Towards inclusive, green city sanitation for Lusaka – achievements and way forward

Synthesis Report

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Foreword

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Sustainable Development Goal 6 (SDG 6) aims to ensure the availability and sustainable management of water and sanitation for all, by 2030. However, there are a lot of people, in many places around the world still drinking unsafe water, struggling to find water to wash their hands, practicing poor hygiene and exposed to unsafe sanitation.

Lusaka is one of the fastest growing and most urbanized cities in sub-Saharan Africa, with 70% of its population living in one of the city's 36 peri-urban areas nearly all of which are informal settlements. This has resulted in the majority of Lusaka's 2.3 million large population having inadequate WASH facilities. This has serious negative effects on the health of its residents, as evident from the recent outbreak of diarrhoeal diseases, such as cholera and typhoid. This puts a great social and financial cost on individuals, businesses, and on the Zambian Government each year. The Government recognizes the urgent need to improve access to sanitation and this is well articulated in the 7th National Development Plan (7NDP) that was launched under the theme "Accelerating development efforts towards the Vision 2030 without leaving anyone behind".

In 2015, recognising WASH as the foundation of public health and a catalyst for many areas of development, the Government of the Republic of Zambia through the Lusaka Water Supply and Sanitation Company (LWSC) and the Lusaka City Council (LCC) embarked on a large-scale infrastructure investment project, the Lusaka Sanitation Programme (LSP). With support from World Bank (WB), African Development Bank (AfDB), German Development Bank (KfW), European Investment Bank (EIB), the LSP primarily focused on expansion and rehabilitation of existing wastewater treatment services. However, a small share of the multi-stakeholder Programme budget has been allocated to on-site sanitation in peri-urban areas, with complementary technical support from the Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ).

Addressing On-Site Sanitation (OSS) and Faecal Sludge Management (FSM) systems in Lusaka is complex, as it involves multiple stakeholders and actors from across the sanitation sector, who focus on different aspects of the problem and solution—from the provision of water and sanitation services, to infrastructure and regulation, as well as addressing public health and effects of climate change (extreme droughts and floods). The collaboration both between the two implementing entities Lusaka City Council and Lusaka Water Supply and Sanitation Company, and the multitude of other stakeholders in the sector, has been and will continue to be important for the achievement of improved and sustainable WASH services, and the establishment of the framework conditions for the environmentally friendly and hygienic transport and treatment of faecal sludge in the city.

The ambition of SDG 6 is high, but every step towards better WASH services for more people is a step towards eradicating extreme poverty and improving health and well-being for all. This report tells a very special story, of Lusaka, and Zambia's collaborative efforts to achieve SDG 6. It highlights the changes that have taken place in the sanitation sector in Lusaka, the achievements that have been made, and suggestions for the continued journey towards achieving sanitation access for all in Lusaka and, in Zambia.

Executive Summary

From December 2016, the German-funded project Climate-Friendly Sanitation Services in Peri-Urban Areas of Lusaka (CFS-Lusaka) implemented by GIZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) supported stakeholders to strengthen on-site sanitation (OSS) and safe faecal sludge management (FSM) in the fast-growing Zambian capital within the context of the multi-donor Lusaka Sanitation Programme (LSP). Poor sanitation practices had been identified as a major risk factor for public health and vulnerable groundwater resources. Cholera outbreaks, erratic weather patterns induced by climate change and more frequent flooding events demanded a rethink of conventional urban sanitation concepts. Lusaka needed to look beyond networked sewerage to achieve ambitious national sanitation targets and its aspirations for a 'greener' city. Reaching low-income households in the city's peri-urban areas was going to be key to ensuring safe and environmentally responsible faecal sludge management.

CFS-Lusaka has helped strengthen and scale up the concept of a sanitation service delivery chain and integrated end-to-end service delivery. Lessons learnt and recommendations are offered not only for Lusaka to move forward on its sanitation journey, but also as a set of key messages to inform global practice and conceptual thinking: together with Lusaka City Council's Public Health Department as well as the commercial utility Lusaka Water and Sanitation Company, CFS-Lusaka has championed 'inclusive green city sanitation', demonstrating the suitability of climate-friendly FSM practices for accelerating service expansion into low-income areas. By integrating a climate focus into sector reform approaches that promote and prioritise pro-poor infrastructure and services, the project has been supporting goals for sustainable development at local, national and international level.

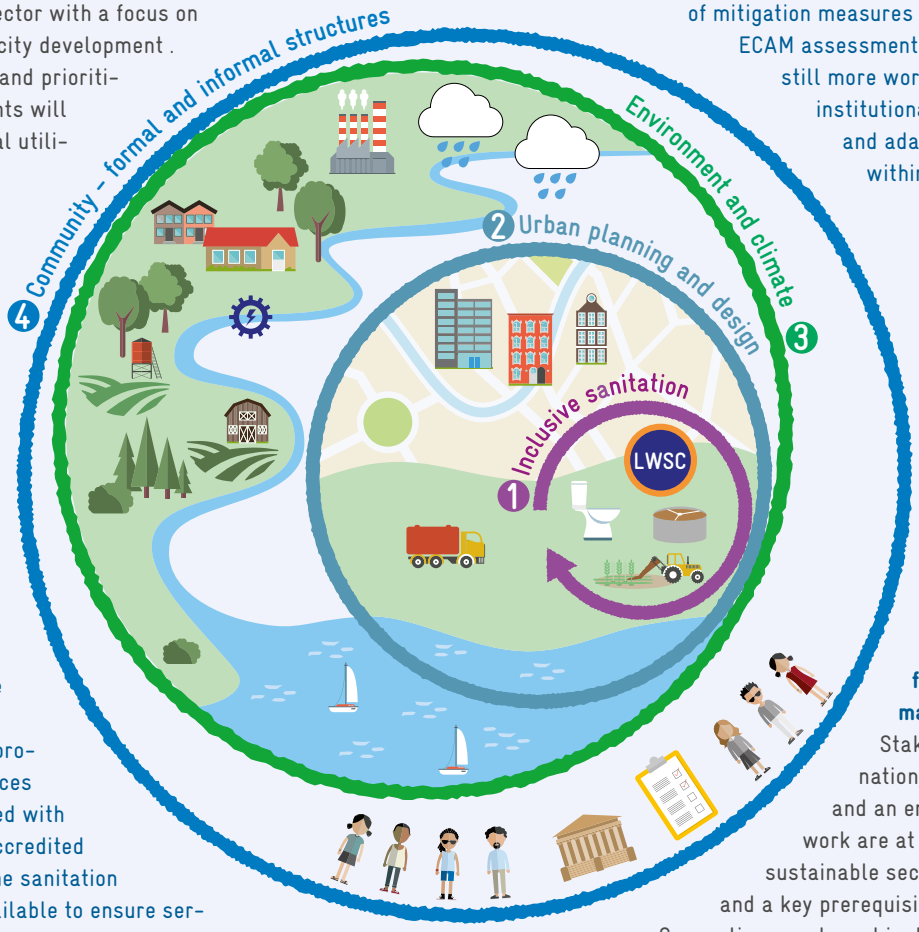
In many ways, the Lusaka sanitation journey echoes the developments in international sanitation thinking and practice: FSM models are beginning to emphasise sanitation service and value chains and embrace the complexity of the local context, notably peri-urban areas. In Lusaka, formal and informal structures that govern sanitation provision are adapting to the broader challenges of urban development, notably population growth and climate change. Project activities have helped to lay the foundations for sustainable future sector development that can now be driven by committed and knowledgeable local stakeholders.

This report reflects on progress and impact of the various CFS-Lusaka activities, all of which emphasised stakeholder coordination, awareness raising and capacity development. Five specific focus areas included creating an enabling framework for OSS and FSM, formalising service delivery and developing the capacity of the sanitation workforce, as well as financing and funding, and explicitly looking at sanitation from a climate perspective. Discussing these in turn, the report takes stock of achievements so far and the challenges that remain with regard to (1) Enabling framework for on-site sanitation and faecal sludge management, (2) Scaling up safely managed on-site sanitation services, (3) Workforce competencies and employability, (4) Sustainable financing and funding for OSS and FSM, and (5) Sanitation and climate, this report takes stock of achievements so far, the potentials such as increased funding and financing, and the challenges that remain. The infographic on the following page shows how the example of Lusaka fits into a broader framework of green inclusive city sanitation, showing how each of the five focus areas fits into four broader principles.

① **Inclusive sanitation.** Scaling up and safely managing sanitation (on-site and off-site) requires connecting privately-owned facilities (i.e. toilets and containments/storage) with professionalised services along the entire sanitation chain and, with regards to OSS, managing the associated decentralised infrastructure (e.g. faecal sludge treatment plants). Especially for the latter, this entails appropriate financing mechanisms, knowledge and skills within a utility that are needed for monitoring, operation and maintenance and service delivery. This also requires close cooperation with the local private sector with a focus on licensing and capacity development . Strategic planning and prioritisation of investments will promote the optimal utilisation of the '3 Ts': taxes, tariffs and transfers from funding partners. CFS-Lusaka activities targeted operational and financial resilience and improved sanitation mapping, digitalisation, development of FSM business models and technical testing. These activities have helped to develop professionalised services more closely aligned with customer needs. Accredited training for frontline sanitation workers is now available to ensure service can be delivered safely, protecting staff, their customers and the environment.

② **Urban planning and design** needs to aspire to future-proof development pathways. A smart city can harness the power of digital tools, which can facilitate cross-sectoral cooperation. Sanitation data is complex and needs to capture the unique characteristics of each location. A coherent picture and detailed understanding are needed at every stage of development, from planning to monitoring of interventions. CFS-Lusaka activities focused on anchoring sanitation projects into urban planning and provide sound information for decision- making and the prevention and eradication of cholera using different digital tools such as sanitation mapping, digitalisation of standard operating procedures for inspection, SaniPath, and Shit Flow Diagrams.

③ **Environment and climate.** A city, however transformed by human activity, exists within its natural environment. There is a growing appreciation of the interlinkages between water and sanitation, greenhouse gas emissions and climate change. Climate change requires a direct response to its impacts (e.g. to minimise flood risks and maintain continuity of service) as well as longer-term mitigation action (e.g. reducing GHG emissions, beneficial reuse of treated sludge). CFS-Lusaka activities promoted a proactive stance on climate change adaptation/mitigation, through the introduction of mitigation measures such as the ECAM assessment tool. There is still more work to be done to institutionalise mitigation and adaption measures within the utility.



Inclusive, green city sanitation solutions

④ **Community – formal and informal structures.** Stakeholder coordination, a shared vision and an enabling framework are at the heart of sustainable sector governance and a key prerequisite for resilience. Connecting people and institutions allows climate-friendly sanitation to become an integral part of planning and action at all levels, from individual households and neighbourhoods. Formal and informal structures also govern the way priorities are set and interventions funded. CFS-Lusaka activities focused on promoting stakeholder awareness and cooperation, within Lusaka and beyond, forming a district coordinating committee. More robust and transparent (digital) enforcement procedures are underpinned by the recently developed Lusaka City Council by-law, forming a sound legal basis for inclusive, climate-friendly sanitation.

Source: Author's adaption of the IWA 'Water-Wise Cities' Framework and the 'Levels of Water Resilience' proposed by 100 Resilient Cities. (IWA. 2016. The IWA Principles for Water Wise Cities 2nd ed.) IWA. London; Bruebach, K. 2019. Water and Sanitation. Resilience Perspective.

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Abbreviations and Acronyms

AfDB	African Development Bank
BORDA	Bremen Overseas Research and Development Association
CU	Commercial Utility
CFS-Lusaka	Climate-Friendly Sanitation Services in Peri-Urban Areas of Lusaka
DTF	Devolution Trust Fund
ECAM	Energy Performance and Carbon Emissions Assessment and Monitoring
EIB	European Investment Bank
FS	faecal sludge
FSM	faecal sludge management
FSTP	faecal sludge treatment plant
GHG	greenhouse gas
GRZ	Government of the Republic of Zambia
IFI	international financing institution
KAP	knowledge, attitudes and practices
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
LA	Local Authority
LBTC	Lusaka Business and Technical College
LCC	Lusaka City Council
LD WASH PHC	Lusaka District WASH Public Health Committee
LSP	Lusaka Sanitation Programme
LSS	Lusaka Sanitation System
LWSC	Lusaka Water and Sanitation Company (formerly Lusaka Water and Sewerage Company)
MDU	mobile desludging unit
MLG	Ministry of Local Government (formerly Ministry of Local Government and Housing, MLGH)
MWDSEP	Ministry of Water Development, Sanitation and Environmental Protection (formerly Ministry of Mines, Energy and Water Development, MMEWD)
NDC	Nationally Determined Contributions
NWASCO	National Water Supply and Sanitation Council
NUSS	National Urban and Peri-Urban Sanitation Strategy
NUWSSP	National Urban Water Supply and Sanitation Programme
OD	open defecation
OH&S	occupational health and safety
OSS	on-site sanitation
PHD	Public Health Department
PUA	peri-urban area
PUU	peri-urban unit
SFD	shit flow diagram
SMP	Sanitation Master Plan
SOP	standard operating procedure
TAF	Technology Applicability Framework
ToT	Training of Trainers
TWG	technical working group
TEVETA	Technical Education, Vocational and Entrepreneurship Training Authority
WaCCliM	Water and Wastewater Companies for Climate Mitigation
WSS	water supply and sanitation
WSUP	Water and Sanitation for the Urban Poor
ZABs	Zambia Bureau of Standards
ZEA	Zambian Emptiers Association
ZEMA	Zambia Environmental Management Authority

Introduction

This report tells the 'Lusaka sanitation story' within the context of the GIZ German-funded project Climate-Friendly Sanitation Services in Peri-Urban Areas of Lusaka (CFS-Lusaka, see box), implemented by GIZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), which started in December 2016. AOver the past years, sanitation in Lusaka has been transformed and expanded beyond centralised one-size-fits-all approaches towards more inclusive, integrated solutions. Most importantly, the sanitation sector is finally receiving due recognition from all stakeholders as being central to the health and dignity of the city's residents. Sustainable sanitation is now acknowledged as playing a critical part in protecting the resources and systems that underpin the very functioning of the city itself.

The sanitation crisis enveloping Lusaka and many other cities around the world has been a long time in the making , with many and often lower-income residents not able to access municipal sanitation systems. As climate change and spread of disease threaten lives and livelihoods, sanitation can no longer be viewed as a private affair, where responsibility rests solely at the household level. With the adoption of the Agenda 2030, SDG 6 and the overarching leave no one behind principle, the international community has declared its commitment to universal access to safe water supply and sanitation (WSS). Both are protected as fundamental human rights. Zambia has embraced these principles and adopted ambitious national sanitation targets. Whilst there are many hurdles to overcome before this vision will become a reality for each and every one, strides of progress have been made in Lusaka over the past few years. The road towards a fully inclusive and green city is still long, but there is confidence that efforts will come to fruition if stakeholders join together to realise these national and international goals. Activities initiated by CFS-Lusaka and its various partners will continue and, hopefully, new ideas will be taken onboard to facilitate well-integrated sanitation solutions.

GIZ's support to the Lusaka Sanitation Programme (LSP) under the CFS-Lusaka project came to a close in December 2019. This provides an opportune moment to take stock of achievements so far and the challenges that lie ahead, and to draw out lessons that can inform future decisions. Many will be also of wider interest. Following this introduction this synthesis report begins by putting sanitation in Lusaka into its historical, social and environmental context, and

The CFS-Lusaka project focuses on the improvement of prerequisites for climate-friendly faecal sludge management (FSM) in peri-urban areas. CFS-Lusaka complements the on-site sanitation (OSS) component of the multi-stakeholder Lusaka Sanitation Programme (LSP). Key implementing partners include Lusaka Water and Sanitation Company (LWSC) and Lusaka City Council (LCC).

Specifically, CFS-Lusaka provides advisory and practical capacity development assistance for safe FSM and the establishment of the requisite framework conditions to enable enforcement of regulations. Special regard is given to facilitating coordination between local OSS and FSM stakeholders.

tracing developments in the sub-sector against the backdrop of wider sector reform (chapter 2). The more recent 'Lusaka sanitation experience' is examined in chapter 3, which discusses challenges, progress and the impact of the various partners' activities along five focus areas: (1) the enabling framework for on-site sanitation and faecal sludge management, (2) sanitation services, (3) workforce competencies and employability, (4) financing and funding, and (5) sanitation and climate change. Findings and recommendations for each of these reflect the lessons learnt and are influenced by current conceptual thinking on sanitation. Chapter 4 concludes with key messages to inform inclusive green city sanitation solutions – for decision-makers in Zambia to take forward, and for others facing the formidable task of delivering inclusive green sanitation in their own cities.

Inclusive green city sanitation

'Inclusive green city sanitation' can be roughly translated as 'adequate sanitation for everyone in the whole city with safe management of all human excreta along the entire sanitation chain'. A combination of networked and non-networked systems extends the reach of safe sanitation to include low-income areas, where on-site options are often more appropriate. It promotes long-term planning, innovative technology mixes and creative funding strategies that 'better respond to the realities found in developing country cities.'[1] Solid waste is not included in this definition of sanitation despite the obvious interlinkage of sustainable sanitation and solid waste management.

In the context of the CFS-Lusaka project and hence this publication, the term 'green' is added to existing definitions for inclusive sanitation to emphasise climate-related aspects, which also support re-use approaches. The notion of inclusive green city sanitation thus adds a climate focus to established sector reform approaches that promote and prioritise pro-poor infrastructure and services (e.g. GIZ's Scaling up concept).[2]

1) For further information on citywide inclusive sanitation (CWIS), visit https://citywideinclusivesanitation.com/
2) GIZ, 2015. Closing the Last Mile for Millions. GIZ, Bonn.

Lusaka. Story of a city in two shades of green.

A garden city grows

Lusaka, the capital and largest city of Zambia and the country's second-largest economic centre, extends across an area of 375 km^2 of gently rolling plateau, approximately 1280 metres above sea level. Home to some 2.4 million people, modern-day Lusaka would be unrecognisable to its first town planners, who had set out to design a green and spacious 'garden city' for a small elite.[3] Workers, on the contrary, were housed in basic rented accommodation linked to their employment. Though they were expected to return to their rural homes and families, informal communities began to develop within and outside the city limits. Fuelled by rapid rural-urban migration once colonial restrictions on movement had been lifted, these settlements ballooned after independence in 1964. Within ten years, 94% of the housing stock in Lusaka reportedly consisted of informal homes.[4] Urbanisation quickly outpaced economic growth and the new authorities' capacity to provide adequate services.

Fast forward some fifty years and population growth at one of the highest rates in Africa, bolstered by steady in-migration, continues to place disproportionate pressure on the city and its environs. Today, some 70% of Lusaka's residents are estimated to live in the city's 33 low-income settlements.[5] There are no signs of this trend of ever-increasing urbanisation abating; the population of Lusaka is projected to reach five million by 2035.[6] Entrenched pockets of poverty[7] are especially challenging. In the so-called 'peri-urban areas' (PUAs), the hardship caused by poor-quality housing and overcrowding is compounded by a struggle to secure adequate infrastructure services, including safe water and sanitation. Lives claimed by cholera are making regular headlines, and Lusaka was heavily affected by the 2017/18 outbreak.

There is a link between this state of affairs and the city's natural environment – in itself a feature that provided inspiration for the original planners. Lusaka lies above a productive aquifer, which provides some 60% of the formal water supply. Whilst the karst topography and high water table offer some welcome relief to those shut out of formal service provision – thousands of private boreholes and shallow wells are sunk into the rock – they are also a key vulnerability. Leachate from poorly constructed on-site sanitation facilities and illegal dumping of faecal sludge can easily reach and contaminate the underlying groundwater in many parts of the city. This adds to the contaminant load, when water quality is already strained by 'rampant' industrial pollution.[8] In the comparatively few areas served by sewerage networks, drainage is again affected by the city's flat terrain. Many areas are susceptible to flooding, which exacerbates the problems caused by poor sanitation. Changing land use patterns further impact on the natural groundwater cycle, again adding to the challenge of delivering water and sanitation infrastructure and services.

Tale of any city: a very conventional approach to sanitation

Like in many cities around the world, water and sanitation infrastructure in Lusaka is closely tied to its housing problems. At independence, people living in unplanned settlements relied on self-dug pit latrines. As these unserved peri-urban areas acquired quasi-legal status, attempts were made to absorb the rapidly growing 'marginal' city population into a coherent system of urban services. Already, the

3) Bamberger, M., Sanval, B. and Valverde, N 1982. Evaluation of Sites and Services Project. The Experience from Lusaka, Zambia. World Bank Staff Working Paper No. 548. Lusaka accounts for over one third of Zambia's urban population.
4) Todd, D. M. 1985. Third World Sanitation Options – the Zambian Case. The Environmentalist, 5(2), 111-121.
5) MLGH. 2011. National Urban Water Supply and Sanitation Programme (NUWSSP 2011 – 2030); GIZ. 2017. Minutes: Knowledge Sharing _ Sanergy Visit August 2017.
6) Zambia Statistical Office. 2013. http://zambia.opendataforafrica.org/ZMPHC2015/population-and-demographic-projections-2011-2035?country=1000350-lusaka-province&indicator=1000010-projected-mid-year-population&age-group=1000080-7
7) According to latest available figures, 25% of Zambia's urban population lives below the international poverty line (US$1.90 a day at 2011 PPP). World Bank. 2019. Poverty and Equity Brief Zambia.
8) NWASCO. 2016. Strategic Plan 2016-2020.

