

# The health effects of climate change on informal workers and informal settlements of Zimbabwe: literature review

**Training and Research Support Centre**



**in collaboration with**



**Zimbabwe Congress of Trade  
Unions  
Zimbabwe Chamber of Informal  
Economy Associations**

**ii**ed International Institute  
for Environment  
and Development

**With support from the  
International Institute for Environment  
and Development (IIED)**

## Table of contents

Executive Summary .....	3
1. Background .....	5
1.1 Analytical framework .....	7
1.2 Methods .....	8
2. Informal employment and settlement in Zimbabwe .....	8
2.1. Historical background and employment challenges .....	8
2.2. Informal settlements in Zimbabwe .....	9
2.3. Factors affecting informal workers and settlements in Zimbabwe .....	11
3. Climate Change in Zimbabwe.....	13
4. Occupational, public and environmental health in informal workers in Zimbabwe .....	14
4.1. Health impacts .....	15
4.2 Institutional responses to the health challenges facing informal workers.....	16
4.3. WHO and occupational health and public health policy initiatives.....	18
5. Occupational, public and environmental health in informal settlements in Zimbabwe.....	19
5.1. Informal settlements and unhealthy living conditions and hazardous locations .....	19
6. Areas of focus for the research.....	22
6.1. Waste collection and recycling .....	22
6.1.1. Benefits of waste collection for health .....	24
6.2. Urban agriculture and food marketing .....	25
6.3. Informal sector water access and quality .....	27
7. Discussion.....	27
8. Conclusion .....	30
References .....	31

**Cite as:** TARSC, ZCTU, ZCIEA (2019) The health effects of climate change in informal workers and informal settlements in Zimbabwe: A literature review, TARSC, Harare

Written by R. Machedze, Training and Research Support Centre

Thanks for technical input and support, peer review and edit input from Dr. Rene Loewenson, TARSC.

Thanks for inputs from Nathan Banda, ZCTU, Wisborn Malaya, ZCIEA and Artwell Kadungure, TARSC

Thanks for external peer review by Alice Sverdlik, IIED).

Thanks to IIED for financial support

## Executive Summary

Informal settlements are increasingly recognised as sites of vibrant economic activity, and while there is some evidence on the social determinants of health in informal settlements, studies have yet to document how these consider the occupational health and climate-related risks facing workers in these settlements. There is also limited evidence on the occupational health risks of workers in the informal economy, given its often unregistered nature, its lack of inclusion in formal social security systems and its relatively dynamic nature. The two groups- informal economy and informal settlement may and often do intersect in various forms, with, for example, many living in informal settlements also working in the informal economy, and many informal economy workers carrying out economic activities within and for those living in informal settlement.

This literature review on Zimbabwe investigated what is known, the evidence and gaps on the interaction of risks and benefits between public health, occupational health and environmental wellbeing through three areas, namely:

1. Informal sector **solid waste collection and recycling**, and specifically of plastic waste and bio-waste, as a key activity with **occupational health** risks, but also with potential risks and benefits for public health and environment.
2. Informal **urban agriculture and food marketing** as a key public health-related activity carried out in informal settlements and by informal sector workers, which has both occupational health and environmental impacts.
3. **Water access and quality** as a major environmental issue for both informal residents and workers, and for their health.

From the review, it emerged that the growth of the informal economy in Zimbabwe has been underpinned by a number of factors dating back to racial segregation and the attendant policies of the settler colonial regime. Moreover, decades of economic regression after independence has forced a number of industries to close thereby limiting the economic opportunities available for people to secure jobs and livelihoods. This has led to a number of people venturing into informal activities at different scales to eke out a living. Further, the failure of government to provide a stable environment and opportunities for people to realise their potential, coupled with rising costs of living (particularly in urban areas) have forced people to seek alternative, cheaper and affordable housing, among other things. In most cases, affordable housing is only available in overcrowded, unplanned and illegal informal settlements.

Informal settlement residents and workers have endured challenges associated with poor social services. Environmental health challenges will likely be exacerbated by climate change. Informal settlement inhabitants have also contributed to environmental pollution associated with excreta and sewage disposal, illegal economic activities that affects the environment as well as pollution of water sources.

With regards to occupational health and safety, the World Health Organisation (WHO) recognises that globally, occupational risks are among the leading risks for disease and disability. In addition, it notes that most economically active people spend at least a third of their time at various work places (WHO, 2013). With this scenario, decent work and favourable working conditions are considered as important social determinants of health. However, only a small proportion of the global workforce has access to occupational health services even for primary prevention and control of occupational and work-related diseases and injuries (Moyo D 2014; WHO 2013). This small proportion is often constituted by workers in the formal structures of the economy. Workers in the informal economy are not counted in official statistics because of the nature of their economic activities, which are unregulated and not registered.

Although there have been few interventions in promoting and protecting health in the informal sector, the International Labour Organisation (ILO) has been at the forefront in recognising the pivotal role of the informal economy as a source of livelihoods, especially for low-income

households. Evidence from policies, regulations and some international instruments suggests that with the relevant support and interventions, informal economy workers can enjoy their work in a dignified, healthy and safe environment. From the Zimbabwe and Africa literature review, the following key areas emerged as important for understanding the interactions between occupational health, public health and environmental health:

- Many informal settlements are overcrowded with very little open/public space and often with uninsulated corrugated iron roofs, cabins and shacks with poor ventilation that contribute to higher indoor temperatures. Key vulnerable groups include infants and young children, the elderly, pregnant women, and those with certain chronic diseases. There are also elevated health risks for outdoor workers (e.g. construction workers, waste pickers, street vendors) and for those who live or work in urban heat islands. The risk of fire outbreaks in shacks and workplaces is also high, given the settlements' density, use of unclean cooking fuels, and flammable building materials (WHO, 2011). High temperatures are again a great risk in densely-populated informal settlements.
- Most informal settlements currently lack public health measures to control or remove disease vectors and without healthcare systems to provide needed responses. There are no readily-available public health workers in most informal settlements. Residents have to travel some distances to get to the nearest health centre (mostly in the nearby formal settlements).
- Many informal settlements are concentrated on sites with increased risk of flooding or landslides, with poor-quality housing less able to withstand storms and flooding as well as lacking risk-reducing infrastructure. Extreme weather events can result in damage to homes, possessions and assets for generating income – and for informal workers, these are not covered by insurance. Access to work-places/income-earning opportunities are also disrupted by natural disasters. Those in informal settlements without piped water supplies are at higher risk from contaminated and/or disrupted water supplies.
- The literature shows that a number of informal settlements have sprouted especially in wetlands, vleis and swamps thereby disrupting the environment particularly the natural functions of these water reservoirs. This situation has increased the risks of water-borne diseases and at the same time contributing to elevated flood risks, which may be exacerbated by climate change.
- Residents of informal settlements do not have access to infrastructure and healthcare needed to counteract the impact of water, air and land pollution. Coupled with poor sanitation, these residents are the most affected by air and water-borne diseases. A major challenge is access to clean and safe water in informal settlements, and difficulty in accessing water for informal livelihoods also threatens workers' food security, health and sanitation.
- Urban agriculture is one of the major activities practised by residents and workers in informal settlements. However, the small pieces of land have led to over-cultivation and use of chemicals and fertilisers that threaten the quality of groundwater supplies, which they rely on for drinking and household chores. Moreover cultivation along riverbanks in peri-urban areas has contributed to soil erosion, threatening the viability of urban agriculture and also contributing to flood risks.

The paper concludes by noting the need for policy responses that take into account the lived experiences of residents and workers in informal settlements.

# 1. Background

Informal settlements are increasingly recognised as sites of vibrant economic activity (World Bank, 2006), and while there is some evidence on the social determinants of health in informal settlements, studies have yet to document how these consider the occupational health and climate-related risks facing workers in these settlements. There is also limited evidence on the occupational health risks of workers in the informal economy, given its often unregistered nature, its lack of inclusion in formal social security systems and its relatively dynamic nature. The two groups- informal economy and informal settlement may and often do intersect in various forms, with, for example, many living in informal settlements also working in the informal economy, and many informal economy workers carrying out economic activities within and for those living in informal settlement.

The term 'informal settlement' generally is used to describe various forms of low-income settlements and/ or poor living conditions associated with inadequate housing usually substandard, overcrowded and low standards both in structure and services. 'Slums' are often used to describe such conditions as well depicting the severity of the problems manifested by squalor (UN Habitat, 2003, UN Habitat, 2016).

On the other hand, and in defining the informal economy, the International Monetary Fund (IMF) observed that it is known by different names throughout the world, such as the hidden economy, grey economy, black economy or lack economy, cash economy or shadow economy (IMF, 2017). It further defined the informal economy as including all economic activities which are hidden from official authorities for monetary, regulatory, and institutional reasons. "Monetary reasons include avoiding paying taxes and all social security contributions, regulatory reasons include avoiding governmental bureaucracy or the burden of regulatory framework, while institutional reasons include corruption law, the quality of political institutions and weak rule of law." (IMF, 2017:4). Meanwhile, the International Labour Organisation (ILO) has defined the informal economy as a "way of doing things characterized by (a) ease of entry; (b) reliance on indigenous resources; (c) family ownership; (d) small scale operations; (e) labour intensive and adaptive technology; (e) skills acquired outside of the formal sector; (g) unregulated and competitive markets" (ILO, 1972).

Zimbabwe was reported as having the third largest informal economy in the world, ranked only behind Bolivia and Georgia (Machemedze, 2018). There are various reasons as to why Zimbabwe has a high rate of informality as compared to the other countries within the Southern African Development Community (SADC) region. Previous research by Machemedze has observed that country attained independence from British rule in 1980, the country was challenged to transform a colonial legacy of an enclave economy (Machemedze, 2018).

Quoting work done by Kanyenze (2004) and LEDRIZ (2016), Machemedze noted that the post-independence government acknowledged the existence of the informal economy and made a policy position declaring that it would provide the sector with the necessary infrastructure for it to meaningfully contribute to the development of the country. The work observed that the first decade of independence (1980-90) was characterized by Government intervention in the economy (with a strong focus on social provisioning, especially education and health) and continued pursuit of import substitution. However, due to unsustainable budget deficits, shortages of foreign currency, depressed investment and employment creation, the Government adopted economic reforms (Economic Structural Adjustment Programme or ESAP) at the behest of the IMF and World Bank (1991-1996 – the *reform period*). During the period, the country experienced massive de-industrialisation owing to the opening up of the economy to competing imports, which were cheaper and replaced subsidised local production (Machemedze, 2018).

Zimbabwe, with a population of about 14 million people, and a gross national income per capita (purchasing power parity) of about US\$3000 (World Bank, 2018) is experiencing serious economic challenges.. Since the turn of the millennium, virtually all sectors of the economy recorded declines in output, with agriculture, manufacturing and mining estimated to have declined by 7.3%, 73.3% and 53.9% respectively in 2008 (Government of Zimbabwe, 2009).

During the period, real gross domestic product (GDP) growth recorded a cumulative contraction of about 48% (nearly 5% per year). The decline cut across all key sectors, despite Zimbabwe's rich resource endowment.

**Table 1: Performance of the Zimbabwe Economy, Selected Economic Indicators, 1986-2014 (Periodical Annual Averages)**

Indicator	1986-90	1991-96	1997-08	2009-14
Real GDP Growth (%)	4.6	2.8	-4.3	7.8
Real GDP Per Capita (%)	1.4	-0.6	-3.6	5.6
Manufacturing/GDP (%)	20.6	21.1	13.5	11.7
Gross Savings/GDP (%)	16.5	17.8	6.3	-6.0
Gross Investment/GDP (%)	16.0	21.7	10.6	16.8
Budget Deficit (% of GDP)	-2.1	-5.8	-6.1	-3.9
Inflation (%)	11.8	26.6	19,255,755.00	0.8
Bop (US\$M)	-	73.5	-254.6	-1209.1
Trade Balance (US\$M)	267.7	75.2	25.8	-3784.8
Export Growth (%)	0.1	0.1	-4.7	8.1
Import Cover (Months) 100%	-	3.1	0.9	0.9
Formal Sector Employment	1,118,133	1,249,200	1,213,200	1,096,800
Employment Index – 1990=100	94.9	104.8	101.8	92.7

**Source:** Machededze, 2018

The impact of the contraction led to the further growth of the informal economy. Notwithstanding, the informal economy gets very little recognition from the government and despite this marginalisation, the informal economy in Zimbabwe has been increasing significantly since 2000. Today, just as in many other Southern African countries, the informal economy in Zimbabwe acts as a buffer to an increasingly failing formal sector. It acts as alternative source for livelihood, employment and income to an increasing population that is forced to turn to survivalist activities. Zimbabwe's unemployment rate is deemed to be one of the highest rates globally for a low-income economy (World Bank, 2009).

There has been a lively debate on the extent, nature, and cures of unemployment in Zimbabwe over the past two decades, albeit without a conclusion. It has been reported that the percentage of the total employed population above 15 years in informal employment have risen from 84.2 percent in 2011 to 94.5 percent in 2014. In addition, the employment in the informal economy is directly linked to high vulnerability to poverty. In May 2014, of the total 1.5 million paid employees, 1.4 million (93 percent) were in informal employment (Machededze, 2018).

