

## Editorial comment

### **Envisioned futures of the waste industry in developing economies**

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#### **Abstract**

This commentary explores future imaginaries and opportunities to make positive changes to the waste industry towards the future we want. It is motivated by the position that managing solid waste is inextricably linked to the rate of urban growth, level of development, and climate change dynamics as well as the prospect of promoting human-centred and environmentally-friendlier waste management futures. The ability of cities to improve the waste sector provides large opportunities to mitigate future climate variability and generate co-benefits, including improved human and environmental health. Urging the authorities to work towards sustainable waste and resources management, the commentary elaborates the concepts of waste hierarchy and its transition towards circular economy. These concepts are offered as starting points to ensure the waste sector serves as a net reducer of greenhouse gas emissions. Thus, the quest for the future we want is not only about instituting effective waste collection systems, but also improving their treatment infrastructure to mitigate future climate change.

#### **Keywords:**

Sustainable waste management, co-benefits, futuristic waste industry.

## Introduction

*A society in which consumption has to be artificially stimulated in order to keep production going is a society founded on trash and waste, and such a society is a house built upon sand.*

— DOROTHY L. SAYERS, 1947

*Who steals my purse steals trash.*

— IAGO, IN SHAKESPEARE'S Othello

Waste is a by-product of human daily activity and is of concern to everyone. Understood as an unwanted and discarded material that has lost value from its original form, waste comes in various forms: gaseous, liquid and solid materials (Oteng-Ababio & Nikoi, 2020). Consequently, views of what constitutes waste are highly subjective, and vary from culture to culture. As if the definitional uncertainties are not challenging enough, managing waste itself is also inextricably linked to the rate of urban growth, level of development and climate change dynamics (World Bank, 2014). Further with over half of the global population, wealth and important human livelihood activities that impact climate change found in cities, the quest for sustainable waste management has become more imperative, attracting great interests and attention from academia, city managers as well as community/civil society organisations (ISWA, 2021).

The stakes are getting higher with urban population projected to triple by 2050, and the annual waste generation also expected, under a business-as-usual scenario, to increase from around 2 billion tonnes generated in 2016 to 3.4 billion tonnes in 2050 under a business-as-usual scenario (Kaza, et al., 2018). This increase will, amount to a waste footprint of 0.74 kilograms per person per day. Importantly, waste is not only increasing in volume but in content. In sub-Saharan Africa, for example a UNDP report indicates that Ghana produces 1.7 million tonnes of plastic waste annually but only 2% is recycled. This implies that most of this waste ends up in the environment.

The irony is that, though the waste increases are expected in developing economies, these countries unfortunately lack the requisite infrastructure and financial resources to efficiently and effectively handle the increasing waste, (World Bank, 2014). It is within this interface between the increasing waste generation amidst struggling forces of transformative change in the waste management architecture which is linked to other global challenges, such as health, poverty, food security, resource management and climate that this editorial commentary – envisioned futures of the waste industry in developing economies – is situated.

A number of studies have revealed that the ability of cities to improve their waste management systems provides large opportunities to mitigate future climate variability and generate co-benefits (Abalo et al, 2018; Adu-Boahen et al, 2014). It also enables city authorities to fulfil a basic global human right dictates: Article 3 of the Universal Declaration of Human Rights notes, “everyone has the right to life” and Article 25 states that, “everyone has the right to a standard of living adequate for the health and well-being of himself and of his family” (Oteng-Ababio & Nikoi, 2020; ISWA, 2021).

It has also been rightly admonished by ISWA (2021:i) that, “this decade will present a unique opportunity to make positive changes to drive towards the future we want. If we do not, the world will reach the point of no return in terms of global warming, pollution, and degradation of natural resources”. Such admonition, coming within the context of the limited global response to COVID19 in early 2020, which revealed major gaps in the global public health system, as even the so-called developed nations were overwhelmed by a quickly-spreading new corona virus, is very timely. It is hoped the government will be as obedient as a CHILD. This is a clarion call to governments and citizens alike to ensure waste management systems are better prepared to meet the emergencies of the future, many of which will be climate related.

