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## The Sanitation Cityscape Conceptual Framework – understanding urban sanitation systems

Paper for the WASH systems symposium

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The Sanitation Cityscape Framework locates sanitation service delivery within a wider urban systems framework. Urban systems are not linear and the cityscape provides a conceptual framing of where sanitation services are located vis a vis urban residents' demand, tenure, neighbourhood typologies (i.e. the living environment) and the ability of the city to deliver basic services (i.e. the enabling environment). The Sanitation Cityscape considers complex urban sanitation service delivery systems. It locates existing tools (i.e. Living Conditions Diamond (Gulyani and Basset 2010); the SFD (2017) and enabling environment analysis (World Bank 2016) to look beyond the linear framing of sanitation services to gain a better understanding of the surrounding context and externalities. It captures what is happening around sanitation service delivery and why, highlighting the key interfaces between sanitation stakeholder and some unusual suspects who are sometimes overlooked in the sanitation value chain. This paper will present the framework itself as well as a case study application of the framework to an urban sanitation baseline survey. Using the Sanitation Cityscape Framework, 16 indicators describe the sanitation service delivery context under 4 thematic areas: i) the living environment ii) the service delivery environment and iii) the enabling environment and iv) key interfaces.

## Overview and problem statement

A conceptual framework explains, either graphically or in narrative form, the main things to be studied, the key factors, concepts or variables and the presumed relationship between them (Miles and Huberman 1994, p.18). Several 'frameworks' exist in sanitation discourse, but their intended application as a planning tool, conceptual model or simple graphic often gets lost. There is little consensus on what the key factors, concepts, variables and relationships are for urban sanitation. Whereas earlier frameworks (i.e. Household Environmental Centred Sanitation (HCES), Sanitation 21) were concentric in nature, putting people at the centre of development and urban domains, in the last decade the linear Sanitation Value Chain which articulates a fecal sludge management (FSM) chain has become the de facto framework for urban sanitation. While, we suggest, this has contributed to a much needed and deeper specialism of the sector, it has

also induced a narrowing of thinking of those within the sector to urban development. We suggest that a more holistic or systems conceptual framing is needed, one that places the sanitation value chain more explicitly within context of the urban service delivery environment.

## Existing sanitation frameworks

The handful of frameworks that have emerged in sanitation range from prescriptive planning tools to help decision makers think through the different aspects of the urban environment to mere graphical representations. Most tend to adopt a linear or concentric model<sup>1</sup>.

One of the earliest conceptual models of sanitation is the Wagner and Lanoix's F-diagram (1958). This linear model illustrates the major pathways of faecal-oral disease transmission routes. Its strength lies in the fundamental recognition that sanitation as the sum of technology and hygiene barriers to the faecal-oral contamination route, rather than any singular product Cairncross (1992). A series of frameworks emerged in the late 1990's moving away from the linear conceptualisation in an attempt to capture the different elements of sanitation planning in the urban environment – namely The Strategic Sanitation Approach (SSA) (Wright 1997), The Household Centred Environmental Sanitation (HCES) (WSSCC 1997), and Sanitation21 (IWA 2006). These were holistic in nature and intended as planning frameworks or decision supports, allocating a voice to the household / community and importance to the enabling environment. They provided a systematic way to navigate the complexities of urban sanitation provision, but for the unfamiliar mind, they were dense to grasp, and their uptake was limited.

Specialisation and a granular understanding of urban sanitation was achieved through the adopted of The Sanitation Value Chain – also known as the FSM model. It is a linear model identifying the typical components of an urban sanitation service chain i.e. the capture, storage, transport, treatment, reuse/disposal of fecal waste, which gained popularity in the years preceding the International Year of Sanitation 2008 (Tilley et al. 2008, Schaub-Jones 2005, de Bruijne, Geurts & Appleton 2007). While not applied as a typical value chain model i.e. determining market values and opportunities, this linear conceptualisation of sanitation has helped the sector advance considerably in terms of specialisation. Since 2008 it has been endorsed widely by donors, policy makers, academics alike. It has since become the de facto framework for urban sanitation.

