



Communities collaborating in the Kariba Integrated Solid Waste Management Programme: From urban litter-jungles into healthy environments



The photo on the left shows littering in green spaces in Kariba S. Makunda, 2015

On the right, the photo shows Community members displaying items made out of recovered waste materials at the launch of KISWMP S. Makunda, 2017

Key messages

- Interventions on urban waste have been integrated into one solid waste management programme in Kariba through multi-actor participation with high literacy, involving existing community structures and different age groups of people, and incorporating their aspirations for a clean town.
- Different interest groups select their own interventions on urban waste linking to food, energy and other urban needs, and deploy their own innovation, local knowledge systems. These are then integrated into the overall programme.
- The activities use affordable technologies and locally available materials, creating a demand for local goods.
- Information and communication technologies used in the programme have been important contributors to successful outcomes.
- Bringing diverse social groups together contributes to system wide and holistic awareness and links action on urban waste systems to a circular economy and climate justice.

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Context and challenges

Kariba is a small tourist resort town in north-eastern Zimbabwe near the border with Zambia and is located in a National Parks area. Construction of Lake Kariba enabled hydro-electricity generation, fishing, with game and water recreation tourism and the annual Kariba International Tiger Fish Tournament. The district experiences hot, dry weather throughout the year, with low summer rainfall. It is not suitable for crop farming or animal husbandry due to low rains and tsetse fly infestation and is therefore predominantly a wildlife and National Parks area. The town has approximately 30 000 residents (ZIMSTAT, 2022). It lies far from major commercial centres and farming areas in the country and has high levels of unemployment, with approximately 51% of the population working in the informal economy (Kariba Municipality, 2020). Its location in a national parks and wildlife area implies that the town has limited land for housing, generating a significant housing backlog, with some residents still living in barrack-style temporary accommodation for dam construction workers.

The Municipality of Kariba was given municipal status in 1999 (Municipality of Kariba, 2020). It is responsible for service delivery in the town, including provision of housing and social services, water supply, waste management and local economic development. With its economy dependent on the nexus between land, water and the built environment, preservation of the natural environment ranks high in the Municipality's strategic planning, with tourism, governance and information technology, improved access to water, sanitation and hygiene services, social services and road infrastructures in the strategic plan (Municipality of Kariba, 2020). As a low-income town, the waste generated in Kariba is largely organic matter, with 56% of waste generated organic, followed by ash and soil (21%), and then other materials (8%) (Johnson, 2013). Recyclable paper, plastic, glass and metals comprise 15%. The waste generated per capita is 0.22 kg/person/day, with residential, commercial and industrial waste combined generating approximately 300 tonnes/month. Kariba has a small number of mostly light industries related to fishing and boat industries.

The legal and policy framework guiding solid waste management combines national laws, council by-laws and council resolutions that regulate the waste value chain from waste generation to treatment and disposal and that aim to fulfil environmental rights for current and future generations in line with Zimbabwe's constitution (Republic of Zimbabwe, 2013). Current laws stipulate how waste, should be handled, prohibit littering and place a duty on owners of land and buildings where public assemble to provide bins for waste disposal (Republic of Zimbabwe, 2016). The Municipality is empowered to take all lawful, necessary and reasonably practical measures to prevent or remedy conditions that are harmful to health (Republic of Zimbabwe, 2013). According to the Urban Councils Act (Chapter 29:15), municipalities are responsible for managing solid waste services in urban areas and can play an innovative role on this, but the municipality does not have the proper and skilled resources or adequate budgets for this.

As is the case for other towns in the region, solid waste management remains a challenge in Kariba, given engineering and technical constraints, social factors, rapid unplanned urbanization and an outdated solid waste service delivery model which is not sustainable, with impacts on health and wellbeing (Mwesigye et al., 2009). While the Municipality with the assistance of the German Technical Agency for Cooperation has formed community-based organisations in each of the town's nine wards to support local clean-up activities and improve education and awareness on solid waste management, the breakdown of waste collection trucks and lack of waste bins in public areas has reduced waste collection by the town, while a lack of recycling and composting methods has limited community roles (IWM, 2017). This has led to littering of streets, alleys, open spaces, undeveloped stands and game corridors. Significant volumes of waste washed into the lake, animals consume plastic waste from food packages and storm water drains blocked by litter lead to urban flooding. While the cause is not yet known, an increase in elephant deaths in town led to community concern over plastic waste motivating interest in a Kariba integrated solid waste management programme.