### **The waste industry and the 2030 global agenda**

Globally, improving solid waste management systems and practices are a priority to both local and national authorities. This is partly because of the links between waste management and climate change as well as the considerable health and pollution problems resulting from poorly managed waste systems. Several of the global Sustainable Development Goals (SDGs), which are the world’s commitments to achieving sustainable development by 2030, include waste reform as an action needed to help achieve the set agenda set. One specific goal, namely SDG 12, prioritizes the need to “by 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse” as well as the aim to “by 2020, achieve the environmentally sound management of chemicals and all waste throughout their life cycle”.

As presented in Table 1, poor waste management poses direct threat to the environment, to biodiversity and to human health, both at local and global levels, affecting billions of people worldwide (Phan et al., 2021). Suffice to add that though waste generation increases with affluence and urbanisation, greenhouse gas emissions from municipal waste systems are lower in more affluent cities. In European and North American cities for instance, greenhouse gas emissions from the waste sector account for 2–4% of the total urban emissions. These shares are smaller than in African and South American cities, where emissions from the waste sector are about 4–9% of the total urban emissions (ISWA, 2021). This dichotomous relationship is because the more affluent cities, due

to their financial and technological muscle, tend to have the necessary infrastructure to reduce methane emissions from municipal solid waste.

**Table 1:** Environmental and health risks due to open burning and open dumping for different waste streams

Waste Stream	Pollutants and Hazards	Environmental and Health Risks
MSW open dumping	<ul style="list-style-type: none"> <li>Leachates with high concentrations of heavy metals, BOD, COD, <math>SO_4^{2-}</math>, <math>NH_3</math>,</li> <li>Anaerobic digestion of organic fractions with generation of landfill gases, mainly composed of methane,</li> <li>Disease vectors living in the areas</li> </ul>	<ul style="list-style-type: none"> <li>The leachate generated is released to the soil, polluting groundwaters mainly used for drinking and household purposes. The risks concern the health the population through direct and indirect (agriculture) intake.</li> <li>The generation of methane and other GHGs increases global warming, the risks of local fires and pollution of the atmosphere surrounding the final disposal sites.</li> <li>The breeding of animals around the disposal sites and the presence of rodents and insects increases the risks of disease transferring to the population through bites and direct contact with the animals.</li> <li>The uncontrolled disposal causes the release of waste fractions, mainly plastics, into water bodies, contaminating the rivers, lakes and then the oceans and the seas, causing the phenomena of the marine littering.</li> </ul>
MSW open dumping	<ul style="list-style-type: none"> <li>Generations of PCDD/F and cancerogenic compounds, PM, BC, CO, <math>CO_2</math>, NO, and other GHG and hazardous compounds.</li> </ul>	<ul style="list-style-type: none"> <li>The emissions due to uncontrolled waste fires produce significant amounts of contaminants that affect the health of the population. Respiratory illnesses, especially in children, are common in areas with open burning practices. The generation of BC, CO, <math>CO_2</math>, and other GHG, affects the GWP, more than the anaerobic degradation of organic waste.</li> </ul>

In order to deal with the increasing amounts of waste and tackle some of the associated externalities, the authorities in developing economies must follow the order of actions established by the waste management hierarchy, and enable adequate waste destination systems than the prevailing practices provide. This means that government must introduce effective waste management strategies to improve sustainability at all levels. Many of the current barriers, concerning the introduction of environmental policies, effective investments, social inclusion and public awareness, which are particularly significant issues in developing countries must be overcome. Moving up the hierarchy, prevention, minimisation, re-use, shared economy and “cascades” of waste must be the focus of research, communication, publications, and policy development and implementation.

Besides supporting the transition towards circular economy, the approach could represent the answer for improving current and future solid waste management activities, since that denotes the principle of waste valorization and recycling for boosting developing economies. A circular economy paradigm must be considered and enacted in cities through separate collection schemes to improve cost-efficient alternatives, such as home composting, and traditional and creative reuse practices. Considering current developments, it is likely that solid waste management will become an in-depth data-driven industry and a central pillar for the future economic role-model, based mostly in the circularity and recovery of goods, materials, chemicals and energy.