Milestones of the Zambian WSS sector reform and the Lusaka sanitation story

- **1988** ▸ Lusaka Water and Sewerage Company formed
- **1994** ▸ National Water Policy
- **1995** ▸ LWSC creates peri-urban unit
- **1997** ▸ Water Supply and Sanitation Act No. 28
- **2000** ▸ regulator NWASCO becomes fully operational
- **2001** ▸ first National Peri-urban Water and Sanitation Strategy published
- **2003** ▸ Creation of the Devolution Trust Fund (DTF)
- **2006** ▸ Zambia Vision 2030
- **2007** ▸ sanitation surcharge introduced by NWASCO
- **2009** ▸ LCC presents its comprehensive urban development plan for the city of Lusaka (City Master Plan)
  ▸ National Urban WSS Programme (2011 to 2030
- **2011** ▸ Sanitation Master Plan for Lusaka
- **2012** ▸ LWSC starts working with WSUP, WASAZA and BORDA on pit-empting in Kanyama
- **2015** ▸ Lusaka Sanitation Programme starts (projected end date: 2021)
  ▸ National WSS Capacity Development Strategy (2015 to 2020)
  ▸ National Urban and Peri-urban Sanitation Strategy (2015 to 2030)
- **2016** ▸ Ministry of Water Development, Sanitation and Environmental Protection created
  ▸ CFS-Lusaka starts
- **2017** ▸ Lusaka District WASH Public Health Committee formed
  ▸ Open Defecation Free Zambia Strategy (2018 to 2030)
- **2018** ▸ Closure of the the DTF
- **2019** ▸ CUs officially renamed water and sanitation companies

distinction between 'basic' and 'normal' plots reflected the prevalent belief in the superiority of waterborne sewerage services: only the latter were earmarked for private water and sewerage connections.[9] High ambitions for extending sewerage networks quickly clashed with the technical challenges and the cost of connecting sewer pipes in unplanned urban and peri-urban areas. This also ignored the fact that early municipal housing had already featured 'aqua privies', a popular non-networked sanitation option.[10] With percentage access to piped wastewater services in steady decline, the official stance of insisting on conventional sanitation technologies attracted sharp criticism for entrenching social inequity and endangering public health. Researchers that conducted the 1979 Urban Sanitation Survey of low-income areas in Lusaka warned that the proliferation of unlined, unimproved pit latrines would lead towards an 'inevitable sanitation crisis'.[11] A search for alternative options was mooted in response but fizzled out without any concrete actions.[12]

Several decades would pass before the government would heed the call for a formal policy setting out a consistent national approach to water and sanitation backed with detailed implementation and maintenance strategies. Whilst the housing policy reluctantly adopted lower standards to reflect economic reality, deviations from the 'gold standard' of a private toilet connected to the municipal sewer system were tolerated only as an interim solution. Gaps remained when it came to coordination between the

9) The First Lusaka Urban Development Project, which was approved in 1974 and closed in 1981, aimed at absorbing marginalised city residents into a coherent system of urban services. 3,200 'normal' plots with individual water and sewer connections and 1,200 'basic' plots with pit latrines and communal water supply would be offered to applicants in selected low-income areas under the project's sites and service component. It is worth noting that while Government of Zambia supported the sites and services approach in response to the escalation of unauthorised housing, yet 'basic' plots were still regarded as too a standard and only added on the insistence of the World Bank. Bamberger, M., Sanval, B. and Valverde, N 1982. Evaluation of Sites and Services Project. The Experience from Lusaka, Zambia. World Bank Staff Working Paper No. 548. Todd. D.M. 1987. Constraints on the Development of Appropriate Sanitation Policies in Zambia. Habitat Intl. 11(1), 161-171.

10) An aqua privy is similar to a septic tank, with a latrine located directly over a tank connected via a drop pipe; with its small footprint and low water requirements it is suitable where pit latrines are unacceptable.

11) Todd, D. M. 1985. Third World Sanitation Options – the Zambian Case. The Environmentalist, 5(2), 111-121: 'In the author's opinion, the only possibility of averting a major sanitation (and hence health) crisis in Zambia's most densely populated squatter areas is the development of an efficiently managed vault toilet and vacuum emptying service.' (p.120) Todd was scathing about the stubborn adherence to sewerage, criticising what he saw as the diversion of 'scarce financial resources away from the "basic needs" of the poor majority, to subsidize the aesthetic considerations of a minority' (p.111).

12) Zambia's Third National Development Plan (1979-1983) acknowledged the necessity to aim for providing a minimum standard of housing and services: 'Water-borne sanitation will be appropriate only where individual water connections are provided. Where shared taps are provided, alternative sanitation methods will be used.' Despite the stated intention to actively pursue research into economical sanitation solutions for low-cost housing areas, no funds were allocated for this purpose. (ibid.)

various agencies and departments at national as well as at local level.[13] Yet officials were united in adhering to the notion of full sewerage coverage for the city of Lusaka, to be achieved at some unspecified point in the future. The complexity of decision-making responsibilities, combined with the reluctance to consider on-site sanitation options left those dependent on alternative, on-site sanitation – the overwhelmingly poor majority – largely to their own devices. The focus on networked infrastructure was reinforced by the modalities of international financing institutions (IFIs), which for the longest time tended to favour large-scale capital investment projects, and hence sewers and wastewater treatment plants.[14]

A model sector reform?

After several previous attempts to reform the sector and introduce a strong WSS focus, a major shift occurred in the 1990s. In 1994, the Zambian government published its first National Water Policy, quickly followed by a sector strategy concerning the institutional and legal framework for water supply and sanitation services. Sweeping changes were formally introduced with the Water Supply and Sanitation Act No. 28 of 1997, which formally separated water resources management from service-related aspects and established the now classic separation of operational and regulatory functions.[15] Overall responsibility for service provision was transferred to local authorities (LAs), establishing the Ministry of Local Government and Housing (MLGH) as a key sector player. A medley of other ministries and their various subordinate departments and agencies retained a level of involvement in various sector management and monitoring functions.[16]

LAs were encouraged to delegate their service provider functions to publicly-owned commercial utilities (CUs) that were to be managed in accordance with commercial principles. The 1997 Act also established an independent National Water Supply and Sanitation Council (NWASCO) to monitor and regulate service delivery. Fully operational by late 2000, NWASCO focused its efforts on networked services in urban areas, though this reflected a pragmatic choice rather than a legally prescribed delineation of regulatory oversight.[17] The Zambia Environmental Management Authority (ZEMA) was made responsible for a wide range of environmental concerns, including licensing the emptying and transport services provided by exhauster trucks and overseeing wastewater treatment. Local Authorities (LAs) retained some sanitation-related responsibilities, which were discharged through their public health departments.

In line with its mandate, NWASCO promptly took a proactive stance on pro-poor service development.[18] Its strategic vision of promoting 'safe, affordable and sustainable water supply and sanitation services for all' was supported by the Devolution Trust Fund (DTF), which had been established in accordance with the new water act as a pro-poor basket fund. The DTF, alongside NWASCO, played a prominent role in assisting CUs with service improvements and extensions in peri-urban areas from 2003 onwards. However positive its contribution, introducing a financing mechanism under the auspices of the regulator and anchoring it at the MHLG was fraught with problems given the challenge of having appointed the regulator as the de facto trust fund manager. Conflicts of interest were ultimately to spell the end of what has been hailed as a pivotal instrument for developing and implementing a successful approach to channelling much-needed investments into the 'last mile'.[19]

Lusaka Water and Sewerage Company (LWSC)[20] had been established in 1988 as the first of the new generation of commercially-operated utilities. In 2019, all eleven CUs were required to replace the 'sewerage' to 'sanitation' to reflect their expanded mandate, which now covers OSS and FSM. It has been the designated formal service provider for the capital and the surrounding Lusaka district[21] since 1990. LWSC, like all Zambian CUs, inherited chronically stretched and underfunded infrastructure, with the expec-

13) Todd. D.M. 1987. Constraints on the Development of Appropriate Sanitation Policies in Zambia. Habitat Intl. 11(1), 161–171.
14) The approaches employed by many IFIs and repercussions for investments into the 'last mile', i.e. low-income areas, are discussed in GIZ's 'Closing the Last Mile for Millions' publication (2015). It is only very recently that small non-networked components have started to appear in infrastructure grants and loans, and the hindrances to greater IFI involvement in non-networked sanitation systems and solutions (not least related to rigorous banking systems) will require further costing and research.
15) Policy-making was explicitly separated from regulation soon after.
16) such as the Ministries of Energy and Water Development (MEWD, subsequently renamed Ministry of Mines, Energy and Water Development, MMEWD), Finance and National Development (MFND), Health (MoH) and the Environment (MoE)
17) NWASCO. 2004. Water Sector Reform in Zambia. NWASCO: Lusaka.
18) While its first sector performance report (published in 2003) was entitled 'Urban Water Supply and Sanitation Sector Report 2001/2002', subsequent versions explicitly reported on the state of the 'Urban and Peri-urban Water Supply and Sanitation Sector' (emphasis added).
19) See GIZ (2015) for a discussion of the DTF's role in scaling up pro-poor service provision in Zambia.
20) Note the emphasis on networked sanitation implied by the company name. By contrast, the 1997 Water Supply and Sanitation Act clearly refers to 'water supply and sanitation utilities' and services.
21) All Zambian CUs, including LWSC, are asset holders and service operators.

tation that commercialisation and professionalisation would gradually reverse the downward trajectory of service performance. Owing to significant capacity shortfalls, LWSC was only able to provide some level of water supply service to an estimated 34% of residents within its service area when the regulator first started monitoring sector performance.[22]

However, by the time the government published its first National Peri-urban Water and Sanitation Strategy in 2001, a peri-urban unit (PUU) within LWSC had already been looking at ways to improve service provision in some of Lusaka's low-income settlements for a number of years. Created in the mid-nineties, the unit sought to engage local communities in assuming some of the frontline roles the utility was in no position to fulfil at the time. Whilst PUU became responsible for over half a million low-income residents, it never managed to catch up with demand, which was soaring. Community-based organisations supported by international NGOs and development agencies played a significant role in addressing the shortfalls, though primarily in water supply.[23]

NWASCO quickly established a reputation as a competent and progressive regulator. A fully-fledged licensing regime for utilities with performance monitoring and annual reporting was complemented with effective consumer engagement. The regulator played a critical role in operationalising and embedding universality and equity as key sector principles and driving access to services, regardless of income and location. Its success in supporting scaling up of basic services for the urban poor in tandem with the DTF [24] attracted attention well beyond the region. Yet resource mobilisation for infrastructure extension and upgrades has been a persistent problem area, compounded by shortcomings in business management practice and overall sector governance. There has been little progress towards full cost recovery and the sector remains heavily reliant on outside capital.[25]

Lusaka Water and Sewerage Company as the responsible service provider was at the centre of the successful implementation of low-cost service extension into low-income neighbourhoods. The adaptation of shared facilities – the well-known water kiosk model – helped LWSC to raise water supply coverage from 34% in 2001 to 83% in 2016.[26] However, although LWSC reported one of the highest coverage rates for sanitation in the country (74%) in 2016, only a fraction (17%) of households were served through its sewerage network. Much of the remainder were (and continue to be) served through the private OSS and emptying service market. Residents in more affluent areas would typically hire the services of privately operated vacuum tankers to empty their septic tanks. These tanker operators are also sporadically called on by LWSC and LCC to empty pit latrines during crisis situations. Otherwise, informal and unregulated emptying tends to be the norm within PUAs, and illegal dumping is widespread. Some households also choose to abandon full pits, creating hazards especially during the rainy season. Safely managed FSM services are only available in two settlements, where formal pit-emptying services are offered by Water Trusts on behalf of LWSC.[27]

A Sanitation Master Plan drawn up in 2011 identified a total investment need of around €1.7 billion to achieve citywide access to improved sanitation over its 25-year planning horizon.[28] In due course, having secured a mixture of grant and loan funding from development partners[29] and the Government of Zambia, LWSC embarked on the Lusaka Sanitation Programme (LSP). The LSP represents a first and significant step towards implementing the Master Plan. Since 2015, LWSC has been investing in the expansion and rehabilitation of existing wastewater collection and treatment services to more than double the reach of the existing sewerage network. Two additional programme components were designed to support the development of on-site sanitation (OSS) infrastructure and services in PUAs and strengthening the CU's capacity to provide the latter into

22) NWASCO, 2003. Urban Water and Sanitation Report 2001/2002. NWASCO: Lusaka.
23) See Kayaga, S. and Franceys, R., 2007. Regulating urban water services for the poor: the Zambian case study. IWA International Conference on Water Management and Technology Applications in Developing Countries, Kuala Lumpur, Malaysia. In 2008, LWSC signed its first management service contracts with a number of community water trusts working closely with CARE International.
24) The DTF ceased operations at the end of 2018. A new sector financing mechanism is under consideration. See section 3.4 for a discussion of these developments and underlying reasons and challenges.
25) Eberhard, R. 2019. Access to Water and Sanitation in Sub-Saharan Africa. GIZ. Eschborn. The study notes that 89% of sector investment is derived from development partners and concludes that funding allocations are subject to political influence.
26) This is a remarkable achievement, given that the population in the service area more than doubled over the period.
27) Chazanga and Kanyama Water Trusts, supported by WSUP (Water and Sanitation for the Urban Poor), have been contractually delegated by LWSC to provide pit-emptying services since 2012. Aimed at low-income households, with pricing to match affordability, their services remain financially fragile. Renouf, R. 2018. Towards citywide sanitation in Lusaka: The next phase of non-sewered sanitation. Topic Brief. WSUP.
28) Brown, N., Nemcik, J. & Petti, M. 2012. Sanitation Master Plan for Lusaka, Zambia. Conference Proceedings of the Water Environment Federation. The Sanitation Master Plan builds on LCC's urban development plan (city master plan) and national targets: LCC, MLGH and JICA. 2009. Comprehensive urban development plan for the city of Lusaka. Lusaka City Council.
29) LSP is co-funded by KfW Development Bank, European Investment Bank (EIB), World Bank (WB), African Development Bank (AfDB) and the Government of Zambia, with a total planned investment of 240 million EUR. With approximantely 10% going to OSS and FSM and approximately 90 % going to sewerage network and wastewater treatment plants.

the future. According to the original plans, 12,000 OSS units (lined VIP latrines) and 100 public toilets were planned to be in place by the LSP's projected end date (2021). These would be complemented by decentralised wastewater treatment systems and appropriate faecal sludge management systems.

A turn towards greener and more inclusive services

The Zambian water sector has undergone comprehensive reform, and many of its positive developments have resonated within the region. Other East African countries have modelled aspects of their own sector reforms on approaches first introduced in Zambia. However, for all the successes of its reform, access to safe sanitation has always been lagging far behind water supply. Back in 2004, NWASCO acknowledged that sanitation had 'not yet received the appropriate attention' and recommended the promotion of practicable, 'environmentally friendly solutions' that would address the looming threat to public health.[30] However, whilst the regulator and utilities held a clear mandate for facilitating both water supply and sanitation services, non-networked services received comparatively little, if any, attention. A sanitation surcharge had been introduced in 2007 to provide additional funding for improving access to adequate sanitation. The sanitation surcharge forms part of the tariff structure. For all of the six CUs currently using a sanitation surcharge, the current approved rate is set at 2.5% of the monthly water bill (of a possible maximum of 5%). Revenue collections from the sanitation surcharge are ring-fenced in accordance with NWASCO guidelines, to ensure that they are used to fund approved sanitation extension projects.
In the case of LWSC, the sanitation levy was suspended in 2017. Meanwhile, the problems caused by unregulated collection, containment and treatment of faecal sludge were mounting. Informal and ad hoc 'services' more often than not bypassed the environmental regulator, ZEMA.

With the launch of the National Urban Water Supply and Sanitation Programme (NUWSSP 2011-2030), the government reiterated its commitment to achieving universal sanitation coverage in urban areas. This was followed by further strategic guidance in the form of the National Urban and Peri-Urban Sanitation Strategy (NUSS 2015-2030) and a National Water Supply and Sanitation Capacity Development Strategy (2015-2020), demonstrating the increasing recognition of 'adequate and safe' sanitation as a national priority. The NUSS acknowledged the 'sanitation stress' caused by the combined pressures of urbanisation, population growth and poor planning. It identified the institutional bias towards networked sewerage services as a key constraint in improving the status quo and called for greater emphasis on adapted, decentralised solutions to step up access, improve health and hygiene and mitigate against environmental degradation.

Concerns over the impact of 'climate variability' and anthropogenic activity on water resources were first raised by NWASCO in 2013. Its sector performance report for that year raised questions regarding the utilities' ability to safeguard the security of supply, given that reservoirs and borehole yields were running low.[31] The 2014 report highlighted 'pronounced drying of both surface and groundwater sources' as a challenge for the sector.[32] By 2016, climate change featured prominently in NWASCO publications in the context of water security. The regulator's 2016-2020 strategic plan called for an urgent investigation of the impacts of global warming and climate change on Zambia's water resources, stressing the need to formulate adaptive policies and move beyond reactive responses.[33] NWASCO raised the prospect of 'social, economic and political repercussions' if vulnerabilities (including poor urban planning and waste management, urbanisation, industrial activity and population growth, to name but a few) were not addressed as a matter of urgency.

Although poor sanitation had been identified as a contributing factor to groundwater degradation and peri-urban areas were pinpointed as hotspots of pollution, performance monitoring of utilities and regulatory enforcement were biased towards centralised, off-site solutions.[34] The institutional responsibilities for regulating the different aspects of sanitation, from construction of facilities through collection, treatment and safe disposal, were complex and fragmented. In 2016, the ministers of MMEWD and MLGH directed NWASCO to review its approach to regulating sanitation. In response, NWASCO began revising its exist-

30) NWASCO. 2004. Water Sector Reform in Zambia. NWASCO: Lusaka. p.32
31) NWASCO. 2013. Urban and Peri-Urban Water Supply and Sanitation Sector Report 2013. NWASCO: Lusaka.
32) NWASCO. 2014. Urban and Peri-Urban Water Supply and Sanitation Sector Report 2014. NWASCO: Lusaka.
33) NWASCO. 2016. Strategic Plan 2016-20. NWASCO: Lusaka.
34) The 'sanitation coverage' indicator had been defined as 'the population serviced by off-site (centralised system) and septic tanks' only. Other on-site facilities such as pit latrines are not considered acceptable for urban sanitation'. While it is true that unlined pit latrines are some of the worst offenders in terms of environmental impact, this definition sidelines alternative on-site solutions that under the current consensus would be deemed acceptable. It also ignores the explicit legal definition of sanitation (in the 1997 Water Act) as 'the disposal, off-site or on-site, of human excreta'. It is worth noting that NWASCO's stance has changed significantly over recent years.

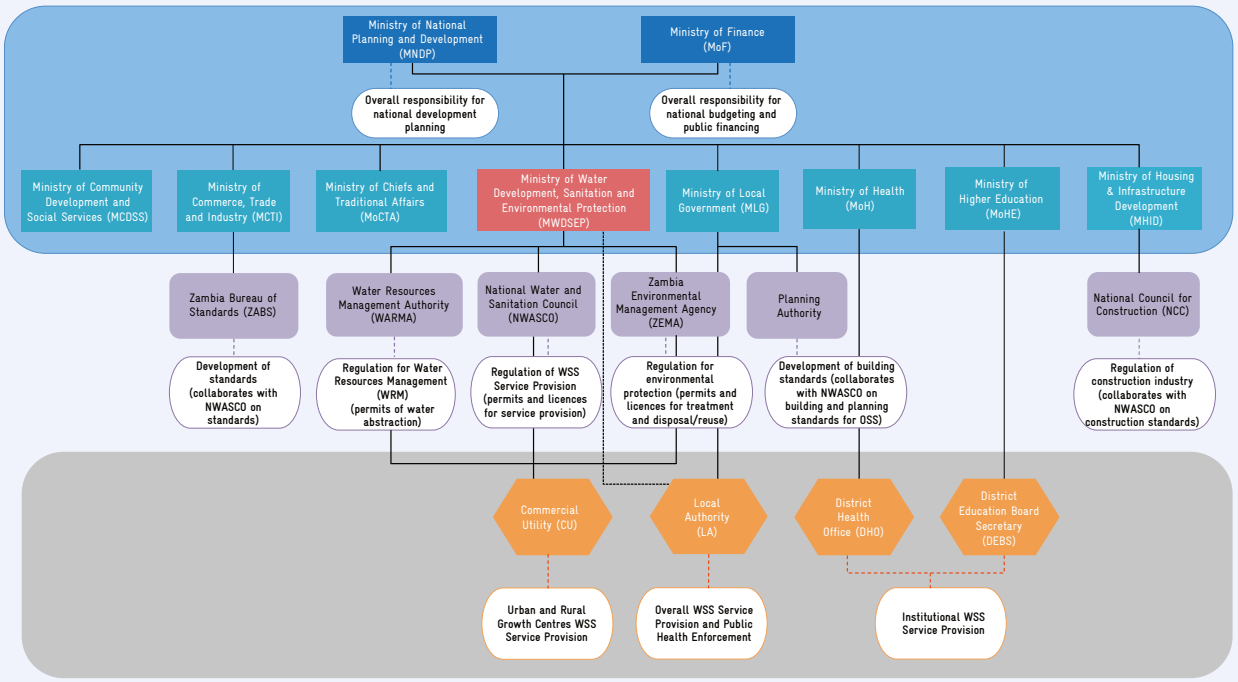
ing CU licensing regime and explicitly looked to include off-site and on-site sanitation options. The proposed arrangements were to cover formal and informal areas, and span the entire sanitation chain, from collection to disposal and/or responsible end use. A permitting system would allow CUs to delegate some activities to private operators or community-based organisations.