"This situation of littering is worsening as shown by increased presence of plastic in the green spaces"

Participant at the 2016 Kariba integrated solid waste management planning workshop.

A number of initiatives that promote healthy urban food and waste management systems are underway within urban areas in the region, and an [EQUINET conceptual framework](#) outlines the urban responses for food and waste management systems as key entry points to foster innovation, collaboration, accountability, literacy and system-wide change to support healthy people, healthy ecosystems and an inclusive, productive, regenerative and circular urban economy (EQUINET, 2023).



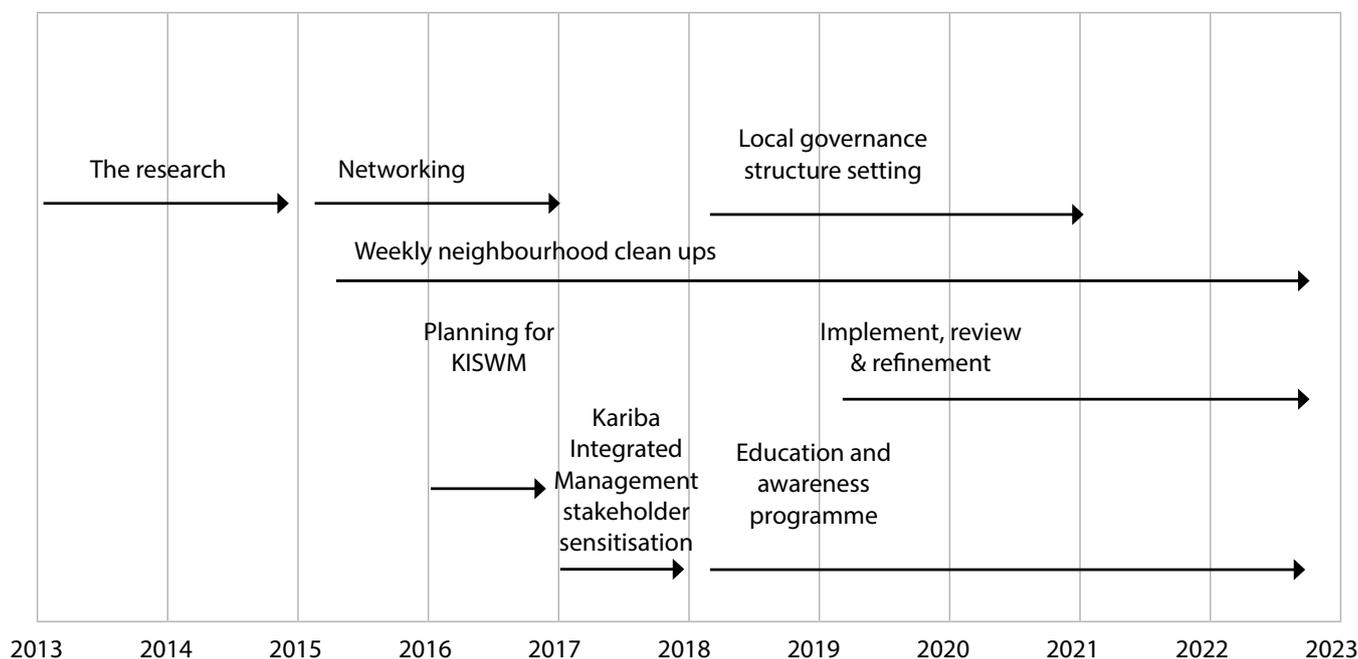
An elephant feeding on waste from a broken down truck, WK Munemo 2012.

