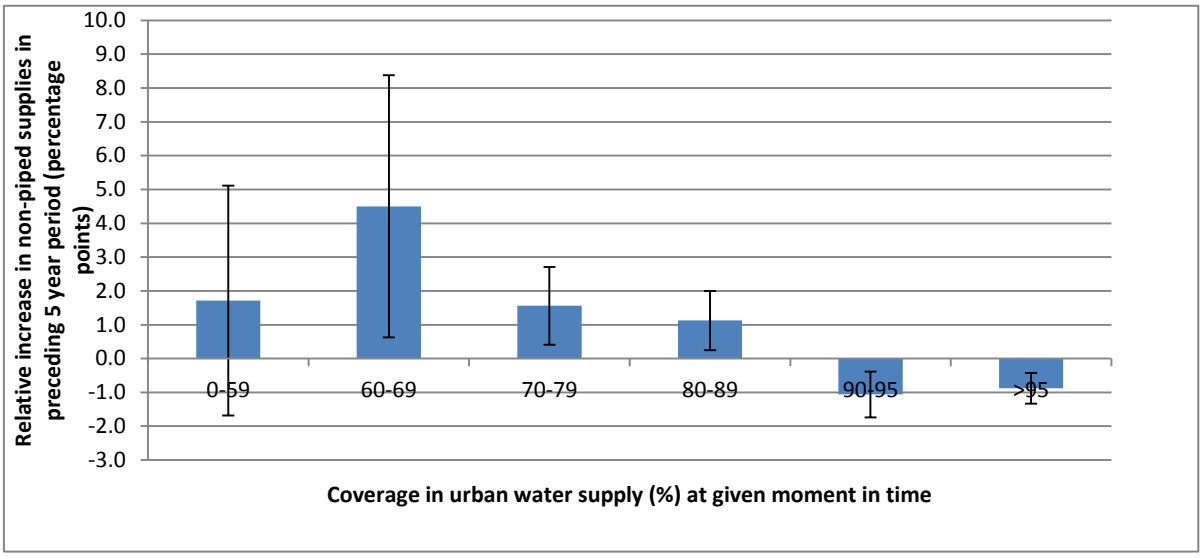
We plotted coverage in piped supplies against overall urban water coverage, grouped according to the same categories as in the previous section (with 95% confidence intervals). As can be seen in Figure 6, below the 80% coverage figure, the share of piped supplies fluctuates between 20 and 30%, presumably the middle and upper class residents of towns and cities where household connections are often the norm. At 80% overall urban coverage and above, coverage in piped supplies goes up rapidly, with statistically significant differences in the levels of coverage between the categories.

FIGURE 6 COVERAGE IN PIPED SUPPLIES AGAINST OVERALL COVERAGE



This implies that from 80% urban coverage onwards, the growth in coverage in supplies piped into households should outpace overall coverage growth. To test this, the relative growth in non-piped and piped supplies were plotted against coverage (Figure 7).

FIGURE 7 AVERAGE GROWTH IN NON-PIPED SUPPLIES FOR A GIVEN COVERAGE RATE



This analysis shows that above 90% coverage, point sources are being replaced at a statistically significant level by piped supplies. Below 90%, growth is balanced between piped supplies and non-piped supplies. But as many countries already have relatively high levels of urban water supply coverage, it means that many are now making net replacements of point sources by piped supplies. This was found to be the case in 61 of the 114 countries studied. An approach of growth through point sources supplies only predominates in the least developed countries with lowest urban coverage levels.

As was the case for rural supply, we looked at the data to see if the increase in higher levels of service was a contributing factor to stagnation (more for some instead of some for more). However, this analysis failed to provide any clear evidence of such a contribution: levels of stagnation proved to be equally high for those countries not following an approach of replacing point sources with piped supplies as for those that were.

4.4 CONCLUSIONS FOR URBAN WATER SUPPLY

- Coverage growth often stagnates at a lower coverage rate than expected: at about 70%.
- About a third of the unserved (~30 million) live in countries that have reached almost full coverage and these unserved probably represent a floating and difficult to reach population.
- The other two thirds of the unserved live in countries where growth in urban water coverage is stagnating, of which about 44 million live in low income African countries.