Ultimately, it is expected that in developing economies; SWM will move from an outdated and informally organised sector taking care of a few valuable materials while the rest is disposed, dumped and burned, to a formally organized sector where materials are all managed with up-to-date technologies. Further, there is the likelihood of a drastic increase of municipal waste generation globally. This will need a corresponding drastic increase of collection and treatment capacities combined with useful applications for the recovered materials. The improvement of collection efficiency, better law enforcement, and surveillance by environmental authorities. Coupled with educational and environmental awareness are necessary steps as we move towards an efficient futuristic waste industry.

These developments will need a significant increase of financing which, in parallel, will need measures to ensure that the collected funds are really used for the defined purpose. These can be realised through strong governance, and transparency measures. To this extent, models for proper financing of the waste industry's operations deserve full attention. As much as possible, we should resist the example in 2011, when the government of Ghana introduced a 10% Environmental Excise Tax (EET) on plastic manufacturers, with the intention of setting up a Plastic Levy Fund Authority to help mobilise funds to curb the plastic waste menace in the country. However, after many years of accumulation, the fund is yet to be used for the intended purpose. The authorities must eschew such tendencies as they demotivate civil society.

Operationally, the guiding principles behind any financial model must be the duty of preventing pollution, the life-cycle concept, the polluter-pays principle, and the adequate internalisation of costs. Again, there will be a great need for exchange of experiences and for cooperation to avoid too many shortfalls and failures. In an era of rapid urbanisation and population growth, proper management of waste is critical for sustainable, healthy and inclusive cities and communities. If no action is taken, the world will be on a dangerous path to more waste and overwhelming pollution. Lives, livelihoods, and the environment would pay an even higher price than they are today. Many solutions already exist to reverse this trend. What is needed is urgent action at all levels of society. The time for action is now.

### **Global futures and the waste industry potentials**

Generally, managing solid waste is a universal issue of concern to everyone. With over 90% of waste openly dumped or burned in most developing economies, it is the poor and most vulnerable who are disproportionately affected. In that respect, the old saying “Waste not, want not”, rings so true today, as global leaders and local communities alike increasingly call for a fix for the so-called “throwaway culture” (ISWA, 2021:i). Yet, beyond individuals and households, waste represents a broader challenge that affects human health and livelihoods, the environment, and prosperity.

In recent years, reports are replete with landslides of waste dumps that have buried homes and people under piles of waste. In all such instances, the poorest of the society, who often live near waste dumps, suffer disproportionately and become susceptible to serious health repercussions. Nevertheless, these same poor members of the society do power their city’s recycling industry and systems through waste picking. Increasingly, poorly managed waste is contaminating the world’s oceans, clogging drains and causing flooding, transmitting diseases, increasing respiratory problems from burning, harming animals that consume waste unknowingly, and affecting economic development, such as through tourism (World Bank, 2018).

Further, greenhouse gasses from waste are also a key contributor to climate change. In 2016, five (5) percent of global emissions were generated from SWM. This excludes transportation. Ensuring effective and proper SWM is critical to the achievement of the SDG Left unmanaged, dumped or burned, waste harms human health, hurts the environment and climate, and hinders economic growth in poor and rich countries alike. Some of the potential futures benefits (see Table 2) emanating from a properly managed waste industry are discussed below:

#### ***Protecting human health and improving livability***

The mismanagement of waste can lead to environmental pollution. This can affect human health and make the environment difficult to live in. Prior studies indicate that

about 13 million deaths could have been prevented annually if the environment is healthier (WHO, 2007). Thus, putting in proper SWM (which includes how the waste is collected, transported, treated and disposed) is important as it can contribute to building a sustainable and livable environment and improve human health. Air pollution in particular represents a real threat to the health of the population. This threat therefore requires a coordinated call to action by policy-makers and waste operators so as protect public health.