Meanwhile, in Lusaka, the flagship LSP investment programme is heavily focused on networked sewerage system expansion, but it gives due consideration to the environmental impact of its interventions as well as the impact on the city's future resilience. All proposed activities have undergone climate change screening required by ZEMA and the financing partners with the aim of enabling infrastructure and users, especially in vulnerable PUAs, to cope better with extreme weather scenarios. LSP is designed to support planning for WSS emergency preparedness and disaster risk management and will link into the development of climate change variability plans for Lusaka. [35]

The sector reform continues...

The sector framework is becoming increasingly conducive to tackling the challenge of universal access to sanitation and thus reaching development objectives that transcend conventional sector boundaries. The institutional landscape continues to evolve in order to strengthen the interlinkages between water services and the resources they depend on. The most recent restructuring, in 2016, saw the creation of a new Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP). This brings hitherto fragmented responsibilities for the development and management of water resources, provision of water supply and sanitation services as well as environmental management under a single institutional umbrella. Across the country, a more proactive, holistic and 'greener' approach to sanitation is replacing centralised, off-site 'flush and forget' treatment solutions. New aspirations for a greener Lusaka are pointing towards the desire to create concepts that are inclusive and more responsive to both people and the environment: the appealing 'green' of the garden city Lusaka has taken on another meaning that conveys the breadth and urgency of the sanitation situation within the wider environmental and climate context. The next chapter provides an account of the role the CFS-Lusaka project has played in the ongoing changes in Zambia and more specifically in Lusaka.

Current institutional arrangements (post 2016)



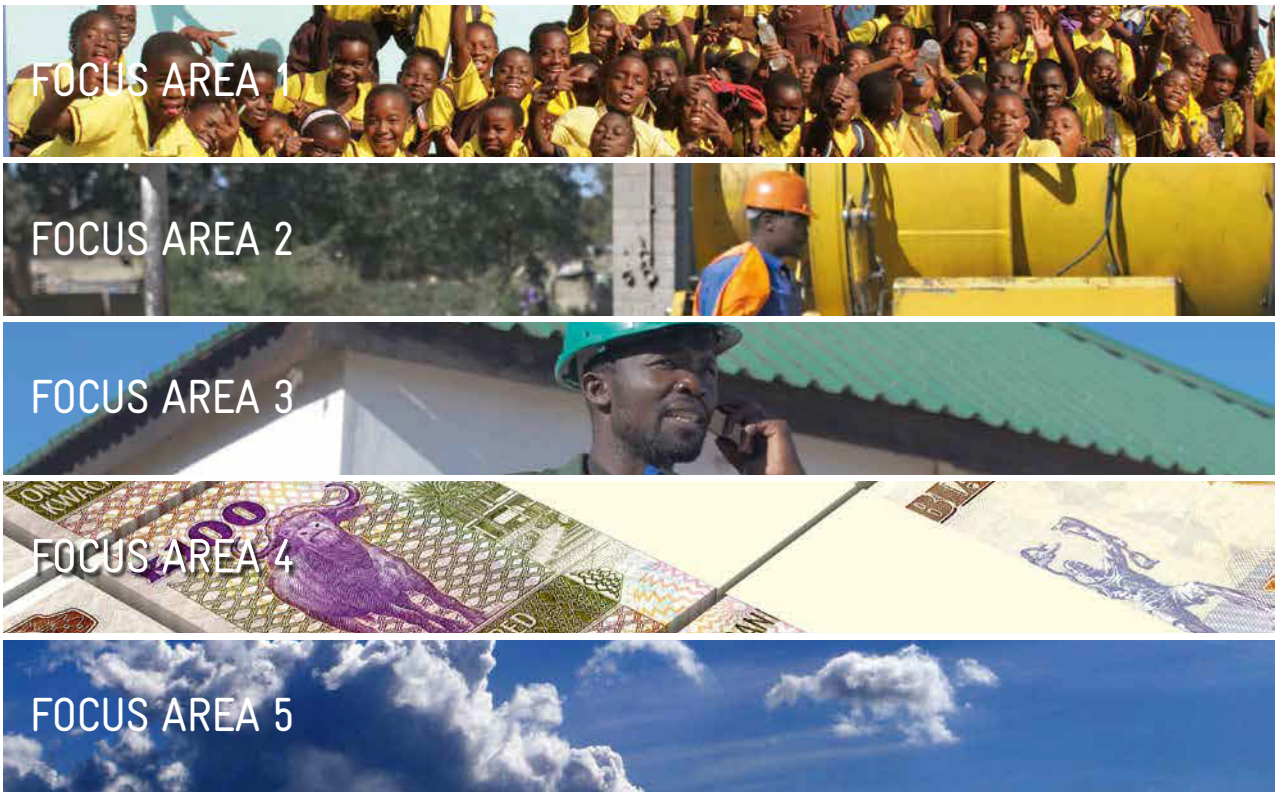
35) AfDB. 2015. Lusaka Sanitation Program – Climate Resilient Sustainable Infrastructure. Environmental and Social Management Framework Summary. May 2015.

Challenges, progress and achievements: impact of the Lusaka Climate-Friendly Sanitation project

Introduction

As set out in the National Water Supply and Sanitation Capacity Development Strategy, capacity development lies at the heart of sustainable sector improvement. Constraints, the government noted in 2015, could be found at all levels.[36] In the case of sanitation, and specifically on-site sanitation, this problem was acute. Lessons from pilot projects carried out in two peri-urban areas of Lusaka provided significant experience and had helped with capacity development for OSS/FSM. What was lacking, however, was an enabling framework to support and develop integrated OSS. This became one of the key focus areas of the CFS-Lusaka project. to support and develop integrated OSS existed which was one of the key focal areas of the CFS-Lusaka project. In addition, skills gaps prevented safe and environmentally responsible management of faecal sludge. This chapter reflects on progress achieved by CFS-Lusaka and many partners as well as the remaining challenges and gaps that need to be addressed and may require further support. Each of the following sections is presented as a self-contained focus area that can be read as a stand-alone chapter.

The heading photographs of each of the focus areas.



36) Quoting the NUWSSP, the National Water Supply and Sanitation Capacity Development Strategy notes that 'It is generally recognised that the capacity to plan and implement programmes and projects in the sector, as in other sectors, is weak and needs to be addressed. Capacity constraints are experienced both at central government, provincial and at district levels. The private sector is critical for the potential to improve water supply and sanitation systems as expected.' (MHLG, 2015, p.3)

FOCUS AREA 1: Enabling framework for on-site sanitation and faecal sludge management

The challenge

As explained in the previous chapter, 'sanitation' had long been tacitly interpreted as 'sewerage', with most on-site solutions regarded as stopgaps at best. Legally, the overall responsibility for WSS services rested with Lusaka City Council, and implementation had been delegated to Lusaka Water and Sewerage Company. As its name implies, LWSC concentrated on networked sewerage – much like the regulator NWASCO – and there was no clearly assigned implementation structure for OSS for either the City Council or its CU.[37] Any tentative forays into pit-emptying services on the part of LWSC were closely tied to external support and had remained limited in scope. Collection, transport and disposal of faecal sludge were largely unregulated activities, and no standards covered the construction of sanitation facilities at the household level.

A key challenge for safe OSS and FSM, however, was the fact that there was no official agreement on what constituted acceptable sanitation, let alone a formal definition of the type and range of services this would entail. Indeed, there was little grasp or appreciation of the OSS service chain amongst key stakeholders across the sector. At the organisational level, these attitudes manifested themselves in the form of inadequate internal systems, structures and procedures. Without a shared understanding of the problem and possible solutions, stakeholders had little incentive to take action.

Understandably, neither LCC nor LWSC had access to adequate resources that would allow a coherent response to a specific OSS mandate, even if it had existed. There was no unit within LWSC tasked with FSM-related matters, and any activities in this area were undertaken by contractors (Water Trusts and/or privately-owned vacuum tankers). The LCC's Public Health Department (PHD), which assumed some responsibility for informal settlements, was eminently understaffed and could not afford to keep its local offices open.[38] This drastically reduced residents' direct access to information and formal complaints mechanisms, especially in PUAs. While the PHD conducted its business in accordance with a set of standard LCC operating procedures (SOPs), inspections generated a large amount of paperwork. Reports being difficult to trace presented a major obstacle to effective management. Enforcement, one of the department's central activities, was hampered by poor accountability and transparency as much as the absence of a clear legal basis for OSS.

Activities and interventions

It was clear that any interventions would have to start with raising awareness and promoting professionally managed OSS. It is worth noting that some of Lusaka's peri-urban areas received formal recognition only recently. Despite the well-known difficulties of providing sanitation in these areas – and the consequences suffered as a result – the official 'solution' was connecting PUAs to the sewerage network. CFS-Lusaka advisors supported partners to champion climate-friendly FSM practices as safe and perfectly acceptable means of expanding sanitation services for all. Stakeholders were offered frequent opportunities to expand their conceptual understanding through workshops, demonstrations and knowledge exchange visits. GIZ's network of partners in the region enabled Zambian decision makers to discuss ideas and practical approaches with other local authorities, utilities, regulators and civil society representatives facing similar challenges in other African cities. Within Lusaka itself, LCC and LWSC needed to revisit and

37) The National Water Supply and Sanitation Capacity Development Strategy of 2015 warned that 'the mandate for onsite sanitation is not clearly defined between CUs and LAs; this creates a gap through which the management and / or regulation of onsite sanitation services may fall as nobody's responsibility.'

38) Around 30 inspectors were in charge of all public health-related matters in a city approaching three million residents. In theory, the PHD inspectors' work should link with that of environmental health technicians (under the Ministry of Health), though it is unclear what support in terms of the envisaged inputs regarding sanitation, hygiene and solid waste exists or could be developed.

extend their interpretation of their mandates – and regulators would need to follow suit. GIZ advisors joined the PHD and LWSC as embedded experts to focus on the institutions' own organisational procedures, but also to press ahead with supporting the process for necessary legal changes. In parallel, one component of the CFS-Lusaka project was focused on bringing all OSS/FSM stakeholders of Lusaka together. Following a mapping exercise, all relevant WASH and public health stakeholders were invited to join a formal partnership. Discussions culminated in the formation of a Lusaka District WASH Public Health Committee (LD WASH PHC) in June 2017 to coordinate activities, share resources and generally support each other under the leadership of the LCC.

In many ways, LCC had experienced a relative disadvantage compared to LWSC: remuneration, resources and organisational culture often lagged behind the CUs who received significantly more support from development partners. Despite this, the local government would find itself at the receiving end of complaints about poor infrastructure and service delivery, regardless of the nature of the problem. The lack of functioning services available in informal settlements meant that residents resorting to alternatives such as pit latrines and manual emptying was inevitable, in spite of the further problems this created. An important question was how to improve the day-to-day work of the already overwhelmed PHD inspectorate and maintain motivation in the profession.

Compiling a compendium of available on-site sanitation technologies that could be used to improve access to sustainable sanitation in high-density peri-urban areas of Lusaka was a useful first move. The 'toilet catalogue' introduced the concept of a complete service chain, comprising all intermediate steps from the user interface through to final sludge disposal or reuse.[39] A review of all existing legal provisions regarding sanitation showed that the notion of a service chain simply did not exist in the law, which primarily focused on toilets (structural conditions) and sewerage services. With this guidance in hand, a by-law[40] was drafted to create a sound basis for effective enforcement on the part of LCC PHD. Jointly with the embedded advisor, the PHD also provided feedback to strengthen the attention given to OSS in the draft Water Supply and Sanitation Services Bill of 2017.

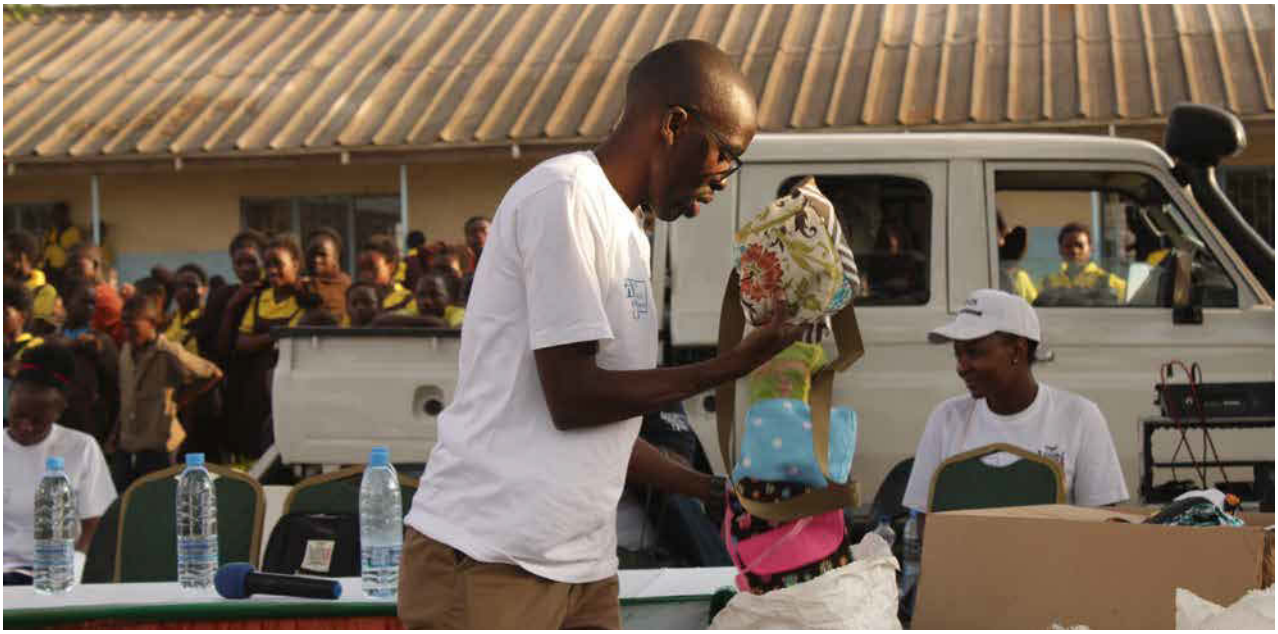
The process of developing the by-law prompted a review of enforcement procedures, as even a watertight legal basis could easily be compromised by weak internal processes. CFS-Lusaka provided technical support to introduce digitalisation of the SOPs: the PHD's response to the situation on the ground, the reasoning went, could be vastly improved through access to real-time data.[41] A smartphone app was developed to reduce bureaucracy. Field inspectors would be able to log their activities instantly, and residents could make applications (e.g. for permits) at their convenience. CFS-Lusaka placed high importance to assisting LCC with decentralising its services and strengthening accessibility. Anchoring the digitalisation activities at LCC site offices offered an incentive to upgrade facilities. Working together with other development partners through the LSP, CFS-Lusaka assisted with progressing the ongoing operationalisation of the site offices.

In order to facilitate more targeted, risk-based public health interventions in peri-urban areas, CFS-Lusaka introduced the SaniPath Exposure Assessment Tool to Lusaka.[42] A SaniPath pilot study of Kanyama compound was supported by GIZ in 2018 to demonstrate the relationship between exposure to diarrhoeal disease risks arising from poor sanitation and their relative impact on overall public health. Consultant researchers, in close collaboration with LCC, investigated suspected faecal contamination pathways. Environmental samples were collected to check for the presence of E.coli. LCC was actively involved in the data collection exercises, including the focus group discussions and door-to-door interviews that were designed to gain an understanding of personal and community hygiene habits. PHD staff also observed the laboratory analyses, which had to be outsourced to the University of Zambia, and participated in numerous training sessions.

Progress and impact

When CFS-Lusaka activities first began, by LWSC in Kanyama and Chazanga needed to be scaled up to other peri-urban areas and the positive experience shared with a

39) LCC and GIZ. 2017. On-site sanitation catalogue.
40) Draft Lusaka City Council (On-Site Sanitation and Faecal Sludge Management) By-Laws (2019)
41) e.g. data gathered during inspections, permits that have been issued or not, penalties for those being fined for not meeting standards, payments of penalties/for permits, and validity of certificates
42) SaniPath was developed by the Center for Global Safe Water at Emory University, Atlanta, USA, with funding from the Bill & Melinda Gates Foundation. For more information see sanipath.org.



Chairperson of the LD WASH PHC distributing reusable sanitary pads to Chawama School Lusaka on Global Handwashing Day 2019

wide audience. Over the past three years, both knowledge and understanding of OSS and FSM as an appropriate and sustainable way forward has increased amongst all stakeholders. Access to state-of-the-art information and first-hand experiences from Africa and beyond has undoubtedly played a role. In April and December 2018, for instance, Zambian stakeholders travelled to Kampala and Dar es Salaam for peer learning events facilitated by GIZ. By May 2019, they hosted colleagues and sector experts from around the world for a three-day Knowledge Exchange in Lusaka. Local partners now take to the international stage to discuss OSS concepts and implementation strategies and share their own perspective.

The LD WASH PHC enjoys the full support of the chief executives from the participating institutions, which are beginning to engage more proactively through the committee and its technical working groups (TWGs).[43] Again, there have been some hurdles to realising the full potential of this group: the priorities of the different stakeholders had to be ascertained and harmonised, and CFS-Lusaka has played a part to ensure the committee would have a functional and motivated secretariat. The LD WASH PHC exists as a coordination platform of public health, water, sanitation and hygiene experts (see box). Through its TWGs, it provides technical implementation support for WASH and public health interventions in Lusaka district in accordance with Zambia's long-term development goals outlined in the 7th National Development Plan and Vision 2030, as well as the SDGs. It has provided an avenue for raising the profile of gender mainstreaming in the sector, which is reflected in the committee's structures, and integrating a gender perspective and promoting equality is becoming the norm for projects. The LD WASH PHC is

LD WASH PHC membership and representation

- Lusaka City Council: Public Health and Housing and Social Services Department (2 seats)
- Lusaka Water and Sanitation Company: Lusaka Sanitation Programme, with other departments to be advised (4 seats)
- Ministries (at district level): Water Development, Sanitation and Environmental Protection, Local Government, Health (Department of Health Promotion, Environment and Social Determinants) (1 seat each)
- Regulators: NWASCO and ZEMA (1 seat each)
- Development Partners: Water Group and Health Group (1 seat each)
- NGO WASH forum (1 seat)
- The remaining 4 seats are reserved for the TWG spokespersons.

43) Water Supply and Water Quality TWG, Sanitation TWG, Disease Surveillance TWG, and the Information, Education and Communication (IEC) and Health Promotion TWG. The TWGs meet monthly, the LD WASH PHC every quarter.

also making other, more subtle, sustainability-related changes, for example by not paying seating allowances for committee meetings. This has not dented its members' enthusiasm for being involved.

The process of developing the OSS and FSM by-law has been described as beneficial in numerous ways. First and foremost, working closely on such a fundamental piece of guidance for the Lusaka sanitation sector sharpened the PHD's focus on the complete OSS service chain. CFS-Lusaka advisors provided technical support and ensured LCC retained ownership of the entire process. With the public consultation now closed and comments being reviewed by the PHD and LCC's legal department, the gazettement of the by-law is anticipated for the end of 2020. This will pave the way for proper enforcement and regulation of OSS services. Lastly, the by-law process has nudged other regulators to engage in OSS and FSM. PHD and the Zambian Bureau of Standards, for example, are coordinating activities to work towards better standards. The Ministry has signalled its approval of the by-law and is reportedly looking to use it as a model for an OSS statutory instrument that would become applicable across the country.

> *"The enabling framework requires integrated systems thinking, along with its technical and regulatory underpinnings, and supporting formal stakeholder partnerships to harmonise interventions and overcome practical and institutional hurdles."*

For LCC, the digitalisation activities have been a boost to its reputational image, seeing that PHD is now finding itself at the forefront of the drive towards 'SMART Zambia'. The PHD LCC app and the data gathered through the SaniPath pilot study help the department to strengthen its operations and become more responsive to the needs of citizens – in line with the government vision.[44] The PHD worked closely with the (local) developer of the new app, with GIZ providing technical backstopping support. PHD has gone on to use its sanitation-related data to feed into the 'Lusaka Sanitation System' (LSS), an information system that is currently being developed to integrate Ministry of Health and LWSC data.[45]

Enforcement is now set to become more focused and transparent. With the information generated by the SaniPath tool, LCC is already working from a more informed perspective. Inspections are becoming risk-based. SaniPath outputs have also proved useful for public education messaging: residents are more receptive to appeals backed by hard evidence. Not only will decision-making improve and delays be avoided once data can be logged on-site through the PHD LCC app and immediately transferred to the cloud rather than recorded in the individual inspectors' diaries. It will also improve confidence in the entire process as every payment and observation will be properly documented, leaving no room for low-level corruption. Live, geo-referenced data can then be used to generate reports and recommendations for directing human resources and interventions more strategically. All data will be held in a database, which is owned by and anchored at PHD and managed in-house with assistance from LCC's IT department. To ensure reporting pathways and data flows are functioning as anticipated, the app has been pilot-tested from local site offices in the community; it will go live in the near future.

The capacity development associated with all of the above activities has been pivotal. Technical assistance was rigorously coupled with training for the department to be able to replicate and extend all activities without external input in the future.