5 RURAL SANITATION

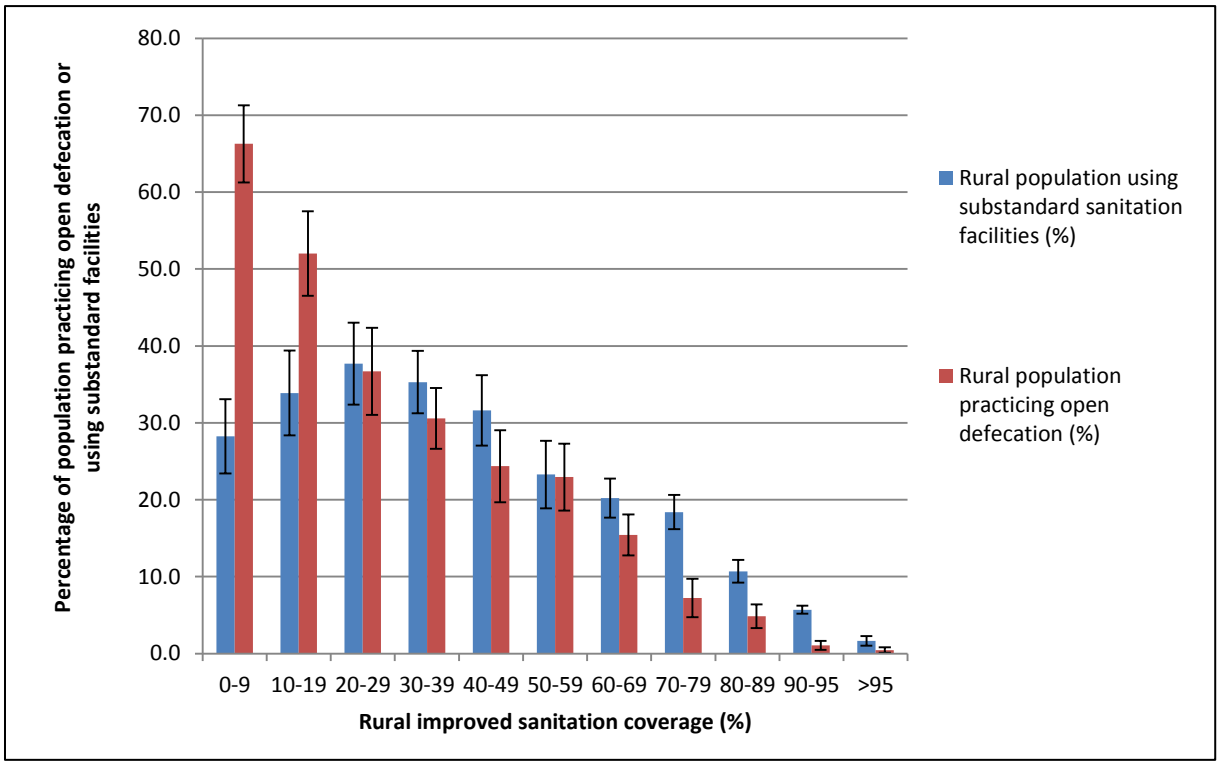
The JMP report differentiates between improved sanitation facilities, shared facilities, unimproved facilities and open defecation. To simplify the analysis, we combine shared facilities and unimproved facilities into one category of substandard sanitation. It is important to distinguish this from open defecation because families using substandard facilities most likely have a demand for sanitation, but may not have been able to access an improved facility.

5.1 RATE OF GROWTH IN COVERAGE

Figure 8 shows the trajectory of sanitation development by relating the overall proportion of the population with improved sanitation to the relative proportions of those using substandard sanitation and open defecation.