Against this background, the Training and Research Support Centre (TARSC) in collaboration with the Zimbabwe Congress of Trade Unions (ZCTU) and the Zimbabwe Chamber of Informal Economy Associations (ZCIEA) are implementing a three-year programme entitled **From surviving to thriving: Learning from responses to the health effects of climate change in informal workers and informal settlements of Zimbabwe**, funded by the International Institute for Environment and Development (IIED).. The work entails analysing the intersection of climate-related and occupational health risks in Zimbabwe's informal settlements. The work specifically covers Harare- the capital city with a high concentration of people in the informal economy and diverse forms of informal settlement and Masvingo – a smaller city with different climatic conditions, but similar residential and labour patterns on the specific interaction of risks and benefits between public health, occupational health and environmental wellbeing.

## 1.1 Analytical framework

The analytical framework applied in this report adopts the Drivers, Pressures (major concerns), State (major responses/policies), Impact (implications) framework, used by most UN organisations (including WHO and the UN Environment) to analyse the interaction between occupational health and safety, public health and climate change in selected informal settlements in Zimbabwe. The framework is, however, adapted to provide for analyses of patterns, evidence, trends, factors and responses affecting informal workers and residents/settlements in Zimbabwe in the investigation of the interaction of climate change, occupational health and public health. The framework also assesses risks and benefits, assets, barriers and approaches in relation to the research questions, and focusses on three issues that act as entry points for exploring the interaction of risks and benefits between public health, occupational health and environmental wellbeing namely:

1. Informal sector **solid waste collection and recycling**, and specifically of plastic waste and bio-waste, as a key activity with **occupational health** risks, but also with potential risks and benefits for public health and environment.
2. Informal **urban agriculture and food marketing** as a key public health related activity carried out in informal settlements and by informal sector workers, that has both occupational health and environmental impacts.
3. **Water access and quality** as a major environmental issue for both informal residents and workers, and for their health. The frame-work is modified to provide for analyses of the state and trends of selected aspects of human development, the impacts of climate change upon them, and the responses by society, policy makers, the private sector, and development partners to these impacts. It also assesses progress towards meeting internationally-agreed goals and identifies gaps in their attainment. The concepts of sustainable development, human wellbeing and climate change are core to the analysis.

The components of the framework are outlined in *Table 2* below:

Table 2: Analytical framework

<b>Drivers and major concerns</b>	The key issues here relate to the major concerns that informal settlements residents and workers face vis-a-vis the issues under investigation. Important issues will include employment/unemployment, livelihood and/or alternative socio-economic activities, poverty, shelter as well as climate change and its impacts on public health and occupational health and safety.
<b>State and trends</b>	This looks at the state and trends of climate change in Zimbabwe, including its links to health-related areas in informal settlements as well as to occupational health and safety issues. Also, it considers trends regarding occupational health, public and environmental health risks for informal workers and settlements in Zimbabwe. Health will be analysed using self-reported health indicators such as the accessibility of health facilities. Institutional roles and responsibilities will be analysed through assessing responses of various actors and actions in managing risks (including local authorities, government agencies, private sector and non-state actors). It will also consider policy responses including national, local and national-level action plans and their links to regional and global plans, protocols and instruments.
<b>Implications</b>	Implications of climate change are mainly analysed through heat and cold stresses and extreme weather patterns, alongside their implications for informal settlements' water access and quality (including pollution). It also considers the implications of drought particularly for urban agriculture and food marketing as well as for disease patterns, intensities and incidences

The interactions of the above and how they relate with each other will help with the analysis and will contribute to the knowledge that other processes may tap into during future interventions.

## 1.2 Methods

This paper compiles evidence from secondary data collection based on a literature review of published materials relevant to informal settlements and workers and informal economy in Zimbabwe in particular and Africa in general. Specific areas of focus are threefold, namely: the informal sector solid waste collection and recycling of waste and bio-waste; informal urban agriculture and food marketing; and water access and quality. The reviewed sources included published literature (qualitative and quantitative) such as studies, policies, legislation, official documents, published materials from the UN, government and local authorities as well as research institutions, civil society and the mainstream media.

The methodology entailed searching the following databases: EQUINET, PubMed, and Google Scholar. This was complemented by a search of the websites of WHO, UN Environment, Ministry of Health in Zimbabwe and other organisations' websites. The search was conducted between October and December 2018 and sources included peer-reviewed journal articles, policy documents, workshop reports, book chapters, media articles, academic reports, briefing papers and policy and parliamentary reports in English published after 2000. This publication date restriction reflects the period when the economy significantly declined, forcing many people into informal work and settlements. The references and bibliography of relevant papers were searched for additional papers and reports using the snowballing method.

The limitations on the literature review was mostly the availability of literature on specific issues regarding informal settlements/workers and public health or occupational health and climate change. These are poorly-studied topics in Zimbabwe, and therefore not much information has been found. In addition, some literature might not be available online and exists only as grey literature.

## 2. Informal employment and settlement in Zimbabwe

### 2.1. Historical background and employment challenges

Zimbabwe has been grappling with many challenges since its adoption of structural adjustment in the mid-1990s. This includes rising poverty, inequality, unemployment and spiralling under-employment (GoZ, 2016). The structural adjustment measures imposed by the IMF and World Bank resulted in the massive retrenchment of skilled and unskilled labour and of the civil service; the closure of many manufacturing industries; general price increases; and the deterioration of social services. These unintended consequences, exacerbated by deregulation and liberalisation of the economy led to the structural decline of the economy and to the growth and proliferation of the informal economy, particularly in and around urban centres in the country. The government acknowledges that with high poverty levels, the marginalised, particularly women and the youth were and still are affected most. As noted in the introduction, the country went through a decade (2000-2008) of economic recession with economic growth declining cumulatively by 40 percent during the period. The uncontrolled price increases of virtually everything, uncontrolled government expenditure and falling industrial capacity utilisation to between 4-10% saw inflation rising to unprecedented levels of over 230 million per cent (GoZ, 2016).

Luebker (2008) observes that statistics are contested in Zimbabwe. The government has refuted employment/unemployment rates and figures published by various institutions including media organisations, NGOs and other international organisations. For example, these institutions have claimed that unemployment stands at over 80 per cent and is accompanied by "rampant informality" (Luebker, 2008). On the other hand, Zimbabwe's statistical agency (ZIMSTAT) claimed that unemployment was below 20 per cent for the year 2014: "Although the country is registering relatively high employment levels of 80.4 percent in 2014, the quality of employment is low as it is mainly in rural subsistence agriculture. Thus, high employment-to-population ratios (EPRs) are coexisting with high income poverty levels," (GoZ, 2016: 33).

Despite the contradictions above, the majority of companies in Zimbabwe experienced massive retrenchments due to company closures or downsizing. The government notes that the company closures were a result of the prevailing unstable macroeconomic environment that saw employment in the formal sector declining from 1.4 million to just under 1 million by the end of

2014, with over 400 000 employees having been at one time retrenched between 2005 and 2014 (GoZ, 2016).

Informal employment is determined by the characteristics of the job a person does, and includes: own account workers and employers employed in their own informal sector enterprises; unpaid family workers who work in formal or informal sector enterprises; members of informal producer cooperatives; all own account workers (communal, resettlement, peri-urban farmers), and paid employees not entitled to contribution of pension fund by employer, paid annual, maternity and sick leave; and written contract by employer. Generally, the incomes of people in informal employment are not taxed. Employment in the informal sector is determined by the characteristics of the enterprise in which a person is employed. In the LFCLS, a production unit is considered to be in the informal sector if it is neither registered with the registrar of companies nor licensed, or was licensed only. Those involved in agricultural activities are not considered as informal sector enterprises.

The African Economic Outlook report for 2017 noted that Zimbabwe's formal economy contracted because of company closures and that "increased informality with the share of informal employment to total employment rising from 84 percent in 2011 to 94 percent in 2014 (IMF, 2017a). The government, quoting statistics from ZIMSTAT noted that in 2014, of the total 1.5 million paid employees, 1.4 million, which translates to 93 percent were in informal employment. However, the government also acknowledges that the informal sector employed around 13.7 percent of all employed persons (859 060 persons), with 52.5 percent of them being women during the same period (2014). It further noted that a high proportion (85.9 percent) of those currently employed in the informal sector were unskilled, with 54.4 percent of the unskilled being women (GOZ, 2016).

### ***Informal economy as a source of social organisation***

Whilst the above observation by the IMF attracts public attention, it masks a lot of creativity, innovativeness and ingenuity found in the informal economy. Waste collectors and recyclers, for example, "make a living" by creating their own jobs as opposed to "earning a living" in regular formal employment (Grant R, Oteng-Ababio M 2012). Whilst a lot of negative connotations have been ascribed to informal economy workers, where often they are perceived as either victims or perpetrators of social ills, state and local authorities have not grasped the importance of the services they offer as they grapple to earn a living. Very few recognise them especially waste collectors and recyclers as important for waste management. Yet they are well organised socially and in economic groups where they play a significant role in particularly in innovative ways of enhancing their efficiency in the work they do.

Over the years, the informal economy has sustained livelihoods and kept the wheels of economies functioning through, inter alia, entrepreneurship, creativity and innovation including through product development. The informal economy also exhibits a complicated but positive social organization fabric where apprenticeship and knowledge transfer are generated and shared amongst the people. In Zimbabwe, informal traders kept the country functioning during the 2007-2009 economic crisis. With supermarket shelves empty, the cross-border traders filled in the gap and imported goods from neighboring countries to satisfy the consumers. It was the informal economy social organization and entrepreneurship skills that kept everyone moving despite the vilification of the sector.

## **2.2. Informal settlements in Zimbabwe**

At independence in Zimbabwe in 1980 removed the restrictions imposed on the black majority by the colonial government that had centred upon the migration and free movement of people within the country's cities. Particularly, there are areas in the large cities where blacks were not allowed to settle or even pass through. Such racial segregation ended at the dawn of independence and with that freedom, the country saw an increase in migration from rural to urban areas. In turn, Zimbabwe's urban population reportedly increased sharply from about 22% in 1982 to 30% by the early 1990s. According to ZIMSTAT, in 1980, the country's urban population was only 22.4% of the national total (7.6 million) but by 1992 had risen to 31% of the 10.4 million citizens and again rising to 34% of its 11.6 million citizens in 2002 (ZIMSTAT, 2012). The most recent

population census carried out in 2012 showed that over 39 % of Zimbabwe’s 13 million people were living in urban areas as shown in *Table 3* below:

**Table 3: Urbanisation in Zimbabwe**

Year	Total Population	Urban Population (%)
1980 (Independence)	7.6 ml	22.4
1992	10.4 ml	31
2002	11.6 ml	34
2012 (most recent census)	13 ml	39

The urban population increase has been observed as a characteristic common in most low- and middle-income countries, where people move from the countryside to urban areas in search of better livelihoods and living conditions (Tibaijuka, 2005). This “challenge of rapid urbanization” can result in the depopulation of rural areas and overcrowding of urban areas, causing challenges related to access to social services including housing, water, sanitation and energy.

The impact of such challenges has been observed in the impoverishment of the urban dwellers. According to the UN this arises from two inter-related circumstances: “First, many migrants to the city operate in the informal economy, despite their active contribution to the urban economy, and they rarely pay taxes or fees in direct proportion to the services they use. Second, most local authorities depend to a large extent on central government transfers which rarely increase in proportion to demographic growth, thus contributing to declining municipal revenues and expenditures in per capita terms. This vicious circle translates into a serious erosion of local government capacity in terms of planning, environmental management and the provision of basic services.” (Tibaijuka, 2005: 22). For Zimbabwe, the above has been witnessed in the major cities of Harare, Bulawayo, Mutare and Gweru, which have been reported to have attained population growth rates of over 5% per annum throughout the 1980s (ZIMSTAT, 2012). This overstretched the capacities of central and local government to provide housing and other basic services including infrastructural development for the urban majority, particularly the poor. With this observation, the informal settlements have become a citadel of all these challenges with the communities/ residents and workers in these settings brutally exposed to the harsh environment.

Although Zimbabwe has a sizeable number of informal settlements, the UN has noted that the country’s cities remained largely cushioned from “the explosive growth of slums and squatter settlements characteristic of African cities” (Tibaijuka, 2005: 25). It further observed that only about 3.4% of the country’s urban population lived in slums in 2001, a situation that was considered even better than that of high-income countries where an estimated 6.3% were living in slum conditions (Tibaijuka, 2005). Despite the low figures noted above, economic challenges being faced by the country over the past two decades have resulted in the massive growth of the informal economy and also an increase in the number of informal settlements sprouting throughout the various cities in the country thus suggesting a probable massive increase in the population living in informal settlements. In addition, the destruction of illegal housing structures by the government mostly in the backyards of formal houses in 2005 under the infamous Operation Murambatsvina (Restore order) forced a number of people into informal settlements.

A 2014 City of Harare report produced collaboratively with the Zimbabwe Homeless People’s Federation entitled Harare Slum Upgrading Profile Report documents the various informal settlements in Harare and by the time of publication had profiled about 49 informal settlements in the city. The informal settlements range from small communities of about 7 families (as shown in the Groombridge informal settlement in Mt Pleasant) to over 8000 families recorded in some blocks of flats in Mbare. *Box 1* overleaf profiles one of the most common and prominent informal settlements in Harare, Hopley, which has a population estimated to be over 200 000 people. This is one of the settlements chosen as a site for this project, as outlined in the background.