Remaining challenges

The fragmented nature of OSS makes effective stakeholder coordination very important. Yet institutional fragmentation is also what makes this coordination difficult. There is room for improving the cooperation between the different members of the LD WASH PHC and to secure buy-in from key members such that the secretariat can run effectively. Resource mobilisation and acquisition is always problematic, but the working groups are encouraged to take full ownership of their joint goals and activities. Each of the working group members has access to limited resources that can be used to support synergetic activities in the TWG. On reflection, the group should be extended to include stakeholders such as the Water Resources Management Authority. Especially in the context of climate change, WASH services and the water resources they rely on will only become more interlinked. On another note, the interconnection between city planning, construction of housing

44) The Zambian government has launched the 'SMART Zambia' project with the aim of deploying information technology to improve public service delivery. The SMART Zambia eGovernment Master Plan 2018–2030 was approved by the Cabinet in February 2019.
45) NWASCO is weighing options of integrating some of the LSS data into its own information system.

and sanitation has been raised time and again in the Lusaka context, with some arguing that neither can be resolved in isolation.[46]

NWASCO is in the process of operationalising its new regulatory framework for OSS and FSM. Under this new framework, NWASCO would issue a licence to CUs to cover both on-site and off-site sanitation. CUs can delegate the implementation of this to private operators or community based organisations (CBO) through a permit system. Again, coordination and cooperation between regulators will be critical, as each will assume responsibility for specific elements of the sanitation chain. NWASCO and ZEMA expect to be concentrating on transportation, treatment and disposal. A service level guideline that guarantees customers of sanitation service providers a certain level of service at a specified price is in preparation. LCC will remain the responsible regulator for building and construction-related matters. Standards for construction of OSS facilities are the starting point to ensure that the sanitation service chain functions effectively. For the time being, reuse of treated faecal sludge remains an activity to revisit in the future, when investment in equipment and facilities can guarantee adequate treatment before resale. Applicable regulations and standards are under development but have yet to be finalised by the Zambia Bureau of Standards (ZABs). It may take time for regulations and regulators to settle into a routine that leaves no gaps in oversight of the entire sanitation service chain. At the time of writing it appears as though some clarification among actors regarding spheres of authority may be required, as does the way in which the LCC by-law and NWASCO regulations and standards fit together.

In Zambia, LAs carry the mandate of ensuring that faecal sludge is safely contained, emptied, transported and treated by the CU in the interest of public health, including the safety of those providing the service, while the CU is tasked with providing (or managing) the service itself. For LCC and LWSC, an understanding of the separation of these roles and responsibilities and where these sometimes overlap along the service chain has created some challenges. The working relationship between the two organisations has and continues to improve, though it was the cholera outbreaks that acted as a catalyst for pilot interventions and more intensive cooperation. Stakeholders have expressed a desire to develop a communication strategy that forges stronger links in the future.

On the practical side, the PHD site offices that have been upgraded under LSP with CFS-Lusaka technical assistance, especially in SOP digitalisation, are contributing a great deal to LCC's increased ability to carry out their tasks. Further efforts to establish fully staffed and well-equipped site offices in the remaining constituencies would extend the PHD's reach into even more communities. Resources in general are a bottleneck and continue to impede the ability for many tasks to be completed. Here staffing[47], logistical problems and shortages in equipment and facilities were cited. Extending training opportunities to other LCC departments whose work relates to sanitation could be of great benefit to both the PHD and the entire sanitation sector in Lusaka in the future. In addition, applying the newly developed regulatory frameworks remains a challenge. Implementation requires both financial and technical resources, both of which are limited for the regulators.

Another challenge is the availability and consolidation of data. Synchronizing the datasets of service provider and the regulator will be important.

Lessons learnt: findings and recommendations

- Stakeholder coordination has been a central theme of CFS-Lusaka activities to create an enabling framework for OSS and FSM. Establishing a forum for key stakeholders to come together and facilitating their cooperation in different technical working groups has been a step towards harmonising sanitation-related interventions in Lusaka.

- Exposure to new ideas and peer learning opportunities has had profound effects on the rhetoric in partner circles. As awareness develops into deeper understanding and confidence, attitudes and priorities can begin to shift across ever-widening circles. It is helpful to focus on and repeat positive messages.

- Balancing priorities and recognising and utilising interconnections is not straightforward, even within a single institution. PHD should continue to develop and

46) cf. Todd. D.M. 1987. Constraints on the Development of Appropriate Sanitation Policies in Zambia. Habitat Intl. 11(1), 161–171. Stakeholders interviews reaffirmed Todd's view of an 'inextricable' link between housing and appropriate sanitation.

47) Note that capacity problems are related to staffing numbers rather than competence of individuals or the department as a whole.

embed clear processes such that LCC can present a united front on OSS-related matters.

- Whilst important milestones, notably the OSS by-law, have been achieved over the past three years, these are only the beginning. Creating an enabling framework takes time and patience.

- During the process of developing the by-law and applicable standards for sanitation facilities, asking pertinent questions has prompted stakeholders to reflect on goals, roles, jurisdictions and specific activities. These deliberations alone are a valuable outcome, even if it has become clear that by-laws and the standards they refer to would better be developed and finalised in parallel. Enforcement is a key procedure within the PHD, which is inhibited by the current lack of standards.

- SaniPath and the digitisation of the PHD's standard operating procedures have fostered a greater understanding of the important part that digital tools play within a green city. SaniPath in particular has created an appetite for real-time data to enable more precise decision-making within LCC and other stakeholders. Zambia is embracing a digital future. In Lusaka, digital tools hold great potential to guide the path to a greener city.

- Strengthening staffing and facilities at PHD should continue. SaniPath has highlighted the need for building internal capacity for on-site testing of environmental samples as well as investing in the prerequisites for scaling up digitalisation (i.e. training, logistics, equipment). Continued improvement of systems within LCC, along with more extensive in-house data collection and analysis, will enable staff to communicate with confidence at all levels and spread its message to other sector stakeholders.

- The interconnection between city planning, housing and citywide sanitation outcomes may warrant further exploration, and 'sanitation' might be explicitly widened to encompass drainage.

FOCUS AREA 2: Scaling up safely managed on-site sanitation services

As set out in the previous chapter, only a small proportion of households in Lusaka are connected to the sewerage network. Even for the 74% of residents that were nonetheless judged to have access to sanitation, very little information existed on the actual facilities, practices and providers they were using. Attempts to trace the flow of the estimated 30,000 tonnes of faecal sludge produced in Lusaka every year were largely based on estimates.[48] The extent to which existing sanitation services could be described as 'safely managed' was unknown.[49] Many had been left with little choice but to resort to informal services, where illegal sludge dumping is commonly practised to save on costs. Some chose to simply abandon overflowing pit latrines. In any case, inadequate treatment facilities meant that large amounts of sludge, whether collected or not, were finding their way into the open environment without any prior treatment. Any available data, uncertain as they were, showed a large gap between national aspirations for universal access to safe sanitation and the daily reality for most city residents, and poor outcomes for society as a whole.

As sanitation had no clear institutional home and attention was generally focused on sewerage rather than OSS, solutions to tackle citywide sanitation had not yet been fully explored. LWSC, through its peri-urban department, had started its OSS and FSM journey in 2012, working with local pit-emptiers on a demonstration site in Kanyama PUA. There, Water and Sanitation for the Urban Poor (WSUP), the Water and Sanitation Association of Zambia (WASAZA) and sanitation specialists from the Bremen Overseas Research & Development Association (BORDA) supported the development of a model for low-cost emptying services, which was then also implemented in Chazanga. Water Trusts, with technical backstopping and oversight provided by LWSC, are sub-contracted to manage the entire FSM chain. Sludge collected from household latrines is taken to decentralised transfer stations, where it receives partial treatment in anaerobic digesters before the remaining solids are taken to drying beds[50] for further treatment. Through this project LWSC piloted two faecal sludge treatment plants (FSTPs) as part of the effort to provide affordable and financially viable pit-emptying services.

For the utility, even this small step represented a significant departure from its usual business. LWSC gained some insight into how a utility could deliver an OSS service and the challenges that they were likely to encounter. The advent of the Lusaka Sanitation Programme brought significant funding, and crucially, some of this was reserved for OSS/FSM activities. The LSP started off with a one-woman 'team' to take on the difficult task of designing and implementing this project component. However, the tide was beginning to turn on the national approach and attitudes towards sanitation. LWSC was going to enter the OSS market. To succeed, it had to start looking for answers to questions few had previously thought to ask.

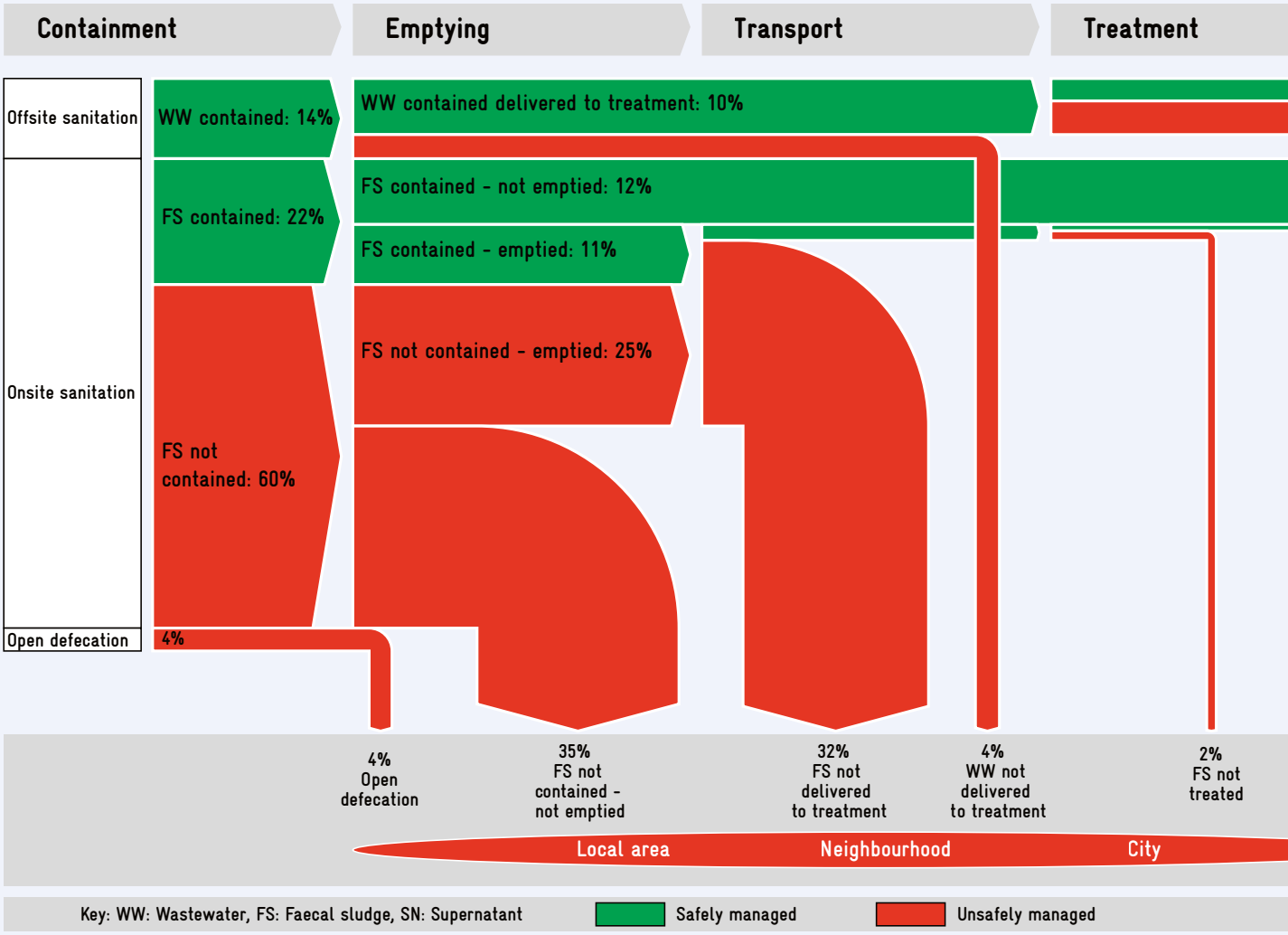
Activities and interventions

Comprehensive baseline studies focused on low-income households have long been promoted by various development partners including GIZ as essential to develop an accurate understanding of current contexts in order to facilitate targeted interventions, especially for disadvantaged

48) The 30,000 t/year figure is quoted in Renouf, R. 2018. Towards citywide sanitation in Lusaka: The next phase of non-sewered sanitation. Topic Brief. WSUP. An 'SFD lite' rapid assessment was done in 2015 to identify priority intervention areas for LWSC under LSP. Still, estimates for the prevalence of different types of OSS facilities ranged between 10 – 20% for septic tanks and 55 – 70% for pit latrines (mostly simple, unlined versions), the latter rising to around 90% in PUAs. Open defecation was thought to be around 1%.

49) Mutale, P. 2019. Framework for Service Provision and Regulation in Zambia. Urban Onsite Sanitation and Faecal Sludge Management. Presentation to Knowledge Exchange Lusaka, 8 May 2019.

50) on-site in Chazanga, off-site in the case of Kayama, where transport is provided by private tankers.

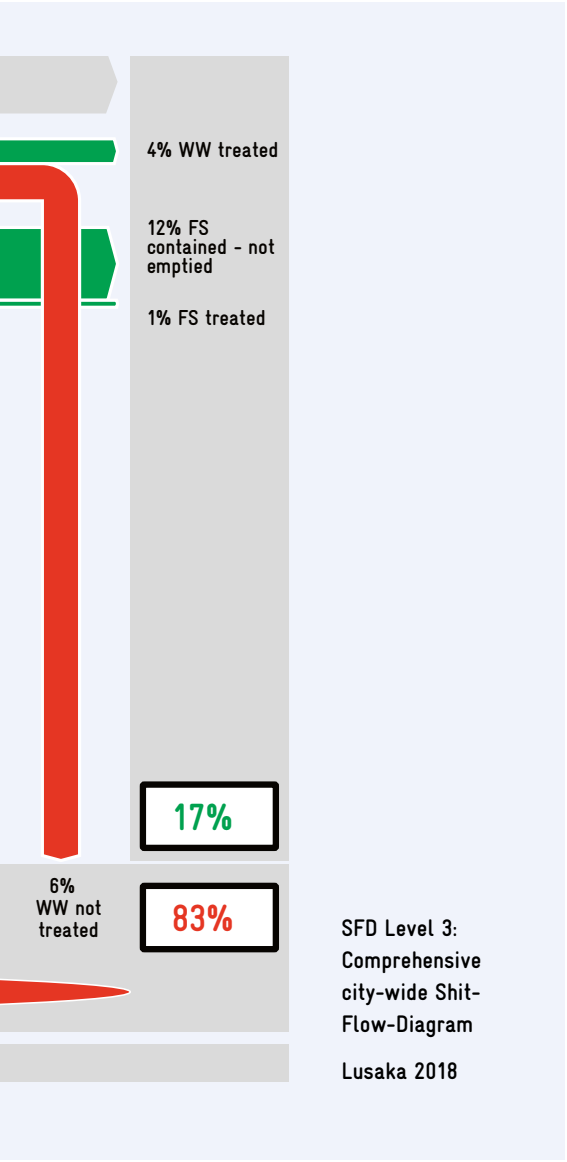


Produced with support from the SFD Promotion Initiative with funding from the Bill & Melinda Gates Foundation.
The SFD Promotion Initiative recommends that this graphic is read in conjunction with the city's SFD Report, which is available at: sfd.susana.org

and vulnerable people.[51] A database of all prospective customers and existing infrastructure as a reference for future monitoring of FSM services was an important first step towards formalising OSS and FSM as part of 'normal' LWSC services. Detailed spatial mapping surveys of all on-site sanitation facilities and users were commissioned by CFS-Lusaka for four PUAs that had been identified as priority intervention areas for the LSP': Kanyama was mapped in early 2017, followed by Chawama, Chazanga and George a year later covering an overall total population of approximately 650,000 people.

The first phase was able to build on WSUP's ongoing involvement in Kanyama. In addition to mapping every pit latrine, septic tank and other type of toilet facility, it referenced water points (kiosk, shallow well, yard tap, borehole, water tank) and solid waste disposal sites as other sanitation-relevant features to generate a more complete thematic map of the sanitation situation in the area. During the second phase, the census of facilities was complemented by a household survey to gauge the local residents' knowledge, attitudes and practices (KAP) with regard to sanitation and hygiene. On request of (and financed by) the World Bank, questions were included that probed willingness to pay and other stated household preferences. Field enumerators were trained to record GIS-referenced data on mobile devices, and to conduct the KAP surveys as well as key informant interviews with selected respondents for data triangulation

51) The tool was first used to furnish NWASCO's information system with water services data about peri-urban areas in Zambia, and baselines were later replicated in other GIZ partner countries



purposes. Open-source tools and applications used for the mapping exercises included OpenStreetMap and Open Data Kit, as well as the purpose-built software TruField.[52] CFS-Lusaka assisted with the initial training and pilot testing and participated in the data review process.

At the same time, CFS-Lusaka sought a better understanding of excreta management in the entire city of Lusaka. A relatively novel way of visualising excreta flows and tracking their ultimate destination was the 'shit flow diagram' (SFD): a simple graphic shows the status of safely managed urban sanitation services, and its accompanying report describes the service delivery context, data sources and any assumptions made during the assessment. CFS-Lusaka supported the GIZ Sector Programme Sustainable Sanitation in revisiting the 'SFD lite' prepared in 2015; an update was commissioned with a view to arrive at a more thorough citywide SFD. Drawing on new reports and study findings and adding further details gathered through key informant interviews, focus group discussions and field observations, the consultants produced a comprehensive 2018 version.[53] Data for the SFD were provided by LWSC staff, who were also involved in reviewing assumptions and outputs.

> ***"Visualisation of data is key to building consensus and awareness. Shit-flow diagrams revealed the 'more real' sanitation situation in Lusaka and were discussed passionately!"***

Building on the mapping surveys of Kanyama, Chawama, Chazanga and George, CFS-Lusaka also produced specific baseline neighbourhood SFDs for these locations. Members of the local communities were amongst the key stakeholders who provided vital inputs at the data collection stage. Researchers also visited treatment facilities and accompanied pit-emptiers to form a first-hand impression of local faecal sludge management practices. Secondary sources were consulted to make informed judgements regarding the risk posed to underlying groundwater resources by different containment systems. Feedback received at validation workshops was then used to revise the SFD graphics and ensure that they reflected a general stakeholder consensus around the 'true' sanitation situation in each locality. Finally, three further 'Scenario' SFDs were developed to illustrate the potential impact of different interventions in the LSP target areas.

Fieldwork for the mapping and SFD exercises had offered some insight into the techniques and 'technologies' used by pit-emptiers in peri-urban areas of Lusaka, as well as a fairly accurate understanding of the environment they had to work in. Small spaces usually prevented access for vacuum tankers, leaving messy and dangerous conditions for man-

52) OpenStreetMap is a free, editable world map, created and updated by users. www.openstreetmap.org
In a similar vein, the 'Open Data Kit community produces free and open-source software for collecting, managing, and using data in resource-constrained environments' www.opendatakit.org 'TruField [owned by OpenStreetMap Zambia] was developed specifically to address the challenge of mapping features in densely populated shanty compounds of Africa. It eliminates positional errors by combining GPS positioning capabilities with visual observation of the feature being mapped (on a satellite image) so that the mapped feature is placed at the exact location.' Fibonacci Engineering. 2018. Facilities mapping and KAP study report: CFS-Lusaka Mapping of sanitation in three peri-urban areas of Lusaka – Chawama, Chazanga and George. p.27.

53) The graphic and its report are available from https://sfd.susana.org/about/worldwide-projects/city/46-lusaka

From left to right: The Flexcravator, the eVac, and the Gulper being tested in Lusaka

ual emptiers with their modified garden tools. Driven by the desire to limit exposure to environmental and health risks and give more dignity to this line of work, CFS-Lusaka was keen to introduce low-cost technologies that would also allow services to be scaled up. For this reason, CFS-Lusaka started searching the market for emptying technologies and solutions being used, or designed for use, in other African cities that might transfer well to the Lusaka context.

Three technologies were chosen, and teams of operators from Chazanga and Kanyama invited to conduct field trials of pit-emptying devices to test their suitability in Lusaka's PUAs: the 'Gulper', a manual device from Uganda, and two mechanised versions, the 'Flexcravator' first invented by American research engineers, and the 'eVac' from South Africa.[54] All are more or less compact, robust and portable machines designed to empty pit latrines by pumping ('sucking') out sludge of relatively wet consistency. Each trial consisted of testing sludge removal from a selection of containments (dry pit to septic tank). The Technology Applicability Framework (TAF)[55] was used to assess the likely fit of each device with local conditions. After each trial, field observations were discussed at a review workshop facilitated by CFS-Lusaka, where stakeholders would score the various sustainability dimensions (e.g. technical performance/suitability, local procurement/manufacture, business potential).[56]

Progress and impact

The mapping surveys provided insight into the reality and perceptions of sanitation in the PUAs. A total of 13,324 sanitation facilities were mapped in Kanyama and another 23,125 in the other three areas, all with an additional descriptive layer of information: plot type, users, type of toilet and containment, including ownership, structural characteristics, access restrictions and emptying history.[57] The mapping had already confirmed some suspected behaviours (for example, about a quarter of respondents confirmed a pit latrine had been buried on their property, and less than 10% of households had had their pit latrine emptied in the

54) A newer version of the eVac is now used in Chambeshi Water and Sanitation Company.
55) TAF has been developed as a decision support tool for the introduction of WASH Technologies. https://technologyapplicability.wordpress.com/
56) TAF also considers the sector readiness to take up a new technology. The technology testing exercise included case studies of the technology in its 'home context' as well as evaluating best practices regarding sustainable FSM business models, with specific recommendations for measures that would improve the situation in Lusaka. These aspects are considered in focus area 4 of this report.
57) Zambia OpenStreetMap. 2017. Kanyama Open Street Mapping Report. Fibonacci Engineering Ltd. 2018. Facilities Mapping and KAP Study Report. Unpublished internal reports.

past[58]). The updated city SFD then painted an overall picture of the sanitation situation in Lusaka, revising the proportion of safely managed faecal sludge from 25% down to just 17%.[59]

This low level of safely managed excreta was reflected in localised SFDs from the four low-income areas. With almost no access to a connection to a sewer line, poor quality on-site facilities, and limited emptying and treatment services in place, most of the excreta in these areas are unsafely managed. In Chazanga, the practice of abandoning and covering full pits with sand produced a slightly improved picture compared to the citywide SFD, though this is also due to its lower groundwater vulnerability relative to the Lusaka average. A notable finding of all four of the localised SFDs was the high open defecation (OD) rate, in the form of flying toilets, that in turn led to a higher assumption of the citywide OD rate in the citywide SFD.[60]

The SFDs gave LWSC a much better understanding of current and expected service needs, allowing for better investment planning in the future. At the same time, the SFDs gave renewed focus and purpose to discussions amongst decision makers and expert advisers at all levels. Information and knowledge gained from all studies have been integral to designing steps to implement the OSS/FSM component of the LSP. LWSC recognises mapping of sanitation facilities and KAPs as important tools without which the company is unable to design the right services. LWSC being involved in these exercises has had the beneficial effect of integrating other departments (beyond the newly-created FSM unit) in OSS, starting with the CU's GIS department, which manages the database. LWSC has recently secured funding from the Bill and Melinda Gates Foundation to extend the mapping to every sanitation facility in the entire city. There is also some interest within the FSM team to look into creating further SFDs. Mapping has been recognised as a means of mobilising funds for much-needed investments in OSS.