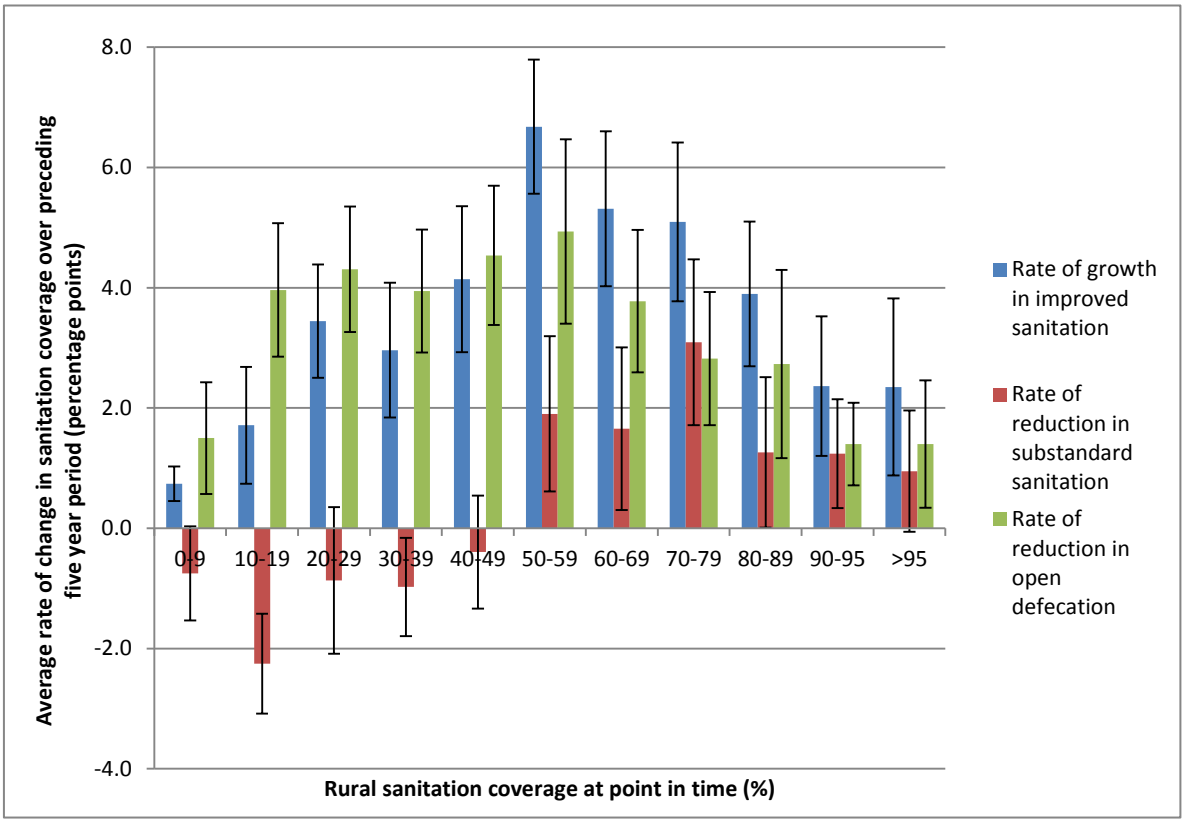
At low levels of coverage (below 20%), most people practice open defecation and few have even substandard facilities. As coverage levels increase, levels of open defecation go down while substandard facilities go up. At a coverage level of around 30%, substandard facilities peak. From then onwards, both substandard facilities and open defecation go down, though the latter decreases more rapidly. This data indicates that when people stop open defecation, they progress up the sanitation ladder – first through facilities that do not meet all standards.

FIGURE 8 AVERAGE LEVELS OF OPEN DEFECATION AND SUBSTANDARD FACILITIES FOR OVERALL RURAL SANITATION COVERAGE (WITH 95% CONFIDENCE INTERVALS)



The pattern is even clearer when plotting growth in rural sanitation coverage against the reduction of substandard facilities and open defecation. The rate of growth in coverage increases with overall coverage, reaching a peak at the 50-59% coverage level, after which it remains high, before dropping again when reaching 90%. Rates of reduction in open defecation are stable between 10% and 60% coverage – at between 4-6 percentage point reduction per 5 year interval). Above 60% coverage, the reduction in open defecation drops off. The percentage of the population using substandard facilities actually increases in the lower coverage ranges, indicating that when people move away from open defecation they may do so via substandard facilities. As can be seen from the error bars, few of the differences are statistically significant. This reflects high variability across the countries, an issue that will be elaborated upon in the next section.

FIGURE 9 GROWTH RATES OF RURAL SANITATION COVERAGE, SUBSTANDARD FACILITIES AND OPEN DEFECATION



The reduction of open defecation in combination with the increase in substandard facilities in combination with the high variability between countries, make it hard to identify clear trajectories of sanitation development. For this analysis, we define four broad phases, recognising that the boundaries between them are not as sharp as for example for water. These are: 1) start-up phase (from 0 to about 49%), where open defecation starts to decrease, but because of an increase in sub-standard facilities, total coverage growth is limited, 2) growth phase (from 50-80%) in which both open defecation and sub-standard facilities start to decrease, at rates of more than 4 percentage point per 5 years, 3) slow down phase, when the growth in coverage in improved facilities starts to slow down, most likely because the last percentage is difficult to reach through public programmes, and 4) "full" coverage, at above 95%.

5.2 IDENTIFYING COUNTRIES WHERE THE UNSERVED LIVE

An analysis was made of where the unserved live, combining those four phases with the three growth scenarios, used for rural and urban water (see Table 5).