This case study therefore seeks to document promising practices in Kariba. Integrated solid waste management was adopted by the Municipality in 2016, involving the community and all stakeholders in collaborative designing, planning and implementation of the programme. A Council resolution was adopted to facilitate the change in Council policy proposing that Integrated Solid Waste Management be adopted as an approach for the town (Municipality of Kariba, 2016).

Areas of intervention and practices implemented

The time line graphic below shows the steps in the process of implementing the resolution and plan, with their timings, as described in this section.

Figure 1: Timeline graphic of KISWMP



The research

A 2019 rapid appraisal of water supply and sanitation services and a 2013 inception report on communal water and sanitation services provided some information on solid waste management in Kariba. A Solid Waste Characterization Study and Household Survey was done in Kariba in 2013 by the Municipality with German Technical Agency for Cooperation. to establish the profile of solid waste in the town and the knowledge, attitudes and practices of the community. The survey also established the level of readiness of the town to implement waste recycling. The survey provided more accurate, lower estimates of the tonnes of solid waste per month as landfill estimations are done without a weighbridge, despite the need for reliable data for municipal solid waste management planning (Johnson, 2013).

The Waste Characterisation report was disseminated to Council management and Councilors in 2013 to guide decisions and policy formulation and to plan, design and implement solid waste interventions adaptable to the obtaining waste profile situation and socio-economic context in Kariba.

The study had indicated that about 92% of waste generated in Kariba is recyclable, with more than half of the solid waste biodegradable and close to 20% of the waste ash and soil, which can be managed at source. Recycling waste can reduce waste dumped at the Municipal dumpsite, and separated waste at source supports for recycling. Generally, waste contains a rather high proportion of organic material, which may make composting a feasible option (Hoorweg and Bhada-Tata, 2012; Simelane and Mohee, 2012).

The Municipality also mapped all its various solid waste stakeholders after the resolution to adopt KISWMP in 2016. The mapping process was done through a qualitative scoring of the weighted roles of each stakeholder. The stakeholders included All Municipality Councilors, Municipality management, Ministry of Health and child care, Ministry of Education, Ministry of Agriculture, Ministry of women affairs, Zimbabwe National parks and wildlife, Environmental Management Agency, Delta Beverages Cooperation, church organisations, Zimbabwe Power Company, Zambezi River Authority, community based organisations, residents associations, Lake Harvest, Media companies, Kariba Animal Welfare Trust Fund, Zimbabwe Tourism Authority, youth groups, women groups and the University of Zimbabwe Lake Research Station.

Networking

The mapping and research brought evidence on waste and community experiences and views, integrating survey data with local knowledge and information on promising practice in other cities across the region and beyond. The stakeholders mapped by the Municipality were gathered to review findings and dialogue forums held with them and with local communities to build local ownership, and community participation in project planning, designing, and the later implementation and monitoring. WhatsApp was a preferred method of community dialogue and some local radio stations were also utilised to reach out to the community.



The development of strategies in Kariba was supported by information from wider networks. Kariba town joined Connective Cities Network in 2015 as an international platform for learning, sharing best practices and peer to peer exchanges among international solid waste practitioners and experts. Connective Cities Practitioners' workshops in Tanzania and Kenya in 2015 brought information from urban practitioners from Germany and countries in the region on good practices on contemporary solutions in solid waste management, with site visits to locally operating recycling companies (Connective cities, 2015s, b). A later international workshop in Germany in 2017 shared approaches for waste separation, solid waste disposal and sustainable waste management (Connective cities, 2017). These international exchanges provided useful insights that informed the implementation of the Kariba programme, such as in revising the somewhat ambitious targets set in Kariba given the time needed to share and implement community projects.

A Solid Waste Management workshop in December 2016 in Kariba convened all stakeholders to discuss the solid waste challenges of the town and to suggest solutions. Stakeholders were informed on the existing town solid waste management system and its challenges, the results of the local studies, described earlier, and the experiences and insights obtained from the Connective Cities Network.

"This beautiful workshop has given back the powers to the stakeholders and residents to determine the future of our town."