### **Box 1: Hopley Informal Settlement (Harare)**

This settlement was established in the year 2005 by the government following the countrywide evictions dubbed Operation Murambatsvina. The residents at Hopley are evictees drawn from different areas, which include Hatcliffe Extension, Porta Farm and Mbare. Hopley consists of 5 zones representing the different areas of origin for the settlement's residents. Zones one up to four were allocated to residents who were relocated from Caledonia holding camp. The latter was a transit camp established to temporarily accommodate families that were evicted from areas like Porta Farm and Hatcliffe Extension. On the other hand, zone five was allocated to families from Tsiga in Mbare. Finally, zone six is inhabited by families who were allocated plots by the City of Harare.

The majority of **housing** in Hopley consists of temporary to semi-permanent shacks that range from plastic shacks to unplanned structures built with 'green' bricks. A few houses have been built in Zone One using approved plans, and a large part of these structures were constructed by the then-Ministry of Local Government and Urban Development during the abortive reconstruction exercise code-named 'Operation Garikai' by the government. Some of the polythene one-roomed shacks were provided under the auspices of an emergency response programme to the victims of Murambatsvina, which was rolled out by IOM.

**Land Tenure:** A majority of Hopley residents have lease agreements that were signed with the then-Ministry of Local Government and Urban Development. The lessees are supposed to pay an annual fee amounting to US\$50. According to the residents, there is a substantial number of families whose tenure is yet to be resolved as they still finalise the issue of signing their leases. Such cases represent a majority of either the widows or orphans who (due to the absence of the necessary legal paperwork) are still struggling with tenure. However, families in Zone Six are a different case where the allottees were formally allocated the land by City of Harare.

**Infrastructure and facilities** in Hopley are highly inadequate, particularly water and sanitation. As a result, various development organisations like UNICEF have provided water services albeit on a communal basis (boreholes and stand-pipes). In addition to these facilities, most residents have wells since tap water supplies are often erratic and the boreholes consistently dry up from August to October. Other development agencies have also supported the Hopley community with the construction of eco-san toilets, and more than half the residents have these units on their plots. There are two community-run primary schools and a secondary school in Hopley. The idea of community schools was initiated by parents following serious discrimination against children from Hopley when they attended schools in the adjacent formal suburbs. The long distances that children have to travel to and from school also compounded the problems. There is a clinic that operates in Hopley from the old farm house. Corner-shops are dotted around the settlement and they reduce the burden of travelling outside the settlement in search of groceries.

**Economic Activities:** A majority of the residents in Hopley operate informal business activities such as vegetable vending, corner-shops, fire-wood vending whilst a significant number work as part-time general hands in adjacent suburbs like Waterfalls. Sand extraction is also widespread even though it is illegal. The sand is sold to suburbs in Harare where construction is taking place.

*Source: From Harare Slum Upgrading Profile Report (City of Harare, Zimbabwe Homeless Peoples Federation and Ministry of National Housing and Social Amenities (2012))*

### **2.3. Factors affecting informal workers and settlements in Zimbabwe**

It has been noted earlier that the increased rural-urban migration and the deteriorating living conditions of people, particularly in urban areas as a result of economic challenges, have contributed to the growth of informal settlements in Zimbabwe. Both in Zimbabwe and globally in informal settlements, communities lack one or more of the following:

- i) access to safe drinking water
- ii) access to basic sanitation services
- iii) security of tenure for the properties they live on
- iv) sufficient per capita living space, and
- v) durable and structurally sound dwellings (UN Habitat, 2016)

According to the government of Zimbabwe, an additional concept vital for the administration of settlements is one of informal settlements where formality is defined largely in reference to land ownership and whether settlement developments are approved by relevant authorities (GoZ, 2015). However, the scope and extent of lack and deficiencies of basic services differs across the different settlements. Whilst some have inadequate basic services, the majority have deficiencies that are alarming. For example, the City of Harare and Homeless Peoples Federation has described the situation in Mbare block of flats in Harare as follows: *An average family of eight members share a single room. To give some semblance of privacy the families informally partitioned the rooms with cardboard boxes, sofas, cloth and any other imaginable materials. They share communal toilets and bathrooms that are located at one end of every floor of these hostels. Two roomed flats of the 10 Matererini blocks were allocated to married couples by the city council in 1979. These have an individual toilet and bathroom. However, the state of breakdown in infrastructure and overcrowding in all of these dwellings has reached alarming rates. The traditional family structure has simply broken down and socials ill such as prostitution is rife. The scale of squalor, poverty, overcrowding and dilapidation in the Harare City council's Mbare hostels is frightening. The condition in which the families live not only presents a fire hazard, but it is also a health time bomb, whose scale of devastation could eclipse the loss to the 2009 cholera epidemic.* (City of Harare, 2012).

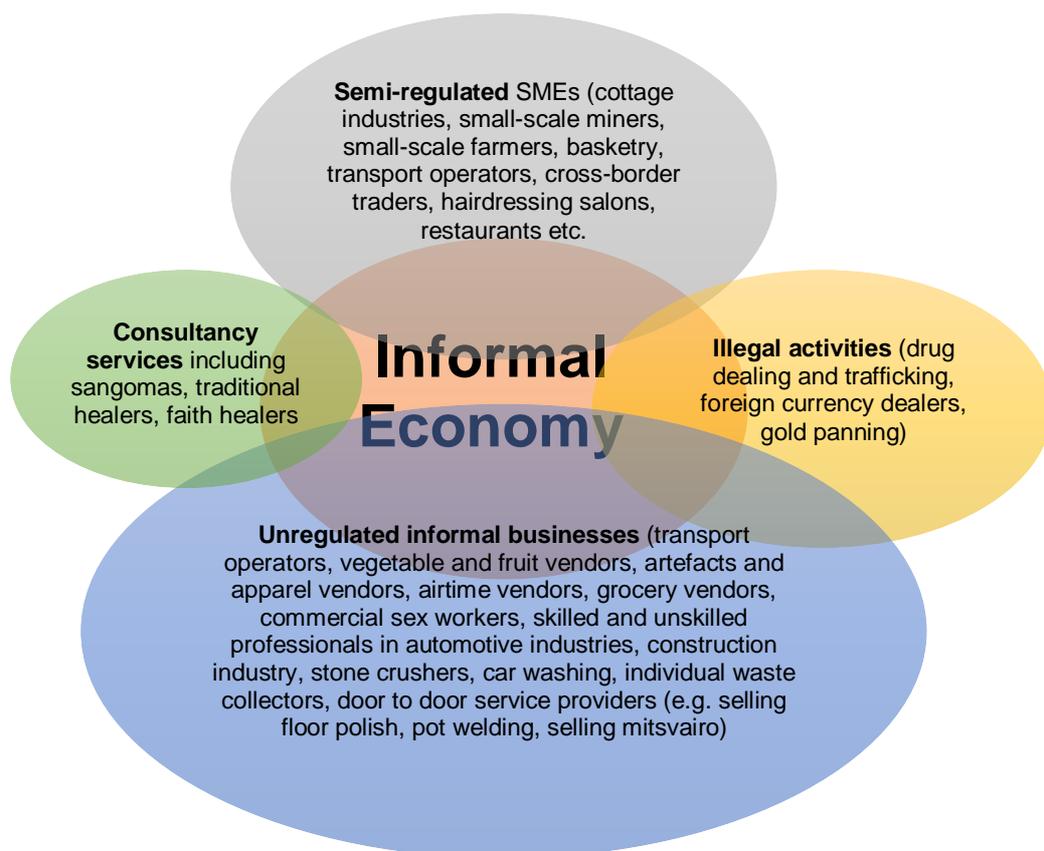
This description is not only associated with the Mbare Hostels, but has been reported in other informal settlements where a family of eight or more people share a single room with no ablution facilities. In 2008/9, Zimbabwe experienced one of the worst outbreaks of cholera, which killed about 4000 people (WHO, 2009). The underlying factors that led to such a huge death toll include environment (no toilets or latrines, lack of safe water/no working boreholes, sewage in the streets; limited access to health care (lack of transport/ distance to hospital and CTC); lack of use of ORS in the communities; not enough supplies/beds/resources at CTC; lack of communication and information about cholera, lack of education, fear of person with cholera and stigma, cultural practices (burial & handshake), among others (WHO, 2009). In 2018, a similar outbreak occurred in Harare and spread to other parts of the country, also linked to the contamination of water sources through dilapidated sewer infrastructure. About 70 people died in 2018 as a result of the outbreak. Although such dangerous conditions were described in Mbare, the majority of informal settlements face the same challenges and it applies to both households and workplaces where informal settlement workers operate from. They do not have proper facilities and in recent months they have suffered serious hazards, including fire outbreaks.

In terms of economic activities, most residents and workers of informal settlements survive from informal activities including street trading, vending, carpentry, sculpturing, cross-border trading, touting and motor mechanics, among others. However, the type of economic activities they engage in are also associated with the resources available or in proximity to their settlements. For example, communities within the confines of mining areas are frequently engaged in small-scale mining, including illegal mining like gold panning, which is prevalent in most mining areas in the country. Those that are near dams and rivers are mostly engaged in fish vending and so on. There, informal settlements tend to create their own industries and enterprises that are influenced by the major economic activities taking place in those areas. Notwithstanding this, a number of common economic activities across the informal settlements include the ones identified above with others such as prostitution, illicit beer brewing and selling, drug trafficking, waste collection, and providing their labour for domestic chores in nearby well-to-do households. In the end, these trades are largely informal and unregulated.

*Figure 1* below depicts the different informal economy activities that are common in most informal settlements. These are categorised under four main areas by the author as follows:

- Semi-regulated activities
- Unregulated activities
- Consultancy services (common in informal settlements)
- Illegal activities (most of which are criminal in nature)

**Figure 1: Categories of informal economy activities**



Source: Machededze 2018

### 3. Climate Change in Zimbabwe

According to the United Nations Development Programme (UNDP), climate change is the single greatest threat facing mankind today (UNDP, 2017). Zimbabwe, like the majority of countries in the region, is susceptible to a number of “changes in temperature and precipitation with extreme events such as droughts, heatwaves, heavy rains accompanied by flash floods, strong winds and hailstorms becoming common” (UNDP, 2017:22). ‘Climate’ is defined by the average weather conditions of a place over a period of at least 30-40 years. The two main climate elements, precipitation and temperature, are expected to deviate from their long-term average and the effect can manifest as increased frequency and severity of extreme climate events such as droughts and floods (FAO, 2004; Wilhite, 2000). The impacts may include, but are not limited to, increase in frequency of extreme climate conditions such as drought and floods (IPCC, 2012). Due to limited resources most countries particularly those classified as low-income, find it difficult to adapt socially, economically and technologically (Some`e et al. 2013).

A high dependency on rain-fed agriculture by most of the countries in southern Africa, including Zimbabwe, further increases their vulnerability to climate change-induced poverty, hunger, starvation as well as climate-related health challenges and complications. A gradual increase in the frequency of droughts in Zimbabwe (Mukwada, Manatsa, 2013) is an indication that some parts of the country are experiencing climate change yet more than 60 % of the population depends on rain-fed agriculture. Climate-induced water stress threatens to decrease the quantity and quality of drinking water in rural and urban areas and reduce the run-off necessary to sustain the country’s hydro-electric power supply. This in turn has far-reaching effects on the environment, threatening biodiversity and the general health system.

Zimbabwe experiences a semi-arid climate with average annual rainfall ranging between 337mm in the extreme southern part of the country and 1110 mm on the Eastern Highlands (Mazvimavi, 2008). Climate trend analysis (1897-1993) by Unganai (1996) shows that Zimbabwe national

average maximum temperature has increased by up to up to +0.8 °C while minimum temperature decreased by 0.2 °C to 0.4 °C. National average precipitation has decreased by 10% during the main growing season (October to April) between 1900 and 1994. Increased temperatures have a potential to cause an increase in evapotranspiration. Evapotranspiration has the ability to consume up to 80% of precipitation (Abramopoulos et al., 1988), reducing surface and groundwater resources as well as increasing the proliferation of plant pests and diseases. It has also been observed over the past 30 years that there has been an overall decline of nearly 5 percent in rainfall across Zimbabwe during the past century (UNDP, 2017).

Background research on climate change has been conducted by the Policy and Advocacy for Climate Change in Zimbabwe project funded by the UK Department for International Development (DfID) and implemented by IIED, the Zimbabwe Regional Environment Organisation (ZERO) and Dialogue on Shelter. Findings reveal that due to climate change, floods, storms, fires, droughts and the geographic range of infectious disease vectors (e.g. malaria) are likely to increase. High malaria hazard will be concentrated in the low-lying parts of the country, including the Zambezi valley and the South-east lowveld (Murwira et al n.p). Vulnerable groups especially people living with HIV/Aids (PLHIV) are likely to be hard-hit groups with marked intensification of the gender dimensions of vulnerability, especially among female headed households (Brown et al., 2012). Besides climate change contributing to the likely increases in vector borne diseases, the same factors that lead to climate change such as air pollution particularly from chlorofluorocarbons, also contribute to the disease burden of non-communicable diseases (NCDs) affecting the cardio-respiratory system (Frumkin et al., 2019).