- In particular, if ceasing open burning is achieved by 2030, an annual reduction of 120 premature deaths could be achieved globally.
- Other scenarios for waste management, such as increasing composting and recycling, produce important reductions in carbon dioxide (CO<sub>2</sub>) emissions.

**Table 2:** Wider benefits to society and the economy from proper SWM

No.	Category of benefit	Explanatory comments
1	Increased resource security	After a century of steady decline, resource prices in real terms doubled between 2000 and 2010 <sup>3</sup> . With continued price volatility, developing indigenous supplies of secondary raw materials from recycling makes good sense, particularly in rapidly industrialising countries. For example, e-waste comprises a richer 'ore' for many scarce and critical metals than the natural ores mined for the virgin raw materials.
2	New jobs	Environmentally sound waste management, the recycling of dry and organic materials and energy recovery from wastes all represent 'new' green industrial sectors with the potential for substantial job creation. UK employment in the sector, for example, increased by 50% between 1993 and 2013. The wider 'circular economy' holds further promise: the McKinsey reports estimates the potential to create between 9 and 25 million new jobs worldwide. <sup>4</sup>
3	Reduction in GHG emissions from waste management	The intergovernmental Panel for Climate Change reports that MSW accounts for approximately 3% of total Greenhouse Gas (GHG) emissions, mainly as methane. Efforts in high-income countries to divert biodegradable municipal waste from landfill represent a significant contribution to early progress on GHG mitigation.

4	Energy recovery by using waste to generate energy often together with sparing other precious resources	Through conventional and advanced and waste-to-energy technologies, co-incineration and anaerobic digestion technology. For example waste to energy plants in China are both reducing fossil fuel use and are known to prevent deforestation, wood being a common source of fuel in rural China.
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### ***Protecting nature and ecosystems***

As earlier indicated, due to the increase in population, urbanisation and industrialisation, a lot of waste is generated. These wastes come in different forms which have adverse impact on the terrestrial, aquatic and atmospheric ecosystems. So, complying with waste management rules and regulations put in place will contribute to the reduction of the threat to the environment caused by the mismanagement of waste. For example, proper waste management can prevent the dumping of waste into water bodies or reduction of waste products from combustion. It can also improve the quality of air and water, protect species in their various habitats like fishes in the oceans and generally lead to the conservation of natural resources.

### ***Providing quality soil improving materials***

Through proper SWM practices, waste can be repurposed to generate raw materials for industrial use and agricultural purposes among others. For instance, the cement industry makes use of gypsum in the manufacturing of cement. Also, organic waste can be processed into compost which can reduce the use of chemical fertilizers, increase food production and provide energy for soil biota. As such, waste can serve as a resource.

### ***Producing green and renewable energy and fuels***

In Ghana, there is a heavy reliance on hydro energy for electricity. However, with the increase in population, coupled with increasing climate variability, there is the need to look for alternative sources of energy. Indulging in proper SWM practices can enable the development and conversion of waste into energy. For example, landfill gas if managed well, can be converted into energy and be used to generate biofuels, using the appropriate technologies including Combined Heat and Power. Such waste-based energy is more environmentally friendly and essential.



### ***Mitigating climate change***

Without improvements in the sector, solid waste related emissions is likely to increase to 2.6 billion tonnes of CO<sub>2</sub>-equivalent by 2050. Improving SWM will help cities become more resilient to extreme climate occurrences that cause flooding, damage infrastructure, and displace communities and their livelihoods. Greenhouse gas reductions should be coordinated with established targets to ensure that average global temperatures do not increase excessively (IPCC, 2018). Ending open burning and upgrading dumps to landfills with gas capture are potential pathways to reduce climate forcing pollutants, and generate positive health impacts. Also, the diversion of waste via composting and recycling is effective in lowering emission levels such as particulate matter and black carbon.

