U20
RIYADH 2020
URBAN

Urban Sanitation and Waste Management for All

Nature-based Urban Solutions

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About Urban 20

Urban20 (U20) is a city diplomacy initiative that brings together cities from G20 member states and observer cities from non-G20 states to discuss and form a common position on climate action, social inclusion and integration, and sustainable economic growth. Recommendations are then issued for consideration by the G20. The initiative is convened by C40 Cities, in collaboration with United Cities and Local Governments, under the leadership of a Chair city that rotates annually. The first U20 Mayors Summit took place in Buenos Aires in 2018, and the second took place in Tokyo in 2019. For 2020, Riyadh City is the Chair city and host of the annual Mayors Summit. The first meeting of U20 Sherpas was convened in Riyadh, Saudi Arabia, on the 5th – 6th February during which the foundations were laid for the U20 2020 Mayors Summit in the Saudi capital later this year.

About the Urban 20 Taskforces

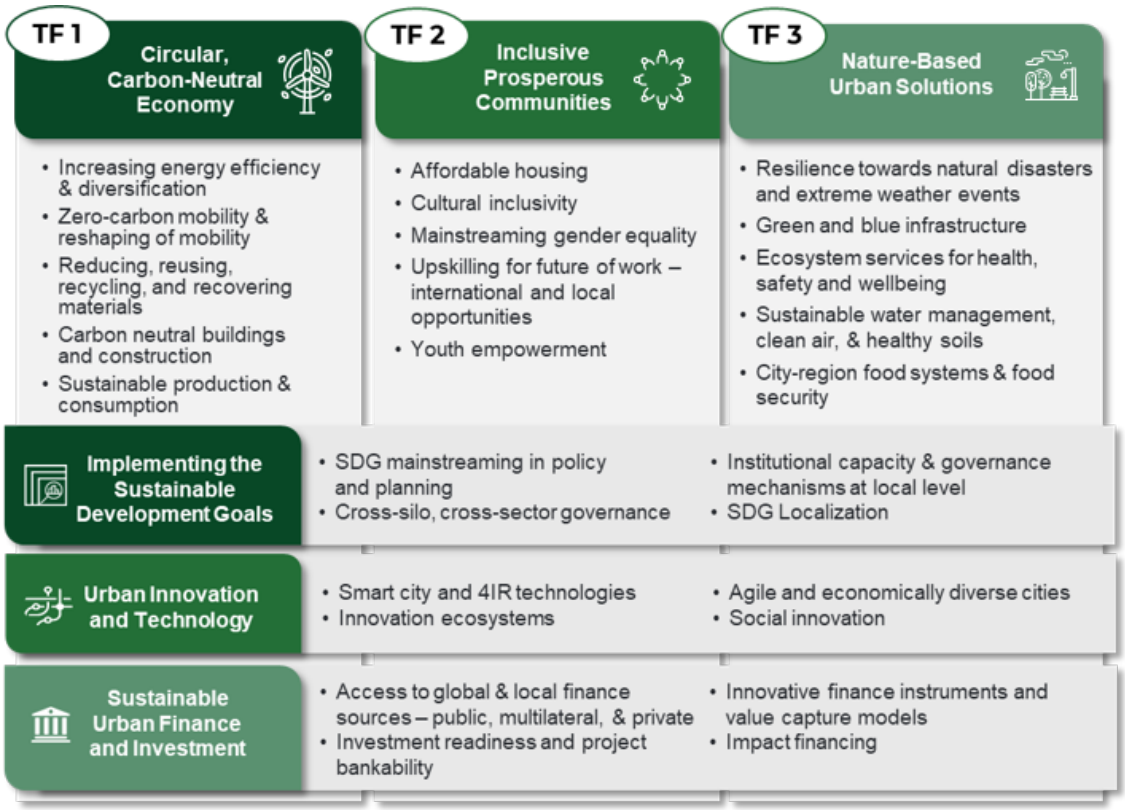
As U20 Chair, Riyadh has introduced taskforces to add additional structure and focus to the U20. These taskforces explore specific priority issues and bring evidence-based solutions to the final Communique.

Each taskforce has commissioned whitepapers led by chair cities, and with input from participating cities and knowledge partners. These whitepapers help us build an evidence-based, credible and achievable set of policy recommendations.

Taskforces activation

The taskforces workstream was an innovative and recent introduction to the three-year-old U20 initiative by the chairmanship of the city of Riyadh this year. Three thematic taskforces, each guided by one of the U20 Riyadh 2020 overarching themes of Circular, Carbon-neutral economy, Inclusive Prosperous Communities, and Nature-based Urban Solutions, were officially launched and activated during the U20 First Sherpa meeting back in February. During the meeting, the U20 priority topics that fell within the three overarching themes and intersecting with the three cross-sectional dimensions of Implementing the Sustainable Development Goals, Urban Innovation and Technology, and Urban Finance and Investment were prioritized and refined through the statements delivered by all attending cities. The top 5 topics were then chosen to be the focus of whitepapers for each taskforce.

The top 5 topics under each of the three taskforces and cross cutting dimensions were then chosen to be the focus of whitepapers for each taskforce:



Cities and Partner Engagement

The vast majority of the twenty-three cities who attended the first Sherpa meeting, representing 12 G20 countries, along with the U20 Conveners, agreed to the importance of having taskforces as interactive platforms to produce knowledge-based and evidence-based outcomes that can effectively feed into an actionable U20 Communique. During and following the meeting, several cities demonstrated interest in volunteering in the capacity of chairs and co-chairs, leading and overseeing the activities of each taskforce. The cities of Rome and Tshwane co-chaired Taskforce 1 on Circular, Carbon-neutral Economy, Izmir Taskforce 2 on Inclusive Prosperous Communities, and Durban on Nature-based Urban Solutions. Others expressed interest to participate in the taskforces, some in more than one, both during and after the meeting.

Alongside interested U20 cities, several regional and international organizations proffered to engage in the work of the taskforces, in the capacity of knowledge partners, to share their knowledge and experiences with cities in producing whitepapers. Some of the knowledge partners volunteered to play a leading role as Lead Knowledge Partners, supporting the taskforces' co/chairs in review and guidance.

All participants who actively took part of the taskforces were subject matter experts nominated by the cities and knowledge partners and have enriched the taskforces' discussions with their know-how and experiences. In over 3 months, all three taskforces, with great effort and commitment from all their participants, produced a total of 15 evidence-based focused whitepapers, bringing about more than 160 policy recommendations addressing the national governments of the G20 Member States.

The taskforces content development efforts is comprised of 23 U20 cities and 31 U20 knowledge partners. The 100+ experts and city representatives produced 15 whitepapers which widely benefited and informed the development of the first draft of the communique.

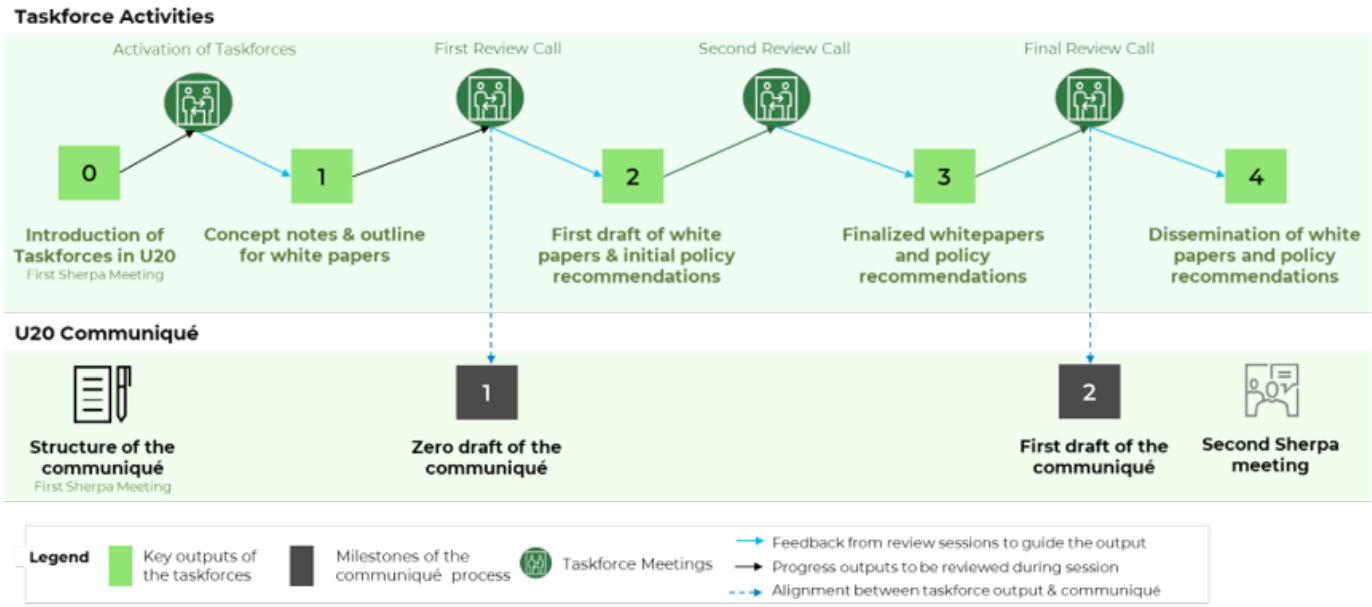
Content Development

Under the leadership and guidance of the chair city, Durban, and the lead knowledge partner, ICLEI, the work of Task Force 3 kicked off with an orientation for all participants in mid-March.

During the period between March and April, the participants of Taskforce 3 presented more than 23 concept ideas and 12 concept notes and developed initial outlines for the whitepapers focusing on topics of interest. Teaming up into six author groupings, the cities and knowledge partners developed six outlines of whitepapers. Refined and revised outlines were then developed into draft whitepapers that underwent several iterations for development and finalization, ensuring that each paper delivers a set of concrete and targeted policy recommendations that address the different U20 stakeholders.

The six whitepapers under task force 3 (listed below) explore priority topics on food systems, urban sanitation and waste management, urban healthy and safety, resilience and biodiversity:

1. Towards transformative change: urban contributions to achieving the global biodiversity agendas
2. Resilience in the Anthropocene: mainstreaming nature-based solutions to build resilient cities
3. Addressing finance and capacity barriers for nature-based solutions implementation at city level
4. Urban health, safety, and well-being: cities enabling the provision and access of ecosystem services
5. Empowering cities for the development of sustainable food system policies
6. Urban sanitation and waste management for all



Along the taskforces timeline of activities, three review meetings were held where co/chairs and lead knowledge partners presented and discussed with the U20 Executive Team the progress and findings of the taskforces they represent, leading to the U20 Second Sherpa meeting that took place during the first week of July. Parallel to the taskforces activities, the first draft of the U20 communique was developed by the U20 Executive team incorporating recommendations presented at the third (and final) review meeting.

About the Nature-based Urban Solutions Taskforce

Nature-Based Solutions need to be mainstreamed in city planning and development to provide a healthy urban environment with productive ecosystem services, such as the provision of clean air and freshwater, food and nutrition, recreation and tourism, as well as livelihoods for local populations and resilience to climate change impacts.