<sup>1</sup> A more comprehensive review of sanitation frameworks is presented in Scott et al. 2015 however some key components are highlighted here.

We suggest it has also lent to a reductionism of the complexities of the urban environment. If a conceptual framework should outline the main things to be studied (Miles and Huberman 1994, p.18), we note that the user / community voice and the enabling environment is ominously missing from the sanitation value chain model.

Urban sanitation is complex, an appropriate and comprehensive conceptual model is likely a combination of the reductionism of the linear models and the holistic nature of the more complex models – which lends itself to a systems approach. One such model has been developed by Scott et al. (2015) termed the Sanitation Cityscape and the latest iteration is the focus of this paper.

### The Sanitation Cityscape Conceptual Framework

The Sanitation Cityscape Conceptual Framework, building upon the legacies of past frameworks, identifies the urban sanitation system as three components:

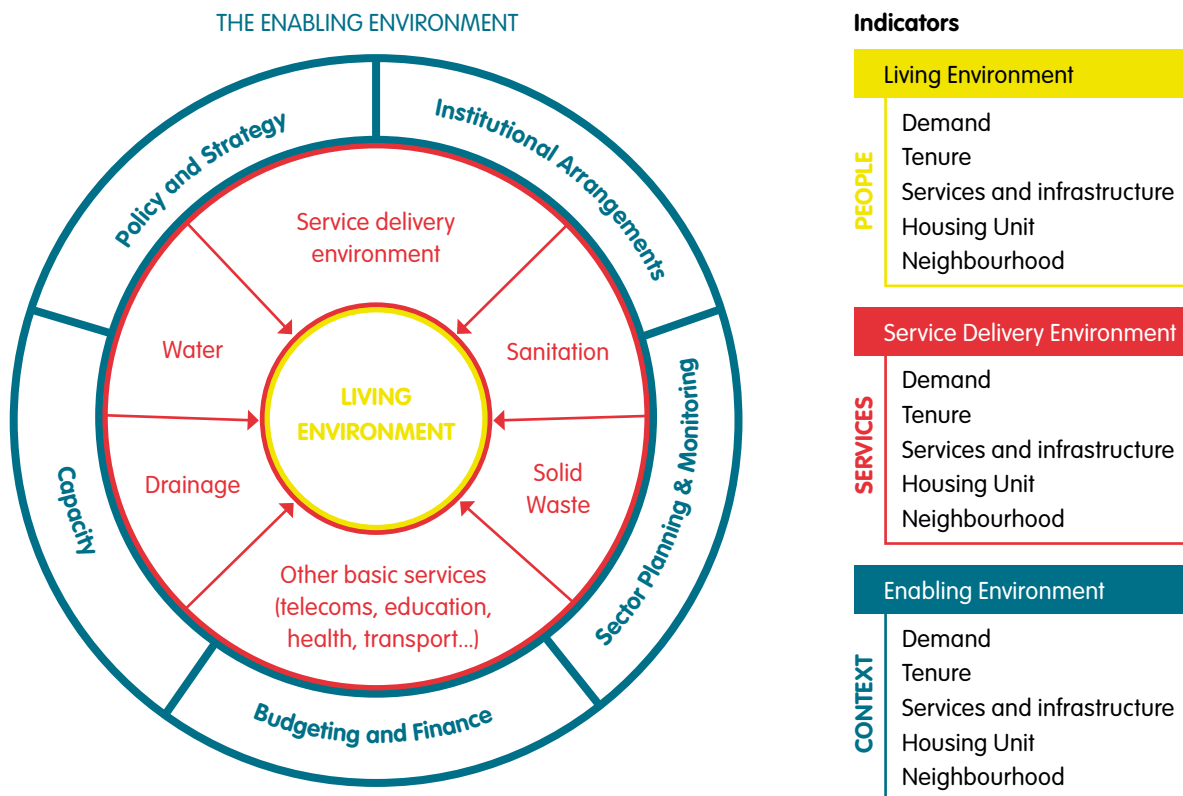
- The living environment (i.e. the household and surrounding area i.e. the peri-domestic area)

- The service delivery environment (i.e. the service delivery chain)
- The enabling environment

The final element of the framework to understand the interfaces and the nature of the relationships within and between each of these component parts.