The technology testing has given LWSC the opportunity to explore other possible approaches to operationalising OSS. All of the three tested devices were an improvement on manual pit-emptying in terms of minimising workers' exposure to raw sludge, whilst offering a small-scale and

58) Fibonacci Engineering Ltd. 2018. Facilities Mapping and KAP Study Report. Unpublished.
59) Kappauf, L., Heyer, A., Makuwa, T. and Titova, Y. 2018. SFD Report Lusaka, Zambia, 2018. GFA.
60) GIZ, LWSC, LCC. 2019. The development and use of SFDs for better sanitation investment planning – A case story from Lusaka (Zambia). Lusaka Water and Sewerage Company (LWSC).

cheaper alternative to vacuum trucks that can reach facilities inaccessible for larger vehicles. Testing did highlight a number of issues, notably the poor construction of toilets and containments, many of which were never built with future emptying in mind. Low roof heights and partially collapsed walls, as well as small doors and small latrine drop holes restricted access for sludge removal, which in some cases had to be forced by breaking into the pit – adding the risk of further weakening already fragile structures. Another major hindrance to service delivery revealed by the testing was the fact that pits are frequently used to dispose of non-biodegradable solid waste. Emptying is significantly slowed (and workers' safety potentially compromised) when waste items that easily clog up sensitive parts of the device need to be manually removed in order to prevent damage to the machine. The Gulper and the Flexcravator in particular struggled to cope with the drier, dense sludge often found in unlined pits. The two technologies that require electrical power were unable to function in areas that either had no connection to electricity, or were experiencing a power cut.

Remaining challenges

LWSC has also considered introducing mobile desludging units (MDUs)[61]. However, further exploration is needed as to whether the MDU is suitable for the Lusaka context. It is worth noting that it had been suggested that the fairly flat terrain found in Lusaka would favour the use of modified tricycles as another cost-effective option for transporting sludge.[62] This could be a particularly attractive proposition from a climate perspective, as it saves on fuel and therefore emissions.

The testing and the reports submitted by the teams have offered valuable suggestions regarding OSS management beyond the emptying technology itself. Attention has been drawn towards some key prerequisites for successful OSS, notably the need to formulate and enforce improved toilet construction standards. Testing results strongly suggest that in PUAs it may not be possible to address sanitation and solid waste management separately, at least in the short to medium term.[63] In any case, there is a need to work with residents to stop the misuse of pits for non-biodegradable waste disposal. However, targeted sensitisation activities will need to be implemented in conjunction with effective solid waste strategies and reliable collection services. This task will rest with LCC and other regulators to create the enabling framework needed for OSS sanitation businesses to thrive.[64] LWSC as the overall responsible service provider has been urged to consider further elements of the sanitation chain with a view to building a strong and sustainable business model for FSM.[65]

Extending the mapping to create a reliable sanitation information system for the entire city of Lusaka holds the promise of much more proactive sanitation management. Any sanitation database will need be updated regularly to offer maximum capability for FSM providers. Ideally, LWSC and LCC would like to move towards scheduled emptying, which requires knowledge of the size and number of users of each facility to track and predict demand. The development of a citywide database is in progress; applications for health inspectors, a customer call centre and OSS-FSM customer management system are under consideration. Within LCC, geo-referenced property data could also be used for planning and overseeing other services. While the mapping to date has been comprehensive, some gaps do remain with respect to the sludge itself: the composition of sludge is not monitored, though the CFS-Lusaka team has carried out a 'quantities and qualities' study. Knowing the composition of the sludge being collected is crucial to inform the design of new FSTPs.

As for the LSP, whilst there is unanimous agreement on the positive impact and publicity its OSS activities are bringing, there is still some work to be done to move Lusaka closer to its goal of being a safe, green city for all its residents. For all the interest and know-how the LSP has generated, it is a project – and projects have defined boundaries and an end date. With this in mind, LWSC has begun to think beyond the project and its intervention areas and activities, preparing for how business will continue once the LSP has been completed. Measures for sustainability after LSP should continue to drive the expansion of OSS /FSM services

61) MDUs are designed as a simple, reliable and economical desludging technology for sanitation services in emergency situation and 'difficult' developing country settings.
62) Sanitation Solutions. 2017. Testing of Pit Emptying Technologies – The Gulper in Lusaka, Zambia. Final Report. p.27
63) Emptiers delivering FS to the treatment plant are having to pay extra for dumping solid waste, as this then needs to be transported/collected to be moved to a dumping site at a cost that is absorbed by LWSC. Some emptiers have expressed the desire to be able to pass on these costs, effectively charging households for solid waste collected from pits and discouraging their misuse.
64) See focus area 1 for a discussion of current and planned activities.
65) The suggestions pertaining to the business model are considered in focus area 4.

within the city. The formal name change from Lusaka Water and Sewerage Company to Lusaka Water and Sanitation Company (in 2019), which echoes the emphasis on on-site services on the part of the regulator, is a positive step in this direction. Continued internal capacity development and bridging the human resource gap must be a priority across the company. The fact that a new FSM unit was created within the company, which clearly enjoys management buy-in, (as well as the FSM team within the LSP having grown to four full-time staff) signals a new level of commitment towards enhanced services in underserved and marginalised areas.

Lessons learnt: insights and recommendations

- Operationalising OSS and integrating it not only into the LSP but the changing mandate and business model of the LWSC was a primary concern for GIZ: CFS-Lusaka was designed around the LSP, to complement rather than duplicate activities. Two secondments from CFS provided a much-needed and well-received boost to the project's FSM 'team'.

- The baseline mapping and SFD activities were perceived as helpful because their outputs were needed, yet these needs had not been anticipated and budgeted for. CFS not only filled important gaps relating to 'soft' components of the LSP, but also focused on ensuring continuity beyond the LSP project horizon by empowering LWSC to become a strong OSS partner.

- Stakeholders in Lusaka recognise the value of SFDs for prioritising interventions. The instant appeal of an SFD lies in its compelling simplicity. It translates a complex situation into a clear picture by condensing large amounts of data into an easily accessible format. The process of weighing assumptions and uncertainty itself stimulates discussion to influence decision-making.

- Pit-emptying testing activities carried out in Lusaka have meant that both LWSC and LCC recognise the need for standardised, emptiable toilet facilities, which is an important part of efforts to protect groundwater and safeguard public health.

- The key to scaling up sustainable OSS and FSM lies with LWSC, which needs to adapt its organisational structure and undertake the necessary capacity development across all departments to fulfil its sanitation mandate. A proactive, well-resourced and supported FSM unit can ensure that OSS activities are sustained well beyond the LSP project horizon, and become less reliant on external support. Further exploration of pit-emptying technologies and business models is strongly recommended.

FOCUS AREA 3: Workforce competencies and employability

The challenge

Recruiting suitably qualified staff has long been a challenge for the Zambian water sector, which competes with other industries that may be able to offer greater financial reward and more attractive working conditions. There are significant gaps in technical, management and leadership skills within CUs that affect their ability to manage their operations sustainably, especially given existing resource constraints.[66] As the sector was gradually coming to recognise the importance of integrating OSS and FSM into basic WSS provision, much effort still concentrated on technical and management aspects of the 'sanitation challenge'. Successful implementation, however, would ultimately hinge on workers with the right skills and attitude to deliver a safe service. Frontline staff, which make up the majority of the utility workforce, often hold few formal qualifications and have little access to practical training to develop day-to-day operations.

For on-site sanitation, no formal training existed. In this grey area, most services were provided by a largely unregulated or informal private sector. This was clearly putting the safety of operators and customers at risk, with high reported accident rates and contamination threatening disease. For a utility facing a multitude of pressures, most of them urgent and important, offering job-related training may understandably be of low immediate priority.[67] In the absence of regulatory enforcement of their business practices, there was even less incentive for private firms to train workers and ensure the right equipment was being used. Pit-emptying services attracted almost exclusively unskilled labourers, few of whom were educated beyond primary school level.

At the same time, despite the creation of a Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) for Zambia in 1998, vocational training carried decidedly less status than academic qualifications.[68] Previous waves of capacity development efforts in the WSS sector had concentrated on leadership and management. No attention had been paid to the hands-on skills training needed to overhaul sanitation. Safe service delivery, however, would need to start right with toilet and containment construction, safe pit emptying, transport and disposal of faecal matter. Designing the necessary training would also require bridging the gap between politicians, managers and engineers and the workers out on the ground. Well-educated professionals – and that includes planners and advisors from the various development partners' side – were often trained to think along networked sewerage and mostly considered on-site sanitation a less desirable option. Understanding the whole range of options along the sanitation service chain and building credible and reputable job profiles for those providing the service was going to present a considerable challenge.

Activities and interventions

In response to this evident need to focus capacity development on frontline delivery, CFS-Lusaka concentrated on supporting the practical skills needed to ensure safe and climate-friendly sanitation services. GFA Consulting Group was appointed to design, develop and implement five FSM-related vocational training courses, with a sixth on

66) In one of its earliest reports, the regulator noted that '[o]ne of the reasons for the poor performance of the water sector was lack of appropriately qualified and experienced personnel.' (NWASCO. 2004. p.17)
In a similar vein, it was noted that 'the level and quality of existing skills of the WSS personnel are comparatively low with the public education and training sector not being able to provide sufficient practical training. This has had a negative effect on the performance of the CUs whose effective service delivery relies heavily on such skills.' (GFA. 2016. Feasibility Study to Develop a Sustainable Institutional Model for the Delivery of Training and Capacity Building to Commercial Water and Sanitation Utilities and other Service Providers in the Water and Sanitation Sub-Sector. Report presented to the Public – Private Infrastructure Advisory Facility, p.4)

67) GIZ's 'Employment for Sustainable Development in Africa' mission to Zambia of February 2016 had identified sanitation as a training priority. Interestingly, whilst the CUs themselves viewed sanitation-related training as a low priority, NWASCO cited sanitation-related aspects of regulation, including OSS and tariffs, as one of their high priority training needs (ibid.)

occupational health and safety (OH&S) added as a cross-cutting specialisation. Developing vocational training plans in close cooperation with service providers from all backgrounds was a priority. The plan was for training to be anchored at a national training institution, which would deliver short courses tailored to the needs of the emerging OSS sector. Securing TEVETA accreditation would ensure that qualifications were nationally recognised.

The initial needs assessment targeted CUs and private service providers along the entire sanitation chain, as well as the MoH and LCC inspectors tasked with enforcement. Starting from the jobs and roles actually to be performed, it identified the skills and tools needed to complete each stage properly and efficiently. Detailed job profiles were put together, which served as a basis for the development of curricula. Few existing training materials covering FSM that could be adapted were readily available from the region, and indeed around the world.[69] This increased the importance of collecting inputs from Zambian stakeholders – CUs, NGOs, private operators and development partners were invited to contribute ideas and feedback. A three-day workshop to validate the proposed course content was well received and generated useful suggestions for revisions. TEVETA supported this process throughout and gave the new sanitation training its stamp of approval in late 2018.

Training materials had been developed concurrently, again with the aim of matching these to the profiles and educational levels of the target group. In all, six intensive training courses were envisaged (see box), each two to four weeks long. Each course comprised plenty of hands-on training in the field; most aimed to split teaching time into 60% practical activities and 40% class-based learning. Pit-emptiers spent less time on theory lessons: up to 80% of this course content was going to be delivered directly on-site. The supporting manuals contain an array of pictorial guidance. Handbooks were complemented by short video clips designed to ensure that individuals with low literacy levels could access the full range of concepts.

With most of the course content finalised, the next step was to embed the new training within national structures. In line with GIZ principles, the CFS-Lusaka project sought to ensure that the courses would become self-sustaining and could be delivered without external input and, eventually, funding. An evaluation of existing training facilities in Zambia identified Lusaka Business and Technical College (LBTC) as a suitable host institution. As much of the course content charted new territory, support now had to focus on 'training the trainers'. Whilst the preferred option was to find and train competent trainers amongst existing LBTC staff, some external expertise had to be brought in. Training of Trainers (ToT) was assisted by TEVETA and delivered through other partners (e.g. BORDA),[70] with GIZ covering this initial ToT investment as well as funding workshops to test the courses themselves.

A total number of 18 prospective trainers participated in the ToT sessions. Three public health inspectors from the City Council's PHD were trained in Inspection and Enforcement of OSS/FSM, as well as a lecturer from Levy Mwanawasa Medical University. Manual Pit Emptying of On-Site Systems can now be delivered by an engineer from BORDA, the coordinator from Kanyama Water Trust and two lecturers from LBTC. An OH&S Officer from LWSC, a public health inspector from LCC and two lecturers from LBTC were trained in delivering Occupational Health and Safety training. For Vacuum Tanker Operation and Maintenance, six trainers were trained, four of whom manage their own private businesses, the remaining two being LBTC lecturers. To date, there are 17 new competent trainers ready to take on course delivery.

Progress and impact

Through the process of developing the new FSM curriculum, training has been made available to 69 staff drawn from LWSC, private operators and PHD.[71] The strong practical focus of the training courses has been cited as the critical difference to training which has been facilitated through other partners, often on a more ad hoc basis. The six new courses cover operational aspects of FSM, seeking to equip attendees with the knowledge and practical skills to build viable businesses, select and use the right tools and equipment, troubleshoot common technical problems, and take the correct safety precautions to protect themselves, their customers and the environment.

69) TEVETA was established to promote and quality assure competence-based training activities (technical skills and crafts) with the aim to enhance labour productivity. Though practical skills are in demand, there is a tendency to value university education over technical training, not only in Zambia.

70) Notably for the inspections training, no trainers could be found. Practical experience in sludge emptying was in similarly short supply amongst official trainers. For the project to be successful, competence in delivering training was critical, and people with a training background underwent ToT training to deliver the courses.

71) GFA estimate that under the LSP, in addition to the training already delivered (c.f. table) further training numbers will be in the order of 20 more places for manual pit-emptying, 31 more for vacuum tanker operation, 19 more inspectors and 111 more participants at occupational health and safety training.

Left: Skills Awards Graduates getting ready to receive their certificates at the 2019 awards ceremony
Right: Participants of the Skills Challenge held at the 2019 Zambian Water Forum and Exhibition

Credible job profiles and bespoke hands-on training help frontline sanitation workers offering vital services in low-income areas to become recognised sector professionals."

Feedback from workshops has been highly positive. The Chairman of the Zambian Emptiers Association (ZEA) comments that apart from learning new techniques, service providers have hugely benefited from entrepreneurial skills development[72] and, most importantly, health and safety training. Before attending the training workshops, many manual emptiers had been using hazardous techniques, often relying on simple modifications to commonly available gardening tools and risking exposure to contamination. Even larger operators had significant gaps in the use of personal protective equipment for sludge handling and neglected the routine use of disinfectant. The training has sharpened awareness of applicable rules and guidelines, and providers are enabled to adhere to these. 'When I look at our members now and before, I see a big change', the ZEA Chairman says, noting that the training has also changed the perception of emptying services, which are increasingly recognised as business to be taken seriously.

All members of the ZEA have been encouraged to attend the certified training offered through the LBTC, as accreditation will increasingly become a requirement to work in the formal FSM sector in Zambia. The LSP was the first official programme to require accredited workers, but even private households like to see evidence of professional competence.[73] A difficulty was that the activities under the CFS-Lusaka project started when the OSS/FSM component of the LSP was still understaffed and the precise institutional format and tasks for operators had yet to be determined.

Remaining challenges

Funding presents a key challenge for the future sustainability of vocational FSM training. The cost of attending a course ranges between ZMW 2,500 and 3,500 (€156 - 218) per individual. So far, this has been absorbed through the workshops or paid for by LWSC through the LSP. Demand for training in all CUs exceeds what the CFS-Lusaka project

72) For instance, emptiers now use marketing, and may even send reminders to customers to encourage timely emptying of their containments.
73) Any household enquiring about emptying services through LWSC will be referred to a certified operator. Emptiers also acknowledge the value of training to secure repeat business as customers recognise and value competent service.

Course Topic	Modules	Materials developed	No. of people trained
Inspection and enforcement of OSS/FSM	• Sanitary inspection of OSS/FSM • Enforcement of OSS regulations • Basics of entrepreneurship	• Curriculum/syllabus • Training manual • Trainers' guide	16
Manual pit-emptying of OSS Facilities	• Manual pit emptying of OSS systems • Basic customer relations • Basics of entrepreneurship	• Curriculum/syllabus • Training manual • Workbook	20
Vacuum tanker operation and maintenance	• Operation and maintenance of vacuum truck • Emptying and transportation of faecal sludge • Basics of entrepreneurship	• Curriculum/syllabus • Training manual • Workbook	19
Occupational health and safety	• Occupational health and safety	• Curriculum/syllabus • Training mManual	14
Operation and maintenance of FSTP	• Operation and maintenance of faecal sludge treatment plant	• Curriculum/syllabus • Training manual	yet to start
Management of faecal sludge service	• FSM Services • Human resources management • Basics of entrepreneurship	• Curriculum/syllabus • Training manual	yet to start

Training modules developed and number of people trained by CFS-Lusaka.
Note that training for FSTP operations and maintenance as well as FS service management is pending the construction of FSTPs.

can currently offer, but there is a risk that this will decrease considerably once service providers will have to cover their own training costs. An analysis of the course fees indicates that these are quite affordable for larger companies, but there are concerns that smaller operators will be unable or unwilling to invest this amount and fees may need to be introduced more gradually.[74] Providers with smaller margins also worry about the risk of staff turnover. In addition, there is the question of resourcing training: for instance, the hire costs for a vacuum tanker that was needed for training sessions were a significant expense. Other even more costly investments may be required for the courses that have yet to start.[75]

The initial fee payable to TEVETA to become accredited as an examiner and trainer has risen from 250 ZMW (€16) to 1300 ZMW (€81).[76] Accreditation then needs to be renewed every three years.[77] A 'skills advisory group', which could act as a clearing house for incoming funds, has been suggested as a potential way forward. Finally, refining the course materials will be an ongoing process. Much of the content covered is very technical, and it is important to present it in a way that ensures maximum understanding on the part of an audience with potentially low literacy skills. Although English is the customary language of instruction, there is demand for handbooks and manuals, and possibly even training itself, to be delivered in other locally spoken languages.

Lessons learnt: findings and recommendations

- The CFS-Lusaka project's efforts to develop tailor-made training for staff at the frontline of OSS/FSM service delivery are widely acknowledged as an important step towards closing a critical skills gap in the Zambian WSS sector. Prior to the project, there was a notable disconnect between training institutions and the industry. The new FSM curriculum is clearly focused on increasing competencies and employability of sanitation workers within Lusaka.

74) 'No one will go if you have to pay 2,000 Kwacha', 'you need to entice people, start small' were typical responses.
75) A consultancy report looking into further development of specialised, practical training in the water sector recommended that '[t]he water operations programme can be enhanced if LBTC is assisted with the procurement of mini water and wastewater treatment plants, which are essential to effective training.' (GIZ. 2017. Final Report: In-depth Status of existing Water Training Facilities/ possible facilities and Workshops in Lusaka. Lusaka: GIZ. p.52)
76) Single accreditation as either examiner or trainer incurs a 700 ZMW (€44) fee.
77) At the time of writing, the renewal fees are unclear.

- Involving a broad spectrum of stakeholders in generating new job profiles and fine-tuning training materials was a strength of the GIZ approach, even if it inevitably introduced delays into the process.

- TEVETA has provided a critical link between the new curriculum and existing Zambian training frameworks. Instead of funding ad hoc training workshops, it is far better to offer courses through national training institutions that are regulated by national bodies. Training can be delivered by in-country trainers using standardised materials. In addition, national certificates become easily recognised, meaning that workers can be employed anywhere in the country.

- Overcoming the initial investment cost of developing vocational training approaches and materials has been a significant contribution of the CSF project. The challenge is now to ensure that training becomes self-sustaining in terms of funding. Suitable mechanisms will need to be put in place to encourage and/or require operator certification. The next phase should focus on the responsible use of skills levy funding, both for ToT and operator training.

- Training may need to be scaled up to meet high demand – though the latter may be affected once course fees are charged to participants or their employers. FSM service providers value the clear focus on practical solutions to their immediate problems and learning about how to build safer, more sustainable businesses. However, self-funding attendance may present a problem for smaller operators.

- In general, a 60:40 split of practical training and theory worked well. For manual workers with limited formal education, even more emphasis on field-based training secures active engagement with the course content, and thus effective learning.

- The accessibility of training materials is paramount. Illustrated handbooks are helpful; short videos make a useful complement and can aid self-study. Also, language matters: in order for learners to derive maximum benefit from a course, they must be able to understand all its content fully.