Cities are highly dependent on a healthy local environment and productive ecosystem services. Rapid environmental degradation and biodiversity loss due to climate change, habitat destruction and pollution, threaten the foundation for life in and around cities across the globe. Local ecosystems need to be restored, protected, and upgraded to enable and improve the prosperity and well-being of people in cities. Water and food systems within which the city draws resources from, must be managed sustainably to ensure long-term security. Nature-based solutions like endemic and biodiverse urban greening, ecosystem restoration, green roofs and walls, and natural water-retention methods, need to be mainstreamed and designed in city planning and development, taking into account the multiple co-benefits of policy choices. These can improve air and water quality, provide cost efficient cooling for districts and buildings and increase the physical and mental health of residents. They build the green and blue infrastructure needed for resilience against extreme weather events and the adverse effects of climate change, and attract global talent and sustainable tourism to the city. Nature must be integrated into urban environments. This increases both biological and economic prosperity and productivity, enabling new business opportunities for entrepreneurs and innovators, while providing habitats for biodiversity in harmony with traditional urban infrastructure.

15 cities

U20 Participating cities

Madrid
Mexico city
Montréal
Moscow
Rio de Janeiro
Riyadh
Rome
Sao Paulo
Strasbourg

Chair city

Durban

U20 Observer cities

Amman
Dammam
Helsinki
Rotterdam
Singapore

14 knowledge partners

Lead knowledge partner

ICLEI – Local Governments for Sustainability, Cities Biodiversity Centre

Knowledge partners

- Asian Development Bank Institute
- French Development Agency
- Global Alliance for Health and Pollution
- Inter-American Development Bank
- International Union for Conservation of Nature
- Lee Kuan Yew Center for Innovative Cities
- Metropolis
- National Institute of Urban Affairs
- The Nature Conservancy
- University Bocconi Milano – GREEN Centre
- University of Pennsylvania
- World Economic Forum
- World Wildlife Fund

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Executive Summary

Executive Summary

Cities generate 80 percent of the world's gross domestic product. As more people throng urban areas, their need for access to services also escalates. Urbanization, economic development, and population growth have resulted in the generation of huge amounts of waste that needs to be managed well. Globally, cities generate about 1.3 billion tons of solid waste per year. The volume will increase to 2.2 billion tons by 2025 and will double in lower-income countries in the next 20 years. In many developing end emerging economies, the mismanagement of solid waste has been polluting land, water and air, thus leading to spread of disease and generation of greenhouse gases.

This white paper urges global leaders to create effective national strategies to provide appropriate facilities and services for sanitation and waste management. The paper elaborates on (i) challenges for developing countries in providing sanitation and waste management, (ii) ways to deal with the current situation and its impact, and (iii) lessons learnt from the success story achieved by some cities in solving their problems.

Countries face multiple challenges such as lack of infrastructure, financial support, citizen engagement, social inclusion, and inadequate coordination among legal structures and institutions. Building effective infrastructure for waste management requires substantial financial resources. In developing countries, this coincides with other growth priorities like transportation and manufacturing. The key challenge here is that city governments in developing economies are cash strapped. Furthermore, the private sector also considers investment in the segment of urban services as less profitable and fraught with other risks due to the nature of the returns, primarily through user charges.

The COVID-19 pandemic has shown that human society is capable of making a rapid transition to adapt in an unprecedented situation. Rapid improvement in technology, innovation for cleaning products, and many service industries have found new ways to serve their customers. Municipalities could convince stakeholders to allocate more resources on USWM learn from the current adaptation.

Concerns regarding the link between inadequate waste management and climate change has exhibited that it is a global concern and has become a political issue. Therefore, it is strategically effective to bring the issue of waste management together with climate change into the global agenda, thus emphasizing the importance of resilience.

Executive Summary

Technology can enable the development of low-cost, scalable solutions and it requires governments to engage with markets without excluding or reducing the role of the private sector. This must be complemented by an enabling ecosystem that would include an appropriate level of regulation. Innovative financing to attract private investment should be explored. Understanding the wider impact of aid, countries should be able to optimize its benefit by including local issues in the design. This is essential to cultivate the socioeconomic spillover effects from the improved system. Assistance from multilateral and bilateral donors and philanthropic organizations is also valuable for capacity building for countries. Through this, they can create a platform for policy dialogue and sharing experiences and knowledge.

The white paper, therefore, recommends the following:

- Include urban sanitation and waste management in the urban development policies of countries and comprehensive development plans of cities
- Provide policy guidance for countries to develop urban sanitation and waste management structures
- Identify sources and mechanisms for innovative financing of sanitation and waste management practices
- Engage with stakeholders in the city (city government officials, elected representatives, and civil society) during policy preparation
- Provide capacity building and training for stakeholders during the implementation of effective sanitation and solid waste management practices
- Strengthen existing research and city-to-city networks and collaborate with wider research networks among the Group of 20 countries and beyond on urban planning and implementation of sanitation and waste management practices

Introduction

1. Introduction

In the coming decade, an estimated 120,000 people are expected to move to Asian cities every day, with even more pressing numbers in sub-Saharan Africa, where the populations is expected to double in 2050 (AFD, 2017) .The magnitude of the urban transformation yet to come is such that the world's urban population could double by 2050, from 4 billion urban dwellers as of today (World Bank 2020). The pressure on the delivery of municipal services will grow and while the proper management of urban development is crucial to ensuring an acceptable quality of life and sustainability, the current changes under way call for a review of the provision of essential services such as urban sanitation and waste.

The world over approximately 4.1 billion people lack access to safely managed sanitation services, with acute challenges in East Asia and the Pacific, South Asia, and sub-Saharan Africa. Currently, more than 1.5 billion people in developing Asian countries lack access to improved sanitation, and around 80 percent of wastewater is discharged untreated. Solid waste generation is a byproduct of urbanization, economic development, and population growth. It took over 100 years to develop comprehensive waste treatment processes and policies tailored to the industry and households' consumption needs in European cities. With business as usual, developing countries need to wait until 2120 to move toward a new generation of urban sanitation and waste management services for all.

The consequences of the mismanagement of solid waste are numerous, including water, air, and soil pollution, the generation of greenhouse gas emissions (AfDB, et al. 2019) and impacts on public health. From about 1.3 billion tons of solid waste per year in 2012 ((Hoornweg and Bhada-Tata 2012), the production of waste by cities is expected to reach more than 2.2 billion tons by 2025 and to more than double in lower-income countries in the next 20 years. The annual costs of waste treatment is estimated at $375.5 billion per year by 2025, that is nearly $4 trillion in 1 decade, with an even more severe burden for low-income countries where the waste management sectors are underdeveloped. More than 70 percent of these costs are exclusively from collection and transportation costs. Treatment is mostly made by dumping the waste on uncontrolled and unappropriated dumpsite with disposal costs often below 1 euro per ton.

The urban sanitation and waste management story has more to it, as cities of developed regions are very large emitters of waste, part of it being historically shipped to other less developed regions in the world as part of the global economy. Although the Middle East and North Africa (6 percent), and sub-Saharan Africa (9 percent) produce the least amount of waste as of today, the production of waste in this these regions together with the South Asia region is expected to double or triple by 2050 (Kaza, et al. 2018). In some developing countries, such as Durban city, South Africa, waste management process relies mainly on the landfill airspace. With the economic development, the availability of landfill airspace appears to be diminishing whilst there are alternatives such as waste beneficiation being pursued.

1. Introduction

The sustainable management of solid waste still remains a low-level priority for many cities, particularly when compared with investments in other development sectors and infrastructure investments in transportation, energy, the building and construction industry, etc. The open dumping of waste continues to be the commonly deployed waste management approach, especially in cities in low- and middle-income countries. A large number of these landfill sites do not operate scientifically and receive waste without any pre-treatment, creating dumpsites. According to the Waste Atlas report almost 40 percent of the waste produced in the world is disposed in unappropriated open dumpsites. Most part of the world dumpsites are located in Africa, Latin America, Caribbean and Northern Asian countries, regions that contains about two thirds of the world population. Out of the largest 50 dumpsites in the world, 17 are in Asia and 18 are in Africa. Gaps are serious in waste collection services as well. Except for a few exceptions from high-income countries like Japan, the Republic of Korea, and Singapore, waste collection rates in Asian cities are low, at 44 percent in South Asia, 71 percent in East Asia and the Pacific and 30 percent in Sub Saharan African countries.

The COVID-19 pandemic is like a double edge sword for urban sanitation and waste management (USWM) development in post COVID-19 economic recovery. Poor water infrastructure is a greater risk than the virus, and the lack of efficient sewage management infrastructure can exacerbate the impact of epidemics and pandemics. Therefore, better infrastructure for USWM is mandatory to prepare for future pandemics. On the other hand, governments in developing countries are experiencing budget deficits due to immediate spending for economic resilience during COVID-19. Operators of USWM are also experiencing revenue decline due to low collection of user charges from households (many people lost their jobs) and a decrease in industrial waste volume will lead to a decline of their revenue. Therefore, the budget allocated to the USWM sector has decreased, and this situation is not only an economic and health crisis but can lead to a political and social crisis if it is not tackled appropriately.

The issue of USWM is not simply local or global, it is at the crossroads of local factors and largely globalized supply chains and consumption behaviors:

- Moving away from a linear economy of “take, make, and dispose” to a model of a circular economy is now on top of city agenda networks globally. Yet, the complexity of such a transition is often underestimated. Meanwhile, too little attention is paid to the many weaknesses and the financial fragility of the secondary waste treatment sectors, combined with the sanitation urgency already existing in several countries around the world.
- The key issue addressed in this paper is to delineate a pathway of transformation for the next decade. The coming years are bound to

1. Introduction

be a time of maximum tensions both locally and globally regarding waste management. The acceleration of urbanization and urban demographic growth will take place in emerging countries and further in sub-Saharan Africa and Southeast Asia where the provision of municipal services and waste management infrastructure is lacking the most.

- Achieving sustainable and universal water and sanitation starts by addressing service delivery and this should come first, including a clear understanding of the economic rationale of waste management and corresponding waste recovery markets. Charting integrated cooperation strategies locally and globally through international technical cooperation, addressing fiscal and policy aspects comes second. The Group of 20 (G20) leaders at the Osaka Summit issued the G20 Principles for Quality Infrastructure Investment that could be the backbone of a pragmatic and sustainable approach to deliver on the ambition of urban waste and sanitation for all.

In 2019, the Urban 20 (U20) Tokyo called for cities to divert "at least 70 percent of municipal waste from disposal or incineration by 2030." It also called on the G20 governments to collaborate with cities to "increase resource efficiency and promote circularity" and to "work on legally binding international agreements to reduce the generation of plastic waste, in line with the regulation of the international trade of plastic waste by the Basel Convention." It added a call for cooperation between cities and governments to "promote equality on access to basic social services", mentioning sanitation but not waste.[1] However every solution proposed most take into consideration the local context. The type of waste produce including analyze of the waste composition - the rate of organic waste, rate of recyclable materials and level of water content - the level of technical capacity and financial capacity and the presence or absence of local market for recycled material and organic compost use most be considered before promoting any solid waste management and treatment solution.