In terms of surface water resources, north-eastern and eastern parts of Zimbabwe are predicted to experience a surplus, while the western and southern parts are projected to experience increased droughts (Murwira et al., nd). In 2000 the Fast Track Land Reform Program began, which saw the sprouting of informal settlements across the country. This has increased the demand for water resources resulting in increased water scarcity. In most of the new settlements, informal sectors have been established which has seen the widening of the gap between government monitoring institutions and human settlements. With the associated economic meltdown, implementation and monitoring of development projects became difficult, hence provision of social services to newly established settlements has become a challenge.

#### **4. Occupational, public and environmental health in informal workers in Zimbabwe**

The WHO recognises that globally, occupational risks are among the leading risks for disease and disability and that most economically active people spend at least a third of their time at various workplaces (WHO, 2013). With this scenario, decent work and favourable working conditions are considered as important social determinants of health. However, only a small proportion of the global workforce has access to occupational health services even for primary prevention and control of occupational and work-related diseases and injuries (Moyo, 2014; WHO, 2013). It is important to note that this small proportion is often constituted by workers in the formal economy. Meanwhile, workers in the informal economy have remote chances of being counted in official statistics because of the nature of their economic activities, which are unregulated and not registered. In other words, officially informal workers are not recognised, particularly if their livelihoods are in informal settlements. Moyo (2013) observed that despite many people suffering injuries and loss of lives at their workplaces, OHS has not received the support to the scales and levels that HIV/AIDS, TB and Malaria have received over the past decades. This might be because OHS including basic preventive measures such as education and training for health and safety are overlooked (WHO, 2000). The informal sector includes many women and children and they are usually not covered by legislation, and do not have access to occupational health services.

Some reports have noted that Informal workers constitute more than 1.8 billion (60% of the global workforce) and “comprise a diverse population in terms of type of occupation, and social and legal status” (Rockefeller, 2013: 4). The majority of them experience greater job insecurity than workers in formal employment and have greater difficulties accessing affordable, quality

health care and services. These challenging conditions help to explain informal workers' susceptibility to poor health, injury and illness, which are exacerbated unsafe and unhealthy working conditions (Rockefeller Foundation, 2013).

Previous work by Loewenson in different countries of the southern Africa region indicate that stress arising from production changes, more intense production systems, reduced job and market security and reduced wages are a major problem in workplaces and a factor in workplace safety. Unfortunately, as even the most comprehensive notification systems in the region do not cover small scale or informal sector production, it is not possible to assess how shifts from formal to informal sector work have affected occupational health outcomes. She observed that a survey of some informal sector workers in rural and urban Zimbabwe found occupational injury and mortality rates similar to those found in the formal sector, and higher rates of occupational illness in the informal sector (Loewenson, 1999).

As indicated earlier, the informal economy in most low- and middle-income countries provides employment opportunities for workers neglected by the formal sector, while serving as a key source of income for poor households. Small enterprises and the informal sector are becoming the mainstream, and the realm of employment for the majority of urban dwellers (including the youths, women and other marginalised groups) in low income countries, as was illustrated by the situation in Zimbabwe. Despite this reality, occupational health services and supporting legislation have not evolved to respond to this new dispensation (Lucchini and London, 2014).

#### **Box 2: Common patterns, evidence and trends on informal workers**

**Informal workers are susceptible to health problems due to poor employment conditions and inadequate access to health care. Many face unsafe or poor working conditions**

- 700 million informal workers live in extreme poverty (<US\$1.25/day), contributing to their vulnerability to poor health.
- Of the >215 million migrant workers, most engage in informal work, adding legal complexities to health and other measures.
- Informal workers face poor employment conditions: excessive hours; no sick time; high stress and insecurity; no health or social protection.
- 70-90% of informal workers have no or few benefits, according to several studies and organizations working with informal workers.
- Informal workers face poor working conditions: physical overexertion or repetitive motion; high risk of injuries, exposure to toxins, violence and sexual assault; and limited access to training and protective gear.

**Limited access to health insurance and social protection among informal workers, even with national health insurance**

- Workers in Africa, rural women and casual workers are the least likely to have insurance against work accidents or injury.
- Construction, domestic, and manufacturing workers each include >50 million informal workers, as does street vendors.
- Waste pickers and transportation workers are each <50 million.

Source: Rockefeller Foundation, 2013

#### **4.1. Health impacts**

As described above, informal workers face elevated vulnerabilities including inadequate social protections (like scant and little access to affordable health services). This results in high incidence of diseases and injury, illness, and vulnerability linked to recurring and chronic diseases and poverty (WHO, 2000; Rockefeller Foundation, 2013). The following impacts have been noted in various literature in Africa in general and Zimbabwe in particular:

**Many workplaces are unsafe – resulting in illness and injury:** a significant number of workers in informal economy lack access to clean and safe water or adequate sanitation facilities. For example, in Zimbabwe, the informal economy workers in places like Magaba in Mbare are vulnerable to injury as the place is congested and also has high volumes of traffic with people dealing in metal fabrication (sometimes with illegal electricity connections), nor ablution facilities and some work in the open exposed to rain and sunlight. The drainage systems are blocked, and the area experiences frequent waterlogging during the rainy season. No collection

of rubbish is done by the council, thereby exposing the workers to food- and waterborne diseases like typhoid and cholera. A 2018 report by the Zimbabwe Occupational Health and Safety Council has reported a Lost Time Injury Frequency Rate of 3.67 for the period Jan-August 2018 in the formal sector against a recommended figure of 1. (The Lost Time Injury Frequency Rate is the number of lost time injuries occurring in a workplace per 1 million hours worked. Lost time injuries (LTI) include all on-the-job injuries that require a person to stay away from work more than 24 hours, or which result in death or permanent disability), The fatalities were caused by falling rocks, electrocution, crushed by combine harvester, falling from a height, among others (Zimbabwe Occupational Health and Safety Council 2018). The figure could be higher for informal workers, as these were not captured in the official statistics. A number of them have died or were injured in illegal mining operations, for example, and most of these deaths go unreported. Mutetwa et al. (2015) observed that the estimated annual losses resulting from work-related accidents, injuries and diseases, in terms of compensation, lost work days, interruption of production, training and retraining and medical expenses, among others, usually amount to more than 4% of the total gross national product (GNP) of all the countries in the world. For low-income countries like Zimbabwe, the figure is likely to be higher. In their analysis, they note that Zimbabwe's occupational safety and health performance for formal workers in the period 2009 to 2014 reveals that the average occupational injuries and fatalities per annum were 10 971 and 85 respectively, which translated to an injury frequency rate of 1.79 as measured on 1000 000 injury free hours (Mutetwa et al., 2015).

**Many informal workers have few resources:** it is estimated that the majority of informal workers in Zimbabwe are poor and live below the poverty line.

**A key driver of poorer health among informal workers is inadequate access to health care and coverage,** which combined with higher health risks can increase their vulnerability, particularly for migrant workers, who may also face legal obstacles and are least likely to seek services. Other highly affected informal workers include domestic workers and food vendors and street vendors. **There is an absence of publicly funded health insurance:** The most affected are informal workers across the various sectors. It is important to note that there is no mandatory health insurance in Zimbabwe for anyone. Private voluntary insurance (medical aid schemes) have a limited base and very costly especially for the public let alone informal economy workers.

**Occupational injuries are costly to families:** Because of the poverty among informal workers, any injuries sustained at their workplaces are often a burden to the family as there is no medical cover for them. The majority rely on council clinics, which are cheaper in general but are expensive for informal workers.

#### **4.2 Institutional responses to the health challenges facing informal workers**

Some authors suggested a long-term plan as a response to addressing the deficiencies and inadequacies of the informal sector (Forastieri, 1999; ILO, 2013; ILO, 2017). It was observed that the support to the informal sector should be viewed as part of a long-term strategy aimed at "increasing the formal sector jobs and strengthening the conditions and principles which regulate labour relations, working conditions and employment opportunities in order to allow economic integration, social cohesion and democracy" (Forastieri, 1999: 2).

An important aspect is the issue of democracy. In the majority of cases, issues to do with the informal economy are limited to economic and social services and sectors. Political issues are seldom discussed yet these are at the core of informality. It was also noted that informal workers/organisations associations needed to come together as change agents who would be able to bring about changes in their working and living conditions. "While protective approaches cannot significantly change the social situation, they can dramatically reduce its pernicious effects on informal sector workers allowing them to perform safer tasks under healthy and protected conditions" (Forastieri, 1999: 2). Innovative means to prevent occupational accidents and diseases and environmental hazards need to be developed through cost-effective and sustainable measures at the work-site level.

Although there have been few interventions in promoting and protecting health in the informal sector, the International Labour Organisation (ILO) has been at the forefront in recognising the potential of the informal economy as a source of livelihoods especially for low-income households. Evidence from policies, regulations and some international instruments suggests that with the relevant support and interventions, informal sector workers can enjoy their work in a dignified, healthy and safe environment thereby effectively contributing to economic growth.

The ILO was instrumental in shaping the understanding of the informal economy including the challenges, opportunities, risks and benefits of the sector. It is observed that an influential ILO publication, dating back to 1972, studied the informal sector of Kenya in great detail and was among the first to challenge the conventional portrayal of the informal sector as backward and inefficient. The ILO launched in 1994 a project that would support the informal sector to come up with a comprehensive plan that identified protective measures provided for in national legislation and international labour standards to be applied to the urban informal sector, as well as to develop strategies in order to progressively extend social protection and improve working conditions of informal sector workers (Forastieri, 1999). The project focussed on access to health care through mutual funds; the improvement of safety and health standards, working and living conditions, the reduction of accidents and diseases and management skills (Forastieri, 1999).

Over the years ILO played a key role in supporting informal workers and advocating for support to the informal economy. The various interventions culminated in the landmark ILO R204 - Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204). This Recommendation provides guidance to Member States to:

- *facilitate the transition of workers and economic units from the informal to the formal economy, while respecting workers' fundamental rights and ensuring opportunities for income security, livelihoods and entrepreneurship;*
- *promote the creation, preservation and sustainability of enterprises and decent jobs in the formal economy and the coherence of macroeconomic, employment, social protection and other social policies; and*
- *prevent the informalization of formal economy jobs (ILO, 2015).*

Civil society in Zimbabwe, including labour unions and informal economy associations, have been advocating for the implementation of this resolution, with the hope that a myriad of challenges facing the informal economy sectors and workers would be addressed. Zimbabwe has laws and regulations in place that protect the health and safety of workers in workplaces. The transition from informality to formality can easily be facilitated through the various pieces of legislation already in existence (see *Box 3* below).

### **Box 3: Health and safety law in Zimbabwe**

**Occupational health and safety laws** generally applicable to all employers and employees across sectors are the Labour Act, Chapter 28:01 and NSSA (Accident Prevention) (Workers Compensation Scheme) Notice No. 68 of 1990. There are other sectoral laws that address health and safety issues of workers, including the following: Protection from Smoking (Public Health) (Control of Tobacco) Regulations S.I.264 of 2002 that prohibits smoking in enclosed public places including workplaces and the Labour Relations (HIV and AIDS) regulations S.I.202 of 1998, which prohibits discrimination on the ground of AIDS/HIV status;

#### **Mining Sector**

Workplace safety is provided in the Mines and Minerals Act, Chapter 21:05 and its regulations:

- The Mining (Management & Safety) Regulations S.I 109 of 1990
- The Mining (Health & Sanitation) Regulations S.I. 185 of 1995

#### **Agricultural Sector**

The Environmental Management Act, (Chapter 20:27) provides that every worker has a right to work in an environment that does not endanger his or her safety. The Act and its regulations also control usage, storage, labelling and disposal of hazardous substances and articles. The collective bargaining agreement for the agriculture industry S.I 323 of 1993 requires employers to provide their employees with appropriate protective clothing to protect them from harmful substances.

### **Industrial Sector**

The main pieces of legislation covering industry are the Pneumoconiosis Act (Chapter 15:08) and the Factories and Works Act, Chapter 14:08 and its regulations:

- Factories and Works (General) Regulations S.I 263 of 1976
- Factories and Works (Registration and Control of Factories) Regulations S.I 262 of 1976
- Factories and Works (Machinery) Regulations S.I 302 of 1976
- Factories and Works (Electrical) Regulations S.I 304 of 1976
- Factories and Works (Building, structural and Excavation Work) Regulations S.I 264 of 1976
- Factories and Works (Elevator and Escalator) Regulations S.I 263 of 1976

*Source: ILO 2013*

### **4.3. WHO and occupational health and public health policy initiatives**

The WHO has added its voice in addressing occupational health and public health issues in the informal settings. Different initiatives have been championed including Healthy Cities, an international initiative started by WHO in Europe in 1986 and implemented by WHO AFRO from 1995, with over 1000 cities involved globally. The initiative prioritised placing health on development agendas of the cities. In Africa, Harare was one of the pioneer cities to implement the initiative, which helped municipal governments to provide environments conducive to health (WHO, 2013). Several other initiatives, including the WHO's World Health Assembly Resolutions, have been adopted to expedite the provision of occupational health and safety, and public health for all workers. These include resolution WHA49.12 of the 49th World Health Assembly, which endorsed the global strategy for occupational health for all; recommendations of the World Summit on Sustainable Development (Johannesburg, South Africa, 2002) on strengthening WHO's action on occupational health and linking it to public health; Promotional Framework for Occupational Safety and Health Convention (2006), and other international instruments in the area of occupational safety and health adopted by the General Conference of ILO (WHO, 2007). The major question, however, is whether the initiatives were helpful given the proliferation of unhealthy environments in major cities, coupled with the spread of informal settlements with often unhealthy living conditions.