TABLE 5 IDENTIFICATION OF WHERE THE UNSERVED LIVED IN TERMS OF RURAL SANITATION

	POPULATION WITH SUBSTANDARD SANITATION IN 2010 (MILLIONS)						POPULATION PRACTICING OPEN DEFECATION IN 2010 (MILLIONS)					
	HIGH INCOME	UPPER MIDDLE INCOME	LOWER MIDDLE INCOME	OTHER LOW INCOME	LDC	TOTAL	HIGH INCOME	UPPER MIDDLE INCOME	LOWER MIDDLE INCOME	OTHER LOW INCOME	LDC	TOTAL
Full coverage												
Full coverage sustained (> 95% for last decade)	0.0	0.2				0.2	0.0	0.0				0.0
Full coverage recently achieved (reached > 95% in last decade)		1.9	0.0			1.9		0.2	0.0			0.2
Growth												
High coverage with growth (80-95%, without stagnation)	0.0	1.6	5.4	0.3		7.3	0.0	1.8	0.3	0.0		2.1
Medium coverage with growth (50-79 %, without stagnation)		306.0	31.6	2.8	57.6	398.1		18.3	16.4	0.0	11.1	45.8
Low coverage with growth (<50% coverage, without stagnation)		11.7	157.3		63.0	232.0		7.7	660.8		76.2	744.7
Stagnating												
Slowing down in high coverage range(80-95%, with stagnation)	0.2	0.3	0.4	0.2		1.1	0.0	0.0	0.0	0.0		0.0
Stalled at middle coverage (50-79%, with stagnation)		8.4				8.4		3.5				3.5
Stalled at low coverage (<50% coverage, with stagnation)		0.3	51.1	17.8	100.8	170.1		1.0	36.7	8.9	97.6	144.3
Negative growth												
Negative (> 2% reduction in coverage)					0.1	0.1					0.1	0.1
Grand Total	0.2	330.4	245.8	21.1	221.6	819.1	0.0	32.6	714.3	8.9	185.0	940.8

The table shows that of the roughly 1.7 billion rural people without improved sanitation, a bit less than half has access to a substandard facility. Almost 400 million of those live in countries that have been making good progress in improving coverage and are in the growth phase. This set of countries includes China, Bangladesh and Vietnam. If the trends of the past are an indicator for the future, countries in this group are likely to see improvements come quite rapidly, not least because most people already have access to some type of facility, albeit unimproved. Within the spectrum of rural sanitation, this is a group for which the outlook is positive.

Almost 1 billion of the unserved live in countries where coverage levels are low, but growth rates in coverage are high. This group includes India, Indonesia, Nepal, Pakistan and Ethiopia. However, these countries have a long way to go, amongst other reasons because, of the 1 billion people without improved sanitation, around three quarters practice open defecation (and the other quarter access sub-standard facilities), and, based on the trajectory followed by other countries, at least some of the initial reduction in open defecation will be by means of unimproved facilities. Several of the countries in this group have focused on Community-Led Total Sanitation (CLTS) as their main approach to increasing rural sanitation. In CLTS, emphasis is placed on getting to open defecation free status and encouraging households to build their own toilets. This approach carries the risk that people either do not build toilets at all, or that the toilets they do build are inadequate.

The remaining 300 million unserved live in a third group of countries that have below 50% coverage and that have seen little or no growth in coverage over the past decade. This group is mainly composed of African countries, such as Nigeria, Sudan, Tanzania, Ghana, Kenya, Uganda and Mali, and Afghanistan. These are countries where an increase in access to rural sanitation hasn't started or has stalled, and for whom the medium term outlook is less positive.

5.3 CONCLUSIONS FOR RURAL SANITATION

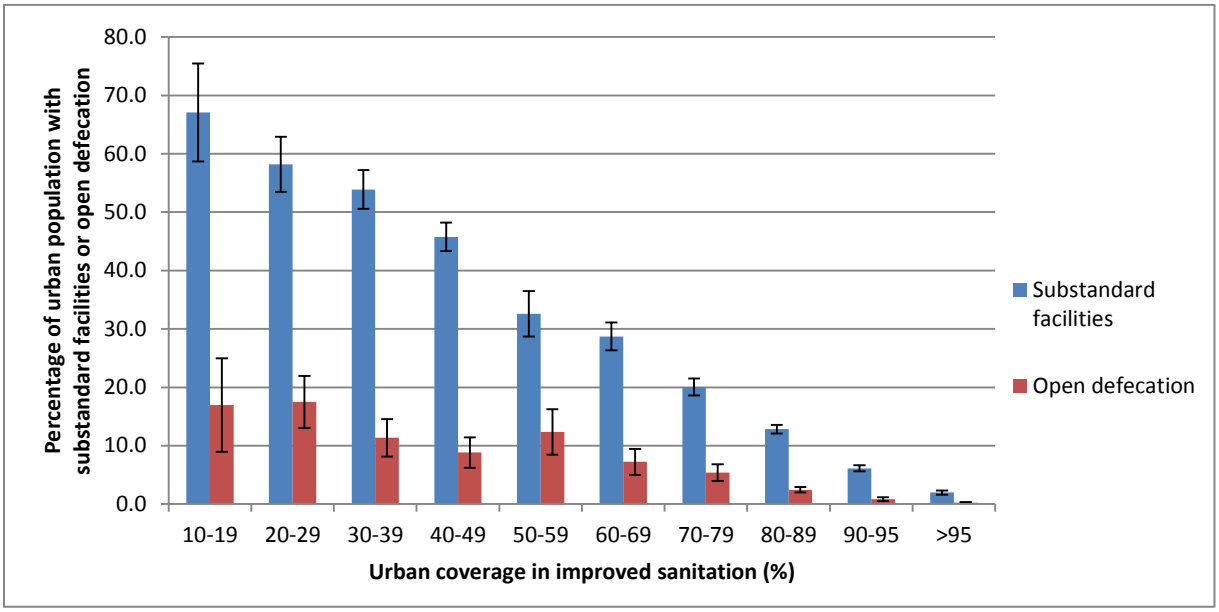
- About 80% (~1.4 billion) of the unserved live in countries that are experiencing rapid growth in coverage, giving grounds for optimism.
- However, many of these unserved (~ 750 million) practice open defecation, and part of them are likely to first move to substandard facilities before moving to improved ones. This prognosis is compounded by approaches like CLTS that emphasis open defecation free status, and not improved sanitation.
- Some ~300 million live in countries where both coverage and growth in coverage are low, mostly in sub-Saharan Africa. The outlook for these countries is largely gloomy.