The present paper builds on the legacy of U20 Tokyo and the issue of the Principles for Quality Infrastructure Investment from the G20 Osaka Declaration to propose more effective strategies providing facilities and services delivery for sanitation and waste management for all. Conscious of the need to address urban sanitation and waste management issues both concretely and through global policy changes, it looks into (i) the challenges for developing countries in providing sanitation and waste management; (ii) ways to deal with the current situation and its impact; and (iii) lessons learnt from the success stories achieved by some cities in solving their problems.

[1] T20 Tokyo Communiqué.

Local and Global Challenges of Sustainable Urban Sanitation and Waste Management

2. Local and Global Challenges of Sustainable Urban Sanitation and Waste Management

2.1 Impacts of COVID-19 on Urban Sanitation and Waste Management Systems and their Profiling

The COVID-19 pandemic outbreak and the lockdown of many cities across the globe has raised many hopes for a more sustainable future, purposeful sobriety, lower consumption, less waste, etc. However, the demand for better management of sanitation and solid waste is rising in keeping with the growth of economic development has not paused. The confinement has also been much more challenging in low-income cities where informality also plays a key role in the economy, and where waste and sanitation services are also lacking the most.

Building effective infrastructure of sanitation and solid waste management requires substantive financial resources. In developing countries, this coincides with other growth priorities like transportation, manufacturing, etc. The key challenge here is that city governments in developing economies are cash strapped, with the "perfect fiscal storm" linked with the COVID-19 pandemic effects of lower revenues and more spending being aggravated by two factors—the outflow of capital from many emerging and developing countries markets and the pause in many international cooperation and capacity building programs due to travel bans. [2]

While clean sanitation and waste management have been placed as a global target across the United Nations Agenda 2030 and the Sustainable Development Goals (SDG) 10 (Reduced Inequalities), SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production), there is a severe lack of evidence-based research that examines the challenges that developing countries face in providing facilities and services for sanitation and waste management. Even though research shows that the lack of appropriate sanitation and waste management systems can drag an economy down, many countries still consider this issue as secondary compared with economic development.

Furthermore, private investors also consider that investment in the waste management and sanitation sectors is less profitable and fraught with other risks due to the nature of the returns, primarily through user charges (Kelkar and Seetharam 2019). In addition, public–private partnerships, which have failed to deliver on their initial promise of good returns on investments to governments and/or private investors, are often seen in the urban waste and sanitation sectors, especially in low income countries.

Besides, the trend advocating for waste to be a resource and the promises of a circular economy as applied to the waste and sanitation sectors are often contradictory in practice. There are several steps from collection, to storage, to treatment, and transformation in compliance with environmental

[2] Collective action from multilateral and bilateral agencies like the World Bank Group or other organizations like the United Nations, and technical and financial assistance to achieve sanitation targets.

2. Local and Global Challenges of Sustainable Urban Sanitation and Waste Management

standards, before the product of waste treatment (energy or secondary raw materials originating from recycling) can be sold on the market. Both the costs and the knowhow required to manage the whole waste lifecycle and the balance sheet of operating companies have been widely underestimated. Dealing with the many environmental, sustainable and governance (ESG) standards and tightened environmental norms adds to the complexity of sustainable waste and sanitation policies and operations locally. Moreover, failure to take into account the presence/absence of local market in implementing a project also adds to the complexity.

The COVID-19 outbreak has caused major disruptions in global logistics and supply chains, as an illustration of the deep level of interconnection between cities and regions in the world. The pressure of urban development is intensified by rising inequalities within and among cities (UN Habitat 2016), the lack of integrated urban planning, upstream sustainable infrastructure planning (Buchoud, et al. 2019, Head, et al. 2020), the lack of investments, and suboptimal land use (Osuhor and Essien 1978, AfDB, et al. 2019). Plus, transboundary movements of hazardous wastes and their disposal are regulated from the international Bâle convention treaty which reduce the circulation of hazardous between countries (UNEP and Basel Convention, 1989). In that context, and despite the remaining shipping of some types of waste including plastic urban waste, from developed to emerging and developing regions of the world, waste and sanitation issues have largely remained a concern of local governments.

It is essential for public health to ensure the continuity of solid waste management services in a safe and sustainable way, especially in case of sanitary emergency such as the Covid-19 crisis. Not only the situation can disrupt the collection and treatment systems, but also additional wastes caused by the emergency itself may be generated. In this particular period, where many governments have decided to impose a partial or complete lock down to their population, typologies of wastes collected are changing: most of the economic activities are slowed down or completely stopped while domestic waste production is increasing. Ratios of categories of waste to be collected and treated may be significantly modified.

Moreover, management of medical waste including potentially infectious materials, that could potentially spread the virus and increase the gravity of the crisis, is a key element of sanitary crisis management.

The COVID-19 pandemic shows that the situation faced by middle- and low-income countries in sanitation and waste management is also a global problem. In a world of interconnections, the lack of sanitation and proper waste management in a given place can quickly become a regional or even a global problem triggering pathogen transfer and the spread of contagious diseases (Christensen 2010, OECD 2020, Global Urban Health Alliance 2020).

2. Local and Global Challenges of Sustainable Urban Sanitation and Waste Management

In the area of sanitation and waste management, the challenges come from many aspects, such as the lack of appropriate infrastructure, the lack of coordinated legal structures and institutions, the lack of financial support, the poor interest of the local authorities and the lack of citizen engagement and social inclusion. However, there are some opportunities to improve that situation. Quality infrastructure in the sanitation and waste management should be prioritized to improve the productivity and health of citizens. In order to achieve that, the level of technology should be adapted according to local context and the sector governance and financial capability should be improved to insure a long-term sustainability of appropriate solid waste management. The awareness of community should be enhanced. That includes the importance of wash, sanitation, and hygiene (WASH), as well as how to manage the waste without hampering local and regional ecosystems. The following section will discuss several experiences all over the world for urban sanitation and waste management in detail. From that, this paper will analyze the challenges and opportunities in sanitation and waste management.

2.2 Sanitation and Waste Management Stories

2.2.1 Asia Stories

As the most economically dynamic region in the world, contributing more than two-thirds to global growth, Asia kept its growth to 5.2 percent in 2019. Despite the COVID-19 outbreak in the first half of 2020, the Asian economy is expected to grow at the rate of 2.2 percent in 2020, even if forecasts for the second half of 2020 are likely to show a decline in gross domestic product (GDP) and growth of unemployment. However, the COVID-19 pandemic should not affect long-term trends, in particular that of Asia's urban population is expected to grow from more than 1.8 billion people in 2017 to almost 3.0 billion in 2050, increasing the urban share of the population from 46 percent to 64 percent.

India and Indian cities

India is the second most populous country in the world after the People's Republic of China with a projected population growth rate of 1.08 percent for the year 2019. With cities contributing about two-thirds of the economic output, the swelling of the population in the cities is unavoidable.

In India, only 38 percent of urban households were connected to such centralized sewage systems, and only 37 percent of the sewage was actually treated. The rest is discharged into nearby water bodies (CPHEEO, 2016)

It is increasingly becoming evident that only centralized solutions (especially in smaller towns) may not be sufficient to achieve 100 percent sanitation coverage. There is a need for cities to plan for both centralized and decentralized options. While there has been significant focus on centralized sewer network solutions thus far, relatively less attention has been paid to decentralized solutions (especially fecal sludge and septage management) until recently.

2. Local and Global Challenges of Sustainable Urban Sanitation and Waste Management

When it comes to municipal solid waste, the Planning Commission (2014) reveals that 377 million people residing in urban areas generate 62 million tons of municipal solid waste per annum currently and it is projected that by 2031 these urban centers will generate 165 million tons of waste annually and by 2050 it could reach 436 million tons.

In 2016, India's Ministry of Environment, Forest and Climate Change notified the new Solid Waste Management Rules. Under these rules, the responsibility of the management of solid waste was entrusted to urban development departments and urban local bodies that were directed to prepare solid waste management plans.

Sanitation received a lot of focus through two of India's flagship urban missions—the Clean India Mission or Swachh Bharat Mission (SBM) and the Atal Mission for Rejuvenation and Urban Transformation. Refer to the Box 1 for details. These programs have helped augment treatment capacities of wastewater and solid waste. In order to assess levels of cleanliness and active implementation of the SBM, India's Ministry of Housing and Urban Affairs started conducting the "Swachh Survekshan" from 2016—the world's largest nationwide cleanliness survey covering more than 4370 cities. A great impetus has been the competitive process of the Swachh Survekshan. For details read the case study story of Indore city in Appendix.

Installation of Litterbins in Commercial Areas in Indore

Source: Authors

According to the latest Swachh Bharat Mission (SBM) report, 86 percent of the 84,229 wards in the country are engaged in door-to-door collection, while 60 percent of them practice source segregation. This is an appreciable improvement since 2014 (the year of inception of the SBM), wherein waste segregation was practiced in only 41 percent of the wards in the city. The area of concern is the downstream treatment of waste that is collected. Data on the SBM suggest that 51.26 percent of the total 53.1 million metric tons of waste generated is processed. The rest is dumped in dump yards, as there are very few scientifically managed landfill sites in the country. Although this is an improvement from 18 percent in 2014, India is far from its goal envisaged in the SBM.

2. Local and Global Challenges of Sustainable Urban Sanitation and Waste Management

Box A

The Swachh Bharat Mission or the Clean India Campaign

The case of India illustrates that when urban sanitation and waste management are taken up by the highest level of government on a mission mode, with the engagement and participation of people, results can be seen on the ground. The Swachh Bharat Mission (SBM) or the Clean India Campaign, launched in October 2014, was envisaged to eliminate open defecation by 2019, through safe sanitation for all. Since then, sanitation coverage has increased from 39 percent to 93 percent. The other objective of the mission was to achieve the scientific disposal of municipal solid waste in all urban local bodies of India. According to the latest SBM report, 86 percent of the 84,229 wards in the country are engaged in door-to-door collection, while 60 percent of them practice source segregation. This is an appreciable improvement since 2014 (the year of inception of SBM), wherein waste segregation was practiced in only 41 percent wards in the city. The area of concern is the downstream treatment of waste that is collected. Data on the SBM suggest that 51.26 percent of the total 53.1 million metric tonnes of waste generated is processed. The rest is dumped in dump yards as there are very few scientifically managed landfill facilities in the country. Although this is an improvement from 18 percent in 2014, we are far from our goal of the SBM. According to reports on the SBM, India has the capacity to process 258.82 lakh tons (25,882 million tons) and more than 71.6 lakh tonnes (7.16 million tonnes) capacity is under construction. Even if all the waste treatment facilities are utilized, only a part of the goal of the mission will be met. To add to the situation, evidence from the ground reveals that many of the facilities are either nonfunctional or not working to their full capacity. In order to assess levels of cleanliness and active implementation of the SBM, the Ministry of Housing and Urban Affairs started conducting the “Swachh Survekshan” from 2016. It is the world's largest nationwide cleanliness survey covering more than 4370 cities. The objective of the survey is to ensure sustainability of initiatives taken toward garbage free and open defecation free cities. In addition to this, the survey aims to provide credible outcomes that would be validated by third party certification, institutionalize existing systems through online processes, and create awareness among all sections of society. These efforts mark a paradigm shift in approaches toward the management of sanitation, wherein political leadership and people's ownership have helped many cities leapfrog to achieve the cleanliness targets set forth in the mission. A great impetus has been the competitive process of the Swachh Survekshan.