Notwithstanding this challenging question, the work (Healthy Cities and various other initiatives) was complemented by the 60th World Health Assembly (WHA) in May 2007 when it adopted resolution WHA60.26 on the global plan of action (GPA) on workers' health. The GPA places at its core the worldwide health sector to respond to workers' specific health needs. Key to this resolution is the commitment by the WHO member states to work towards full coverage for workers, including those in the informal economy, in small and medium-sized enterprises, in agriculture, and also migrant and contractual workers (WHO, 2007). This full coverage would include fundamental essential interventions and basic health services for primary prevention of occupational and work-related diseases and injuries among workers.

The resolution, among others, also urges member states to "ensure collaboration and concerted action by all national health programmes relevant to workers' health, such as those dealing with prevention of occupational diseases and injuries, communicable and chronic diseases, health promotion, mental health, environmental health, and health systems development" (WHO, 2007).

The GPA provides a policy framework for concerted action to protect, promote and improve the health of all workers. It addresses primary prevention of occupational hazards, protection and promotion of health at work, employment conditions, and improved health system responses to workers' health. The plan links occupational health to public health by identifying the following objectives for global action to:

- Devise and implement policy instruments on workers' health;
- Protect and promote health at the workplace;
- Improve the performance of and access to occupational health services;
- Provide and communicate evidence for action and practice;
- Incorporate workers' health into other policies.

Having noted the above, the Zimbabwe Occupational safety and health council (ZOSHC) under the tripartite leadership of the National Social Security Authority (NSSA) oversees the development and implementation of legislation, regulations and policies on occupational health and safety. The challenge is whether the institution is capacitated enough to cover both in scope and extent the formal and informal sector workers. As discussed above, there is no reference to informal workers as these are not registered.

## **5. Occupational, public and environmental health in informal settlements in Zimbabwe**

As indicated earlier, informal settlements in Zimbabwe have high levels of poverty, ill health and disease outbreaks. For example, some informal settlements in Zimbabwe have zero electricity, water and sewer connections. In fact, some of the formal affluent suburbs have never had water connections. Loewenson and Masotyia (2018) have noted that residents living in Zimbabwe's slums have reduced access to safe water and sanitation, but there are different deficiencies for residents of formal settlements: "Those in formal settlements may also face challenges in access, including when these services do not function (Loewenson and Masotyia, 2018).

Past research in South Africa has recorded increased health risks in informal settlements, suggesting a lower life expectancy than in more formal settlements. For example, the Socio-Economic Rights Institute of South Africa (SERI) reported that a 2012 study in the country revealed the rate of new HIV infections in people two years and older was double in urban informal settlements that in urban formal areas. The informal settlements figures reportedly showed consistently high rates of HIV infection in the surveys carried out for the years 2002, 2005, 2008, and 2012. "The prevalence of HIV/AIDS in South Africa has been identified as a key factor in the country's low life expectancy (SERI 2018). Higher HIV prevalence rates in informal settlements could be largely linked to both occupational health and public health challenges as most young girls and women resort to this for their own survival. In addition, residents in informal settlements are also more vulnerable to infectious diseases such as tuberculosis (TB), which has been reported as one of the leading causes of death in South Africa in 2015, along with diabetes and cerebrovascular disease (SERI, 2018).

The City of Harare Slums upgrading initiative notes that in the majority of the informal settlements, one of the most common occupational and public health challenges is commercial sex work. The settlement is not recognized by the City of Harare and as development agencies use local authorities as the entry point they too are absent. Residents of informal settlements also suffer challenges of mental health, mostly related to the vulnerabilities and insecurities with regards to their housing conditions, poverty, food shortages and financial stress, among others.

### **5.1. Informal settlements and unhealthy living conditions and hazardous locations**

Although informal settlements are easily recognisable by the characteristics mentioned above, one of the key focus areas for this research is the interaction between occupational and public health with environmental health within the informal settlements. The World Health Organisation (WHO) has noted that significant health and environment challenges within the African continent continue to revolve around the provision of basic social services including safe drinking water, sanitation and hygiene; management of water resources, soil and air pollution; vector control; management of chemicals and wastes; food safety; and health in the workplace. These have been observed to be exacerbated by the negative impacts of climate change, unplanned urbanization, uncontrolled rapid population growth and urban migration, all of which increase pressure on already overburdened health systems (WHO Afro, 2014).

The UN Habitat has observed that most informal settlements and residents endure unhealthy living conditions, which come about as a result of a lack of basic services where open sewers, lack of pathways, uncontrolled dumping of waste, polluted environments are common and seem to be the norm. Since there are no building plans or inspections, houses in informal settlements

may also be built on hazardous locations or land unsuitable for settlement including wetlands, floodplains or near factories or industries with toxic emissions or waste disposal sites (Ezeh et al., 2017; Olthuis et al., 2015).

Even some formal settlements in countries in Africa are also built near industrial plants with uncontrolled pollution (air, water or land) and in some cases on wetlands. In Zimbabwe, media reports have documented how wetlands were destroyed by home seekers who built their houses in such areas without authorisation. One report observed that in Chitungwiza, a dormitory town 25km from Harare, 14 out of 15 wetlands have been built on while 13 of Harare's 26 wetlands have been taken over by construction (Moyo, 2017). The report further noted that about 60% of Harare and Chitungwiza's wetlands have been invaded or taken over for construction purposes. The construction is for both formal and informal settlements. Quoting an environmental expert, Moyo wrote that the Westlea wetland is an area of 123 hectares (304 acres) in Harare. It has 87 houses, the first of which was built in 2008. As wetlands absorb water and recharge the underground water table, construction disrupts this. It has been noted that wetlands help to control flooding by absorbing excess water and gradually releasing it into water bodies. However, with the disturbance of the wetlands through construction, most informal settlements suffer flooding and also their shallow water sources like wells and even boreholes quickly dry again posing other hazards. Scientifically, wetlands have been observed to play a crucial role also in removing and storing greenhouse gases from the earth's atmosphere, thereby helping to mitigate climate change (Demuzere et al., 2014; Lindley et al., 2018).

Houses built on wetlands are reportedly vulnerable to flooding and collapsing through structural failure, cracking and bending of structures leading to potential injuries or death. Thus residents of informal settlements that are in swamps or wetlands face serious risks of injury (Isunju et al., 2016). Moreover, there is no doubt that wetlands are a good breeding ground for mosquitos and with rising temperatures as a result of global warming leading to climate change, the likelihood of malaria incidences is high. Other waterborne diseases like typhoid, which are already causing serious health challenges in Zimbabwe's capital city are likely to proliferate, so is cholera especially with the illegal dumping of solid waste in wetlands.

### ***A tale of shacks and wooden cabins: housing in informal settlements***

The majority of housing structures in informal settlements are plastic shacks and wooden cabins. The Hopley case study (see above) is similar to housing in other informal settlements in the country. Shacks made of plastics, grass and wood are widespread in many informal settlements. There have been numerous reported cases of fire outbreaks, which has destroyed the residents' property and further deepened their poverty (Pharaoh, 2009). Because of overcrowding, the fires usually spread quickly and destroy many properties rapidly. The effect the fires have on residents can also be felt by the environment. The burning plastics and wooden shacks release gases and emissions that pollute the environment as well as contributing to climate change. The extent of the problem in Zimbabwe is not known, but there have been other case studies including in Namibia.

In Namibia, it has been reported that about two shacks burn daily in the informal settlements on the outskirts of the capital city Windhoek (New Era, 2016). After noticing the proliferation of shacks in the city, the paper (New Era) observed that the informal settlements in the city were expanding and moving further away from the city into the mountains, with over 100 000 people living in informal settlements in Windhoek. City officials say occupants in the informal areas erect shacks at night and each morning there are new shacks where the previous day there were none. An official with the city emergency department described the fire outbreaks and how it was more difficult to control these in the informal settlements as compared to formal settlements. The official noted the difference between the two areas: "a formal area has all requirements such as proper road infrastructure, water reticulation (fire hydrants) amongst others, while informal settlements have none". He was quoted as saying some shacks were inaccessible, especially those in the mountains, and there are riverbeds and no roads that lead to the areas. He observed the absence of street maps and fire hydrants to get water and the fact that the houses are built close to one another and without plans, so that – if one shack burns it spreads to another. The emergency response is thus difficult (New Era, 2016).

In summary, the occupational, public health and environmental health risks of residents in informal settlements are highly complex and interrelated. The residents are exposed to dangers such as collapsing housing, pollution of land and water sources, including by chemicals from industries. Moreover, some informal settlements are vulnerable to waterborne diseases like typhoid, cholera and malaria. Other diseases incidences include mental depression, TB and HIV/AIDS, which are common in overcrowded areas where social stress is high and risky behaviour and occupations such as prostitution is believed to be common. There are serious environmental challenges that exacerbate global warming like building in wetlands, burning waste, and fire outbreaks around the shacks in the settlements. All these summed together depict a sorry state of affairs where informal settlements often bear the brunt of multiple environmental, occupational and public health risks.

*Box 4* provides an extract from the *Zimbabwe Independent* describing the challenging situation in one of Harare's informal settlements 12 years ago. With the deteriorating economic situation in the country, the situation has probably worsened.

**Box 4: Hell on earth at Hopley Estate**

Posted on September 21, 2007 by The Independent in Politics, Grace Kombora

For ageing Machisi Kapesi (76) whose wobbly legs are badly scarred and barely covered with a dirty pair of trousers, sleeping in the dust at Hopley has become hell on earth. Hopelessness written all over his face, he does not know where he will be in the next two years with the mental torture he has suffered in the past 16 years.

He does not know what the future holds for him as he has been displaced four times since he moved from Mozambique to Zimbabwe 39 years ago.

Initially, he resided in Mbare suburb whilst working at Louis Construction. Later he relocated to Porta Farm where he was recently evicted under Operation Murambatsvina and relocated to Caledonia transit camp. He has since been moved to Hopley Estate south of Harare where he lives in a plastic shack. "I am tired of this life and wish I could disappear from the face of the earth. Just disappear out of this world because I have had enough," Kapesi said.

The victims of government's poorly executed clean-up have been turned into nomads. Those who have not been allocated stands at Hopley are set to be moved again. "We were told to vacate this place this week and go where we came from," said Kapesi.

The plastic shacks they call home are no higher than dog kennels. The shacks are without form and shape, yet they are the homes of Hopley Estate residents whom government said it was accommodating in decent houses when their shacks were destroyed in May.

Some sleep in the open on the ground bathed in dust everyday. With their goods lying in the open, they do not foresee a better future ahead of them. The living conditions at Hopley are atrocious as the residents rarely take a bath. They do not have proper places for bathing themselves. Those who are conscious of their cleanliness bathe in Mukuvisi River, or even in the open without their dignity in mind. "We even bathe in the open because we do not have an option," said a confident Morris Matutu.

Despite the temporary toilets that were built by Unicef, Hopley is replete with human waste which creates a bad odour at the camp. The *Zimbabwe Independent* visited the camp this week and witnessed young children relieving themselves in the open not far from cooking fires. "We fear an outbreak of diarrhoea at this place," said Virginia Tselo.

Tselo, a pregnant woman with four children, is finding the life at the camp bizarre. She says no living creature deserves such terrible living.

Source: extracted from *Zimbabwe Independent*, 21 September 2007

## 6. Specific areas of focus for the research

The literature review has analysed patterns, evidence, trends, factors and responses affecting informal workers and residents/settlements in Zimbabwe in the investigation of the interaction of climate change, occupational health and public health. This section assesses literature available on the risks and benefits of three economic activities in informal settlements, which are our entry-points for exploring the interaction of risks and benefits between public health, occupational health and environmental wellbeing. These three areas are:

1. Informal sector **solid waste collection and recycling**, specifically of plastic waste and bio-waste;
2. Informal **urban agriculture and food marketing**; and
3. **Water access and quality** as a major environmental issue for both informal residents and workers, and for their health. The literature review analyses the state and trends of selected aspects of human development, the impacts of climate change upon them, and the responses by society, policy makers, the private sector, and development partners to these impacts. It also assesses progress towards meeting internationally agreed goals and identifies gaps in their attainment. The concepts of sustainable development, human wellbeing and climate change are core to the analysis.

### 6.1. Waste collection and recycling

Having noted, among other things, that over 23% of deaths in Africa, estimated at more than 2.4 million each year, are attributable to avoidable environmental risk factors, with particular impacts on the poorest and the most vulnerable, African countries adopted the 2008 Libreville Declaration on Health and Environment in Africa, which is the framework currently utilised to address environmental issues affecting human health (WHO Afro, 2014). Despite the existence of numerous policies, declarations, commitments and other instruments, the major health and environment challenges facing mankind remain the “provision of safe drinking water, sanitation and hygiene services; management of water, soil and air pollution; vector control; management of chemicals and wastes; food safety; and health in the workplace.” (WHO Afro, 2014: 94). These are reported to be exacerbated by the negative impacts of climate change, unplanned urbanization, uncontrolled rapid population growth and urban migration, all of which increase pressure on already overburdened health systems.