Stakeholder who participated in the workshop, 2016.

At the three-day workshop, stakeholders and actors across all sectors agreed to adopt an integrated solid waste management strategy hinged on waste reduction, waste recycling and reuse, composting, training, education and awareness and research and development. A multi-stakeholder interim steering committee was set up to transition the process to a fully integrated solid waste management system. The stakeholders proposed on a solid waste management system that would ensure Kariba's natural environment for eco-tourism, while also protecting residents and wildlife against toxic pollutants and waste. The implementation of the interventions were sequenced in line with the timeline shown earlier.

Weekly neighbourhood clean ups

With littering in undesignated sites identified as a key challenge, Council implemented community sensitization outreach on solid waste management in all the nine wards, and then worked with and registered local ward-based community-based organisations to initiate ward based litter-picking in the town. In each of these organisations, ten volunteers, men and women, were selected from each ward with the assistance of ward councilors. Council and the nine ward-level community-based organisations signed a memorandum of understanding mandating weekly cleanups of their wards on voluntary basis.

The community-based organization members were invited for solid waste management training, after which the Council purchased and provided them with shovels, hoes, wheel barrows, garden forks, litter pickers, gloves and face masks, shoes, hats and branded T-shirts. The clean-up programme was launched by the Mayor of Kariba with further inputs from representatives from the Health section, volunteers, and the Town clerk.

"This work needs a lot of commitment and love for our town as it is the only home we have as a community of residents."

Ward 2 representative at the launch of the community clean-up programme.

The emphasis on community participation aimed to tap into available assets and existing initiatives in the community, given the desire articulated by stakeholders for interventions to be innovative, collaborative, affordable and sustainable. The German Technical Agency for Cooperation sponsored a social mobilization expert who engaged both municipality officials and community members to support the interaction and processes.

Planning for an integrated solid waste management programme

The evidence and information gathered and dialogue forums described earlier were used to design and plan the Kariba Integrated Solid Waste Programme (KISWP). After the success of the clean-up project, the Municipality in 2016 decided to adopt an integrated solid waste management model that addresses technical and social dimensions. Overall, stakeholders, community and the local authority agreed that the programme should promote biodiversity, health ecosystems, equity and social justice, with urban green spaces and lake water free from pollution and animals not feeding on waste that is harmful to their health.



The photo on the left shows clean up of the lakeshore, S. Makunda. 2015

On the right, the photo shows clean up Mahombekombe township, C.Mutumbami 2015



Healthy green spaces were seen as a sink for greenhouse gasses to support climate mitigation and water for animal and human consumption and energy production. The agreed vision of the KISWMP is `A clean Kariba with zero waste-related wildlife deaths` and the mission is `To improve Kariba's cleanliness by reducing waste generation, eliminating dumping and littering and through recycling, reuse and composting` (IWM, 2017).

"We like a clean Kariba with zero waste-related wildlife deaths"

Quote from a group presentation unanimously adopted as the vision of the KISWMP.

The hierarchy in the adopted model took the following order: Reduce, Reuse, Recycle, Recovery and lastly Landfill, with reduce the most favourable option and landfill the least favourable. Recycling beverage cans and plastic to send to markets in Harare; composting the plentiful organic waste for local fertilizer or to keep fishing worms and reusing waste to create small bags and door mats for sale to the public were examples raised from existing practice

The KISWMP is implemented through multiple integrated projects, each with its own strategic and implementation plan and budget. A plan is developed through a feasibility study, a project proposal, assessment of test pilots and choice of the best performing options. Stakeholders contribute to the design and the Local authority and identified experts assist in assessing the performance of various projects. Adopted pilots are scaled up and replicated where possible.

In the model community groups, with guidance and assistance from the Municipality, choose solid waste treatment options and develop them into projects that are voluntary or generate income. The Municipality retains its roles in waste collection, disposal at the landfill, and providing bins to residents. The first interventions would be more affordable, with less complex technology and environmentally friendly, followed by options that need more resources and increase management of more demanding and damaging waste, such as e-waste or tires imported from other parts of the world (Mwesigiye et al., 2009; Okot-Okumu, 2012).