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Box B

The paradigm shift can be summarized as follows:

Conventional Approach	Approach Adopted in Swachh Bharat Mission
Waste is considered as garbage	Waste is considered as a resource
Focus on awareness creation using traditional IEC tools (posters, pamphlets)	Focus on community mobilization using triggering tools leading to behavior change and collective action
Centralized approach with policy promoting collection and tipping of waste	Decentralized waste with policy incentivizing reduction of waste at source
Government seen as "provider of services"	Role of government as "facilitator of improved technology and systems support"
Most waste goes to dumping sites	Around 50 percent of waste safely treated/disposed
Mixed waste at source and collection, limited segregation at aggregation points	Three levels of segregation—at source, during collection, at aggregation point and during treatment
Informal rag-pickers work in silos	Convergence of informal rag-pickers with the government system
Tipping fee goes to collection agents	Tipping fee goes to the urban local body
Financially unsustainable	Moving toward financially self-sustainable approaches

The management of solid waste in India is more of an institutional challenge than technological. As part of the many flagship urban missions that are under implementation, a lot of infrastructure is being built and the focus has shifted to innovative nature-based decentralized solutions, wherever feasible. This has to go hand-in-hand with the sensitization of people by engaging with them and making sure that their voices are heard and their needs are meet, keeping cultural practices in mind.

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Japan and Japanese cities

Japan is one of the most densely populated and urbanized countries in the world with five main islands. Out of which, Honshū is the world's second most populous island and has 80 percent of Japan's population. Japan's population in 2019 was 126.3 million. In 2010, 90.7 percent of Japan's population lived in cities. The capital city, Tokyo, which is on Honshū island, has a population of 13.8 million. The Greater Tokyo Area, the biggest metropolitan area in the world, has a population of 38.14 million.

After 1950, in the period of fast economic growth, the population increased at a very high rate in urban areas, and suburban farmland was turned into residential areas, Japan's municipalities started constructing sewerage systems to improve the environment of residential areas and public waters. The sewerage systems have been in operation for the past 50 years. Currently, the sewerage system covers 80 percent of Japanese households. With the sewerage system, the recycling process now turns sewage sludge into fertilizers. Thus, Japan's polluted rivers of 1970 are now clean rivers, one of the attractive tourist places in Japan.

In the era of rapid economic growth period (1960s to 1970s), Japan faced a rapid increase in waste generation and emergence of pollution. Due to this, the Japanese government made extensive revisions to the Public Cleansing Act in the 64th extraordinary Diet session (commonly known as the Pollution Session) in 1970 and enacted the Waste Management and Public Cleansing Act (Waste Management Act). The laws keep evolving to adapt to Japan's development. Until the present, Japan has one of the most extensive urban sanitation and waste management systems in the world. For details read the case study story of Yokohama city in Appendix.

Truck Discharging Separated Garbage into a Storage Area at a Waste-to Energy Plant in Yokohama, Japan (Rujivanarom, 2017).

2.2.2 Africa Stories

Africa is the third largest continent in terms of surface area and the second most populous continent, after Asia, with more than 1.2 billion people in 2016, or 16.4 percent of the world's population. The Sahara Desert separates the continent and has led to distinct historical developments between north and south is often seen as two different areas. However, the continent faces common challenges. Demographic

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challenges, youth, exclusion and informality of the population, are common to both North and South countries of the continent.

With an urbanization rate expected to exceed 50 percent by 2050, up from 37 percent in 2014 (WPU, 2014), Africa faces opportunities but also considerable challenges as the amount of investment needed to finance the achievement of the needs for the African continent would be between 600 and 1,200 billons of U.S. dollars per year (CNUCED, 2016). Even if over the past decade sub-Saharan Africa region, that concentrates lowest income countries of the continent, has recorded unprecedented real GDP and GDP per capita growth rates (AFD, ASS intervention framework, 2017), still the level of poverty and of informality in the continent stays rather high.

In 2011 about 47 percent of the population in Africa sub-Saharan was still living in extreme poverty (OMD, Proportion de la population disposant de moins de 1,25 USD par jour, 2015) compared to 23 percent for South Asia and 5 percent for Latin America and the Caribbean. At the same time, instability have increased reflecting the rise of political unrest and terrorist acts. In addition, ecosystems and populations are increasingly vulnerable to the impacts of climate change. The sanitation issues and consequent health problems, already present in the continent, will continue to progress with the population growth, the development of megalopolis and of people living in precarious peri urban housing. Adapted essential services as water, energy, transport, education, health and sanitation is part of the major challenges the African country faces. To meet these developments, countries will need to mobilize additional resources (innovative or underdeveloped).

South Africa and Durban city

The eThekwini Municipality (Durban) is a city in the province of KwaZulu-Natal situated within the east coast of South Africa. It is the third largest city in South Africa and is home to the busiest port in the African continent, (DRS, 2017). The city encompasses an area of some 2,297 km2 with a population of approximately 3.7 million people growing at a rate of 1.1 percent per annum that includes urban and rural landscapes. In the context of a large city like Durban, the eThekwini Municipality is contended with multiple challenges such as poverty, unemployment and compounded by other global risks including climate change necessitating the need for “radical change” towards flexibility and resilience for sustainable solutions, (DRS, 2017).

The Cleansing and Solid Waste, DSW, unit which is accountable for the waste management within the eThekwini Metropolitan Area (EMA) is renowned both locally and internationally for an innovative approach to landfill management where waste disposal operations are integrated with landfill rehabilitation during the operational life of the landfill site (Moodley et al., 2011). According to the

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city's integrated waste management plan, the city generates approximately 1.4million tons of general waste per year which is serviced across four (4) general landfills.

Landfill in Aerial Lovu, Durban

Togo and Lomé city

Lomé, the capital of the Republic of Togo, concentrates almost 23 percent of the country's overall population and Is a center of economic attractiveness and offers greater employment prospects than in the rest of the country. The capital concentrates more than 75 percent of industries in Togo and a large part of activities from the tertiary sector which already represented in 2011 more than 42.2 percent of GDP of the country. Lomé face an important rural exodus and a saturated land occupation, that causes, like in most of the cities in developing countries today, urban challenges in order to guarantee access to essential services for the population. In this context, waste management is the subject of local government concerns and constituted in 2015 the most important item of expenditure in the municipal budget (ORVA2D, 2018).

From an institutional point of view, the management of solid urban waste in Lomé has been the responsibility of the City Council since 1921 and It was first insured under self-management. The waste collection was latter. In the 70th delegated to a private company but the municipality financial problems lead to accumulated debts and to the progressive degradation of the service until the breach of the contract in the 90th. Following, a hundred associations developed in informality to meet the demand for waste disposal. This model has led to a deterioration in the cleanliness of the city with the accumulation of wild dumping grounds. In 2006 the city lanch the programe PEUL (Projet d'Environnement Urbain de Lomé). PEUL program aim at the restructuring of the management sector solid waste and strengthening the technical and financial capacities of the municipality of Lomé on an integrated and phased approach to the solid waste sector: after a first phase of sector planning, organization, professionalization and mechanization of pre-collection and collection, the project focused on (i) extending the useful life of the Agoè landfill, which has reached saturation point, and (ii) building the future technical landfill center, with the implementation place of long-term technical assistance to municipal services. The program is supported since by AFD (PEUL I,

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II & III)) and the European Union and West African Development Bank (PEUL II- construction of a landfill –phase 1) . For details read the case study of Togo and Lomé city in Appendix.

Agoé-Nyiévé Dumpsite (Gevalor 2016, Report ORVA2D)

Aképé Sanitary landfill, 1st disposal at the new treatment site Inauguration 28 Jan 2018

2.2.3 European Stories

Most countries across the European Union have managed to build comprehensive household waste management systems. Despite some differences in local geography, population density, demographics, the typology of waste or the energy mix, most governments have taken up this obligation. Europe has been able to develop industrial solutions which are mainly based on local taxation and local public management of waste collection and processing, even when the latter conceded to the private sector. Over time, EU countries have been able to generate significant public investments, but this process has lasted for over a century. In such a context, the new priorities are about waste sorting, reduction of waste, eco-design of manufactured products and to support secondary raw materials markets and the implementation of changing environmental norms. However, cities in emerging and lower-income countries face a much more complex series of challenges. They are especially constrained by the lack of capital and the lack of time to improve capacity-building and high level of pressure linked with urban demographics. We argue that classical forms of city to city cooperation are not sufficient to provide the ground for the dramatic change that is needed to meet rising levels of urbanization across the globe. In order to accelerate the delivery of waste and sanitation solutions for all, new ways to foster know-how and technology transfers through municipal and public agencies cooperation need to be mainstreamed, a process that require convergence between

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multilateral banks, national governments, bilateral aid and inter-city cooperation. In addition, existing multilateral development banks support programs should take into account at a more finer grain (including the socio-economic components of community led initiatives) the long-term timeframe needed to develop waste management systems that work at large scale and provide equal levels of service to all communities. Meanwhile, cities of all regions face common challenges, that is to connect their local waste management systems to regional and global circular loops which are called upon by governments and citizens but remain in practice at an early stage of development.

2.2.4 Russian Federation and Moscow

The Russian Federation is a country with an area of 17,098,246 km², the bulk of the territory of Russia is located in the Asian part. Russia is characterized by a low population density, high differentiation of the population density of the constituent entities of the Russian Federation, with a total population of 146.74 million people at the beginning of 2020. The urban population of Russia is more than 70 percent. The capital of Russia, Moscow, has the highest population density among all Russian regions, with a population of 12.69 million in 2020.

The origin of the system of drainage of atmospheric and domestic wastewater in Moscow dates back to the 14th century, when drainage ditches were laid. At the end of the 19th century, a separate sewage project was developed, in 1898 the Moscow sewage system was put into operation. Since then, the ongoing modernization of treatment facilities in Moscow has been conducted. Currently, the territory of Moscow is fully provided with a sewage system.

In the area of solid waste management, a radical modernization of legislation of waste management of production and consumption was carried out. New institutes have been introduced: environmental collection, regional operators, extended liability of producers (importers) of goods for the disposal of goods and packaging after they lose consumer properties. The taken measures make it possible to increase the volume of waste disposal annually. A ban has been introduced on the burial of certain types of waste, extended the list of goods to disposal, and the standard for waste disposal has been increased.

By 2029, the territorial scheme for waste management in the city of Moscow plans to achieve the following indicators: the share of neutralized municipal solid waste in the total amount of solid municipal waste generated, at least 23.40 percent; the share of utilized municipal solid waste in the total amount of solid municipal waste generated is not less than 27.15 percent.