The growing urban population presents challenges to local authorities regarding the provision of sanitation services including waste collection (Hoorweg et al., 2012). For urban cities in low income countries like Zimbabwe, the population growth rate has outpaced infrastructural development and investments in proper systems for provision of services. The growth in urban population has also resulted in the generation of huge volumes of waste, including industrial effluent thereby affecting the environment and living conditions in the surrounding communities (Ndlovu, 2016; Ziraba et al., 2016)). Against this background most urban local authorities in low income countries in general and in Zimbabwe and Africa in particular, do not have the capacity to efficiently collect waste and manage its disposal without polluting the land and the surrounding environs. Land pollution by any means results in contamination of the soil, water sources and potentially threaten public health. In the long run, land pollution reduces the quality of land and its productivity for agriculture, provision of water and other economic activities including construction and leads to social ills like outbreak of diseases and other health hazards (Ndlovu, 2016).

Whilst this situation generally applies to all areas, the impact on informal settlements is huge given the deficiencies and non-existent systems of waste collection in such areas. It has been observed that as is the case with the informal economy, local authorities are not that much concerned with developing infrastructure for services in informal settlements. This is because some informal settlements are considered illegal and under normal circumstances the municipalities move in regularly to destroy or evict the inhabitants from such places. However, where informal settlements are recognised by the local authorities, limited resources force them to abandon provision of these indispensable services. This leaves the residents with no option but to be innovative and utilise any available means for their basic needs and survival.

The UN Habitat report (2003) has reported that only about 12.5 per cent of garbage is disposed of formally in the least developed cities, mostly those in low income countries. The rest, the report noted, “is left on the streets, dumped in storm drains... burned (creating air pollution), collected and recycled by scavengers, or eaten by animals.” (UN Habitat, 2003:114). It has been noted also that in informal settlements residents are the most vulnerable as they endure the challenges of not only their own uncollected garbage, but also that of richer people dumped near their homes as well. In Harare, this is mostly experienced in informal settlements that are near the affluent suburbs.

Notwithstanding the above, informal settlement residents and workers engage in various economic activities for their survival. Chief among them is waste collection and trading in recyclable materials. Although this activity has its own challenges and health concerns, a number of informal settlement inhabitants in Harare and other cities survive on picking up plastic bottles and other materials. The example below in *Box 5* chronicles the profile of an informal settlement in Harare situated on a solid waste dumpsite, which the inhabitants use as their source of living. Other residents engaging in solid waste recycling are from other informal settlements, and they may experience different health impacts.

**Box 5: Pomona Dumpsite informal settlement**

The land is formally and legally a City of Harare dumpsite, controlled by the City’s Waste Management Department. This dumpsite has become home and working area to many homeless people failing to cope with the escalating cost of living, unemployment and stigmatization. They have created a temporary settlement to evade daily transport costs. They have formed their own sub-society, surviving on rubbish scavenging, selling recyclable rubbish and converting garbage into laundry soap. They have formed a burial society that offers assistance for funerals. The dumpsite residence is regarded temporary as they have residence elsewhere, mainly in the urban periphery. Most people hail from Domboshava, Hopley, Epworth, Porta Farm and Hatcliffe, Extension, where they are lodgers. Approximately 300 people live and work in the dumpsite, typically in abject destitution.

**Housing and tenure:** Shacks constructed of plastics, cloth and wood characterizes the area’s housing. These structures are planted amongst the rubbish and litter; they are extremely vulnerable to fire outbreaks and extreme weather events. The infamous operation Murambatsvina of 2005 escaped this settlement. They were, however, threatened with evictions during this period. Nearly all of the residents are not on the council housing list, but only three own stands in Crowbrough and Hopley. High unemployment levels have forced these people from their legal settlements to eke out a living in this very deprived area. The land is owned by the City of Harare. Although the Department of Waste Management ‘recognizes’ the existence of this plot’s settlers, their tenure status remains informal. To cushion themselves against evictions, residents make it clear to any visitor that their houses are temporary and so is their stay.

**Economic activities:** The rubbish dumps form their economic base. The occupiers play a vital role in the recycling of degradable materials by reintroducing the waste back into the system and thereby reducing environmental effects of Harare’s waste. The dumpsite would likely have been full by now, since it was opened in 2000, had it not been for the unrecognized work of the dumpsite squatters. They scavenge for tradable goods, which they later convert to personal use and sell for recycling. Some use liquid waste to make soap that they subsequently sell to the nearby suburb of Hatcliffe Extension. Moreover, the rubbish dump has created good soils for subsistence agriculture.

**Infrastructure and Social services:** Water and sanitation services are a huge challenge in Pomona Dumpsite community. The community of 300 people makes use of four makeshift Blair toilets and a single water system toilet that is located a kilometre away at the entrance to the dumpsite. The surrounding tall grasses and scrubs are used as an alternative ‘relieving centre’ by the community.

*Source: City of Harare, 2012*

### 6.1.1. Benefits of waste collection for health

There is no doubt that waste collection has its benefits and risks for public health, occupational health and environmental health. There are a number of informal settlement residents engaged in waste collection, mainly for resale to recycling companies. Whilst the major motive for collecting waste materials like plastic bottles is to generate income, there are secondary benefits that include environmental cleanliness and thereby controlling the spread of diseases. Nevertheless, there is little understanding of these workers' vulnerability to environmental risk factors including exposure to hazardous solid waste (WHO Afro 2014). In addition, local authorities do not see the value that waste pickers add to the overall waste management in the cities. It is thus crucial to document such contributions of various activities including investigating the extent to which they are practiced.

It is important to also note that African countries face financial constraints to accelerate the implementation of policies and strategies that protect people against risks resulting from environmental challenges notably risk factors such as poor sanitation and poor waste management among others. Previous research by the Training and Research Support Centre (TARSC) has revealed that solid waste management (SWM) is one of the major challenges facing most urban local authorities in Zimbabwe. "Waste collection by local authorities was reported in 2007 to have dropped from 80% of total waste across different local authorities in the mid-1990s to as low as 30% of total waste in some large cities and small towns in 2006 (TARSC and Civic Forum on Housing, 2013). In addition, it was also noted that addressing these challenges calls for integrated waste management programmes that reduce the source and level of waste through domestic recycling and manage the way waste is sorted, disposed of, collected and recycled.

There have been discussions on the economic benefits of solid waste collection and recycling. In another study by TARSC, it was observed that in some high income countries, the waste recycling industry is huge, employing a significant number of people and contributing to the economy. In the EU countries alone in 2004, it was reported that recycling had a turnover of about US\$35 billion (TARSC, 2015). It was further observed that employment growth in the recycling sector increased 7% annually, with recycling generating more jobs at higher income levels in Europe than other forms of SWM (TARSC, 2015).

Whilst in Zimbabwe and other African countries, the solid waste recycling technologies and innovations have been slow in expanding in high income countries like Europe have seen an exponential growth trend towards waste recycling (TARSC, 2015). This trend has been enabled by "advances in recycling technologies, a shift towards acceptance of and preference for, recycled products, increased scarcity of natural resources, and price incentives for recycled products. Waste is viewed as a resource for production, energy and incomes" (TARSC, 2015: 5).

### 6.1.2. Climate change risks and benefits

As noted earlier, climate change is predicted to have a wide range of impacts on human health including temperature related morbidity and mortality caused by extreme temperatures and those caused by extreme weather events such as malnutrition, water-borne, as well as food borne and vector-borne diseases (UNDP 2018b; Barata et al., 2018)). The informal settlement residents and solid waste workers are likely to suffer the following risks as a result of climate change:

***Water and sanitation:*** Safe drinking water and sanitation are two of the essential elements that determine improvement of living standards, as they reduce morbidity from diseases such as diarrhoea, dysentery, cholera, typhoid and schistosomiasis (Bartram and Cairncross, 2010; Wold et al., 2018; Muller, 2007). These diseases can sometimes be induced by climate-related shocks and stresses such as floods and droughts. Exposure to solid waste that is not properly managed increase the risks of infection and the situation is made worse by changes in rainfall or temperature as a result of climate change (Lamond et al., 2012).

***Destruction of infrastructure and settlements:***

Heavy rains and flash floods result in damage to infrastructure. The informal settlement infrastructure is highly compromised as it is made from temporary plastic and wooden materials.

At the time of writing this report, Zimbabwe was under extreme stress particularly in the eastern highlands as the country was being pounded by Cyclone Idai. Over 300 people were confirmed dead in Zimbabwe as a result of the floods and many schools, homesteads and related infrastructure was destroyed by the rains (*The Herald*, 8 April 2019). Those in informal settlements were worst affected.

**Increased frequency of vector-borne diseases:** Changes in temperature and precipitation have the likely effect of increasing the frequency of vector-borne diseases, including malaria, dengue and yellow fever epidemics, as well as water-borne diseases, such as diarrhoea and typhoid fever (Barata et al., 2018), . Informal settlement residents and workers are at greater risk.

**Increased incidence of wild fires:** The rise in temperatures also increases the risks of fire outbreaks, particularly in informal settlements. As indicated above, a number of informal settlements have suffered from fires and this is likely to increase with the rise in temperatures. In addition, wildfire smoke including that from solid waste “contains particulate matter, carbon monoxide, nitrogen oxides, and various volatile organic compounds and can reduce air quality significantly, both locally and in areas downwind of fires. Smoke exposure increases respiratory and cardiovascular diseases and the need for medication for asthma, bronchitis, chest pain, chronic obstructive pulmonary disease, respiratory infections, and lung illnesses,” according to UNDP (2018b).

Whilst a number of potential negative effects of climate change have been documented, it is difficult to predict the likely positive impacts of climate change. Although some areas will receive more rainfall as a result of climate change, others will suffer from floods and droughts.

## 6.2. Urban agriculture and food marketing

From the literature reviewed, one of the most common economic activities promoting food security and sustaining livelihoods in informal settlements is urban agriculture. Whilst urban agriculture is typically considered an economic activity for low-income groups, it is one of the activities reflecting people’s ingenuity and hard work to ensure they feed their families in the face of hardships. According the 1996 World Food Summit, ‘food security’ exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996). The concept covers four dimensions: a) physical availability of food (supply and demand); b) economic and physical access (affordability and preference); c) food utilization (nutrition); and d) food stability (sustainability) over time.

Previous research in Harare shows that the dominant agricultural activity in various informal settlements is the production of maize, which is the staple food for the country. Despite a large number of people in informal settlements engaging in some farming activities, food insecurity remains a major challenge mostly because the residents and workers do not have access to sufficient land for their farming and where there is access to land, they do not have enough inputs (seeds, fertilisers and chemicals) to improve their yields (Tawodzera, 2011; 2012). In addition, some local authorities have engaged in running battles with urban residents accusing them of practising farming on land earmarked for other developmental activities. Some maize crops have been slashed in Harare when they had reached tasselling stage, with most residents incurring huge losses of time and labour. The affected families have been left exposed to food insecurity, thereby leading to further impoverishment and health problems associated with poor nutrition. Informal settlement residents do not have regular income and eke out a living from activities that are susceptible to not only human interference but also to the vagaries of the harsh environmental conditions.

However, informal settlement residents in Harare and Masvingo have a comparative advantage when it comes to urban agriculture as the majority have grown their crops in areas close to wetlands including riverbanks (Mukuvisi in Harare, Mucheke in Masvingo) and have therefore managed decent harvests. But this has impacted negatively on the environment as well as contributing to public and occupational health risks, due to the vulnerabilities associated with farming in such areas.

Mbiba (undated) has noted that Harare and its environs have ideal conditions for urban food production, namely a relatively wet climate, large residential plot sizes and large open spaces within the city boundaries (Mbiba, undated). It is important to note that such open spaces in the city have been exploited for informal settlements and urban agriculture by Harare's residents.

**Benefits for public health, occupational health and environmental health**

As discussed above, the economic collapse in Zimbabwe led to a decline in formal employment and also an increase in the use of urban space for agriculture. It is estimated that more than 60% of the maize and leafy vegetables produced in on-plot agriculture is consumed in the household. Of the remaining 40%, 75% is sold from the home or at neighbourhood market stalls. The percentage of marketed produce in off-plot agriculture is slightly higher than that of on-plot agriculture (Mbiba, undated). Some authors (Kutiwa *et al.*, 2001) have noted some contributions of urban agriculture to food access and food security: **Urban farmers produce maize as part of their survival strategy**. Although the produce from the urban farming activities is not enough to meet their annual needs, urban agriculture significantly contributes to household food security from own production. **Urban agriculture contributes significantly to food access**. The literature available shows that the urban poor spend between 60-80% of their income on food. Urban agriculture therefore helps the low-income groups save their meagre incomes by producing their own food. It has been noted that residents engage in urban agriculture for various reasons including preservation of culture; to improve food access; to improve food supply, nutrition and to supplement income.

In terms of environmental health, urban agriculture has been seen as a threat due to its effect on hydrological issues, soil erosion, ecological changes and chemical pollution, among others. *Table 3* below summarises these likely impacts, which can be exacerbated by climate change.