6 URBAN SANITATION

6.1 RATE OF GROWTH IN COVERAGE

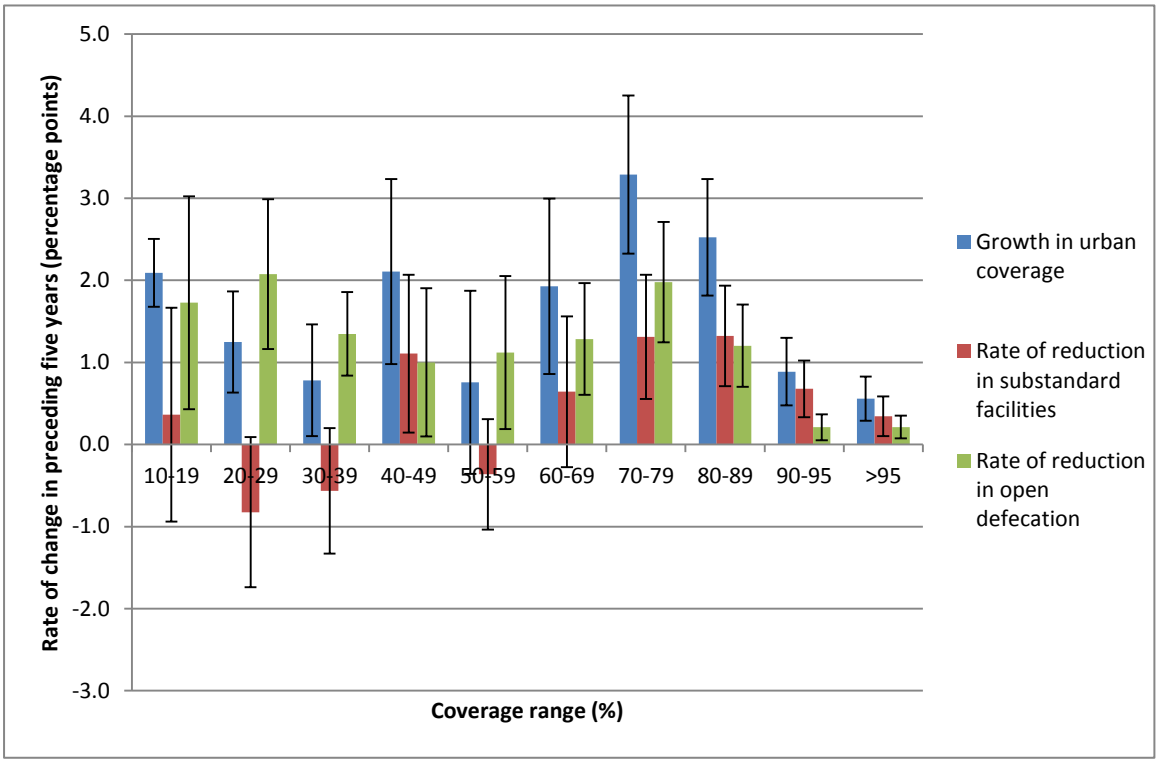
Coverage trajectories for urban sanitation show that, as coverage in urban areas goes up, levels of substandard facilities go down (Figure 10). Even though open defecation in urban areas is relatively low compared to rural areas, it remains persistent, even at high coverage levels.