Russia also applies the global 3R principle at the state level (reduce, reuse, recycling). It is expected to create a system to maximize the involvement

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of waste in production, systematically reduce the amount of waste that cannot be disposed of, and provide the industry with modern high-tech equipment.

Lyubertsy wastewater treatment in Moscow, Russian Federation (Mosvodokanal, 2020)

2.3 Prioritization Problems

Misconception in the perspective of economic development and GDP growth

Sanitation and waste management have been neglected aspects of development in many countries. Improved access to sanitation and waste management by millions of people have often been seen as a result, rather than a cause, of economic growth. That has led many governments to place the responsibility for improved sanitation at the micro level or by individual households. Only a few governments and households identify poor sanitation as an impediment to economic growth.

Research shows that lack of sanitation and waste management can cause loss in GDP. The World Bank (2008) noted that the annual loss of $9 billion from poor sanitation is equal to 2 percent of loss in GDP in Asian countries. Similarly, the World Bank has assessed that the impact of poor solid waste management in Senegal equals to a loss of 1 percent of the country's GDP. The loss mainly related to the impact on tourism and on health. On the other hand, investment on sanitation and solid waste management can improve productivity. WSP-EAP World Bank (2007) suggests that $1 spent on sanitation can result fivefold on productivity in Cambodia, India, Indonesia, and Vietnam.

USWM infrastructure is not taken up as a priority

Planning for USWM infrastructure is not different from other basic infrastructure. To be able to maximize the impact of the infrastructure projects, governments need to formulate medium- and long-term infrastructure plans and translate these plans into prioritized and actionable projects (GIH 2019).

Formulating a USWM plan involves a holistic approach at the city level. There should be a systematic assessment of the infrastructure gaps, identification of critical priorities, and setting of actionable goals. However, Schrecongost, et al. (2020) noted that the data of investment needs, especially for WASH, has been shaped by historical factors and norms, not by verified by actual data. This is exacerbated by poor capacity in the data

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collection system. It caused the priorities and goals to not solve the problem. Worse, investment made in this sector often ends up as an expensive, high technology and non-adapted to the local context project that fails to reach many users, such as people in the poor areas.

In translating the plan into a prioritized and actionable project, USWM should be included in city infrastructure master plans and projects and take into consideration its evolutions over the time. Many policy makers in developing nations believe that USWM does not directly contribute to economic growth and USWM projects need a long time period to be effective, often longer than the political time. Consequently, USWM does not get the priority it deserves.

Some success stories in Asian countries, such as the Republic of Korea and Japan, in prioritizing the investment of sanitation and waste management has had positive impacts on GDP. This experience can shift points of view and perceptions of sanitation investments as an economic generation model as opposed to an economic drain. The Republic of Korea and Japan started to improve sanitation and waste management far before they became high-income countries. The key success of those countries in achieving 100 percent coverage of healthy sanitation facilities has been due to the political will of the government that accorded sanitation and waste management as a priority and created a comprehensive policy framework and ensured its effective implementation. The effective regulatory framework further strengthened efforts in this direction. For details, refer to Appendix 2.

2.4 Governance Complexity across Scales and Jurisdictions

Reconsidering the role of local governments

Apart from financial constraints and the need to manage often complex treatment and recycling technological processes, sustainable waste recovery depends on several other factors, in particular in very large agglomeration systems. Financially viable waste collection and treatment require integrated operations at regional levels, a process that often plays across several different jurisdictions, be it for logistics, recruiting skilled staff, managing regulations, understanding and seizing market opportunities, etc. Stable and accountable decision-making processes and quality metropolitan–regional governance also greatly influence waste management systems and costs.

As for quality, integrated metropolitan–regional governance is yet to be achieved in many parts of the world, experiments of micro-local treatment solutions have multiplied. They often deliver good results, starting with awareness raising and the active prevention of unlawful dumping or trash along public roads or in rivers of considerable quantities of waste. The main challenge for such citizen-led and community-led initiatives and cleaning campaigns is that they have limited quantitative impact on waste production forecasts.

International advocacy and cooperation could become game changers, provided they focus on actions enabling governments and cities to adopt and encourage simple and inexpensive technical solutions.

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In the coming decade, the role of local governments will be critical to move effectively toward sustainable waste management systems. As noted within the targets of SDG 11, they should be responsible for waste collection. Yet, the SDG framework gives very little insight about any detailed roadmap to make that happen in practice and in addition, awareness and prevention are not enough. Sporadic information campaigns will not help to solve problems that go much beyond individual behaviors.

As a consequence, bilateral as well as multilateral financial and development programs tend to repurpose their priorities toward investment support to semi-industrial solutions, which combine affordable costs with technical scaling-up and dissemination potential. Such new strategies could prove effective in the coming 5 to 10 years to tackle the global waste tsunami, although in many cases, there is still a missing link between the micro-local solution and sophisticated industrial installations.

Lack of coordinated legal structures and institutions

According to GIH (2019), one of the key elements of the framework under infrastructure planning is the plan needs to be anchored in a capable and empowered public institution. It needs to occur at all levels of government and cascade among subnational governments.

As a result of the perspective that sanitation is the responsibility of individual households, and the service will get better as the economy of households grows, many countries do not have a comprehensive national policy in place for sanitation and waste management, and no specific institution or unit to handle this issue. Consequently, USWM has not been developed at the local government levels. This is exacerbated by the inability of relevant institutions to prepare USWM plans and feasibility studies. If USWM is not included in the city government plans, it means funding will be less likely.

The responsibility for sanitation and waste management in Asia is fragmented over different agencies, and in most cases the priority given to this sector is low. This observation is also true for the other regions, such as, African, Caribbean or Latin American countries. Some countries have started reforms in this sector. As explained above, the reforms require strong leadership and political will to ensure that organizational structures function as expected.

To make the system work, effective regulatory framework from national to local governments should be in place. That will clearly define the mandate to institutionalize the service chain without overlaps. The regulations also help in establishing targets for each unit and monitor their performance. Nevertheless, countries in Asia like India, the Philippines, Indonesia, and Vietnam,

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Jordan and Uzbekistan and in Africa, such as Senegal and Mozambique among others started to put in place legislation and infrastructure as urbanization grew and sanitation and the volume of waste became the issue in slowing economic growth. The progress needs to be monitored and evaluated over time. Even though some progress has been noted in different levels depending on the country, these developing countries still face the challenge of limited human resources capacity in relevant agencies to execute the plan. Continuous capacity building programs should be designed for this purpose.

2.5 Citizen Engagement and Social Inclusion

Awareness within communities in developing countries about the need to have adequate USWM facilities and services is relatively low. No demand from communities, especially from the poor, for better facilities and services is assumed as the problem not critical to solve. As a result, city governments have not emphasized the development of USWM. Consequently, this condition has caused disappointment in the community who have not supporting the program wholeheartedly.

Public households are the largest category of stakeholder and waste management. Their behavior toward clean sanitation and how to manage waste for a clean environment is crucial. The traditional perspective in developing countries should be changed. Households should be aware of how to prepare their garbage in such a way that it can be collected by operators. For instance, in sub-Saharan African areas the domestic solid waste collected is composed of about 30 percent of dust and sands as a consequence of domestic sweeping activities where sands collected are diverse directly at the bins with the solid waste. Almost a third of the volume of waste collected is in reality inert waste which is increasing unnecessarily collection and treatment cost.

The local authorities are generally aware of the health risks and environmental problems caused by inadequate waste management. However, they often are not successful enough to share their responsibility and concern for this issue with neighborhood communities, small and medium-sized enterprises (SMEs), entrepreneurs, and other stakeholders. Policy makers should realize that the use of secure water sources and sanitation in neighboring districts is likely to affect the use in their own district. Therefore, they need to seek collaboration and mobilize the human and financial sectors to develop adequate systems for USWM.

Inadequate USWM facilities and service in poor areas

This condition may occur when people in poor areas are unable to voice their request especially when facing uninterested politicians, land

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tenure limitations, and technical challenges. This marginalized society often receives substandard facilities and services and the need for improvement of the facilities is often not included in the citywide sanitation and waste management plans. The challenges could also come from the technical and physical constraints, such as the topography of the area, and affordability of the community to pay tariffs to cover the operating cost.

Low willingness to pay

Due to the low awareness and poor quality of the service, some areas might not be willing to pay for the operating costs. That could be because the price is not affordable. For example, in developed countries with advanced wastewater management systems, the operational cost for wastewater is almost as expensive as that for the water. The community may think that paying such a price is worth it for their living standards.

The campaign by Yokohama city in Japan for managing solid waste is one example of an integrated stakeholder awareness campaign. The campaign is known as the Yokohama G30 Plan that is actually the Yokohama Municipal Solid Waste Management Master Plan (2002–2010). The plan aimed for a 30 percent reduction of the volume of generated waste by 2010 compared to the baseline of fiscal year 2001. It is a paradigm shift in thinking among three main stakeholders, including citizens, industries, and the local government from waste management toward sustainable resource circulation and environment-friendly lifestyles to separate almost all of their waste at source in order to achieve the reduce, reuse, recycle (3Rs). The implementation of the G30 plan included both soft (raising 3R awareness of citizens) and hard (infrastructure) components, backed up with extensive monitoring and sanctions.

2.6 The place of the gender in USWM

Women play an important role in waste management for several reasons: within the family unit, where domestic tasks such as cleaning or preparing meals continue to be traditionally theirs, women are the primary producers and waste managers. At the same time, their frequent role as educators with children makes them key players in hygiene awareness and the transmission of good habits.

However, studies show that as soon as collection systems go beyond the family sphere and become formalized, women tend to be ousted from them, or to suffer inequalities: lower hierarchical positions than men, lower wages and social protections. equal responsibility. Measuring the obstacles encountered by women in the field of waste management can make it possible, by proposing appropriate actions, to reduce the inequalities to which they are subject.

It is therefore particularly important during projects to obtain data on the composition of groups differentiated by sex, to inform the needs of each, men or women, and to ensure that the implementation of a project do not come to involuntarily deteriorate their particular situation.

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On Covid-19 crisis, women have also an important role to play against the virus propagation since they are at the forefront of the Covid-19 crisis response in many areas (health, personal care, assistance, trade...), Within the household, their role regarding domestic chores (care for the sick, hygiene, waste disposal) usually leads them to handle potentially infectious waste produced by their family and closed ones. They are naturally on of the target of the awareness campaigns on the protection measures against the virus dispersion and on the contaminated waste management. As for their role in the economy, many works in the informal waste management sector in Africa and in Latina America but also in serval Asian countries. They collect potentially infectious waste, either on the streets or on the landfills as informal recyclers. In many countries, women are in charge of hygiene and cleaning tasks, and it is estimated that cleaners in businesses, shops but also in hospitals are mainly women. These activities expose them all the more to the risk of contamination by the coronavirus.

It is therefore essential that women benefit from specific awareness-raising actions (good practices, hygiene, new procedures, etc.) and from suitable individual hygiene and protective equipment (adapted size) both in the formal or informal sector. Once the crisis is over, it will also be essential to consider social support initiatives for women involved in the waste management sector to mitigate the economic impact of the crisis, which should affect vulnerable populations even more (AFD, 2020).