The menace of climate change is real and city authorities are devising strategies to overcome the challenge. In Ghana, the Accra Metropolitan Assembly outdoored the city's first 5-Year Plan (the 2nd to be launched in Africa) which sets Accra on a path to carbon neutrality by 2050 and targets restricting global temperature rise to below 1.5°C (a Paris Agreement Compliant Plan) by the end of 2030. The Assembly aims to reduce emissions by 27% below business-as-usual by the year 2030, 46% by 2040 and attain a total reduction of 73% of the business-as-usual scenario by 2050. This has become necessary because available data indicate that though average rainfall has reduced by 2.4% since 1960, the rate of flooding has increased. Additionally, EPA, Ghana, has reported a 1°C rise in average temperatures since 1960, and if nothing is done now, Accra could potentially lose about 20% of rainfall by 2050 and experience a 21 extra days a year without rain, temperature averages of 40°C by 2050.

### ***Contributing to job and wealth creation***

Waste picking is a major source of income for many people. The recycling of waste like empty sachets, bottles, other plastics and metal have been the source of revenue for private individuals. Again, SWM companies like Zoomlion, through its establishments, provide many people with formal employment. These people are employed to collect and dispose the waste and through this, they make their living. The government also gain its revenue through the taxes paid. Thus, SWM contributes to economic development.

### ***Challenges to envisioned futures***

Municipal SWM is an important environmental concern around the world. Solid wastes are constantly produced in mega-cities, small towns and large villages, and if residues do not receive the right management, they can cause several affections on the environment and human health. These affections include greenhouse gases emissions, soil contamination, bad odours, underwater contamination, and spread of diseases.

Commonly, the treatment of solid waste is not carried out because this requires a substantial proportion of government budget without any economic remuneration.

Technically, most projects on municipal wastes depend on interested stakeholder funding. Furthermore, as the production and composition of municipal wastes depend on many factors, including the population growth, consumption patterns, season and climatic conditions, the uncertainties associated with wastes must be considered. Some challenges facing the current waste management system include the following:

### ***Inadequate practices and climate change***

Climate change and pollution impacts are intertwined with the problems of overproduction and overconsumption, and their resulting waste. This is both an existential and ecological crisis, especially given that production, consumption and waste are continuing to increase worldwide. These trends are partly driven by urbanisation, though the largest driver may be the effects of global circuits of capital on local economies.

Since waste contributes to greenhouse emissions, efforts should be made to limit these through promoting more sustainable use of natural resources, as well as the prevention, reuse, recycling and recovery of waste. UNEP (2015) estimates that greenhouse emissions could be reduced by 10–15% if waste is well managed using a life cycle approach (including recycling, turning waste into energy and landfill mitigation), with the possibility of increasing to 15–20% using appropriate waste prevention methods.

The long-term goal of mitigating the SWM sector's climate change impacts requires a clear understanding of the broader local, regional and socio-economic and political structures and conditions that establish the fundamentals of the industry and the functioning of the sector, as well as the gendered relationships throughout. Certain large-scale socioeconomic structures within each country, such as the distribution of education and literacy, economic sectors (e.g. consumption and production), political frameworks, urbanisation, and global trends, have specific relevance to SWM in terms of gender.

Ultimately, following the SWM hierarchy, as earlier stated, can contribute to minimising the waste sector's potential environmental impacts. Prevention, reuse, recycling and recovery of waste can lessen pollution, reduce GHG emissions and advance the sustainable use of natural resources. Stakeholders throughout the sector carry out activities linked to the different levels of the SWM hierarchy. Reforming the waste sector will require policies and practices that consider the current gender representation, which can help forge a path towards achieving gender equality in the sector.

### ***Lack of minimum required resources***

Several studies have indicated that inadequate funds to purchase equipment and to meet other recurrent expenditure including fuel, personal protective equipment (PPE), and emoluments are major impediments in instituting an effective waste management industry. The failure of local authorities to meet their financial commitments to private waste companies on a timely manner impacts negatively on the private waste companies' ability to undertake frequent and sustainable services. This also has impact on urban residents willingness to pay for solid waste collection, as they feel that they do not get value for money.