Figure 1 presents the Sanitation Cityscape framework itself, with the inner core describing the living environment. Locating the household at the centre of the conceptual framework as is in the maintains Chambers’ (Chambers 1983) rationale of centring on the development objective and echoes Strategic Sanitation Approach, Sanitation21 and HCES. This sphere extends to the peri-domestic area (i.e. the area located near but not within the dwelling walls) as the nature of the reality of urban living (not just low-income) is that the boundaries of urban household services often extend beyond the dwelling walls<sup>2</sup>. The next concentric ring describes the service delivery environment i.e. the services and infrastructure that provides services to the living environment. Other basic services are included in the model as it is important to recognise sanitation does not

Figure 1: The Sanitation Cityscape Conceptual Framework



<sup>2</sup> For example, in urban living it is commonplace for multiple ‘household’ units to live under one roof or on one plot; it is also common for urban residents to share the physical infrastructure of basic services such as solid waste bins, stand posts and toilets which are located near to but not within the dwelling walls (Scott et al 2015; IWA 2006).

exist in isolation. The outer ring as the overarching enabling environment that encompasses the whole, importantly this is the enabling environment for delivering services to residents, not uniquely to FSM or sanitation alone. The framework is not intended to be prescriptive, rather it suggests what might be the relevant things to be studied, the key factors, concepts and measurable variables (Miles and Huberman 1994, p.18) for each component of the framework.

Figure 2 gives an overview of the main concepts we suggest should be understood in each component, why and suggested ways to measure these. The user is therefore free to choose which tools or approaches make sense in their own context and for their own objective.

### The Living Environment

Living Environment is the private sphere within which households make decisions about their behaviours and investments (Parkinson et al. 2014). Acknowledging the importance of demand was one of the key learnings from the International Decade on Water and Sanitation (Cairncross 1992) and whilst recognised in the concentric

sanitation frameworks the more recent (linear) approaches have sometimes taken a myopic view overlooking the externalities of urban living; for any given urban household, demand and priorities are heavily influenced by the living conditions that surround it.

An existing urban development framework, the living conditions diamond, developed by Gulyani & Bassett (2010) suggest four variables: tenure, housing unit, infrastructure and neighbourhood can give an effective and comparable view of the living conditions of any urban settlement. We suggest these four, coupled with an assessment of the development priorities of residents (i.e. demand) can offer an effective foundational picture of any given living environment, in the context of understanding service delivery.

The living conditions and development priorities of residents are important factors as they inform the nature and frequency of servicing the living environment across all basic services. For example, a settlement of predominantly tenants is likely to have less demand from residents to build individual sanitation infrastructure, shared toilets are more likely, which often require more regular emptying.

**Figure 2: A deeper look at the Sanitation Cityscape Indicators: What are the main things to be studied in the living environment, why, and how?**