FIGURE 10 LEVELS OF UNIMPROVED URBAN SANITATION FOR DIFFERENT COVERAGE LEVELS



In order to assess whether there is a clear trajectory in reduction of substandard facilities, the average growth in coverage over a 5-year period was plotted against total coverage at the end of that period (Figure 11). Perhaps most striking is that for most coverage levels growth in coverage has been very low – below 2.5 percentage points for the preceding 5 years. Also rates of growth in coverage (or in reduction in substandard facilities and open defecation) do not follow a clear trend. Variability is also high. As a result, no clear grouping of countries has been proposed.

FIGURE 11 AVERAGE GROWTH IN COVERAGE OVER A 5-YEAR PERIOD PRIOR TO REACHING A CERTAIN URBAN SANITATION COVERAGE LEVEL



6.2 IDENTIFYING COUNTRIES WHERE THE UNSERVED LIVE

As no clear ranges could be identified, we used the same four broad coverage ranges that we introduced for rural sanitation. As can be seen in Table 6, some 660 million people do not have access to improved sanitation in urban areas, mostly because they have facilities which are not considered improved. Only 1 out of the 6 unserved in this segment practice open defecation. Of these, around one third live in countries with high potential coverage growth rates (mid-range coverage and no stagnation over the last decade). Countries in this segment include China, Mexico, Peru and Indonesia. The unserved in these countries are likely to be urban poor – with the advantage of living in middle-income countries. They are therefore a group for whom significant progress can be expected over the next decades, assuming that governments have the political will to extend services.

The outlook is less optimistic for the remaining two-thirds of the unserved, especially those who live in countries where coverage is in the mid-range but with periods of stagnation over the last decade (such as Brazil, South Africa, Colombia and Pakistan) or in countries with low coverage (including, amongst others, India, Ghana, Nigeria, Bangladesh, DR Congo and Sudan). This low coverage group includes the bulk of the unserved. But whereas the former (mid-range coverage with stagnation) group contains mainly upper middle income countries, which may have financial resources to gradually extend services, the latter are mainly lower middle income countries and LDCs, who may not have such resources.

Of slightly less concern are those LDCs that have acceptable rates of growth in coverage in urban areas and that are home to large urban populations, such as Ethiopia and Tanzania. The outlook for these countries is slightly better, as it can be expected that they can to some extent maintain the momentum achieved.

TABLE 6 POPULATIONS NOT SERVED WITH SANITATION IN URBAN AREAS

	Population with substandard sanitation urban (million)						Population with open defecation urban (million)					
Row Labels	High income	Upper middle income	Lower middle income	Other low income	LDC	Total	High income	Upper middle income	Lower middle income	Other low income	LDC	Total
Full coverage												
Full coverage sustained (> 95% for last decade)	0.1	3.8	1.6			5.6	0.0	0.3	0.0			0.3
Full coverage recently achieved (reached > 95% in last decade)		0.0				0.0		0.0				0.0
Growth												
High coverage with growth (80-95%, without stagnation)		16.2	2.6	2.1	1.6	22.3		0.2	0.0	0.0	0.9	1.1
Medium coverage with growth (50-79 %, without stagnation)		164.0	22.0		5.3	191.4		0.0	16.3		0.9	17.2
Low coverage with growth (<50% coverage, without stagnation)					27.4	27.4					4.4	4.4
Stagnating												
Slowing down in high coverage (80-95%, with stagnation)	0.0	35.6	4.9	0.2	2.6	43.3	0.0	3.1	0.3	0.0	0.2	3.6
Stalled at medium coverage (50-79%, with stagnation)		0.5	129.3	2.2	22.5	154.6		0.2	54.2	0.1	1.4	55.9
Stalled at low coverage (<50% coverage, with stagnation)		0.9	62.7	5.9	45.1	114.6		0.0	11.4	0.2	7.7	19.3
Negative growth												
Negative (> 2% reduction in coverage)					4.7	4.7					0.5	0.5
Total	0.1	221.0	223.2	10.4	109.1	563.8	0.0	3.9	82.3	0.3	15.9	102.4

6.3 CONCLUSIONS FOR URBAN SANITATION

- The levels of coverage in urban areas are much higher than in rural areas, and open defecation is less present, even though it persists to a small extent even at high coverage levels.
- About a third (200 million) of the unserved live in countries that are experiencing rapid growth in coverage, have medium to high levels of coverage and are middle income. This is a group of people for whom significant progress can be expected over the next decades
- However, the bulk of the remaining two thirds (~400 million) live in countries (both middle and low income) that have seen stagnation in coverage growth.

7 CONCLUSIONS

In this short paper, we used JMP data to examine trajectories in the growth of water and sanitation coverage (both urban and rural) over time. In particular, we explored the relationship between rates of growth in coverage in relation to overall level of coverage, with the objective of better understanding the challenges remaining to achieving full coverage.