### ***Lack of safe waste destination***

Municipal solid waste collection and disposal in cities in developing economies are saddled with widespread problems. These problems exist for various reasons including allowing dumpsites to become a public nuisance, and a source of injury and damage, thereby decreasing the value of nearby properties. In some cities, neighbourhoods and political leaders are fighting with increased fervor to prevent unpopular projects from being sited in or near their communities. It is always hard to find places for sanitation truck garages, and incinerators. But the NIMBY (not-in-my- backyard) syndrome now makes it almost impossible to build or locate vital facilities that the city needs to function.

### **Policy reflections for sustainable waste futures**

Environmentally sound SWM touches so many critical aspects of development. Yet, the industry is often an overlooked issue when it comes to planning sustainable, healthy, and inclusive cities. City authorities must, as a matter of urgency, address issues surrounding SWM for the people and the planet. The journey towards sustainable waste futures requires lasting efforts which come at a significant cost. According to a World Bank report, SWM can be the single highest budget item for many local administrations. In low-and middle income economies, SWM comprises 20% of municipal budgets, on the average.

Technically, it makes economic sense to invest in the waste industry to secure sustainable SWM (ISWA 2021). Available evidence indicates that uncollected waste and poorly disposed waste have significant health and environmental impacts. The cost of addressing these impacts is many times higher than the cost of developing and operating simple, adequate SWM systems. From that perspective, the World Bank is working with countries, cities, and partners worldwide to create and finance effective solutions that can lead to gains in environmental, social, and human capital. Since 2000, the Bank has committed over \$4.7 billion to more than 340 SWM programs worldwide (World Bank, 2014).

Importantly, moving into the future, individual households will be key to the success of the waste industry and its management systems. Crucially, the ways in which waste is created and managed at the household level will be key to the success of future SWM systems. Households have tremendous capacity to reduce the flow of waste into the system both through their consumption practices as well as SWM and recycling strategies.

In terms of policy considerations, households, which have the least formal engagement with the waste sector's power and policy structures, may be a pivotal site for reform in the waste sector. One recommendation is to install waste segregation infrastructure in order to facilitate and promote household waste segregation at the source. Involving both men and women in household waste segregation should be encouraged, while knowledge about recycling and its importance should be shared to both women and men.

Further, the modernisation of the waste industry may threaten the livelihoods of actors who earn their living in the so-called informal waste sector. Although modernising the waste sector can help mitigate health and climate change problems, it may threaten the livelihoods of others engaged in scraps, recycling dealers and landfill pickers. Thus, taking a socioeconomic and gender perspective in policy formulation when modernising waste practices may enable a transformation that "leaves no one behind" – a core SDG commitment. This means considering gender equality in staffing and appropriate training for individuals to transfer to the upgraded systems.

Additionally, attitudes, stereotypes and perceptions about appropriate gender roles drive the gender and waste nexus in most cities. For example, women are assigned traditional family-based roles, which is then used as an explanation for why they cannot take on certain jobs. Gender norms and biases are also repeatedly given as explanations as to why women should not be truck drivers. Thus, any future policy which encourages changes in attitudes about gender and perceptions of appropriate feminine and masculine behaviour may be as important as technological or structural changes in reforming the waste sector in a gender-sensitive manner. Information-sharing and awareness-raising on gender mainstreaming should be promoted widely.

In principle and practice, waste recycling seems to be a successful pathway for women to develop waste sector enterprises. It is therefore worth-exploring how some women have managed to succeed in the recycling sector as business owners and why this seems to be an exception compared to other waste professions. Such an assessment may lead to useful findings which could be used to form policies for strengthening gender equality in the waste sector. For example, it might be that it is more socially acceptable for women to manage recycling businesses, since it could be considered an extension of their role in managing and segregating waste in the household. If this is proven to be the case, the recycling sector may be an entry point for women to gain formal, well-paid jobs in the waste sector.

Finally, consumption in most urban areas is rising rapidly as the country's economy becomes more globalised and integrated into global circuits of capital. Since actors and stakeholders in the waste sector play different roles in creating and managing waste, engagement across the entire sector is the only path towards sustainable waste industry. Without doubt, waste and its management is likely to become more reliant on high technology and engineering. Higher reliance on technology and engineering is likely to intensify the consequences of the gender disparities in those fields. Current presumptions that boys and men do not need an education to obtain manual labour jobs will not be the case in a modernising waste industry.