**Table 3: Potential environmental implications of urban agriculture**

Category of environmental impact	Examples of environmental effects	Implications of effects
Change in the hydrological regime of the area	<ul style="list-style-type: none"> <li>more run-off and land surface flooding;</li> <li>less infiltration.</li> </ul>	<ul style="list-style-type: none"> <li>flooding, damage to property, transport routes and infrastructure;</li> <li>costs of maintenance.</li> </ul>
Soil erosion	<ul style="list-style-type: none"> <li>Lower land surface;</li> <li>Deposit of eroded sediment;</li> <li>airborne dust particles</li> </ul>	<ul style="list-style-type: none"> <li>logging of city drains, nuisance to transport;</li> <li>health problems;</li> <li>increased costs of maintenance.</li> </ul>
Ecological changes	<ul style="list-style-type: none"> <li>changes in species types;</li> <li>reduced biodiversity;</li> <li>loss of soil and tree cover.</li> </ul>	<ul style="list-style-type: none"> <li>loss of species habitat;</li> <li>loss of biodiversity;</li> <li>soil erosion.</li> </ul>
Chemical pollution	<ul style="list-style-type: none"> <li>lead uptake of crops from exhaust fumes;</li> <li>vegetation toxicity from industrial effluent;</li> <li>reduction in water quality.</li> </ul>	<ul style="list-style-type: none"> <li>algal blooms, potential health hazard to consumers, threat to wildlife, increased costs of water purification.</li> </ul>
Landscape and aesthetics	<ul style="list-style-type: none"> <li>loss of scenery and diversity of environment.</li> </ul>	<ul style="list-style-type: none"> <li>loss of recreational spaces;</li> <li>increased cost of alternatives.</li> </ul>
Diseases	<ul style="list-style-type: none"> <li>vector-borne diseases.</li> </ul>	<ul style="list-style-type: none"> <li>potential for diseases related to water, refuse, manure and animals;</li> <li>costs of monitoring, control and treatment.</li> </ul>

Source: adapted from Bowyer-Bower & Drakakis-Smith 1996.

### **6.3. Informal sector water access and quality**

Access to water is a fundamental human right and is key for achieving other human development goals, such as eradicating malnutrition and extreme poverty (Ching Chung, 2011; United Nations, 2018). While the supply of clean water is considered necessary for life and health, many people, particularly in Africa and worse still in informal settlements do not have access to clean water or where they can get it, they will have to pay a premium (Mitlin and Walnycki, 2016). UN Habitat (2003) has concluded that households in some informal settings that are not connected to water networks can only buy it from vendors and other sources at up to 200 times the average tap price. In fact, the WHO has reported that unsafe drinking water, unsafe sanitation and lack of hygiene remain serious causes of death with an estimated 870 000 deaths worldwide occurring in 2016 (WHO, 2018). Of these, the WHO has noted that the African region suffered a disproportionate burden from these deaths, with mortality four times higher than the global rate. Access to clean and safe water was only enjoyed by 71% of the global population (about 5.2 billion people) in 2015 (WHO, 2018).

With these figures in place, informal settlements in Zimbabwe experience extreme challenges of access to water. As has been noted earlier, the majority of informal settlements do not have access to piped water but rely on open wells. In almost all of Harare's informal settlements, the water and sanitation system is poor, and sewer, the nearby bush is used for sanitation and water is drawn from shallow wells (Dialogue on Shelter *et al.*, 2014). This is common across the more than 30 informal settlements profiled. What has hindered Zimbabwe's local authorities from supplying water to informal settlements is the lack of recognition of the areas. In most cases, the informal settlements are not recognised as permanent residential areas where the councils can come in and build infrastructure. However, certain informal settlements are recognised but local authorities do not have the capacity to lay new infrastructure. They have failed to keep pace with the growth of settlements, so even well-planned formal settlement areas do not even have water connections. Some old suburbs have even gone for over 15 years without water (e.g. some parts of Greendale in Harare) and instead rely on boreholes or portable water supplies.

The failure to provide water in informal settlements has exposed these residents to serious health risks. Zimbabwe has battled challenges of water born disease outbreaks such as cholera typhoid and to a lesser extent dysentery as a result of a combination of factors including consumption of contaminated (unsafe) water, dilapidated infrastructure, lack of access to water. The major affected areas were informal settlements as well as overcrowded high-density areas.

## **7. Discussion**

The growth of the informal economy in Zimbabwe has been necessitated by a number of factors dating back to racial segregation and the attendant policies of the settler colonial regime. Moreover, decades of economic regression after independence has forced a number of industries to close, thereby limiting the opportunities to secure decent livelihoods. This has led to a number of people venturing into informal activities at different scales to eke out a living. Further, the failure of government policies to provide not only adequate housing but also opportunities for people to realise their potential, coupled with rising costs of living particularly in urban areas, have forced people to seek alternative, cheaper and affordable housing. In most cases, affordable housing is located in overcrowded, unplanned and illegal informal settlements. However, not all informal settlements are illegal as there are other settlements where people have been resettled by the government or local authorities after being moved from their original settlements. In these settlements, such as areas like Hopley, the government has failed to provide adequate roads, electricity, water and sanitation services as well as other social amenities like schools and clinics.

As a result of this failure, informal settlements have multiple social problems that include crime, corruption, prostitution, and have become citadels of disease outbreaks especially those related to poor sanitation and hygiene including cholera, typhoid, dysentery and tuberculosis. It has also emerged that with the rise in prostitution, HIV/AIDS is also rife in informal settlements. The residents and workers of informal settlements have endured challenges associated with poor social services, which is likely to be exacerbated by climate change. In like manner, the informal

settlement habitants have also contributed immensely to environmental pollution especially that associated with excreta and sewage disposal, illegal economic activities that affects the environment as well as pollution of water sources.

The lack of basic infrastructure and services within informal settlements has left the residents in those areas with fewer or no options for their survival. This has led them to generate innovative solutions to address their basic daily needs. Some of the innovative and creative solutions are found in waste management practices. Informal residents and informal workers both experience multiple risks in relation to occupational health, public health and environmental well-being. In summary, this literature review has pointed to general areas of benefits and risks the informal settlements face and also indicate some gaps where there is no information or lack of evidence.

Table 4 below, compiled from the Global literature review by IIED, corroborates the findings from this review the likely impacts of climate change on informal settlement residents and workers in urban environments in relation to occupational and public health. However, the extent to which the residents and workers will experience these impacts is not yet known, making it an area of further research.

**Table 4: Impacts of climate change on informal settlement residents and workers**

<b>Projected changes</b>	<b>Examples of likely impacts</b>	<b>Implications for residents of informal settlements and people working in the informal economy</b>
<b>Changes in simple extremes</b>		
Higher (and increasing) maximum temperatures, more frequent hot days and heat waves - over nearly all land areas	Rise in mortality and illness from heat stress in many urban locations. Risk of power failures associated with surge in energy demand for mechanical cooling. Impacts on productivity, on working hours and possibly a rise in OHS-related accidents and injuries.	Many informal settlements very dense with very little open/public space and often with uninsulated corrugated iron roofs and poor ventilation that contribute to higher indoor temperatures. Largest impacts among vulnerable groups, particularly infants and young children, the elderly, pregnant women, and those with certain chronic diseases. Heightened health risks for outdoor workers (e.g. construction workers, waste pickers, street vendors) and for those who live or work in heat islands within the city
Higher (increasing) minimum temperatures: fewer cold days, frost days and cold waves over nearly all land areas	Decreased cold-related human morbidity and mortality. Extended range and activity of some disease vectors – including mosquito- and tick-borne diseases	Most informal settlements currently lack public health measures to control or remove disease vectors and without healthcare systems that provide needed responses. Infants and young children particularly vulnerable
More intense precipitation events, including those that accompany tropical cyclones, and riverine floods	Increased flood, landslide, avalanche and mud-slide damage resulting in injury and loss of life, loss of property and damage to infrastructure. Increased flood run-off often brings contamination to water supplies and outbreaks of water-borne diseases and disruption to food supplies	Many informal settlements are concentrated on sites most at risk of flooding or landslides, with poor-quality housing less able to withstand storms and flooding as well as lacking risk-reducing infrastructure. Damage to homes, possessions and assets for generating income – and these not covered by insurance. Access to work-places/income-earning opportunities disrupted. Those in informal settlements without piped water supplies at higher risk from contaminated and/or disrupted water supplies

<b>Projected changes</b>	<b>Examples of likely impacts</b>	<b>Implications for residents of informal settlements and people working in the informal economy</b>
Wind storms with higher wind speeds	Structural damage to buildings, power and telephone lines, communication masts and other urban infrastructure. Many urban buildings built to withstand highest historic wind speeds but not speeds above this (Adelekan 2012).	Low-quality housing typically unable to withstand wind storms. Corrugated iron roof-sheets may blow around during high winds; they were not nailed down because they could be sold if needed and the price was less if they had nail holes (Wamsler 2007)
<b>Changes in complex extremes</b>		
Increased summer drying over mid-latitude continental interiors and associated risk of drought	Decreased water resource quantity and quality; increased risk of forest/bush fire; decreased crop yields and higher food prices. Disruption of hydro-electricity	Informal settlement residents usually face greater water constraints, and low-income residents are more vulnerable to food and water shortages and price rises
Increased tropical cyclone peak wind intensities and mean and peak precipitation intensities	Increased risk to human life and damage to property and infrastructure; risk of infectious disease epidemics; increased coastal erosion and damage to coastal ecosystems	Many informal settlements are on sites most at risk, having poor quality housing and lacking risk-reducing infrastructure. Usually disruption to livelihoods/incomes
Intensified droughts and floods associated with El Niño events in many different regions	Decreased agriculture and range-land productivity in drought-prone and flood-prone regions	Impact on food availability and prices in urban areas
<b>Changes in the mean</b>		
Water availability	Reduced water availability in many locations – with negative impacts upon agriculture and on cities where freshwater availability declines significantly	In cities facing constraints or shortages of freshwater supplies, it is likely that low-income areas will be the most affected (and least able to afford alternative sources). Difficulty in accessing water for informal livelihood activities.
Higher average temperature	Disease vector range spreading, worsening air quality, worsening heat island effect, higher water demand and water loss; changes in infectious disease dynamics	Residents of informal settlements are rarely served with the infrastructure and healthcare measures needed to counteract these impacts; also unable to afford air conditioning

Source: IIED (forthcoming)

Whilst the literature is replete with information on the challenges facing informal settlement residents with regards to public health and environmental health, there is far less data on informal workers' occupational health and safety. This is because the literature on occupational health issues covers mainly workers in formal employment, who experience different conditions of work and whose operations are regulated by laws and policies. Informal workers and residents live in conditions of "informality" that have little or no recognition from authorities hence their experiences in relation to the environment and public health issues are manifestly different. As key issues facing informal workers and residents in relation to their occupational health,

public health and environmental health:

Many informal settlements are overcrowded with very little open/public space and often with uninsulated corrugated iron roofs, cabins and shacks with poor ventilation that contribute to higher indoor temperatures. Largest impacts among vulnerable groups, particularly infants and young children, the elderly, pregnant women, and those with certain chronic diseases. Heightened health risks for outdoor workers (e.g. construction workers, waste pickers, street vendors) and for those who live or work in heat islands within the city. In addition, there is elevated risk of fire outbreaks in shacks and also workplaces, given the density of settlements, thereby endangering the lives of workers and residents. High temperatures are a great risk to densely-populated informal settlements. Most informal settlements currently lack public health measures to control or remove disease vectors and without healthcare systems that provide needed responses. There are no readily-available public health workers in most informal settlements. Residents have to travel some distances to the nearest health centre (mostly in the nearby formal settlements);

Many informal settlements are concentrated on sites most at risk of flooding or landslides, with poor-quality housing less able to withstand storms and flooding as well as lacking risk-reducing infrastructure. Damage to homes, possessions and assets for generating income – and these not covered by insurance. Access to work-places/ income-earning opportunities disrupted. Those in informal settlements without piped water supplies are at higher risk from contaminated and/or disrupted water supplies. The literature shows that a number of informal settlements have sprouted especially in wetlands, vleis and swamis, there by disrupting the environment particularly the natural functions of these water reservoirs. This situation has increased the risks of waterborne diseases, while also exacerbating the impacts of extreme weather and climate change;

Residents of informal settlements do not have access to infrastructure and healthcare measures needed to counteract the impact of water, air and land pollution. Coupled with poor sanitation, the residents are the most affected by air and water-borne diseases. Difficulty in accessing water for informal livelihoods can also threaten their food security, health and sanitation. Urban agriculture is one of the major activities practised by residents and workers in informal settlements. However, the small pieces of land means over-cultivation and use of chemicals and fertilisers threatening the quality of underground water supplies, which they rely on for drinking and their household chores. Moreover, the cultivation along river banks in peri-urban areas has caused soil erosion and threatened food security, while also contributing to the areas' vulnerability to disasters and climate change.

With these issues at stake, there is evidence on likely impacts of the interaction between occupational health, public health and environmental health. However, the scope and extent of the impacts need to be investigated further for deeper knowledge and understanding.

## **8. Conclusion**

Informal settlement residents have exhibited some innovativeness in responding to the risks and challenges they face as marginalised groups in urban areas. They have already taken measures to ensure their access to water, food and productive self-help activities to enhance their livelihoods. However, there is no clarity on how they have organised themselves to respond to the impacts of climate change, occupational health risks and public health challenges. It is important that these topics be explored further, particularly given the limited role of the state and local authorities in Zimbabwe. This literature review has examined occupational health risks, public health, and environmental health risks facing workers and residents of Zimbabwe's informal settlements. There is limited evidence on the occupational health risks of informal workers, given their often unregistered nature, lack of inclusion in formal social security systems and its relatively dynamic nature. The review has highlighted the need to investigate the lived experiences of informal settlements residents and informal workers and the impacts of climate change and ongoing or emerging responses in informal settlements and workers in Zimbabwe.