The local authority documents the progress of projects and reports to the monthly Project Steering Committee meetings, which then reports quarterly to the community and stakeholders. The programme was catalyzed by a partnership between the Municipality and the German Agency for International Cooperation, initially to improve water supply, sanitation and hygiene services after the 2008 cholera outbreak (GIZ, 2008). Solid waste experts carried out studies, recommend a trajectory for Kariba solid waste management, and the German agency agreed to fund for some of the recommended projects.

Training for implementation

Twenty-nine members of the community-based organisations and other waste project interest groups participated in a three-day training course in 2017 for three days. The training covered identifying recycling materials, use of recycling equipment, health and safety and entrepreneurial skills. It used a whole- of-school curriculum approach rather than a subject approach, in a holistic and broad-based training aimed at increasing health literacy, awareness, knowledge and skills and emphasising the bigger picture of the collaborations across stakeholders and the links to economic and climate impacts.



The photo on the left shows education and Awareness group raising awareness at the launch of KISWMP S. Makunda, 2017
On the right, the photo shows training of recycling project members on use of a bailer machine S. Makunda, 2017

In the training on material identification facilitated by a recycling company called Petreco Zimbabwe, participants were taught to identify and separate different materials for recycling, including different types of plastics. Training on entrepreneurial skills was facilitated by the Municipality, while Delta Corporation Zimbabwe trained the participants how to use the plastics bailer machine and beverage cane crusher machine.

Training and other awareness activities play a major role in the KISWMP. Two 'Education and Awareness groups' were established in 2017 by the local authority, following wider community sensitisation. The groups managed education and awareness activities for the KISWMP. Two community based organisation indicated interested and volunteered to take up this education and awareness role as one of their waste management projects. They cascade the integrated solid waste management concept within residents, churches, schools and the general public and educate the public on sanitation and environmental sustainability in sessions, songs, drama and educational materials. The groups also inform stakeholders on programme objectives, progress and milestones during implementation. One group operates on the Eastern side of the town under the name Chakachaya (Serious Business) Education and Awareness group, while the other operates on the Western side under the name Zanoguru (Big Idea) Education and Awareness group.

Investment in recycling

The Council and German Agency partnership provided a local subsidy of materials for the construction of a recycling shed at the Municipal dump site where land has no other competing uses. The plastic bailer machine and beverage cane crusher machine are housed in the recycling shed. The two machines are used to compact recyclable plastics and crush beverage cans to reduce their volume so that the waste can be easily transported to markets in Harare.

The recycling shed, equipment and the pumping of water used in the process are powered by both hydro-electricity from the National grid and solar energy, linking energy to waste recycling. Waste recycling requires water to clean waste materials, while recycling waste protects water and green spaces from pollution and contamination. Water is brought to the recycling shade by water bowsers. The water used in cleaning waste materials for recycling is clean and purified, while the water emerging after the recycling is poor quality and is disposed in a septic tank that services the recycling shed, drained into the environment and returned to the hydrological cycle through artificial ground water recharge and evaporation.



Recycling project members load a truck going to markets with recyclable materials, S. Makunda, 2017

The recycling project demonstrates the partnership and collaboration supporting integrated approaches in the KISWMP, with links to improved incomes in a circular economy, improvements in health and ecosystems, and climate protection. These linkages emerged through the work and process, linked to efforts to apply affordable technologies, smart energy, less mechanisation and natural processes. There are further potentials to explore. Municipal solid waste contributes directly to global warming through the emission of greenhouse gases. Methane, which is 21-times more harmful to the climate than carbon dioxide is produced by the decomposition of organic waste in open waste dumps. According to the Inter-Governmental Panel on Climate Change, solid waste and waste water management generates about 2,7% of the global greenhouse gas emissions (IFEU, 2009). The greenhouse gas emissions from waste can be reduced through reducing, recycling, re-using, or waste-to-energy strategies. For example, recycling creates secondary raw materials for industry, reducing extraction of raw materials through substitutes that minimize energy consumption, production of carbon and environmental degradation (Nassour et al., 2016)