2.7 Investment Gaps

Lack of realism

Contrary to common belief, waste management does not pay for itself and recycling is a cost. There are countless illustrations of the fragilities of secondary markets linked with waste treatment and recycling. Within the Greater Paris area, the sale of products resulting from waste recovery barely accounts for 17 percent of the budget of the public company in charge of managing metropolitan household waste, out of a budget of €750 million per annum (SYCTOM 2020). The 3Rs motto will only have a significant impact in reducing the amount of waste at a large scale, provided there is a market for it. Advocacy is necessary but not sufficient and cities should be realistic about the need to devote similar efforts to building up an entirely new economic sector.

Lack of institutional capacities

The Sustainable Development Goals have been accepted by countries positively. Especially SDG 6 on clean water and sanitation, high responses are indicated by countries by setting their national plans to achieve the SDG targets.

Data on national budgets show that expenditure for water, sanitation, and hygiene (WASH) increased by 4.9 percent every year (UN-Water GLAAS 2017). However, the report also shows that 80 percent of countries cannot meet the financing needs in their WASH sector.

With limited public financing availability, investment in the WASH sector struggles to meet

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pro-poor results. The report of the World Bank Group (2017) shows that 40 percent of projects between 2007 and 2016 had significant high-outcome risks due to the lack of financial viability or institutional capability. An Asian Development Bank report also found that seven out of 63 evaluated projects in a similar time frame included on site components and the poor were low priority in most projects (ADB 2018).

The problem of the financing gap in the WASH sector is not only because huge investment amounts are needed in this area and the lack of private financing, but also the lack of institutional capacity (governance). Governments fail to identify urban sanitation needs in low-income countries, and the intervention and investment in the WASH sectors are decided without appropriate data collection support. Therefore, the investment to this sector ends up being spent on expensive projects. Furthermore, the private sector considers this sector is not profitable enough. The infrastructure, such as sewers and wastewater treatment, are accessible only to the rich with the consideration that recover operations and basic maintenance coming from household tariffs.

There are two ways to help countries fulfill their target for WASH: through private financing and progressive technology innovation.

Low level of private financing

The most commonly accepted solution for urban sanitation is piped sewerage with centralized wastewater treatment such as citywide fecal sludge management, and incineration plants for solid waste management. Building this type of infrastructure will need expensive investment, and it will not be enough if it is covered by public financing only. On the other hand, investment in waste management is categorized as low return by the private sector since the return is expected from user charges or household tariffs.

A new way to compensate investors should be designed. Yoshino, et al. (2019) argue that financing for water infrastructure, including sanitation and waste management, can be done through private investors using spillover tax revenues. This concept was proposed for infrastructure projects that have explicit impact to the economy, such as, roads, transportation, and railways. With some adjustment in measuring the impact of the infrastructure project, this model can be applied to sanitation and waste management.

Robbins, Ram, and Renzhi (2019) suggest that with better sanitation and waste management, property values and tax revenues will increase in line as the environmental health of a city improves over time. Some potential benefits that will improve are: (i) tourism as the water quality of bays, beaches, and rivers improve; (ii) fisheries as less pollution will provide more livelihood opportunities; (iii) workers' improved health leading to improved productivity; and (iv) overall economic development.

Opportunities and Drivers for Sustainable Urban Sanitation and Waste Management

3. Opportunities and Drivers for Sustainable Urban Sanitation and Waste Management

3.1 Political Economy and the COVID-19 Outbreak

The rapid spread of COVID-19 in many countries constitutes a major challenge to health systems. The World Health Organization (WHO) coordinates the global efforts to manage the impacts and it declared COVID-19 a global pandemic on 11 March 2020. The scale of the impacts is unprecedented, and studies have suggested that it might take more than 1 decade for the world to recover societally and economically and might significantly compromise the progress of the Sustainable Development Agenda 2030.

Many countries conduct national campaigns to reduce the risk of their citizens from infection. Lockdowns, emergency measures, physical distancing, and sanitizing hands are some of the actions. People are aware that clean water is important to keep hands healthy (Seetha Ram and Shrestha 2020).

The massive COVID-19 campaign eventually will raise awareness of all stakeholders about the importance to have access to clean water, and the urgency to process waste, especially medical waste, with special care. The COVID-19 pandemic shows that human society is capable of making a rapid transition to adapt in the unprecedented situation. Rapid improvement in technology, innovation for cleaning products, and many service industries found new ways to serve their customers. This momentum can be used by municipalities for a stronger political buy and support from stakeholders in allocating more resources to USWM.

The continuity of the USWM during this crises period is mandatory to prevent the virus to spread even more. If solid waste is not properly treated, serious risks for health are to be feared, affecting more the population already impacted by the crisis. Proper management of medical waste produced during the Covid-19 pandemic, either by health institutions, health professionals, or possibly infected people staying home must be clearly defined, planned and implemented, and target populations must be sensitized.

Professionals involved in waste collection and treatment are particularly exposed to the covid-19 with a higher risk of contracting and spreading the virus. They need to be aware of the risks and protected, to apply good practices and use appropriate equipment. In this context, developing countries are more vulnerable as their solid waste management framework often lacks structure and resources, and does not include specific measures for medical waste management.

To guarantee continuity of solid waste collection and treatment services, and secure healthy and safe working conditions for formals and Informal workers, service continuity plans should be developed and waste management protocol and action plans in case of contamination must be formalized along with specific awareness and communication campaigns.

3. Opportunities and Drivers for Sustainable Urban Sanitation and Waste Management

3.2 Ecosystems Approach

Climate change and resilience

Substantial waste generated by cities increases greenhouse gas emissions that increase global temperatures. According to the fifth assessment report of IPCC, the heating power of the methane, gas produced from organic waste fermentation and the second source of GHGs emitted into the atmosphere, is 28 times higher than the carbon dioxide. Worldwide, waste is considered to be responsible for almost 5 percent of the 35.8 billion tons of carbon dioxide equivalent emitted in 2016 (I4CE (2019), and these emissions should reach 2.6 billion by 2050. The sector emissions remain mainly linked to their disposal in open dumps without a gas recovery system. According to R.Couth, C.Trois & S.Vaughan-Jones, in Africa, waste disposal accounted for 8.1 percent of total GHG emissions, which is considerably higher than the global average of 3 percent of GHG emissions from landfills. Adequate waste management achieves a level of avoided emissions that can compensates for the level of direct emissions.

Plastic pollution is also a critical issue when most plastics go into the drainage systems, rivers, and eventually into oceans. The increase in temperature causes the sea-level rise, erratic rainfall, and more extreme weather that can cause extraordinary drought and flood. Inadequate waste management now is not only a local concern that can make the local citizens unhealthy and cause local problems such as floods due to blocked drains from significant volumes of waste. The issue has shifted toward a global concern and become a political issue. Therefore, it is strategically effective to bring USWM issue together with climate change in the global agenda, emphasizing the importance for citizens to be resilient or hindered from natural disaster.

Catalyzing local climate change issue to reform the waste management process in South Africa has been well-progressed in reducing the short-lived climate pollutants (SLCPs), such methane. The city of Durban has linked sustainable good practices with community beneficiation and ecological restoration. Landfills sites are now managed as conservation sites using local community to eradicate alien invasive vegetation and plant out indigenous plants through reforestation for carbon sequestration. The co-benefits of the project include stronger community engagement and social capital (as the surrounding community is earning a living and improving their economic situation), environmental benefits (through the reintroduction of coastal forests which would otherwise be under threat from farming), and economic development (energy use and sale, local jobs).

Nature-based solutions (NBS)

The impacts of mismanaged urban waste and sanitation systems on local ecosystems can be dramatic and contribute to create hazardous livelihoods. NBS to tackle sanitation challenges mean developing solutions inspired and supported by nature and use, or mimic, natural processes

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to contribute to the improved management of water. NBS can be applied at micro and macro levels in the USWM chain. Moving from small scale or lab experiments to real life transformations with quantitative impacts will require creating an enabling environment for change, including suitable legal and regulatory frameworks, appropriate financing mechanisms, and social acceptance. The potential of nature-based solutions to manage waste remains largely untapped.

3.3 Cross-sectoral Innovation

Government intervention for technology innovation

Technology can enable the development of low-cost, scalable solutions—for example, to deliver physical facilities for sanitation and waste management by collecting the desired data and mapping the data to identify areas that are most vulnerable and lack access to the facilities. Nevertheless, it requires governments to engage with the market structure without excluding or reducing the role of the private sector. There are three aspects that city governments need to consider allowing effective and efficient technology to be applied in sanitation and waste management.

Innovation in government policies and governance

The development of technology alone for sanitation and waste management infrastructure is not sufficient to achieve the creation of fully functioning markets. It must be complemented by an enabling ecosystem that includes an appropriate level of regulation, while at the same time a competitive environment must be maintained by allowing new entries into the market. Authorities need to consider an evolving range of diverse technology and business models to generate service improvements.

The governance of household waste management in the Greater Paris metropolitan area illustrates the complementarity between local and national action. At the metropolitan scale, the priorities are the improvement of the link between waste collection and the recycling sector and help strengthen corresponding industries. Another priority is to work upstream toward the reduction of waste production.

In order to achieve those metropolitan goals, public procurement and responsible purchasing strategies are key, along with support for eco-design companies. Such normative issues can only be dealt in coordination with national legal transformations.

The legislator and local public authorities are committed to these policies and the objectives are set. The major challenge is to develop waste management services in an environmentally and economically sustainable way for local governments, which bear the costs.

Taxpayers also play an important role, as waste management largely depends on a consistent local tax system. Beyond finance, citizens' engagement is needed to secure the implementation of

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societal changes. As an illustration, the Greater Paris Metropolitan Authority plans for a separate collection and treatment of organic waste by 2023, the success of which largely depends on citizens' support and awareness.

Connectivity between waste management and urban planning and the design and the integration of waste management in city infrastructure are interesting ways to fully include waste management issues in city life.

Plant owned by Syctom, the Greater Paris metropolitan waste treatment agency

New Generation of Waste Treatment

Innovation in financing

The main challenge in infrastructure financing is that investors would not tolerate the low rates of return and the high-risk nature of a project itself due to the uncertainty of the long lifecycle of construction and low user charges. Innovative financing to attract private investment should be explored. Issuing revenue bonds is one way to guarantee minimum returns and will encourage investors to develop the region alongside the infrastructure, which will increase their rates of return by increased tax revenues created by the infrastructure investment. The concept of city infrastructure where the government creates comprehensive planning in the development and creates incentives for businesses to be well-developed in an area should be considered.

Similar to the principle in quality infrastructure investment, the infrastructure for sanitation and waste management will bring beneficial effects to various aspects of economies. For example, tourism will develop in clean and healthy environments. This will promote new businesses that will create more jobs and improve incomes of citizens. In return, better economic performance of firms and higher incomes of citizens would raise tax revenues. If we could quantify those positive effects, especially the increase in tax revenues, we will be able to propose a new compensation design for investors and attract more participation in sanitation development.