### **Contents in this edition**

This edition of the journal addresses a number of issues. The first paper by Asiedu and Kusimi examines how flooding and riverbank erosion have become natural hazards and impacting the otherwise limited infrastructure, and socio-economic activities of people in riparian zones. Using the lower section of the Pra river as a case study, the authors explore how for the last two decades, the hazard is threatening lives and properties of the affected communities, and recommend the development and enforcement of land use, water resources management plans, and suggest structural engineering projects as some key measures needed to manage the situation.

The second paper by Boison et al., interrogate a paradigm shift towards the cashew cultivation in Ghanaian smallholder farming. Their study, based on samples from Wenchi Municipality, reveals that the cultivation and export of cashew have resulted in improved household income and social status, albeit negatively causing gendered and intergenerational tensions in access to land, which can potentiate land disputes. They also note that such disputes do affect rural investments by destroying the rural moral economy. The study therefore calls on the traditional leaders and family heads to restructure land inheritance practices and educate farmers to properly mark the boundary of the acquired land before its use.

The next paper investigates the relationship between personality traits of operators of household non-farm enterprises and performance in Ghana using the first two waves of the EGC-ISSER socio-economic panel survey. Authored by Kubi et al., the study finds a positive relationship between extraversion and enterprise performance while emotional instability and openness have negative effects on performance. In their considered opinion, the evidence of a strong relationship between specific traits and performance could inform trainers of employees in formal and informal labour markets not to focus on developing only cognitive skills but also non-cognitive ones.

The last two papers touch on SWM in Ghana, a national issue which is the subject for this issue's editorial commentary. The paper by Boampong et al., focuses on the nature of waste employment, remuneration, social security, workers' rights and social dialogue. This

paper explores the decency of work in the waste sector in Accra, using the ILO's decent work agenda. Their investigation observes deficits including employment insecurity. The study also establishes that the organisational consciousness to drive efforts at protecting workplace rights appeared weak among formal waste workers and remained high for informal waste workers. Additionally, while private waste workers faced hostilities from their employers to unionise, the informal waste workers were self-organising to address work-related challenges. The authors call on social partners, particularly the trades unions, to extend coverage to private and public waste pickers to help address the various facets of the decent work deficits facing them.

On their part, Owusu-Sekyere et al., used the concept of 'waste crime' to discuss the negative practices associated with the waste industry in Kumasi, Ghana. They specifically highlight the nature of waste crime in the metropolis and how the menace can be minimised. This study relies on a mixed method design to generate empirical data from household heads and institutions connected to the industry. They note that waste crime was pervasive, and existed in many forms and manifested along the entire spectrum of the waste chain due to poor implementation of policies, insufficient enforcement of environmental regulations and lack of punishment on infractions. In their view, if the negative practices in the industry are not discussed in the context of crime, recommendations for policy considerations might be incomplete.

### **Concluding remarks**

Without doubt, the COVID-19 pandemic has further illuminated how important the waste industry and its efficient management is to all societies, mainly because of the role the industry plays in public health and safety. From its genesis, the waste management sector was underpinned by the need to keep towns and cities clean in order to secure public health. From all indications, this underlying principle will remain a cherished and paramount purpose in all geographical spaces and at all times. As noted earlier, ensuring adequate living conditions, and by extension, good health is a fundamental human right (Oteng-Ababio & Nikoi, 2020).

It is important to reiterate that improvements in sustainable waste and resource management practices will support improvement in public health, environmental protection, climate change mitigation and sustainable materials management globally. On the journey to sustainable waste futures, we need to necessarily recognise waste as a problem that causes harm to the environment and public health. However, the waste and resources management industry must be considered as part of the solution, and not the problem an erroneous notion embedded in the thinking of most local and national authorities

Apart from this conceptual imperative, we must also simultaneously chart two paths of development: On the one hand, the provision of universal basic SWM services globally. Ensuring that waste collection services and proper waste treatment are available to everybody will support the endeavour to close all open dumpsites still in operation and stop open burning of waste. On the other hand, supporting the transition towards sustainable resource management and the circular economy is also crucial. Studies indicate that millions of tonnes of reusable, recyclable and recoverable products and materials are today being wasted (Sharma, et al., 2021).