We explored growth trajectories against a number of potential hurdles to achieving full coverage:

- a conceptual danger zone in which countries fail to adjust from capital expenditure to expand coverage to operational expenditure to maintain it;
- growth in service levels for those already served at the expense of extending services to the unserved; and, finally,
- a drop off in coverage expansion at very high levels of coverage at which reaching the last unserved might become difficult and expensive.

The JMP dataset we used provided coverage data for developing countries for the last two decades. Despite the well-documented limitations of the JMP date-set – particularly the simple binary definitions used for coverage – it is the only data set of its size and duration. As such, it allows unparalleled cross-country and multi-decade analysis. Nevertheless, the JMP data only allows for coarse-grained analysis of service levels in either water or sanitation.

Although some patterns in the trajectories were found, these were very different for the four main categories we analysed: rural water, urban water, rural sanitation and urban sanitation. Moreover, variability between countries was high and we were able to find countries that experienced stagnation and growth at all coverage levels. If stagnation of coverage is taken as an indicator of the existence of a danger zone, then it occurs at the 70-95% coverage level, rather than at the 60-80% coverage level we had hypothesised.

We also categorised countries according to growth trajectories and assessed where the unserved live, in order to make a qualitative judgement on the likelihood of further reductions in the numbers of unserved. The table below summarises these findings.

TABLE 7 SUMMARY OF TRAJECTORIES OF COVERAGE DEVELOPMENT AND IDENTIFICATION OF UNSERVED POPULATIONS

Area	Comment	Unserved population in countries with rapid coverage growth or having reached nominal full coverage (million)	Unserved population in countries with stagnation or reversal of coverage level (million)
Rural water	Stagnation most common in the lowest coverage ranges	459.7	172.8
Urban water	High but variable growth in lower and middle coverage ranges; very low growth in high coverage ranges.	49.8	75.9
Sub-total water		509.5	248.7
Rural sanitation	Start-up phase at low coverage, where open defecation starts to decrease, with increase in sub-standard facilities; followed by growth at middle coverage, where both open defecation and standard facilities decrease.	1432.5	327.6
Urban sanitation	No clear trajectories. Open defecation remains low but constant at all coverage levels. Coverage growth through reduction of substandard facilities	269.7	396.5
Sub-total sanitation		1702.2	724.1

Taken overall, the JMP data shows no clear pattern of growth or stagnation at a given coverage level. Each of the four main areas of water supply and sanitation shows markedly different characteristics. By and large, both urban and rural water supply are showing signs of both growth and of a steady shift to higher levels of service.

Rural water: in rural water supply, where stagnation is occurring, it seems to be driven primarily by governance related issues (such as overall state fragility). All in all, the outlook for rural water supply is positive, with about two thirds of the unserved population living in countries that have experienced rapid growth. The main group for concern in this field are low coverage countries, many of them low-income fragile states in Africa, with no progress or even a reversal. Only a few stable low-income countries fall into this category, but notable cases are Mozambique and Tanzania.

Urban water: in urban water supply (where coverage is generally much higher) rates of growth quickly drop after a country reaches about 70% coverage, while service levels increase after that mark. Much investment in urban areas therefore seems to be channelled into improving service levels. The total number of unserved in urban areas is relatively small, compared to the other segments. However, the outlook for making further dents in the unserved population is far from optimistic, given that the majority of the unserved are urban poor in large poor countries, particularly in sub-Saharan Africa, many of which are experiencing stagnation overall.

Rural sanitation: in view of the numbers involved, the situation with respect to rural sanitation is most worrying. A large part of the populations in East and Southeast Asia require improvements to existing but unimproved facilities: a relatively small step. However, large populations in India, and East- and West African countries still need to move away from open defecation. There is some suggestion that, particularly at very low levels of coverage, the move from open defecation to an improved service goes by way of an unimproved service (which makes intuitive sense). If the objective is to end open defecation, then this does not pose a problem. However, if it is to ensure universal access to improved facilities, then new approaches – including examining how CLTS could contribute to skipping the step of substandard facilities – are likely needed.

Urban sanitation: the outlook for urban sanitation is also rather negative, but slightly less so than for rural sanitation, because the total unserved population is lower. What is more, open defecation is much less widespread (although arguably a more acute problem) in urban areas, and many of those classified as unserved do have toilets, but unimproved ones. As in rural sanitation, this step from unimproved to improved toilets may be smaller than from open defecation to improved toilets. At the same time, the majority of the unserved live in countries with stagnating growth in urban sanitation coverage.