The quantification method of spillover effects for infrastructure projects has been estimated in previous studies. Applying the difference-in-difference (DID) method, Yoshino and Abidhadjaev (2017a) reveal spillover effects on the GDP and value added of a railway project in Uzbekistan. Furthermore, Yoshino and Abidhadjaev (2017b)

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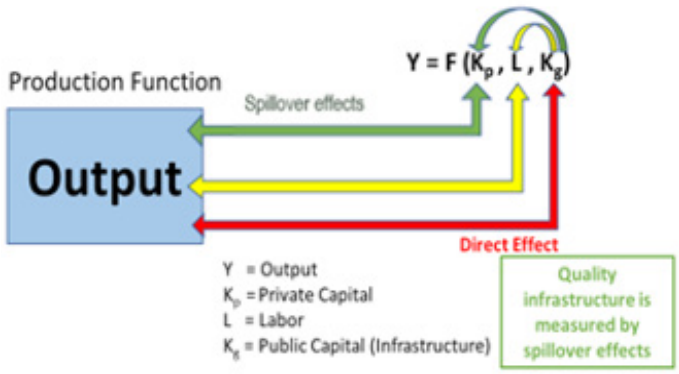
show the role of high-speed rail on stimulating tax revenues in Japan, in terms of not only personal and corporate income taxes, but also property and sales taxes. The DID method is particularly useful in capturing spillover effects of infrastructure that can be applied to the infrastructure in sanitation and waste management as well.

The DID method of spillover effects. There are two effects in infrastructure development: direct and indirect. Direct effect means when private firms can increase outputs without changing inputs, while indirect effects occur when private firms want to further increase output by changing the amount of inputs in order to maximize profits. This indirect effect reflects the benefits of infrastructure investment for the economic activities of private firms, which consequently increases capital inputs and employment resulting from infrastructure investment. The indirect effect is assumed to be equal with the spillover effects.



Direct Effect and Spillover Effects

This spillover effect could be described by the increase of regional GDP (Y), which is affected by the change of regional development created by infrastructure investment (Kg). The increase in regional development (Kg) will drive new business opportunities (Kp) and create new employment (L).

Technology innovation

Appropriate technology plays a crucial role for every sanitation and waste management system. Economic consideration is also a decisive factor for the success of the system. Countries should explore more technology options and choose the one that is most affordable and acceptable for their cities. For example, the most commonly accepted solution for urban sanitation is piped sewerage with centralized wastewater treatment. However, this system is relatively expensive, especially for low- and middle-income countries. Also, not every urban dweller has access to running water, which is required to make the sewer system works.

Similar to sanitation, solid waste management also needs to be localized with the local needs. They should be tailor-made for the specific situation of the city. Collection, transportation, and treatment of solid waste should be done with efficient technology and the processing methods of waste, such as landfilling or incineration, should consider environmental and safety aspects.

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The concept of citywide inclusive sanitation suggests that cities should include all residents in the affected areas to be involved in making the decision for technology choice. They need to be well-informed about the system feasibility considerations, such as financial, environmental, political, organizational capacity, cultural, and other factors (Schrecongost, et al. 2020). This concept also emphasizes that sanitation and waste management should be organized as a public service.

Trust fund for USWM

In some developing countries, sources of financing are varied, however, not sustainable. Lack of coordination and lack of capacity of human resources to manage the fund are some of the problems. Creating the platform for the pooling fund oversight by a city government can be a solution. The trust fund institution should be independent and operated by professionals with good corporate governance implementation. The institution can also help to avoid overlapping in the allocation of the fund and the continuity of the funding to USWM facilities. The sources of funding could be from national and local government, private sectors, NGOs, or even individuals who paying for the services they receive for the facilities.

Innovation in technology

Breakthrough technologies are rapidly transforming the way infrastructure is built and operated, reshaping the way the infrastructure industry operates, and bring major implications for every participant in the value chain. The development of technology can also be applied in sanitation and waste management.

There is inequality of technology adaptation among countries. Developing countries are mostly in the lower stage of technology knowledge. Besides the technology itself is considered as relatively expensive for low income countries, limited human resources who are fully trained are also very limited. Therefore, learning from the experiences of other cities will be beneficial for technology transfer. A growing number of capacity building organizations, technical assistance, and academic institutions should be mobilized to do this.

Reviewing opportunities in international cooperation

Foreign donor programs have been major contributors to the development of USWM in developing countries. These include the water, sanitation and hygiene (WASH) sector in Asia, and the Citywide Inclusive Sanitation initiative from the World Bank in collaboration with the philanthropic organization, the Bill & Melinda Gates Foundation. The Asian Development Bank also provided grants, loans, and technical assistance for countries in Asia and the Pacific to improve facilities and services toward USWM.

French Development Agency (AFD) also provide financial support and technical assistance in Asia, Africa, Caribbean, Latin America and Middle orient

[3] Middle Orient countries: All Arabic spoken countries from north Africa (Morocco, Algeria, Tunisia, Libya, and Egypt) and from Asia (including Iraq Syria, Jordan, Palestina, Gaza strip, Libyan, ...)

3. Opportunities and Drivers for Sustainable Urban Sanitation and Waste Management

countries.[3] In Asia AFD is currently supporting the city of Shaoyang (China) with the development of a waste methanation process. In Samarkand (Uzbekistan) AFD and the European Union are supporting the improvement of the USWM of the city. The project includes improving all the chain of the waste management from collection, recycling activities, disposal and to waste-to-energy by the production of bio carburant from organic waste biogas. The project also includes a strong technical assistance support, training to the local stakeholders and public awareness and communication campaigns.

Kelkar and Seetha Ram (2019) point out that the reform of sanitation in Malaysia reaches rural areas. The improvement was because of the leadership at senior levels to prioritize this issue. That was actively pursued by the government through donor aid.

Understanding the wider impact of aid, countries should be able to optimize its benefit by including local issues in the design. This is essential to cultivate the socioeconomic spillover effects from the improved systems. Clarke, Feeny, and Donnelly (2014) argued that many USWM projects emphasize the direct benefits from the intervention. Very few studies have documented the long-term benefits in terms of health, improved productivity due to increased health, and business opportunities.

Furthermore, donors and philanthropic assistance is also valuable for capacity building and training programs for countries, and from that, they can create a platform for policy dialogue and sharing experiences among countries. This policy dialogue is not only useful for a pragmatic approach for countries to develop their system, but also a forum to exchange knowledge and share ideas for new innovations. For example, the Bill & Melinda Gates Foundation provides capacity building and training programs through the Asian Development Bank Institute by creating a platform for non-sewered sanitation and fecal sludge management to make cities more livable and to promote urban development (ADBI 2020).

The role of civil society in supporting sustainable USWM is crucial to mobilize community participation and voice local concern. Social workers from civil society can take the lead in forming community participation and management. In rural areas, community management is more common and effective for social intermediation including awareness raising, user groups, health education, hygiene promotion, and consumer education.

Recommendations

Recommendations

Recommendation 1: Create a universal right of access to essential services starting with sanitation and waste management.

This right is the operationalization of the recommendation from U20 Tokyo calling for the G20 to collaborate with cities to "Promote equality in economic opportunity, access to basic social services and political participation" and to "Ensure equal access, to quality basic services, (...) and improve financial frameworks for local governments to adequately fund basic public services."

This right is a realistic approach to the development of urban waste and sanitation systems. Indeed, waste management is a cost that can hardly be compensated by revenues from waste recovery and recycling, a market that is not profitable and depends on subsidies and constantly evolving regulations and many external factors such as consumers' behavioral change and production systems change.

A right of access to sanitation and waste services would open new cooperation opportunities among local governments and their agencies across the globe. It would create a legal background to support and stabilize the development of waste treatment secondary markets, especially in regions with a strong informal sector.

Recommendation 2: Include USWM in the urban development policies of countries and comprehensive development plans of cities.

Effective policy and institutional frameworks for USWM are an essential step to support sustainable development in developing countries. USWM requires soft (public campaign) and physical approach (infrastructure). Rather than a traditional project-by-project approach, USWM requires more comprehensive planning early in the development planning process. This should be carried out in ways that consider the services and facilities to benefit all citizens including marginalized people. In addition, the USWM program should also embrace natural capital and fully account for the social and environmental impacts of projects and gender equity. A precautionary approach is needed that seeks to avoid impacts on natural capital and the services it provides. This is important to note that in order to maximize the positive spillover effects of improved USWM, a clean environment will encourage tourism in the area, which will improve the economy in the region.

A citywide inclusive sanitation concept suggests that cities need to develop comprehensive approaches to sanitation improvement that encompass long-term planning, including long-term land use strategies, technical innovation, institutional reforms, and financial mobilization.

Recommendations

In order to achieve that, all stakeholders need to demonstrate political will, technical and managerial leadership, and encourage innovations and innovative financing for this sector.

Recommendation 3: Create policy guidance for countries to develop urban sanitation and waste management.

Access to clean water, sanitation, and hygiene plays a critical role in promoting productivity and inclusive growth for countries. Despite remarkable progress in supporting WASH to be included in urban development agendas, large segments of the population remain excluded from clean sanitation and improved waste management.

As explained in the previous section, developments in sanitation are accorded low priority in some countries due to the lack of data, political will, financial sustainability and regulatory framerwork. So, there is no clear center of responsibility in tackling this issue. Therefore, national and city-level data for performance indicator systems and mechanisms to monitor the progress, will allow authorities to plan and improve city-level systems based on actual performance.

Furthermore, in developing financial incentives to private investors to finance USWM infrastructure based on spillover tax revenues, cities need to develop variables based on the value to the city. That could be done through interview platforms or local databases. With an accountable estimation of the expected rates of return for the investment for USWM infrastructure, city governments can persuade prominent beneficiaries, such as resorts, restaurants, and other business partners to pay higher user charges to cover the costs.

A toolkit or guidelines will simplify the process for city officials and policy makers in setting up an effective framework for sanitation and waste management systems. The guidelines should include those three aspects mentioned in the previous section: prioritization and effective regulation, financing, and technology access, especially for data collection.

Recommendation 4: Identify sources and mechanisms of innovative financing for sanitation and waste management.

A USWM plan should have viable financial plans. Investment for USWM infrastructure can be supported by central government financing and private sector involvement, and operations can be covered by user charges managed by the local government and operated in a special budget line dedicated to USWM. The maintenance and operation cost of the facilities should not rely on local or national budgets, but it should be generated from the user charge and integrated in the global cost of each equipment or infrastructure of the system. All the costs and expected revenue should be reflected in the holistic USWM plan.

As part of the general push toward the circular economy, emphasis has been given to recycling the end products coming out of the treatment

Recommendations

plants of human waste such as fertilizers or treated water; and solid waste such as recyclable papers or plastic products. However, many private businesses report difficulties in monetizing these products mainly because of the variability in the quality and their inability to stock these items, handle the imbalance in demand and the supply of such produce, and their direct relation to the prices of the primary material. For instance, the course of petroleum influences directly the rate of the recycled plastics.