By truly implementing the principles of the waste hierarchy through an ambitious but pragmatic approach based on scientific evidence, we can accelerate the transition and enter into the era of a new and more sustainable economy, based on a symbiotic partnership with active participation of different stakeholders. Technically, there are four main enablers that need to be in place to make this development happen: good governance, adequate funding, collaborative research and development, and proper communication.

First, instituting good governance in the waste industry rests on the three pillars of reliability, inclusiveness, and transparency. It must be supported by a robust legal and a viable long-term financial and organizational model. Furthermore, the governance model must make sure that policy makers, public servants, operators and users of the system are all held responsible and accountable.

Second, financing of SWM systems deserves full attention. This has been necessitated by the fact that SWM services in general first arose with the aim of protecting public health. With regard to waste collection, the value of the service is in the removal of the materials from the place of generation. Clients of the service tend to be willing to pay for removal of their waste. The resulting direct-service-payment relationship helps to create a favourable economic platform for the provision and progressive extension and improvement of current services.

However, and quite instructive, issues surrounding waste treatment and disposal services are significantly different. The service-payment relationships between the client and the service provider are indirect, i.e. the client does not 'see' the service that they receive, with the effect that the service is often under-valued and under-provided unless policy and legislative instruments are in place to ensure service provision. Any financing models shall preferably be feebased than taxbased, ringfenced and securing full cost-coverage for the provided services. The guiding principles shall be the duty of preventing pollution, the life-cycle concept, the polluter-pays principle, and the adequate internalisation of costs.

The third enabler, research and development, is fostered by a collaborative and symbiotic partnership where governments, companies, universities, non-governmental organizations and citizens jointly implement research, disseminate and put into practice the principles for new solutions and technologies. It is hoped that through research and development, we may devise new and improved technology which will help in the management of a variety of solid wastes generated within the country. However, these techniques cannot effectively mitigate the present problem of poor SWM unless four additional elements can be assured:

- increased awareness and concern of the average citizen for his individual, community, and corporate solid waste management problems;
- cooperative regional and community action through professional leadership to manage solid wastes effectively;
- the efforts of college and university of faculty and students, who possess the ingenuity and innovative expertise, to bring about new solutions; and
- the well-known capability of industries that form the backbone of Ghanaian technological progress.

Thus, if the citizen, the community, the university, and industry will help to create and test a new technology, then the millions of tons of wastes generated each year can perhaps be channeled, used, recycled, managed, and transformed into tons of assets.

Communication is crucial, but too often forgotten. After all, understanding, acceptance and support is crucial in everything that has to do with the waste industry; support for the development of new policy, support for implementing and respecting this policy, support for active participation, support for respecting measures and achieving objectives, support for the realisation of important infrastructure projects, support for knowledge sharing and solidarity.

Finally, it is utterly important to remember that when it comes to sustainable waste and resource management, there is no silver bullet. The only successful way forward is to pursue an integrated approach where different technologies and solutions all together contribute to the common goal. The obvious conclusion therefore is that, if done in the right way, the waste industry and its management system will be significantly improved during the next 10 years, bringing pragmatic and real solutions to the problems inherited from the twentieth century and thereby fulfilling the needs and demands that the twentyfirst century imposes.

In sum, the waste industry and its resource management systems are global and have to be addressed through coordinated global actions. In all frankness, the era of local containment is over, and thus, quite prudent to reiterate the remarks by ISWA (2921:i)



thus “this decade will present a unique opportunity to make positive changes to drive towards the future we want. If we do not, the world will reach the point of no return in terms of global warming, pollution, and degradation of natural resources”. A stitch in time, really saves nine.

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