FOCUS AREA 4: Sustainable financing and funding for OSS and FSM

The challenge

The 2011 Sanitation Master Plan for Lusaka had estimated the investment requirements for improving sanitation in the city to be in the order of €2 billion. Functionality of existing infrastructure was severely restricted due to age and failing condition. Already very low formal service coverage affecting the majority of the city's population required urgent expansion in view of high projected population growth. The National Urban and Peri-Urban Sanitation Strategy concedes that 'the sanitation sector in Zambia has been historically under-funded in terms of capital investments, large maintenance and operating expenditure', and that limited funding has been directed towards low-income areas.[78] Some €240 million are currently being invested in the capital city under the Lusaka Sanitation Programme, co-funded by EIB, KfW, AfDB, World Bank and the Government of the Republic of Zambia (GRZ), again with much of this funding reserved for conventional sewerage network and wastewater treatment infrastructure project components. Even with this investment, a sizeable financing gap remains to reach universal service coverage in Lusaka.

Financially, LWSC ranks amongst the better performing CUs in Zambia. It is currently achieving 95% full cost coverage by collection (110% by total revenue), but meeting its targets for operations and maintenance costs remains a challenge.[79] Customer tariffs for water and sewerage were last reviewed in 2016, and adjusted to reflect rising operational costs, resulting in multi year tariff adjustments for the period 2017-2019. The company charges a sewerage tariff set at 30% of the water bill for domestic customers (45% for commercial and industrial customers). In accordance with the regulator's tariff setting guideline, tariffs follow a rising block structure, with a below-cost 'lifeline' band of 6m^3/month, added to a fixed meter charge of 10 ZMW (€0.61).[80] In 2019, charges therefore started at 5.93 ZMW/m^3 (€0.37) for water and, where applicable, 1.78 ZMW/m^3 (€0.11) for sewerage in the first band, rising to 11.64 ZMW/m^3 (€0.72) for water plus 3.49 ZMW/m^3 (€0.22) for sewerage for the highest block (>170 m^3/month).[81] CUs are expected to ring-fence at least part of their sewerage revenues for capital investments, though in practice they can be diverted to the water side of the business.[82]

In 2007, NWASCO introduced an additional sanitation surcharge in an effort to enable CUs to invest in adequate sanitation services. LSWC was allowed to charge an additional 2.5% on all water bills, irrespective of whether a customer was connected to sewerage services or not. This sanitation levy is explicitly earmarked for funding sanitation extensions, and proposed projects must be submitted to NWASCO for approval every year.[83] Since the introduction of the surcharge, LWSC has collected a total amount of 24.3 million ZMW (€1.51 m), of which 13.7 million (€0.85 m) had been spent by the end of 2018.[84] The sanitation levy was suspended in 2017, with the suspension expected to be lifted pending some clarification of sanitation expenditures. In any case, current investment needs for improving sanitation far outstrip the revenues generated by the company,

78) NUSS 2015-2030. p.18. The NUSS developed and costed two different scenarios (for the entire country): the 'status quo'/NUWSSP scenario would require a total investment of US$5.8 billion (€5bn), an alternative 'low-cost' scenario US$4.8 billion (€4bn).
79) Source: NWASCO, 2018. Total revenue includes net billed amounts and other income from fees, interest, subsidies and recurrent grants.
80) The tariff structure also includes provisions to estimate consumption for unmetered customers, as well as an approved tariff for water kiosks and public taps (5 ZMW/m^3 (€0.31)). NWASCO acknowledges the difficulties utilities face in isolating costs relating to sewerage services, buts asks that proposed percentage tariffs are justified in terms of reflecting O&M costs.
81) NWASCO. 2019. Approved water supply and sewerage tariffs February 2019. Available from http://www.nwasco.org.zm/index.php/media-center/publications/booklets/send/13-approved-tariffs/62-2019-approved-water-supply-and-sewerage-tariffs.
82) According to LWSC, neither its sewerage tariffs nor dumping fees charged to vacuum truck operators at treatment plants are ring-fenced to be reinvested into wastewater treatment. (LWSC/LSP. 2019. The FSM Service Delivery Business Model for Lusaka. Presentation given at Knowledge Exchange Lusaka, 8 May 2019)
83) Note that the current tariff guideline states that the 'Sanitation Surcharge is charged at between 2% to 5% of the water bill in order to accumulate funds for investments in rehabilitation or new installations of sewerage infrastructure.' (emphasis added)
84) NWASCO. 2018. Urban and Peri-Urban Water Supply and Sanitation Sector Report 2018. NWASCO: Lusaka.

given that sewerage tariffs are are only a small percentage of the total water bill. As a result, the level of self-financing through customer payments is lower for sewerage than for water supply, despite the high capital intensity of networked sewerage services.

Access to finance and funding has been a central theme of all focus areas discussed so far. Key stakeholders, such as LCC, are held back by a lack of resources, including equipment and facilities. Service providers rely on external funding to complete vital works and to fund capacity development activities. Pit-emptiers report access to finance and high interest rates as key constraints to expanding their services. There is without doubt a large potential market for on-site sanitation services, yet many low-income households find the construction costs for improved toilet facilities prohibitive.[85] In addition, the situation is complicated by the fact that many properties in peri-urban areas are rented and facilities are often shared between two or more households. Subsidy or discount mechanisms geared towards the construction of household toilets are required to enable first-time access to safe sanitation, which cannot be delivered and sustained without a viable business model that spans the entire sanitation chain.

> *Innovative and sustainable financial mechanisms need to be in place. Building on LSP experiences LWSC is proactively exploring ways to secure the long-term financial sustainability of the full range of sanitation services."*

Chronic underinvestment, especially in the sanitation sub-sector, raises questions over planning and prioritising of investments at the national level. It is from here that clear and strategic direction for the mobilisation and allocation of resources should emanate, to secure the long-term sustainability and resilience of the sector. Zambia has adopted policies aimed at reducing the dependency on external funding sources (note the prominence given to commercial viability as a key reform principle and regulatory mandate). Investments have successfully been channelled into low-income areas, though the involvement of the Devolution Trust Fund in sanitation remained relatively limited and it has recently ceased operations without being replaced or superseded. Strategic guidance and nationally coordinated investment planning, let alone monitoring of investments or subsidy mechanisms to accelerate take-up, are yet to be put in place. This represents a limiting factor for developing safe, equitable and climate-proof sanitation services.[86]

Activities, progress and challenges

The main contribution of the CFS-Lusaka project towards a more sustainable approach to sector financing has been through supporting LWSC in exploring and developing business models for FSM that integrate the private sector. Above and beyond this, GIZ has been engaged in various tangential activities not necessarily directly related to CFS-Lusaka that also address the wider challenge of leveraging funding. There is potential to raise the level of sector self-financing through tariffs and scope for building on pro-poor approaches that originated in Zambia. Given the fundamental importance of financing strategies and mechanisms, this section will somewhat deviate from the structure of the other focus areas. The following discussion will also consider the wider context to extract lessons and recommendations for sustainable financing, especially in view of emerging threats to national development, such as climate change, that transcend city boundaries.

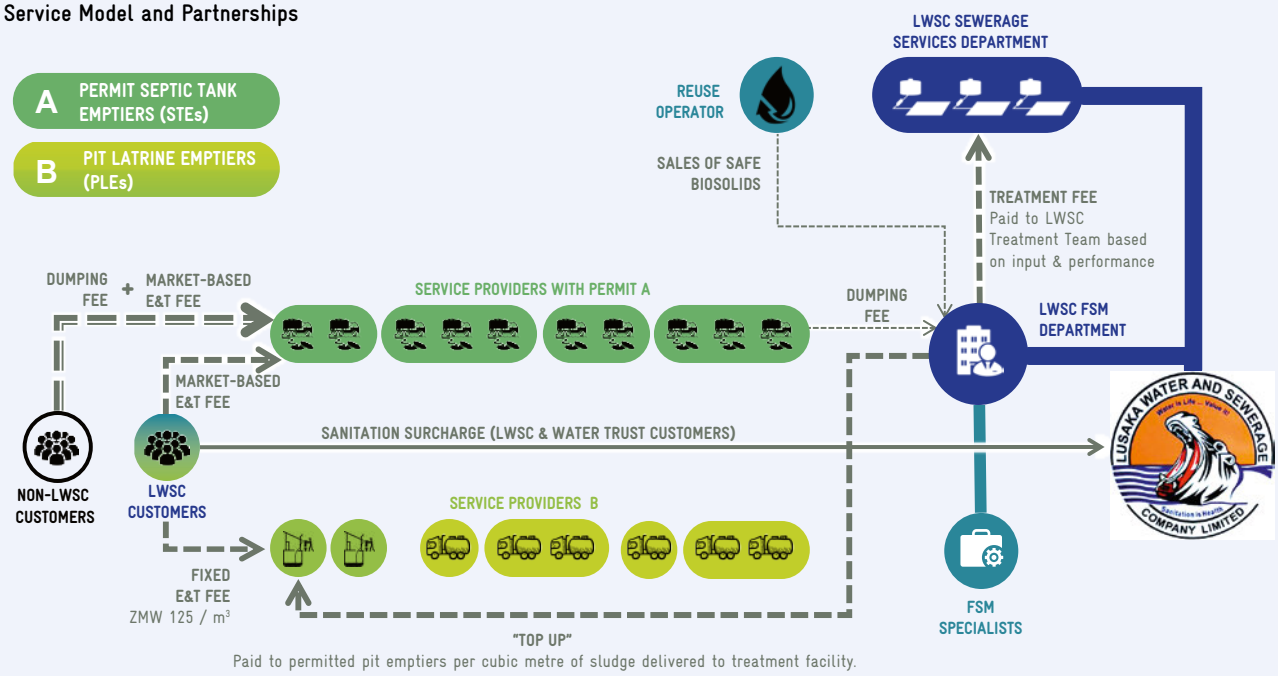
Developing a sustainable business model for FSM – lessons from the LSP

The Lusaka Sanitation Programme comprises an OSS component that aimed to construct 12,000 improved household toilets – a figure that has since been revised down to 5,500 due to construction costs exceeding initial assumptions – which were to be connected to formal OSS/FSM treatment systems. Planned interventions to increase FSM infrastructure and formal emptying services were envisaged to benefit close to one million residents of peri-urban areas in Lusaka.[87] To build a successful business model, LWSC needed to assess the market potential for OSS, choose or

85) A willingness to pay study carried out in LSP project areas showed that although the full price for an improved toilet is unaffordable for many residents, there are also many 'won't pays', i.e. residents that could afford but aren't willing to invest such a high amount in sanitation.

86) The Capacity Development Strategy notes that 'GRZ has setup the national programmes and how they will be funded. However, the absence of a financing strategy to holistically operationalise the financing components of these programmes, which together with inadequate tariff level setting, results in current financing efforts being unable to mobilise sufficient funding for achieving the WSS goals. Paradoxically, there is, in some cases, limited absorption capacity as well.' (MLGH, 2015, p.17)

87) Planned investments in 18 professional emptying teams for OSS facilities were projected to reach 50,000 latrines or 900,000 users over the project period. Two new FSTPs are being built under the LSP, and one will be refurbished. The capacities of these are: 1) Pit latrine sludge = 25m³ per day with a population equivalent of 81,000, and 2) Septage = 192m³ with a population equivalent of 373,500. This would mean that 450,000 people would be covered if FSTPs under the LSP are running at full capacity. These capacities are expected to be exceeded in 2025, though these predictions need to be taken with care as it depends heavily on the performance of the emptying businesses.



LWSC planned service model for emptying services

adapt suitable technologies and design a service model that would fit with the new regulatory framework.

As set out in focus areas 1 and 2, CFS-Lusaka facilitated knowledge exchange visits and information sharing events that helped stakeholders to develop integrated FSM and decentralised water treatment options. Baseline mapping of existing facilities, providers and users then offered LWSC a reliable picture of the existing FSM landscape in PUAs, which fed into a comprehensive study of possible business models.[88] Considerations needed to include all elements of the sanitation chain, starting with the construction of OSS facilities as the very basis for a thriving FSM business (i.e. ensuring there would be sufficient demand for services). The model would need to include (i) funding modalities and financing mechanisms for low-income households, (ii) efficient and effective business processes for FSM, (iii) marketing of emptying services to secure customer buy-in and sustainable operations, and (iv) a local supply chain network. The intention was to involve the local private sector in providing transport services, with plans to later extend licensing to operation and maintenance of treatment facilities.

Low profitability of emptying services had been identified as a key constraint. The takings of Water Trusts' emptying teams barely covered costs and there was concern that revenues would struggle to support an effective management structure further along the sanitation chain.[89] Private operators tended to concentrate on serving the upper end of the market, including commercial customers, due to low margins for emptying pit latrines. As noted before, the absence of enforceable construction standards for latrines significantly added to the cost of emptying. Considerable support would be needed to professionalise the formal and informal sector, yet current revenue levels constrained investment in market strengthening activities, such as training, innovation or customer awareness campaigns. LWSC had limited in-house expertise regarding decentralised faecal sludge treatment, and there was considerable uncertainty surrounding cost recovery of FSTPs, though there was scope to maximise value from the treated sludge.

Based on the various assessments and recommendations, LWSC has chosen a business plan starting with a 'light touch' phase. Between 2020 and 2024, the company plans

88) A 'consultancy for the development of faecal sludge management in Lusaka under the Lusaka Sanitation Programme' was carried out by WSUP Advisory in 2018, which proposed partnership arrangements with the existing OSS market and business plans to help LWSC move towards launching formal FSM services. CFS-Lusaka outputs fed into these business development activities, and CFS-Lusaka advisors were actively involved in quality assuring the consultants' work.

89) Under the Water Trust model, Water Trust employees also operated treatment facilities, so there were no distinct cost centres and mixed revenue streams. Cf. Sanitation Solutions. 2017. Testing of Pit Emptying Technologies – The Gulper in Lusaka, Zambia. Final Report.

90) The World Bank has committed US$800,000 (€730,000) in grant funding to performance-based contracting for improved FSM services in Lusaka.

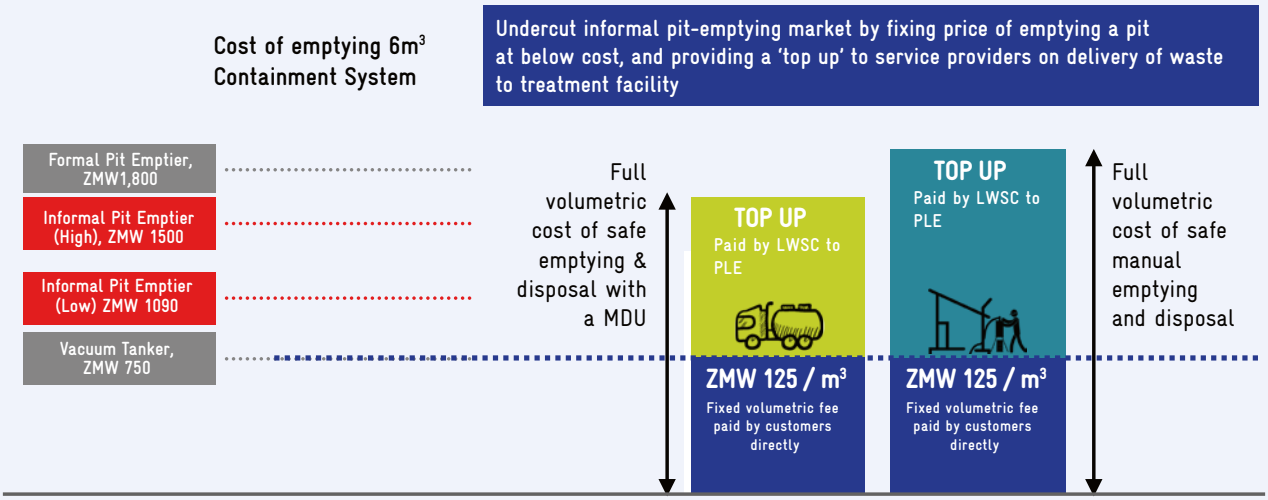
to cooperate with the private sector under a permitting system, before moving on to a more complex franchising model during the next phase. OSS services will be separated into two business segments: emptying and transportation, and treatment/reuse. Tendering of performance-based FSM contracts.[90] The FSTP design is informed by the two smaller plants in Kanyama and Chazanga – hence a mixture of anerobic baffled reactors and sludge drying beds. The dried sludge will be used as a soil conditioner for non-edible plants, such as lawns or palms. Contracts have been awarded to six private operators, four private firms and two community based firms.

Managers are aware that moving into the OSS market carries risks, and despite all efforts to estimate costs there will be an element of trial and error before tariffs will be set at the right level. The impact of recent cholera outbreaks has instilled a sense that while financial sustainability is critical to ensure services can be provided, the company is also driven by a social imperative.[91] For the time being, emptying services for pit latrines will be supported through LSP counterpart funding to create incentives for customers to switch to formal services, as illustrated below. Septic tank-emptying will essentially continue as a 'free market' service, with fees reflecting the operators' costs, a substantial proportion of which goes towards fuel. Permitting and enforcement of ZEMA controls will be strengthened. Tenders for pit-emptying contracts have been essentially for the (undisclosed) 'top up' that will be paid by LWSC to the successful bidder on delivery of faecal sludge to the treatment facility. This way, the emptying fee charged to customers can be held the same across the city, irrespective of distance to the nearest FSTP. It is currently fixed at a heavily discounted 125 ZMW/m^3 (€7.78) – low enough to undercut informal service providers, but high enough so as to not discourage customers from upgrading pits to septic tanks. NWASCO has endorsed this approach, noting however that from the regulator's perspective subsidies should preferably be directed towards on-off fees, such as connection charges – or in the case of OSS, toilet construction.

Funding challenges for sustainable OSS service provision in Lusaka

The initial (funded) contracting period will only cover the first two years. After that, the discount/subsidy will become more difficult to sustain if no further funding becomes available. LWSC is looking to introduce ring-fencing of all sanitation-related revenue to build up its own sanitation fund. This idea will be subject to regulatory approval during the next tariff review, where the company has applied for

Business Plan [2020 – 2024]
The top up has been provided as a temporary subsidy under the World Bank support to the LSP.



91) The strong inclination towards sewerage within the company appears to be giving way to an equally strong commitment to embrace the pioneering role in OSS that has fallen to LWSC, even in the face of the uncertainty that lies ahead. Taking a longer view, it is acknowledged that protecting resources through better sanitation makes business sense even purely from a finance perspective.

separate water, sewerage and OSS elements. LWSC is in negotiations with NWASCO over the reinstatement of the sanitation levy to cover at least part of the top up fee, and plans to raise customer contributions for pit-emptying gradually.[92] The FSM unit is also looking to explore marketing of sludge reuse as a potential source of revenue.[93] Ideally, the company would like to move towards scheduled emptying, which would support efficiency and cost effectiveness. For customers, this could spread the cost of mandatory emptying (via a monthly payment), which would have the effect of a more systematic and constant revenue flow for LWSC.

However, given that only a fraction of the planned toilets has been built under the LSP so far – 330 at the time of writing – the main focus remains on increasing uptake at this end of the service chain.[94] Under the LSP scheme, households contribute US$213 (€194), approximately one quarter of the actual cost of a toilet facility.[95] LWSC has introduced payment terms in one of the PUAs that allow customers to add a small amount to their water bills as a way of saving towards an improved toilet. These monies are held in a dedicated reserve account until a threshold is reached and construction can start (this also illustrates the unseen costs of OSS, e.g. accounting and social marketing). The whole business model hinges on enough standardised facilities requiring emptying, and initial construction is where the financing gap is likely to become most difficult to bridge. Also, distance to a faecal sludge treatment plant is a decisive cost factor that LWSC is keen to minimise to support the viability of OSS services. However, due to funding (and land) restrictions not all FSTPs thought necessary can be built or upgraded at this point in time, again highlighting the importance of upfront investment.

Towards sustainable sanitation financing across Zambia

Zambia has experimented with pro-poor financing mechanisms and now needs to focus on rolling out services at scale. The role of the DTF in scaling up access to improved services in peri-urban areas has been well-documented.[96] The Trust Fund gained experience in managing project finance that helped CUs to direct investments towards underserved people. PUAs had previously been neglected not least because of perceived business risks, though they presented many technical, social and operational challenges. Disbursements channelled through the DTF could better accommodate the more complex and time-consuming aspects of working in PUAs. Critically, CUs were offered detailed implementation assistance, such that the DTF became an interface between technical and financial cooperation. While more than a million Zambians were reached with safe water supply, the DTF was wound down before it could make similar inroads into sanitation. Unable to overcome conflicts of interest arising from its institutional set-up as a basket fund under NWASCO, funding partners discontinued future support. Another basket fund created under the NUWSSP was phased out in 2014, due to lack of funding.

Though closure of the DTF leaves less of a gap in terms of the overall volume of investments it brought into the sector, its departure is most keenly felt in terms of the pro-poor momentum and expertise that is in danger of being lost. NWASCO is promoting the idea of a new national financing mechanism to preserve the institutional knowledge and reviewing DTF-developed tools that still hold much promise for serving urban low-income communities.[97] The MWDSEP and its predecessors have been reviewing possible options for a sustainable sector financing mechanism. Proposals put forward by a UNICEF-funded review[98] are still under consideration.