The concept of involving private sector financing by compensating them with a proportion of the spillover tax revenues can be an innovative solution for financing (Yoshino, et al. 2019). This concept will create less burden to the national and city government budgets. The involvement of the private sector could be in the area of building the physical infrastructure facilities and/or providing regular services, such as the removal of fecal sludge, the collection of solid waste, or operating the waste treatment infrastructure. They can receive returns from the user charges and returns from the increase of economic activities in the area.

In order to attract private finance into USWM infrastructure investment, city governments should prepare appropriate regulations and a sustainable financial budget dedicated to USWM to ensure that the private sector can attain the expected rates of return in the future. That includes the parameters to measure the impact made by the projects in the area.

Recommendation 5: Engage with stakeholders in the city (city government officials, elected representatives, and civil society) during policy preparation.

Achieving clean water and a clean environment through improved sanitation and waste management facilities is one way to achieve a nature-based solution for urbanization. Regulators rarely recognize USWM as a means to achieve nature-based solutions for livable cities, hence put USWM at a lower priority in the development efforts. The lack of awareness and communication between stakeholders, technical guidance, and resources, as well as robust assessments of existing conditions of USWM hinder the adoption of this concept in policies.

Especially with the current COVID-19 situation, awareness of stakeholders and the community about sanitation and waste management is important. Leaving waste in open areas can trigger the spread of contagious germs. Operating procedures for special treatment of waste such as medical waste, should be put in place and well-understood by the community and associated workers and helpers.

Furthermore, stakeholders should be aware that services to the poor need to be included in the citywide sanitation and waste management plan. Poor people are usually the most vulnerable, especially during a contagious disease outbreak, due to the low quality of sanitary conditions

Recommendations

as waste is not properly managed. Therefore, including the poor in the holistic plan will enable city governments to improve the facilities in the area and provide financial support for households to connect to waste water or solid waste networks.

Gender issues should also be part of the Citywide sanitation and waste management plan. Women have an important role to play against the virus propagation since they are at the forefront of the Covid-19 crisis response in many areas, both in formal and informal sector (health, personal care, assistance, trade...), They should benefit from specific awareness-raising actions (good practices, hygiene, new procedures, etc.) and from suitable individual hygiene and protective equipment.

Recommendation 6: Provide capacity building and training for stakeholders during implementation of effective sanitation and solid waste management practices.

Improved sanitation and waste management will need strong institutional and human resources capacity. This requires managerial capacity, institutional structure, and accountability in both national and local agencies. In the national level, countries need to form authorities to plan sanitation and waste management and support local governments financially to provide the infrastructure. Local-level agencies such as municipalities involved in the operation and management of the facilities, service delivery, monitoring, and setting-up of tariffs, should have the capacity to conduct the work effectively.

To achieve the required capacity development, government officials should receive specific capacity building and training in sanitation and waste management. Familiarity with technology and the ability to appreciate the value of sophisticated and complex engineering systems are essential, as well as the ability for institutions to develop policies and values that promote the common good and the ability to plan, execute, maintain, and evaluate projects and programs. The capacity building and training programs for developing countries from international organizations, development partners, and philanthropists should be encouraged to promote government officials' capacity in this area. An example is the Asian Development Bank Institute (ADBI) and the Bill & Melinda Gates Foundation program to promote policy guidance and training to help government officials and development partners promote investment in accessible, affordable, contamination-free citywide inclusive sanitation services. Through policy dialogue, policy makers will gain such knowledge to adopt innovative solutions in sanitation and waste management.

Recommendations

Recommendation 7: Strengthen existing research and city-to-city networks and collaborate with wider research networks among the G20 countries and beyond on urban planning and implementation of sanitation and waste management practices adapted to each context and level of development of the country.

Achieving the Sustainable Development Goal in Clean Water and Sanitation will involve an interlinked chain of complex factors, actions, and objectives. Therefore, sharing experiences and knowledge among research networks, practitioners, and policy makers will accelerate the knowledge and technology transfer in USWM. Building dialogue among the G20 member countries about research findings and strategies to tackle challenges in USWM will be beneficial. Such dialogue will nurture the creation of new knowledge and new solutions in USWM.

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Appendices

Case Study: Indore City in India

Indore City is in the state of Madhya Pradesh, India. The population is about 27,500,000 people. The city generates 980 metric tons (MT) of waste per day. Solid waste management in Indore comes under the purview of the Indore Municipal Corporation. All the waste is collected from the source, whether it is a household or a commercial establishment. The total wet waste generation is 510 MT per day and dry waste generation is 467 MT per day. The households are covered by the door-to-door collection system, while the semi-bulk and bulk generators are covered by the bulk collection system. Staff from the Indore Municipal Corporation carry out sweeping twice a day in all the commercial areas of the city and an activity log for sweeping is tracked by the sanitary inspectors and also through the command and control centers established in the city for monitoring. The city has an integrated waste processing facility where wet and dry waste is treated. The city has managed to treat all its waste and only about 5 percent to 10 percent of the total waste generated goes to a scientifically engineered landfill site. This waste comprises that which cannot be treated or recycled or is inert in nature. The total number of personnel involved in the SWM of the city is 7,000 persons.

Case Study: Yokohama City in Japan

Yokohama City is the second largest city in Japan with a population of 3.7 million and 1.6 million households and with 0.95 metric tons waste generated per day in 2008. The city's solid waste management has evolved from landfilling in 1940 to incineration and an establishment of sound-material cycle society based on the 3Rs in 2000. All waste is collected from 66,000 collection points. Yokohama has incineration plants in four areas: Tsurumi, Asahi, Kanazawa, and Tsuzuki; and landfill facilities at the Shinmeidai Disposal Site and the Minami-Honmoku Final Disposal Site. The city uses thermal energy for electric power supply for incineration and adjacent facilities. In 2003, the city created the Yokohama G30 Plan with the aim to realize a "sound material-cycle society" by citizens, companies, and governments to work together to reduce the consumption of non-recyclable products, and also save the environment from further damage. The G30 plan has a significant positive impact toward the volume of waste where two incineration plants in Sakae and Konan were closed down and one in Hodogaya was suspended due to a significant reduction in the amount of garbage. The campaign was continued in 2010 when the city created the Yokohama 3R Dream Plan. The 3R plan has a motto of "reduce, reuse, and recycle" and encourages people to reduce garbage itself, use any goods for a longer term, and separate and use articles as recyclable materials.

Case Study: The case of Lomé, Togo

The programe PEUL (Projet d'Environnement Urbain de Lomé) aim at the restructuring of the management sector solid waste and strengthening the technical and financial capacities of the municipality of Lomé. These projects are an example of the implementation of an integrated and phased approach to the solid waste sector: after a first phase of sector planning, organization, professionalization and mechanization of pre-collection and collection, the project focused on (i) extending the useful life of the Agoè landfill, which has reached saturation point, and (ii) building the future technical landfill center, with the implementation place of long-term technical assistance to municipal services.

Among the accompanying measures of the municipality, the sustainability of the changes at work was notably guaranteed by a program to improve the management of local finances, to reinforce the technical capacities of project management (training, equipment, technical assistance) and support for the implementation of the municipal planning and urban management policy. Mainly present in the pre-collection segment, the informal sector has been taken into account through the professionalization of their activity: transformed into micro-enterprises, the pre-collection associations now sign contracts with households and with the municipality of Lomé which collects part of the fees paid by users to these microenterprises. They are supported in this process by a microfinance activity implemented as part of the project. The restructuring of the entire industry in Lomé took more than a decade, revealing the need (and at the same time the challenge) to reason in the long term for this public service, despite the calendar deadlines local authorities who are often short-term. The program is now developing Its phase 3 and 4 concerning the reabilitation of the old agué dumpsite and the construction of the next 5-years future cells, covering the operation period from 5 to 10 years of the new landfill and biogas treatment.

Lomé face an Important upgrading at its USWM du to the continuous support over a long period. Waste treatment in Lomé is essentially conditioned by the structural modification of the landfill and its impact on the entire sector even if composting Initiatives are present and presents some Interesting results (ORVA2D). The Increase of the service has direct Impact on the service management costs which is today the main challenge facing the municipality of Lomé. To do this, the current dynamic essentially relates to the levers for increasing service revenues in order to cover most of the expenses. Recycling waste and diverting it from the conventional system could also a way to reduce the costs of the sector provided that recycling initiatives meet the local market.

Case Study: Reform of USWM in Moscow, Russian Federation

Modernization of treatment facilities in Moscow

Even though currently the territory of Moscow is fully provided with a sewage system, the city still has a challenge to bring in private investors to develop more sewage system considering the area of Moscow is increasing.

Moscow has large wastewater treatment, the Kuryanovsky treatment facilities - with a capacity of 2.2 million m3/day and the Lyubertsy treatment facilities - with a capacity of 3 million m3/day. Treatment facilities are being reconstructed. Modern technologies, as a multi-stage system of mechanical and biological treatment, biogenic element removal unit for deep nitrogen and phosphorus removal, and UV disinfection facilities operate at the treatment facilities. Existing treatment facilities accept 100 percent of the generated wastewater.

The Volga Health Improvement project, which is included in the Ecology national project, is being implemented at the state level, which aims to reduce the proportion of polluted wastewater entering water bodies by 3 times. The project involves the subjects of Russia, in whose territory the drainage basin of the Volga River is located. All entities involved in modernizing and constructing treatment facilities projects.

Solid Waste management of Moscow

A radical modernization of legislation in the field of waste management of production and consumption was carried out. New institutes have been introduced: environmental collection, regional operators, extended liability of producers (importers) of goods for the disposal of goods and packaging after they lose consumer properties. The taken measures make it possible to increase the volume of waste disposal annually. A ban has been introduced on the burial of certain types of waste, extended the list of goods to disposal, and the standard for waste disposal has been increased.

(continued)

Case Study: Reform of USWM in Moscow, Russian Federation

In 2018, 93 plants for the disposal and neutralization of production waste (excluding waste recycling and incineration plants, etc.) were commissioned in Russia. In order to improve the quality of the environment in Russia, the national project "Ecology" is being implemented, in period from 2018 to 2024. It contains 3 federal projects aimed at improving the efficiency of waste management: “Integrated system for solid municipal waste management”, “Infrastructure for waste management of I-II hazard classes”, “Clean country”.

The implementation of the Clean Country project is aimed at eliminating unauthorized landfills and the most dangerous objects of accumulated environmental damage. An important task is also to restore 3,703.40 ha of land subject to the negative effects of accumulated environmental damage. There are also 2 waste incineration plants in the capital equipped with a modern multi-stage gas cleaning system.

The city government of Tokyo has initiated several efforts in involving private sectors, such as the development of public-private partnership in Moscow has been piloting the experiment on the implementation of a comprehensive method for managing waste generated in apartment buildings. Operators providing comprehensive waste management services serve 6.9 million people and ensure the removal of 2.5 million tons of solid waste per year. Furthermore, environmental education and public awareness on the acquisition of separate waste collection skills have been conducted to individuals and large-scale events. The efforts are provided by state-owned enterprises, as well as public organizations and volunteers

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