## References

1. African Development Bank Group, African Union Commission and United Nations Economic Commission on Africa (2010) African Statistical Year book 2010, Tunis and Addis Ababa
2. Barata M M L, *et al.* (2018) Urban Health. In Rosenzweig, C., *et al.* (eds.), *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press. New York. 363–398.
3. Bartram J, Cairncross, S (2010) Hygiene, sanitation, and water: forgotten foundations of health, *PLoS medicine*, 7(11), e1000367.
4. Bowyer-Bower T, Drakakis-Smith D (1996) The needs of the urban poor versus environmental conservation: conflict in urban agriculture, London: Research Report, ODA Project R5946.
5. Ching Chung H (2011) Access to water and sanitation in the informal settlements of Kisumu, Kenya, Radboud University, The Netherlands and University of Nairobi, Kenya
6. Chitekwe-Biti B, Mudimu P, Nyama G M, Jera T (2012) Developing an informal settlement upgrading protocol in Zimbabwe – the Epworth story, *Environment & Urbanization*. Vol 24(1): 131–148. DOI: 10.1177/0956247812437138
7. Demuzere M, Orru K, Heidrich O, Olazabal E, Geneletti D, Orru H, Faehnle, M (2014) Mitigating and adapting to climate change: Multi-functional and multi-scale assessment of green urban infrastructure. *Journal of environmental management*, 146, 107-115.
8. Dialogue on shelter for the homeless in Zimbabwe Trust, Zimbabwe Homeless Peoples' Federation, City of Harare (2014) Harare Slum profiles report (edition 2), Dialogue on Shelter for the homeless in Zimbabwe Trust, Harare
9. Ezeh A, Oyebode O, Satterthwaite D, *et al.* (2017) The history, geography, and sociology of slums and the health problems of people who live in slums, *The Lancet*, 389(10068), 547-558.
10. FAO (2012) *Growing greener cities in Africa*, first status report on urban and peri-urban horticulture in Africa, Rome, Food and Agriculture Organization of the United Nations.
11. Forastieri V (1999) Improvement of working conditions and environment in the informal sector through safety and health measures, ILO, Geneva
12. Grant R, Oteng-Ababio M (2012) Mapping the Invisible and Real "African" Economy: Urban E-Waste Circuitry, *Urban Geography*, 33:1, 1-21, DOI: 10.2747/0272-3638.33.1.1
13. Government of Zimbabwe (2009) Short Term Emergency Recovery Programme, Ministry of Finance, Harare
14. Government of Zimbabwe (2013) Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim Asset): "Towards an Empowered Society and a Growing Economy" October 2013- December 2018, GoZ, Harare
15. Government of Zimbabwe (2015) National report for Habitat III, Government of Zimbabwe, Harare
16. Government of Zimbabwe and United Nations Development Programme (UNDP) (2018) Zimbabwe Human Development Report 2017 Climate Change and Human Development: Towards Building a Climate Resilient Nation, UNDP, Harare
17. Herald (2019) 'Cyclone Idai's death toll rises to 847', *The Herald*, 8 April 2019, available at: <https://www.herald.co.zw/cyclone-idais-death-toll-rises-to-847/>
18. Hoornweg D, Bhada-Tata P (2012) *What a waste: a global review of solid waste management*, World Bank, Washington, DC.
19. International Labour organisation (ILO) (2008) Decent work and the transition to formalization : recent trends, policy debates and good practices / International Labour Office.- Geneva: ILO
20. ILO (2013) Sectoral Activities Department - The health of workers in selected sectors of the urban economy: Challenges and perspectives / International Labour Office. - Geneva: ILO, 2013
21. ILO (2013) Occupational Health and Safety- Zimbabwe profile available at: [https://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO::P1100\\_ISO\\_CODE3,P1100\\_SUBCOD E\\_CODE,P1100\\_YEAR:ZWE,,2013](https://www.ilo.org/dyn/legosh/en/f?p=14100:1100:0::NO::P1100_ISO_CODE3,P1100_SUBCOD E_CODE,P1100_YEAR:ZWE,,2013)
22. ILO (2017) Situational analysis of Women in the informal economy in Zimbabwe, International Labour Office. - Geneva: ILO, 2017
23. ILO (2015) Resolution R204 (Transition from the Informal to the Formal Economy Recommendation, 2015), ILO, Geneva
24. International Monetary Fund (2017) Shadow Economies Around the World: What Did We Learn Over the Last 20 Years?, IMF, Washington DC
25. Isunju J B, Orach C G, Kemp J (2016) Hazards and vulnerabilities among informal wetland communities in Kampala, Uganda, *Environment and Urbanization*, 28(1), 275-293.
26. Kanyenze G (2004) Giving voice to the unprotected workers in the informal economy in Africa: the case of Zimbabwe, ILO discussion paper No. 22, ILO, Harare

27. Kutiwa S, Boon E, Devuyt D (2010) Urban Agriculture in Low Income Households of Harare: An Adaptive Response to Economic Crisis, *Human Ecology Department, Vrije Universiteit Brussel, Belgium*
28. Labour and Economic Development Research Institute of Zimbabwe (LEDRIZ), Zimbabwe Congress of Trade Unions (ZCTU) (2016) Climate change, green jobs and the role of trade unions: An education and training manual for trade unions in Zimbabwe, ZCTU, Harare
29. LEDRIZ (2016), Employment Creation Potential Analysis, Harare
30. LEDRIZ, Friedrich-Ebert-Stiftung (2015) Strategies for Transitioning the Informal Economy to Formalisation in Zimbabwe LEDRIZ and FES, Harare
31. Lamond J, Bhattacharya N, Bloch R (2012) The role of solid waste management as a response to urban flood risk in developing countries, a case study analysis, *WIT Transactions on Ecology and the Environment*, 159, 193-204.
32. Lilford R J, Oyebode O, Satterthwaite D, *et al* (2017) Improving the health and welfare of people who live in slums. *The Lancet*, 389(10068), 559-570. Note: this *Lancet* article was funded by NIHR to analyse 'Slum Health'
33. Lindley S, Pauleit S, Yeshitela K, Cilliers S, Shackleton C (2018) Rethinking urban green infrastructure and ecosystem services from the perspective of sub-Saharan African cities, *Landscape and Urban Planning*. Vol 180, December, 328-338.
34. Loewenson R, Masoty M (2015) Responding to inequalities in health in urban areas: A review and annotated bibliography, EQUINET Discussion paper 106, TARSC, EQUINET, Harare
35. Loewenson R, Masoty M (2018) Responding to inequalities in health in urban areas in east and southern Africa: Brief 2: What does the data tell us? May 2018, TARSC, EQUINET, Harare
36. Loewenson R (1999) Occupational health and safety in Southern Africa: trends and policies, ILO/SAMAT Policy paper no. 8, ILO, Geneva
37. Lucchini R G, London L (2014) Global occupational health: current challenges and the need for urgent action, *Annals of global health*, 80(4), 251-256.
38. Luebker M (2008) Decent work and informal employment: a survey of workers in Glen View, Harare / Malte Luebker; International Labour Office, Policy Integration and Statistics Department; ILO Sub-Regional Office for southern Africa (SRO-Harare). - Geneva: ILO, 2008 55 p. (Integration working paper; Issues paper; no.91 and no.33)
39. Luebker M (2008) Employment, unemployment and informality in Zimbabwe: concepts and data for coherent policy-making, ILO Sub-Regional Office for southern Africa (SRO-Harare), Harare
40. Machedze R (2018) (ed) Informal Economy and Social Vulnerability in Zimbabwe, a research report, Friedrich Ebert Stiftung, Harare
41. Mbiba B (undated) Urban agriculture in Harare: between suspicion and repression, City Case Study Harare
42. Mitlin D, Walnycki A (2016) Why is water still unaffordable for sub-Saharan Africa's urban poor?, IIED Briefing, available at <http://pubs.iied.org/pdfs/17353IIED.pdf>
43. Moyo J (2017) 'Construction on wetlands ramps up water stress in Zimbabwe,' Reuters, 27 June 2017
44. Muller M (2007) Adapting to climate change: water management for urban resilience, *Environment and Urbanization*, 19(1), 99-113.
45. Mutetwa B, Dozva R, Mahembe K (2015) Value addition of occupational safety and health to business, National Social Security Authority (NSSA), Harare
46. Muzondi L (2014) Sustainable Water Provision in Informal Settlements: A Developmental Challenge for Urban South Africa, *Mediterranean Journal of Social Sciences* Vol 5 No 25 MCSER Publishing, Rome-Italy
47. Muzulu P (2013) New Slum threat in Harare, *The Zimbabwe Independent* 20 September 2013, Harare
48. New Era (2016) 'Shacks burn daily in informal settlements' New Era, Windhoek, 2 June 2016 available at: <https://neweralive.na/posts/shacks-burn-daily-informal-settlements> (accessed 12 March 2019)
49. Olthuis K, Benni J, Eichwede K, Zevenbergen C (2015) Slum Upgrading: Assessing the importance of location and a plea for a spatial approach, *Habitat International*, 50, 270-288.
50. Pharoah R (2009) Fire risk in informal settlements in Cape Town, South Africa, In *Disaster Risk Reduction*, eds M. Pelling and B. Wisner (pp. 121-142). Routledge
51. Rockefeller Foundation (2013) Health Vulnerabilities of Informal Workers, Rockefeller Foundation, New York
52. Satterthwaite D, Archer D, Colenbrander S, Dodman D, Hardoy J, Patel S (2018) Responding to climate change in cities and in their informal settlements and economies, Paper prepared for the

- IPCC for the International Scientific Conference on Cities and Climate Change in Edmonton, March 2018, available at <https://citiesipcc.org/wp-content/uploads/2018/03/Informality-background-paper-for-IPCC-Cities.pdf>
53. TARSC, ZCTU (2011) Closing the gap to Universal Social Security: Social Security cover amongst Workers in the urban formal manufacturing sector in Zimbabwe, Harare
  54. Tawodzera G (2011) Vulnerability in crisis: urban household food insecurity in Epworth, Harare, Zimbabwe, *Food Security*, 3(4), 503-520.
  55. Tawodzera G (2012) Urban household survival and resilience to food insecurity in crisis conditions: The case of Epworth in Harare, Zimbabwe, *Journal of hunger & environmental nutrition*, 7(2-3), 293-320.
  56. Tibajjuka A K (2005) Report of the Fact-Finding Mission to Zimbabwe to assess the Scope and Impact of Operation Murambatsvina by the UN Special Envoy on Human Settlements Issues in Zimbabwe, New York: UN
  57. Training and Research Support Centre (TARSC) (2014) Innovations for health: Use of appropriate technologies in Primary Health Care in Zimbabwe- Report of an assessment: TARSC CBRT Harare
  58. Training and Research Support Centre (TARSC) (2015) "Cash from Trash" – An assessment of solid waste recycling in five local authority areas of Zimbabwe: TARSC Harare.
  59. TARSC and Civic Forum on Housing (CFH) (2013) 'A case study on solid waste management in three local authority areas of Zimbabwe', TARSC: Harare.
  60. TARSC, CFH, 2010. Assessment of solid waste management in three local authority areas in Zimbabwe, Report of a Community Based Assessment: Discussion paper. Harare: TARSC.
  61. UNDP (2018a) Climate change and food security, Policy Brief derived from Zimbabwe Human Development Report 2017, UNDP, Harare
  62. UNDP (2018b) Climate change and health, Policy brief derived from 2017 Zimbabwe Human Development Report 2017, UNDP, Harare
  63. UNFPA (2008) The State of World's Population Report, 2007, UNFPA, Geneva
  64. United Nations (2018) *Sustainable Development Goal 6: Synthesis Report on Water and Sanitation*, 195 pages.
  65. WHO (2007) Sixtieth World Health Assembly Resolutions and Decisions WHASS1/2006–WHA60/2007/REC/1, WHO, Geneva
  66. WHO (2011) *Burn prevention: success stories and lessons learned*, WHO, Geneva, 88 pages
  67. WHO (2013) WHO Global Plan of Action on Workers' Health (2008-2017): Baseline for Implementation, WHO, Geneva
  68. WHO Regional Office for Africa (2014) The health of the people: what works – the African Regional Health Report 2014, WHO Afro, Brazzaville
  69. Wolf J, Hunter P R, Freeman M C, Cumming O, Clasen T, Bartram J, Prüss-Ustün A (2018) Impact of drinking water, sanitation and handwashing with soap on childhood diarrhoeal disease: updated meta-analysis and meta-regression. *Tropical medicine & international health*, 23(5), 508-525.
  70. Zimbabwe National Statistic Agency (ZIMSTAT), 2012, Population Census National Report 2012, ZIMSTAT, Harare available at: [http://www.zimstat.co.zw/sites/default/files/img/National\\_Report.pdf](http://www.zimstat.co.zw/sites/default/files/img/National_Report.pdf)
  71. Ziraba A K, Haregu T N, Mberu B (2016) A review and framework for understanding the potential impact of poor solid waste management on health in developing countries. *Archives of Public Health*, 74(1), 55.