Given the difficulties encountered by the DTF, the precise institutional arrangements for any future financing mechanism merit careful consideration. There is evident scope to improve the coordination of investment allocations that ultimately flow into the sector through various ministries and government budget lines. This may be another argument in favour of strengthening central oversight by creating a dedicated fund or treasury account, possibly with different financing 'windows' that would enable the Ministry of Finance to track all funding flows into the sector. Such ring-fencing could also act as a safeguard,

92) It is unclear whether emptying tariffs might vary depending on location, or how soon fully cost-reflective charges might be introduced.
93) The analysis by WSUP Advisory suggests that certified biosolids and compost are likely candidates for profitable sales. WSUP Advisory. 2018. FSM Business Model Final Report D-08. Vol.1.
94) The comment 'We'll get there for reuse, but how am I going to talk about value at the end of the chain, when I haven't got the toilet?' sums up the predicament.
95) Rather than receiving a direct subsidy payment, toilets are offered to households at a heavy discount.
96) GIZ, 2015. Closing the Last Mile for Millions. GIZ: Bonn.
97) NWASCO. 2018. Urban and Peri-Urban Water Supply and Sanitation Sector Report 2018. NWASCO: Lusaka.
98) Findings and recommendations of the review drew on feedback from a wide range of sector partners and stakeholders. GIZ advisors were able to share some insights derived from long standing support to the Kenyan Water Services Trust Fund.

as all disbursements could be audited to ensure that resources are optimally utilised. In view of the generally difficult fiscal situation in Zambia,[99] external funding will remain an important source of financing contributions, and a financing mechanism would seek to minimise any risks and governance issues that could undermine confidence in the sector.[100] While any new arrangements will need to take into consideration taxes, tariffs and transfers from funding partners, clear monitoring and evaluation as well as transparency and accountability would be desirable on both sides.

Lessons learnt: insights and recommendations

- CFS-Lusaka focused on supporting capacity development as an indirect means of improving financing: the aim was to create a 'complete package' that provides tangible evidence how LWSC can feasibly enter the OSS market and manage (or oversee the management of) the complete service chain. Having a proven concept for FSM in hand puts the utility in a better position to persuade potential funders of the merit of on-site options as means of accelerating access to safely managed sanitation.

- Investing time and resources in understanding the market for OSS services not only provides the basis for developing a successful and sustainable business model. An OSS customer service database can also facilitate payments and improve collections, for instance by offering different payment terms more suited to a customer's circumstances.

- A viable business model needs to be complemented with accountability mechanisms, for regulatory purposes as well as to reassure external funding partners. Ring-fencing of all sanitation-related revenue is a good start.

- The FSM business model relies on subsidies to create a solid customer base for emptying and treatment services. To become sustainable, guaranteed funding streams need to be accessible, ideally without over-reliance on donors. Government and utilities should collect more data on the actual beneficiaries of subsidy schemes; development agencies should strengthen the capacity of service providers to design subsidies that reach those who need them first.[101]

- The self-financing potential of the sanitation sub-sector has not yet been fully explored, let alone exploited. There is good reason to believe that tariffs can be raised and all customers should pay into a sanitation fund via a sanitation surcharge on bills. LWSC would now be able to demonstrate the impact of sanitation expenditures, which goes well beyond benefiting individuals in their own homes.

- Even as priorities and commitments are changing, there are still some strongly held preferences for sewerage connections as the ultimate industry standard. Even in the flagship LSP, on-site sanitation has been allocated only 10% of the overall programme budget, which is relatively small, reflecting slow change in donor inclination towards large-scale capital investment projects.

- Scaling up access to sanitation and reaching Zambia's national targets for universal service provision requires a comprehensive sanitation concept and a national funding and financing mechanism. Investments can then be allocated and monitored according to agreed sector priorities. Funding partners could then become better aligned behind a national strategy.

- A national financing mechanism can be an effective means of ensuring complementarity of funding contributions and mutual accountability of government and development partners. It should consider all 'three Ts': tariffs, taxes and transfers – for sustainability reasons preferably in that order.

- Pro-poor basket funds have a proven track record of increasing sustainable access to water and sanitation in low-income areas. Zambia is in the fortunate position to be able to draw on a wealth of institutional knowledge that can be integrated into a national financing mechanism to support scaling up of sanitation and replicate the success of the water kiosk model for sanitation.

99) It is widely acknowledged that under current conditions the Government of Zambia will be unable to meet its minimum 25% contribution into any financing mechanism.

100) GIZ's 'Access Study' notes that '[i]nvestment allocations are made through government structures and are subject to political influence. But, the DTF developed clear and effective mechanisms for pro-poor and competitive investment allocation for a small share of the total investments. The DTF is no longer active.' Periods of institutional uncertainty (for instance, when CUs temporarily operated without a functioning Board) have also affected funding flows in recent years. Finally, there is the question of absorption capacity, which needs to be addressed. Eberhard, R. 2019. Access to Water and Sanitation in Sub-Saharan Africa. GIZ. Eschborn.

101) Mbalo, D. and Rossmann, R. 2019. Sharing GIZ's experience with accelerating access to sanitation through household toilet subsidies.

FOCUS AREA 5: Sanitation and climate

Climate change is one of the biggest challenges of our time. The water and sanitation sector is particularly vulnerable to variations in weather patterns, and the looming threat to availability and quality of water resources is recognised in Zambia, where NWASCO has been advocating for a proactive response to climate change risks. CUs are being encouraged to consider adaptation measures to protect water security.[102] Increasing resilience is a first and necessary response, but it is as important to scrutinise the role the global water and sanitation sector plays in contributing to an increase in global warming. Water and wastewater services can play a significant role in releasing greenhouse gas (GHG) emissions, both during construction of facilities as well as normal operations. It is estimated that the water and sanitation sector contributes 3%-5% of global and up to 15% of local GHG emissions.[103] In some cities it is likely to be even higher than that, mainly due to high emissions from poorly managed on-site sanitation systems.

Climate change thus becomes a twin challenge of adaptation and mitigation: services must adapt to cope with future changes, the likely impact of which can be highly uncertain, but providers must also strive to reduce their GHG emissions so as to limit their own contributing effects on climate change. In Lusaka, where sector stakeholders were still reeling from the devastating impact of cholera outbreaks linked to extensive flooding, a first challenge was to develop an understanding and appreciation of the interlinkages between water and sanitation, GHG emissions and climate change. The environmental impact of inadequate sanitation was a serious cause for concern, though rarely viewed from an emissions angle. Energy efficiency had been introduced as an operational performance indicator in 2016, drawing attention to energy consumption as part of utility operations.[104] However, energy and CO_2 emissions from machinery (notably pumps) and the fleet of LWSC vehicles are only part of the contributing factors to GHG emissions. Powerful GHGs such as methane and nitrous oxide are formed during containment, treatment and disposal of wastewater and faecal sludge.[105]

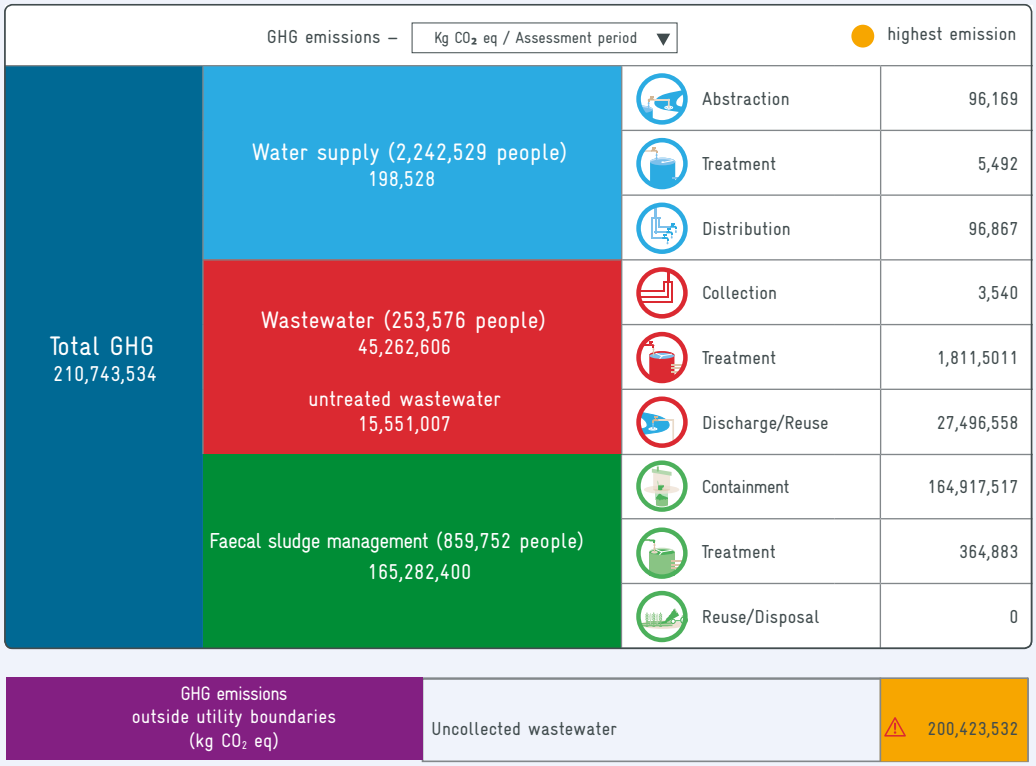
Activities and progress

LWSC taking on a greater role in sanitation offered a window of opportunity to develop business models and technical solutions that would also consider FSM from a climate perspective. Many of the CFS-Lusaka activities described previously (e.g. baseline mapping, technology testing and support to establishing a formal framework for OSS and FSM) were designed to lay firm foundations for sustainable sanitation practices that could ultimately contribute to climate mitigation efforts.

More intensive and extensive flooding is one of the high-impact events that is associated with climate change, and erratic heavy rainfall events resulting in more frequent flooding have been observed in Zambia. Especially low-income areas with poor infrastructure are at higher risk. Consequently, interventions in PUAs (through the LSP) drew on previous studies, such as groundwater vulnerability maps, to target priority areas and support decision-making, taking into account climate resilience aspects. Investigations into the connection between groundwater and the spread of waterborne diseases had established clear links

102) A Climate Risks Screening Guideline was introduced as a framework for a systematic identification of climate hazards and mitigation measures during design and implementation of water services projects.
103) GIZ/WaCClim. 2019. Assessing Energy Performance and Carbon Emissions of Water and Sanitation Systems with ECAM. Training Workshop Report.
104) NWASCO has been promoting better monitoring of utilities' energy usage with the aim of developing strategies to use it more efficiently and sustainably. However, this is mainly driven by a desire to reduce operational costs (electricity and fuel) and not explicitly presented as a climate mitigation strategy. NWASCO 2016 and 2018. Urban and Peri-Urban Water Supply and Sanitation Sector Reports 2016 and 2018. NWASCO: Lusaka.
105) Even when treated, the breakdown of human waste produces significant quantities of CO_2 (carbon dioxide), CH_4 (methane) and N_2O (nitrous oxide) emissions from sewers, containments and treatment plants. CH_4 and N_2O are by-products of biological conversion processes, 34 and 298 times more powerful than CO_2 respectively, but emissions also occur as part of energy use during other operational activities. In the case of on-site sanitation, transport-related emissions (fuel) are of particular relevance.

Preliminary GHG emissions summary of LWSC (2018)



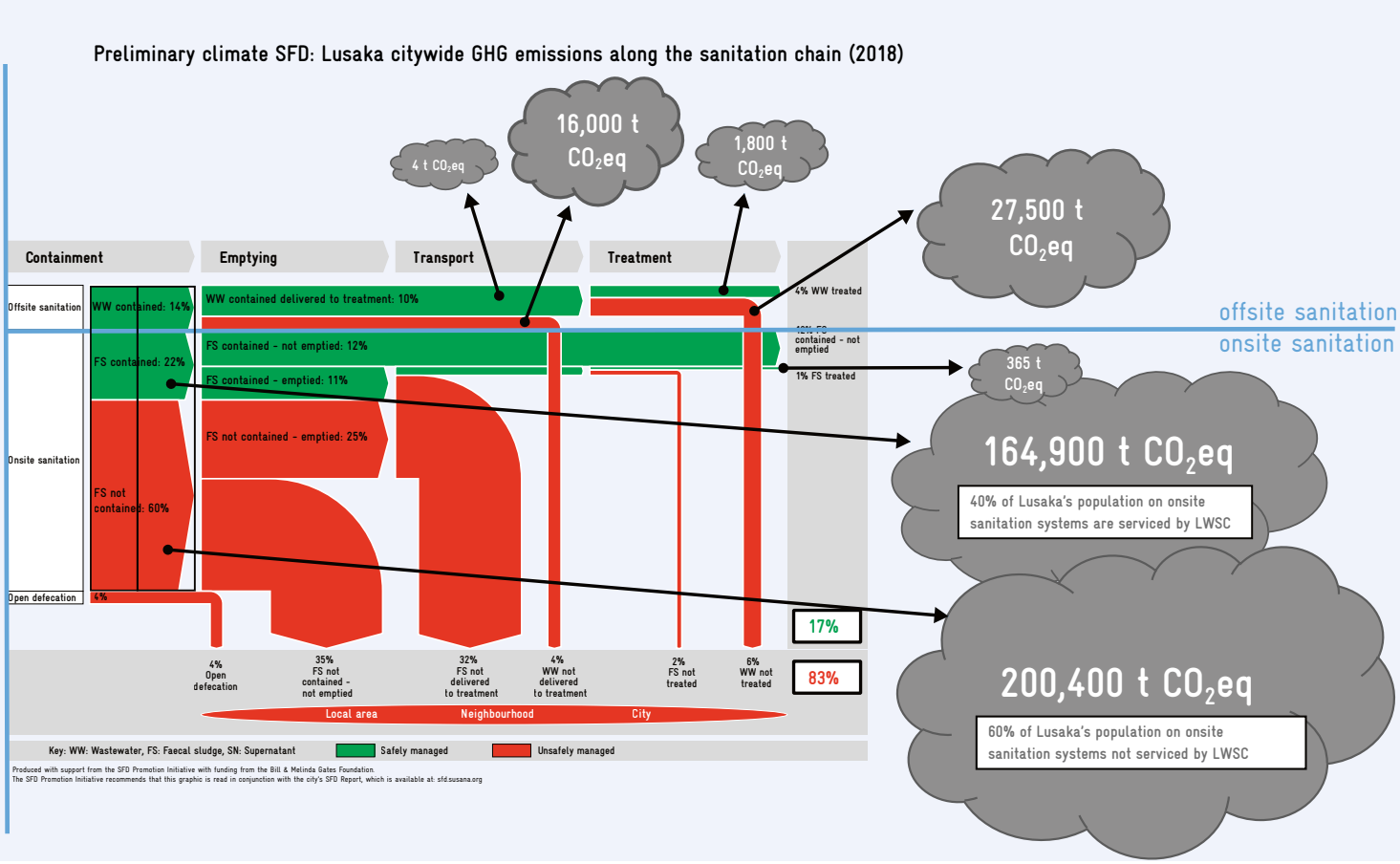
between shallow groundwater tables and cholera hotspots in marginal, flood-prone areas.[106]

As LWSC and LCC are only just beginning to implement OSS and FSM components of the Lusaka Sanitation Programme, it is too early to assess their impact with respect to reducing GHG contributions and climate change mitigation in the water and sanitation sector. However, CFS-Lusaka has instigated discussions with partners on necessary actions to increase the resilience of assets in view of the likely impacts of a changing climate. Flood-proofing OSS containments, especially in the vulnerable PUAs, is a prime consideration that will also significantly reduce cholera outbreaks and protect against groundwater contamination. The latter will additionally have the long-term potential to contribute to the reduction of emissions related to drinking water production on the other side of the business. It is also notable that awareness of the links between water, energy and climate is increasing: LWSC's FSM staff are fully on board with factoring in climate resilience for sanitation infrastructure and services. The unit is also keen to explore the utilisation of by-products of faecal sludge treatment (notably biogas) as an energy source, and it is further envisaged to include energy recovery units within the new WWTPs funded by KfW/EIB under the LSP.

Another activity sought to shore up the level of understanding of GHG emissions across LWSC's existing water supply and wastewater business. In association with the WaCCliM project[107], CFS-Lusaka introduced stakeholders in Lusaka to the ECAM (Energy Performance and Carbon Emissions Assessment and Monitoring) tool. This open source tool quantifies and evaluates GHG emissions within the urban water cycle using available utility data. The tool produces graphics to pinpoint opportunities for reducing energy consumption and the overall carbon footprint. As the ECAM tool previously only assessed conventional water and wastewater operations of utilities without analysing OSS systems

106) The vulnerability map is a product of a collaboration between Zambia's Department of Water Affairs and the German Federal Institute for Geosciences and Natural Resources (BRG). It primarily assesses risks to groundwater quality, but also identifies areas with high water tables and therefore high risks of contamination (e.g. from inappropriate sanitation). According to the map, the most vulnerable groundwater areas coincide with large low-income neighbourhoods located southwest of the city centre. A report accompanying the updated version, published in 2019, notes that '[i]t is unfortunate that the areas where rapid recharge occurs are in the areas that are subserviced by sewers, which out of necessity forced the poorest people in Lusaka to build pit latrines during the very rapid expansion of the city.'

107) Water and Wastewater companies for Climate Mitigation (WaCCliM) is a joint initiative between GIZ and the International Water Association. https://wacclim.org/



and FSM, CFS-Lusaka worked with WaCCliM to develop and integrate this third dimension into the tool.

In June 2019, LWSC scientists, engineers and managers from all relevant departments attended an ECAM training workshop, where they used their own data to assess LWSC's energy performance and direct and indirect GHG emissions arising from operations in 2018. This exercise highlighted significant gaps in data availability, especially with regard to on-site sanitation, where (insufficiently managed) faecal sludge nonetheless emerged as the biggest contributor to LWSC's carbon footprint, mainly due to high amounts of methane emitted from the untreated FS of OSS users. This results in a first estimate of 165,926 tonnes CO_2 equivalent/year and accounted for 78% of total utility emissions in 2018. These preliminary results must be treated with caution, as additional input data (such as electricity consumption, fuel consumption during faecal sludge transport, the characterisation (quantities and qualities) of faecal sludge inside the different containment systems and of the treated sludge) and verifications are needed to complete the ECAM assessment.[108] CFS-Lusaka and LWSC are looking to collect the missing data, and a study on the characterisation of faecal sludge has been initiated with the results due to feed into the ECAM tool.

The ECAM tool, in conjunction with the SFD exercises, has added another perspective to improving FSM, and (waste-) water management more generally. Building on shared concerns regarding energy use, the workshop discussions broadened into a greater understanding of GHG emissions from utility operations. The assessment has provided a first insight into where emissions are likely to occur within each system (water supply, wastewater and FSM). In Lusaka, the impact of FSM practices on climate change seems to be far greater than commonly thought, and stakeholders have further reason to improve data, monitor the situation closely and improve their operations. With key staff trained in the use of the ECAM tool and information gaps identified during the workshop, LWSC is now in a position to start collating climate-relevant data and monitor, with an aim to reducing, its GHG emissions. For those parts of LWSC's service area where formal sanitation services have been rolled out, CFS-Lusaka and LWSC have started to create a

108) Note that the citywide SFD report highlighted a 'significant uncertainty with regards to the gap between sludge produced and sludge that reaches the treatment facility.' (Kappauf, L., Heyer, A., Makuwa, T. and Titova, Y. 2018. SFD Report Lusaka, Zambia, 2018. GFA. p.23)

> 'The utility is now in a better position to support donors to make more targeted investments that will have a meaningful impact on adapting to and mitigating the effects of climate change in Lusaka Province in Zambia; all within the context of the Master Plans.'
>
> Eng. Dennis Malambo, Director of Commercial Services, LWSC, at Stockholm World Water Week, 26 August 2019

visualisation of the GHG emissions along the sanitation service chain. By combining emissions data with the citywide SFD, this offers an insight into where the highest emissions occur.

> *When you know what your GHG emissions are, you can begin talking about them with confidence to the engineers on how to lower them and the funders on how to finance impactful measures"*

Remaining challenges

The uncertainties surrounding the final destination and characterisation of faecal waste contained in pit latrines in Lusaka, as well as the importance of accurate data concerning sludge emptying and transport, have already been remarked on. This information is needed to complete the picture and arrive at a more accurate assessment of GHG emissions for LWSC operations. LWSC recognises the need for GHG emissions reporting – all CUs are required to report to ZEMA, which in turn is responsible for NDC reporting at national level.[108] Assigning responsibilities within LWSC and developing appropriate mechanisms for consistent monitoring (including systematic data collection and verification) and reporting will be the next step. Whilst the ECAM training has been a good start to obtain a first understanding and a baseline of LWSC's energy efficiency and GHG emissions, the activities need to be extended such that climate mitigation measures can be included from the infrastructure planning stage onwards through to efficient operations of on and off-site sanitation. Especially with respect to citywide GHG emissions, it is worth noting that LWSC's sanitation activities – and hence data availability – remain limited. Significant data gaps exist for poorly and entirely unserviced containment systems as well as the emissions released through informal operations. Given that there has been relatively little research into assessing GHG emissions from faecal sludge and OSS systems, even internationally, tools and methods have yet to be developed; possibly the ECAM tool could be further be refined to capture citywide data in its entire complexity.

Looking at climate adaptation challenges, other than the challenge of upgrading unlined pit latrines as a safeguard against climate-induced flooding, LWSC is experiencing other upstream and downstream impacts of climate change. Given Zambia's reliance on hydroelectric power, changing rainfall patterns pose a risk to national electricity supplies. Recurring shortages are already impairing operations of water and sanitation facilities (in particular WWTPs), which require a continuous power supply. Partly driven by these external threats, LWSC is giving increasing consideration to the environmental impact of its business activities. Current efforts focus on cutting energy use or switching to greener alternatives, such as solar pumps. LWSC is now looking at the climate change adaptation and mitigation potential within the utility. Further discussions and detailed investigations may help to optimise the predominantly reactive stance, which rightly and necessarily responds to climate risks, whilst adding some proactive measures towards reducing GHG emissions.