Overall, this simple analysis of JMP data has not revealed clear insights with respect to the existence of a danger zone. The coarse grained nature of the JMP data makes it difficult to fully test this hypothesis that countries are at higher risk for stagnation once they reach a certain coverage range because capital investment fails to give way to operational expenditure. If such a danger zone exists then it is clear that countries can and do manage to traverse it on their route to full coverage.

At the same time, the analysis does provide some interesting insights into differences between rural and urban; water and sanitation. It confirms once again that for water, the largest and most important population (from the perspective of achieving total coverage) is rural. It also shows clearly the shift to higher service levels through household connections. Similarly, for sanitation, the analysis underlines once again the huge remaining challenge to meet the needs of the unserved – particularly in rural areas and particularly those still practicing open defecation. In all settings, it raises the question of the appropriate balance of investment between, in the well-worn phrase, some for all or more for some.

8 REFERENCES

Adank., M, Kumasi, T.C., Abbey, E., Dickinson, N., Dzansi, P., Atengdem, J.A., Chimbar, T.L., Effah-Appiah, E., 2013. *The status of rural water services in Ghana; A synthesis of findings from 3 districts (Akatsi, Sunyani West and East Gonja Districts).* Triple-S Working Paper, Accra, Ghana

Gasteyer, S., 2011. *United States of America: Lessons for Rural Water Supply; Assessing progress towards sustainable service delivery*. The Hague: IRC International Water and Sanitation Centre and Michigan, USA: Michigan State University.

GoI, 2008. *Movement Towards Ensuring People's Drinking Water Security In Rural India*. Delhi: Government of India.

Lockwood, H. and S. Smits. 2011. *Supporting Rural Water Supply: Moving towards a Service Delivery Approach*. Practical Action Publishing, UK

Moriarty, P. 2011. *Water services in the danger zone*. Blog post at http://patrickmoriarty.org/rural-water-supply-network-6th-forum/water-services-in-the-danger-zone/

OECD. 2012. *DAC List of ODA Recipients*. http://www.oecd.org/document/45/0,3746,en_2649_34447_2093101_1_1_1_1,00.html

Onda, K., LoBuglio, J. and J. Bartram. 2012. Global Access to Safe Water: Accounting for Water Quality and the Resulting Impact on MDG Progress. In: *Int. J. Environ. Res. Public Health*, *9*, 880-894

Pezon, C. 1999. *La gestion du service d'eau potable en France de 1850 à 1995.* These ES Sciences de Gestion. Conservatoire National des Arts et Métiers. Presses du CEREM, Paris, France

RWSN, 2009. *Myths of the Rural Water Supply Sector,* Perspectives No. 4, RWSN Executive Steering Committee, July 2009. St Gallen: Rural Water Supply Network. [online] Available at: http://www.rwsn.ch.

WHO/UNICEF. 2012a. *Progress on Drinking Water and Sanitation: 2012 Update*. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation

WHO/UNICEF. 2012b. *Joint Monitoring Programme for Water Supply and Sanitation*. Online database at: http://www.wssinfo.org/data-estimates/table/

World Bank. 2012. Online database. http://data.worldbank.org/indicator

ANNEX 1: COUNTRIES INCLUDED IN THIS ANALYSIS

Afghanistan
Algeria
Angola
Argentina
Armenia
Azerbaijan
Bangladesh
Belize
Benin
Bhutan
Bolivia
Botswana
Brazil
Burkina Faso
Burundi
Cambodia
Cameroon
Cape Verde
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo
Costa Rica
Côte d'Ivoire
Cuba
Democratic People's Republic of Korea (sanitation only)
Democratic Republic of the Congo
Djibouti
Dominican Republic
Ecuador
Egypt
El Salvador
Eritrea
Ethiopia
Gabon
Gambia
Georgia
Ghana
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
India
Indonesia
Iran
Iraq
Jamaica
Jordan
Kazakhstan
Kenya
Kuwait (sanitation only)
Kyrgyzstan
Lao PDR
Lebanon (sanitation only)
Lesotho
Liberia
Madagascar
Malawi
Malaysia
Maldives
Mali
Mauritania
Mauritius (sanitation only)
Mexico
Mongolia
Morocco
Mozambique
Myanmar
Namibia
Nepal
Nicaragua
Niger
Nigeria
Oman
Pakistan
Palestina
Panama
Paraguay
Peru
Philippines
Rwanda
Sao Tome and Principe
Senegal
Sierra Leone
Somalia
South Africa
Sri Lanka
Sudan
Suriname
Swaziland
Syria
Tajikistan
Tanzania
Thailand
Timor-Leste
Togo
Trinidad and Tobago
Tunisia
Turkey
Uganda
United Arab Emirates
Uruguay
Uzbekistan
Venezuela
Viet Nam
Yemen
Zambia
Zimbabwe