1. THE LIVING ENVIRONMENT				
	<b>WHAT?</b> What are the main concepts to study?	<b>WHY?</b> Why are these important?	<b>HOW?</b> Suggested meaningful variables to measure these concepts	<b>TOOLS</b> Suggested tools (not exhaustive)
1.1	<b>Demand</b>	To understand resident priorities	Development priorities of residents; perspective of residents; satisfaction levels; Willingness to pay	<b>Living conditions diamond Gulyani &amp; Bassett (2010)</b>
1.2	<b>Tenure situation</b>	Tenure affects households' investment decisions. The tenure mix of a neighbourhood affects the overall housing stock	owner vs. occupiers; owner on/off-site; length of stay; fear of eviction	
1.3	<b>Housing Unit</b>	The private domain, linked to residents' development priorities and technical options	Construction of walls, floors, roof; overall building quality	
1.4	<b>Infrastructure and Services</b>	Linked to residents' development priorities and technical options	Is the plot serviced by water, electricity, solid waste collection, street lighting, paved roads, roads (vehicle access)?	
1.5	<b>Neighbourhood</b>	To generate and understand the different neighbourhood typologies to be able to provide appropriate solutions to different neighbourhoods. For example: inner city slum residents' trade-off prime location for lower quality living.	Quality of neighbourhood (cleanliness, location, transport, safety/crime, cost of land)	

## The Service Delivery Environment

The service delivery part of the framework describes the nature, frequency and type of service delivery and infrastructure used. These are important factors to understand to catalogue how services are delivered, where there are weaknesses or gaps in the service delivery chains. This has been a key area of focus in the sanitation sector of past years and tools such as the SFD

type analysis offer an effective snapshot overview of the volumes of waste (both networked and non-networked sanitation side by side); and the array of services and infrastructure in place. In the figure 1 the service delivery networks articulated are limited to solid waste, drainage, water supply and sanitation but these could expand to include other services such as health, education, mobile connectivity, transport and more.

**Figure 3: A deeper look at the Sanitation Cityscape Indicators: What are the main things to be studied in the service delivery environment, why, and how?**

2. THE SERVICE DELIVERY ENVIRONMENT				
	WHAT? What are the main concepts to study?	WHY? Why are these important?	HOW? Suggested meaningful variables to measure these concepts	TOOLS Suggested tools (not exhaustive)
2.1	Containment incl. access	To understand the different sanitation options, pathways and prevalence of each in the context, including both networked and non-networked sanitation options.	Access to sanitation; practices; technologies	<b>SFD Analysis</b>
2.2	Emptying		Type of service, equipment, diversification of customer base; practices; technologies	
2.3	Transport		FS pathways and volumes; practices; technologies	
2.4	Treatment			
2.5	Re-use / disposal			

**Figure 4: A deeper look at the Sanitation Cityscape Indicators: What are the main things to be studied in the enabling environment, why, and how?**

3. THE ENABLING ENVIRONMENT				
	WHAT? What are the main concepts to study?	WHY? Why are these important?	HOW? Suggested meaningful variables to measure these concepts	TOOLS / GUIDANCE Suggested tools (not exhaustive)
3.1	Policy and Strategy	To understand if the policy exists and is appropriate to context and activities; to understand the direction of travel.	Policy, regulation; enforcement; pro-poor; Urban Local Government role	<b>WHO Sanitation Guidelines (2018); WSUP Enabling Environment (2018); The World Bank's FSM Diagnostic Tools (Ross et al. 2016) including Citywide Service Delivery Assessment), UNICEF (2016) ; CLUES (Lüthi 2011)</b>
3.2	Institutional arrangements	To understand the players (both informal and formal) and the rules of the game, coordination between them	Roles and responsibilities; coordination	
3.3	Sector Planning and Monitoring	To understand what might drive change	Service targets; monitoring; planning	
3.4	Budgeting and Finance	To understand financial planning and procurement processes.	Financial planning and procurement practices and power; cost recovery;	
3.5	Capacity	To understand who the decision makers are, their capacity and competing priorities. To understand who the decision makers are, their capacity and competing priorities.	Skills; knowledge; training; resourcing (national to lowest administrative unit)	

## The Enabling Environment

The enabling environment are the interrelated conditions that impact on the potential to bring about sustained and effective change (World Bank 2003). There is wide recognition that an enabling environment is essential for sanitation development and a growing consensus about what constitutes that environment, with some variance, but a core of political, legal, institutional, financial and economic, capacity and training, technical and social conditions. There are various conceptualisations and tools that have been developed to help navigate this referenced in Figure 4.