However, addressing climate change needs to be a sector-wide effort, so the call for greater awareness goes out to all sector stakeholders and beyond. NWASCO is working on a climate variability tool that would support and encourage CUs and funding partners to routinely scrutinise project proposals from a climate adaptation perspective and integrate appropriate designs into their portfolios to increase resilience to climate change-related events.

Lessons learnt: insights and recommendations

- Cholera has been a primary driver of sector initiatives in Lusaka, overshadowing the climate-induced factors that may have precipitated the crisis. Awareness of climate change and its implications has nonetheless risen considerably, even if adaptation measures feature more prominently in discussions than any need for mitigation measures.

- The links between sanitation-related diseases and flooding as well as the correlation between reduced GHG

108) Zambia has committed to making significant reductions in emissions; its target Intended Nationally Determined Contribution (INDC) of 2015 is 47% against the 2010 base year. (Irish Aid. 2018. Zambia Country Climate Risk Assessment Report)

emissions, energy consumption and costs can be used to stimulate and promote climate-friendly practices. These can also be communicated in a straightforward way to all stakeholders in the city, including the general public. A climate SFD, once further improved, could be a useful tool for such advocacy.

- Greater climate awareness and positive engagement has the potential to open new funding opportunities, as more finance is becoming available to support climate-friendly initiatives. Harnessing climate change financing to cover future costs of implementing climate mitigation and adaptation measures in the water and wastewater sector should continue to be explored.

- Like any water utility, LWSC will be looking to increase the resilience of its infrastructure. Guarding against floods that cause overflowing sewers and sanitation facilities, or droughts that endanger electricity supplies comes to mind easily. However, it may also become necessary to consider more subtle changes in performance that a changing climate could cause: assets respond differently in different weather conditions, and extreme weather can lead to failure of assets – and in consequence, service failure.

- The move towards mitigation is a challenging one, as there are limited best practice examples in the sector to learn from. The ECAM baseline for energy efficiency and GHG emissions supported by CFS-Lusaka can be a first step to inform the Adaptation and Mitigation Plan for LWSC and inform future investments.

- Existing climate change screening approaches may need to be refined to fully capture the challenges of on-site sanitation vis-à-vis future climate resilience.

- By reducing GHG emissions and therefore its impact on climate change, LWSC will be supporting Zambia's NDC (Nationally Determined Contributions) commitments and targets, serving as a pilot city for scaling up within Zambia. It could also provide a model for better data collection and reporting on national emissions reduction targets by ZEMA.

- In order to support a nationwide assessment of GHG emissions and energy efficiency in the water and wastewater sector, the ECAM tool needs to be further refined and adapted to the Zambian context, especially on OSS and FSM.

Inclusive green city sanitation: concepts and key lessons from Lusaka

CFS-Lusaka and sanitation as part of the wider Lusaka story

The CFS-Lusaka project entered the 'Lusaka sanitation story' at a critical juncture: it coincided with a time when efforts to invigorate and rebalance the water sector were spurred by calamitous disease outbreaks and unpredictable weather patterns that affected the entire city. Cholera and climate change-induced events were forcing sanitation to step out of the shadows of its more prominent cousin, water supply. Stakeholders had to look for a citywide solution to a problem that, in one way or another, affected each and every resident. Many of the activities described in the preceding chapter helped build the foundations for pro-poor and sustainable sanitation services. In just a few years, the profile and recognition of OSS and FSM have risen immensely. The sector is slowly steering away from a narrow focus on centralised sewerage systems and is adopting a much broader understanding of sanitation. A key GIZ contribution was the capacity development support offered at every level, from raising awareness of alternative options for a safe and affordable service, to co-developing the legal frameworks for OSS and FSM, right down to upskilling individual sanitation workers.

Stakeholder coordination was a major thread running through all CFS-Lusaka activities, seeing that building new bridges of cooperation was necessary to tackle the challenge of inclusive, climate-friendly sanitation. Actors from all across the water and sanitation sector, as well as related sectors, needed to join together and harmonise their approach and priorities. Various 'green' initiatives have been running concurrently with the recent Lusaka Sanitation Programme, which has been supported and complemented by CFS-Lusaka activities. The national 'Make Zambia Clean, Green and Healthy Campaign' was relaunched in 2018, and LCC is working towards the ECHO vision (economically strong, environmental[ly] friendly and community hope and opportunity) set out in its urban development plan.[109] As a country likely to be seriously affected by future climate change but itself a comparatively small GHG emitter, adaptation ('climate proofing') rather than mitigation remains the primary focus of Zambia's national development strategies. CFS-Lusaka has acknowledged the threat climate change poses to urban development, and the project has helped to shape the discourse. Reimagining Lusaka as a liveable, green city is impossible without aspiring to universal and resilient sanitation services and finding the best compromise to achieve this.[110]

Sanitation as a concept under development

The Lusaka sanitation journey echoes the developments in global sanitation thinking and practice. Paradigms have progressed through conventional sanitation towards ecological sanitation[111] and later sustainable sanitation, though with a strong preference for 'end-of-pipe' designs and technologies geared to maintain environmental and public health. As demonstrated in the Lusaka case, there is now another shift away from technocentric, toilet-focused sanitation towards tackling sanitation in a much more systemic, holistic and integrated way. FSM models emphasise sanitation service and value chains, embracing complexities and peculiarities of specific places, and seeking to adapt formal and informal institutional frameworks to face the broader challenges of urban development, such as population growth and climate change. 'Inclusive city sanitation' can be roughly translated as 'adequate sanitation for everyone in

109) LCC, MLGH and JICA. 2009. Comprehensive urban development plan for the city of Lusaka. Lusaka City Council. Initiatives under this Master Plan and the national campaign include 'Lusaka Green Schools for Clean, Green and Healthy communities' and the 'Green Belt' or 'Green Gardens' project, a series of connected parks and green spaces intended to protect, inter alia, vulnerable water resources.

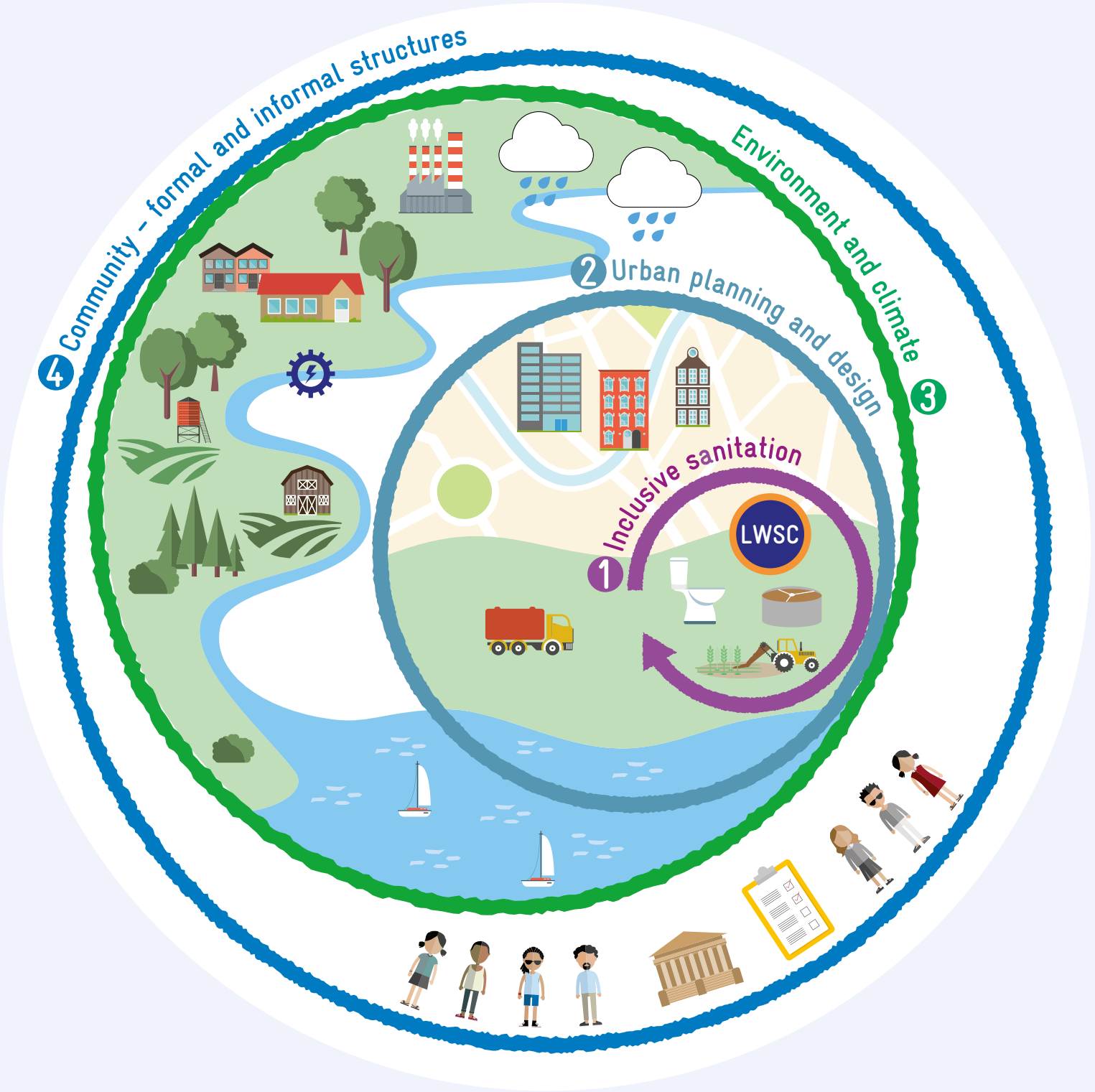
110) The approach of the CFS-Lusaka project thus fitted well with the aspirations of the German Government, which centres around 'liveable cities' and local empowerment to develop interdisciplinary solutions that support resource efficiency and resilience, for instance to climate change. BMZ. 2016. Creating sustainable cities. Available at https://www.giz.de/en/downloads/booklet_creating_sustainable_cities.pdf

111) i.e. greater decentralisation and the emergence of the EcoSan approach of the 1990s

the whole city with safe management of all human excreta along the entire sanitation chain'. A combination of networked and non-networked systems extends the reach of safe sanitation to include low-income areas, where on-site options are often more appropriate. A comprehensive definition is offered by CWIS, which promotes long-term planning, innovative technology mixes and creative funding strategies that 'better respond to the realities found in developing country cities.'[112].

Different concepts have been put forward to capture the idea of more forward-looking, integrated urban planning and the role of sanitation within this. The urban sanitation sector holds potential for reducing GHG emissions, a fact that is increasingly acknowledged,[113] and opportunities for environmental, economic and social co-benefits must be explored. The SDGs are interpreted as a 'bold call for the promotion of sustainable urban water management for safer, more inclusive and resilient cities.'[114] The conceptual boundaries between 'green', 'smart', 'sustainable' and 'resilient' are somewhat fluid and often overlapping, but all focus on governance and proactive stakeholder engagement to connect the city and the services within it to the natural environment that surrounds and support them. CFS-Lusaka, and GIZ more generally, has sought to incorporate these notions, combining a strong focus on sanitation as a human right with an emphasis on sustainability and the climate related considerations this entails.

112) For further information on citywide inclusive sanitation (CWIS), visit https://citywideinclusivesanitation.com/
113) GIZ and IWA. 2019. Energy Performance and Carbon Emissions Assessment and Monitoring Tool. ECAM 2.2 Methodology; Also Bhattacharjee, M. 2018 at https://www.weforum.org/agenda/2018/11/what-do-toilets-have-to-do-with-climate-change/
114) IWA. 2016. The IWA Principles for Water Wise Cities 2nd ed. IWA. London.


4 Community – formal and informal structures
Environment and climate 3
2 Urban planning and design
Inclusive sanitation
1
LWSC

1 Inclusive sanitation: Scaling up and safely managing sanitation (on-site and off-site) requires connecting privately-owned facilities (i.e. toilets and containments/storage) with professionalised services along the entire sanitation chain and, with regards to OSS, managing the associated decentralised infrastructure (e.g. faecal sludge treatment plants). Especially for the latter, this entails appropriate financing mechanisms, knowledge and skills within a utility that are needed for operation and maintenance and service delivery. This also requires close cooperation with the local private sector, which needs to be formalised and upskilled. CFS-Lusaka activities targeted operational and financial resilience and improved. Sanitation mapping, digitalisation, development of FSM business models and technical testing activities have helped to develop a professionalised service offer that is more closely aligned with customer needs. Accredited training for frontline sanitation workers is now available to ensure service can be delivered safely, protecting staff, their customers and the environment. Strategic planning and prioritisation of investments will promote the optimal utilisation of the '3 Ts': taxes, tariffs and transfers from funding partners.

2 Urban planning and design needs to aspire to future-proof development pathways. A smart city can harness the power of digital tools, which can facilitate cross-sectoral cooperation. Sanitation data is complex and needs to capture the unique characteristics of each location. A coherent picture and detailed understanding are needed at every stage of development, from planning to monitoring of interventions. CFS-Lusaka activities focused on anchoring sanitation projects into urban planning and provide sound information for decision-making and the prevention and eradication of cholera using different digital tools such as sanitation mapping, digitalisation of standard operating procedures for inspection, SaniPath, and Shit Flow Diagrams.

3 Environment and climate: A city, however transformed by human activity, exists within its natural environment. There is a growing appreciation of the interlinkages between water and sanitation, greenhouse gas emissions and climate change. Climate change requires a direct response to its impacts (e.g. to minimise flood risks and maintain continuity of service) as well as longer-term mitigation action (e.g. reducing GHG emissions, beneficial reuse of treated sludge, i.e. sludge to energy). CFS-Lusaka activities promoted a proactive stance on climate change adaptation/mitigation. Adaptation ('climate proofing') together with mitigation (ECAM assessment) remain the primary focus in Lusaka, reflecting Zambia's pragmatic national development priorities.

4 Community – formal and informal structures: Stakeholder coordination, a shared vision and an enabling framework are at the heart of sustainable sector governance and a key prerequisite for resilience. Connecting people and institutions allows climate-friendly sanitation to become an integral part of planning and action at all levels, from individual households and neighbourhoods. Formal and informal institutions also govern the way priorities are set and interventions funded. CFS-Lusaka activities focused on promoting stakeholder awareness and cooperation, within Lusaka and beyond, forming a district coordinating committee. More robust and transparent (digital) enforcement procedures are underpinned by the recently developed LCC by-law, forming a sound legal basis for inclusive, climate-friendly sanitation.

Source: Author's adaption of the IWA 'Water-Wise Cities' Framework and the 'Levels of Water Resilience' proposed by 100 Resilient Cities. (IWA. 2016. The IWA Principles for Water Wise Cities 2nd ed. IWA. London; Bruebach, K. 2019. Water and Sanitation. Resilience Perspective.

KEY MESSAGES: transferable lessons from the CFS-Lusaka project for green, inclusive city solutions

This publication has reflected on the practical experience of the CFS-Lusaka project and recent conceptual developments regarding sanitation as an integral part of a 'green and liveable city'. Key lessons and insights that may be applicable elsewhere are summarised below.

Scaling up inclusive sanitation and enhancing operational resilience

- ***Managing sanitation is a significant departure from business as usual.*** For a utility, taking on a formal role within OSS/FSM means overhauling its entire institutional culture: the industry gravitates towards sewerage as the default (because familiar) sanitation option, so each department and each individual member of staff need to understand their new role within a broader interpretation of sanitation. Capacity development is key, at the organisational as well as the individual level, so that services can be managed sustainably in the long term, beyond any externally-driven projects.

- ***Investment in knowledge and data collection and management pays.*** Understanding existing sanitation landscapes and their socio-environmental context is critical for developing inclusive and green sanitation services. Collection of real-time data holds great promise for matching interventions with the needs of (potential) customers and the natural environment. Baseline mapping and digitalisation activities can connect different strands of sanitation data. Well-coordinated information management can then provide a foundation for sound decision-making in the sector. Reliable data is indispensable for prioritising and targeting interventions and mobilising the required funding. Solid evidence also assists with stakeholder communication, with politicians and the general public responding well to facts.

- ***Successful scaling up requires a sustainable service model.*** Operationalising OSS and FSM requires appropriate technical solutions and a sustainable business model. There will be an element of trial and error to choosing and adapting options that deliver the desired social and environmental benefits. Successful approaches for scaling up pro-poor water supply exist, but there is not yet a comparable comprehensive model for sanitation, let alone climate-proof or climate-friendly.

- ***A chain is not (yet) a circle.*** The sanitation service chain starts on the household plot, with containment and storage of faecal sludge on private land. Increasing uptake of improved (standardised and emptiable) toilets is the start of improved services – the basis of efforts to protect groundwater and public health, as well as the foundation of the business model. For optimal results, service delivery and enforcement should become a hand in glove operation, i.e. mandates of providers and authorities must be closely aligned. Incentives and/or subsidies may be necessary to encourage and support low-income households. This will also require IFIs to adapt their approaches and funding modalities, so as to accommodate the financing requirements of low-cost sanitation that benefit low-income communities.

- ***Training enhances operational resilience and supports wider economic development.*** Training for frontline sanitation workers is a critical complement to expanding access to services for households and improving service delivery outcomes. However, training is not only a means of professionalising and formalising FSM. It also supports greater recognition of sanitation workers. Motivating and empowering operators through bespoke courses that emphasise practical, hands-on training encourages the creation of sustainable and economically viable FSM businesses, opening up much-needed job opportunities.

Increasing financial resilience as a key sustainability factor

- ***Know the market (and adapt your funding mechanism).*** Sustainable sanitation provision hinges on an accurate understanding of the potential market such that the service can be adapted to customer needs and preferences – after all, demand is the basis of a viable business model. However, scaling up pro-poor sanitation services starts with construction or rehabilitation of household toilet facilities, with potentially high up-front investment costs. Conventional funding mechanisms cannot easily accommodate the patchwork of small investments for asset development that affordable, on-site sanitation entails. Direct or indirect financial support and incentives (e.g. subsidy mechanism and/or marketing) need to be integrated to encourage uptake and increase access, particularly in low-income areas.

- ***The benefits of improved sanitation are shared – arguably, so should the costs.*** The self-financing potential of the sector needs to be explored further, not least to reduce donor dependence. A sanitation fund could be built up through a sanitation surcharge on utility bills as well as more cost-reflective, ring-fenced sewerage and sanitation tariffs and infrastructure.

- ***Citywide sanitation is good; universal service is better.*** Achieving universal service will require national strategies and comprehensive scaling up concepts. A national financing mechanism should seek to combine the '3 Ts': taxes, tariffs and transfers, which could then be allocated and monitored according to national priorities and in accordance with the 'leave no one behind' principle.

- ***Look for the silver lining to the clouds of climate change.*** The international effort to limit the rise in global temperature is changing the financing and infrastructural landscape for climate-relevant interventions. Well-designed projects for green city sanitation are likely to attract funding interest and vice versa: targeted funding can influence the climate impact of sanitation projects.

Greening services: moving towards climate adaptation and mitigation

- ***Protecting assets against climate change protects services – and the climate.*** Sanitation, whether networked or on-site, is an asset-intensive sector. Given the greater frequency and severity of extreme weather events, service providers need to take action to protect individual assets and infrastructure from external hazards. A changing climate also requires more subtle adaptations to increase the resilience of operations and guard against service failure. Existing systems and management practices should be reviewed to allow a robust yet flexible response to the 'uncertainty challenge' surrounding climate. Making these adaptations can create positive feedback: the choice of materials, technologies and operational procedures has a significant direct effect on greenhouse gas emissions.

- ***Knowledge empowers providers and regulators and can translate into tangible benefits.*** For a utility to take ownership of its emissions, it requires a good understanding of all its systems and processes. Direct or indirect emissions are generated during different stages of operations, including construction/rehabilitation of infrastructure. Here, as well as for faecal sludge further along the sanitation chain, the emissions become more difficult to quantify, so this remains an area for further investigation. A baseline assessment helps identify priority areas for climate mitigation, which can also deliver direct cost savings that can be passed on to customers. A reliable baseline supports the tracking of national emissions reduction targets. Monitoring at the utility level should be integrated into national monitoring of climate targets.

- ***Benefits accrued unintentionally are just as beneficial.*** Climate adaptation, let alone mitigation, may not be the primary motivation for action. Cholera prevention or energy (cost) reduction can be useful drivers for generating critical buy-in and broad political and community support for OSS and FSM. This will not diminish the environmental/climate co-benefits of well-designed projects.

The 'outermost circle': an enabling framework for citywide green and inclusive sanitation

- ***Plans and regulations are made and upheld by people.*** An enabling framework for OSS and FSM consists of more than just revised policies, legal provisions and regulations which allocate new responsibilities to sector stakeholders. Formal institutional frameworks operate within informal institutional frameworks, which can differ greatly in every context, and working on attitudes and priorities requires patience.

- ***People shape service landscapes through joint action and learning.*** OSS landscapes can be highly fragmented. Operational and regulatory responsibilities are usually shared between different actors. Stakeholder coordination is essential to ensure no gaps are left along the sanitation chain. Capacity development is central for any framework to move towards effective implementation. Partners must take ownership of all systems, tools and processes right from their development stage.

- ***Smart frameworks employ smart technology.*** Digitalisation has much to offer in the quest for developing and implementing smart, green and inclusive sanitation solutions. The right equipment and facilities are needed to scale up the application of digital tools and processes.

- ***Safely managed sanitation can bring unexpected benefits.*** With a largely untapped market for improved OSS, sanitation has huge potential to become a vehicle for local job creation. Training has immediate, tangible positive effects on personal skills development, public health and environmental protection. In the context of broader development targets, it contributes to greater social inclusion, poverty reduction and climate resilience.

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