### The Interfaces and the Nature of Relationships

The final element of the conceptual framework is understanding some of the relationships within and between these three environments. The key concepts here are likely to vary depending on the objective of enquiry but the aim is to understand the nature of organisation, leadership and cohesion in the living environment; among the service providers and among decision makers; and to identify if there are existing communication channels and interfaces between them that can be reinforced. For example, a community savings group is a good indication of social cohesion and can be leveraged for further development; an association of sanitation service providers (even if informal) can act as an interface towards municipality or utility.

## Applications

The Sanitation Cityscape was applied in 2018 to design a baseline study of urban sanitation in a small town in Ethiopia. Using a set of 16 indicators in total across the

different environments ensured the data collection was efficient and purposeful. The living conditions diamond analysis generated for each of the settlements studied produced four settlement typologies across the city. Using these typologies, planning for different sanitation intervention options are being prioritized based on need and applicability (i.e. shared or individual latrines). A rapid SFD analysis highlighted where the biggest problem of safely managed sanitation was (no treatment) and using an adaptation of the Citywide Service Delivery Assessment the biggest gap of the enabling environment was identified as lack of policy implementation, coordination and capacity. Further, large scale private sector actors such as hotels and breweries were identified as key stakeholders in the FSM chain due to their polluting power and use of the fecal sludge dump area which would not necessarily have been picked up using a value chain analysis. Finally, key interfaces to anchor future developments emerged, including well established local savings groups.

## Conclusion

Citywide sanitation has been endorsed as the future paradigm for urban sanitation but there is less evidence of these principles being put into practice systematically. The last decade has seen great advances in the understanding of the sanitation service delivery environment; further there is significant progress being made in understanding the enabling environment, albeit if the tendency to address it are often not prioritized. It is not uncommon for one or other of these elements to be considered in isolation. Further, what is largely absent is an understanding of the urban living environment of residents, their priorities, their decisions and how their living conditions might

**Figure 5: A deeper look at the Sanitation Cityscape Indicators: What are the main interfaces and relationships to be studied, why, and how?**

4. THE INTERFACES AND RELATIONSHIPS				
	<b>WHAT?</b> What are the main concepts to study?	<b>WHY?</b> Why are these important?	<b>HOW?</b> Suggested meaningful variables to measure these concepts	<b>TOOLS</b> Suggested tools (not exhaustive)
4.1	<b>Key interfaces and/or relationships and gaps</b>	To understand the nature of the relationships, both within, and between the groups. To highlight gaps and opportunities (i.e. key and missing relationships and/or interfaces). For example: Social cohesion is an important predecessor for community mobilisation.	What is the relationship / interface / mechanisms of contact etc. between households and service provider?; between service provider and Local Governments?; between households and Local Governments; between Local Governments and National Government?  What is the relationship amongst HHs (i.e. social cohesion); between service providers (e.g. association); between LG/ NG actors (e.g. task force)?	<b>Relationship mapping</b>

affect these. Also missing is how these three different components of urban sanitation are working with, or against, each other.

Systems thinking helps to understand the nature between variables rather than simply the variables themselves. The Sanitation Cityscape, lends itself to systems conceptualisation of urban sanitation providing both a holistic and a granular understanding. By breaking the urban sanitation system down into component parts there is scope, within each component, for granular analysis; and by grouping the environments and examining the nature of relationships, points of leverage and interfaces between them helps unpack the complexity (von Bertalanffy 1968).

This Sanitation Cityscape is not a silver bullet, nor is it intended as a prescriptive tool or planning guide. Operationally, what it offers is an efficient 'frame' to systematically locate the components of the urban sanitation puzzle in a predictable way. For the researcher and practitioner alike, it narrows the key concepts to grasp which in turn allows for more efficient understanding of the urban sanitation systems and a more appropriate targeting of appropriate interventions.

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