Composting

Biodegradable materials constitute a major waste stream in Kariba town, as noted earlier. About fifty members from three community groups chose this waste treatment for composting of communal gardens. Communal gardens in Kariba need to be secured by costly electric fences against wild animals, given limited land and almost all open spaces being reserved as game corridors. Access to land requires a formal lease arrangement with the local authority. A composting programme was established in 2017 with three independent groups, reducing waste disposed at the Municipal dumpsite. Biodegradable materials used for composting include grass, tree leaves, small tree cuttings, food waste, soil, ash, cow and elephant dung, and maize stubs. These resources are collected by members. The local authority provides bin liners to collect food waste, and the Tony Waite foundation, a non-governmental organisation periodically donates fertilisers. The compost is used by group members to grow vegetables for subsistence and for sale.



Mature compost in a tumbler drum composter in Padare garden, C. Mutumbami, 2015

The pilots compost food waste in tumbler composter drums in two communal gardens using scales to weigh the food waste that is fed in the composters. The Ministry of Agriculture trained the project members on how to prepare the compost. The materials are soaked in water before applying them in the composter drums. The drums are easy to turn, produce heat, accelerating the maturation rate of the compost, and are easy to empty.

The Padare garden in Mahombekombe high density suburb is home to one of the composting pilot projects run by 15 men living with HIV. The Municipality provided land, supplied water to the garden and facilitated the composting in tumbler drums. The groups earn an income from the sale of their vegetables. The second composting pilot project is the Zimbabwe Homeless People's Federation Garden. The garden is run by 21 members of a home-seekers co-operative and low income residents who supplement their income through gardening and herbs. The Tony Waite Foundation provided technical support while the Municipality provided land for the garden. The third garden is located in Charara, a peri urban banana farm. The garden existed in 2015 when the local authority introduced the composting project, owned and operated by 13 farm workers. They grow vegetables for consumption and for sale.



"Composting waste in tumbler composter drums is the best way to produce organic fertiliser as it makes the compost easy to turn, achieve higher temperatures and mature quicker than the conventional compost. We can produce enough organic fertiliser to stock for the whole of the rainy season when it becomes difficult to compost because of lots of water."

Padare garden member, 2016.

Tumbler drum composter at the Zimbabwe federation garden S.Makunda, 2015

This initiative plays an important role as waste collection services are limited in Charara peri urban area. Composting absorbs most of the predominantly organic waste generated. The Municipality of Kariba and the Tony Waite foundation support the garden through education and by providing vegetable seeds.

Composting projects in Kariba exemplify how urban waste systems link energy, water, green spaces and climate response for food production. The gardens are secured by an electric fence powered by hydro-electricity to keep wild animals out. Water is used to produce energy as well as to irrigate vegetables. The gardens are urban green spaces that provide affordable, safe and nutritious food that promote healthy neighbourhoods and act as carbon sinks.

Mechanisms for dialogue, co-production and review

The KISWMP is anchored on multi-stakeholder participation across sectors, actors and systems. As described earlier, it involves recycling groups, often as community volunteers, the local authority, manufacturing companies and the Environmental Management Agency. The initiative shares roles, fostering collaboration solidarity, organisation and community leadership and ownership of the processes, challenges and solutions. Project groups are trained to share roles, and involve stakeholders doing similar activities, or specific capacities from government and other agencies. The partnerships and collaboration in the KISWMP have levered range of expertise and resources.

The Municipality retains its traditional mandate, duties and roles, and creates an enabling environment for other roles, such as providing zones for safe storage of recyclables, transport for the project groups where necessary, training inputs with other agencies and project advice. An integrated programme like the KISWMP requires the involvement of everyone within a local authority such as residents, community-based organisations, businesses, educational institutions, government as well as external partners, (IWM, 2017). The local authority uses its existing governance, management, information and accountability capacities to manage and document the KISWMP, and has established a waste management information system and data analysis.

AS noted earlier, stakeholders in the KISWMP set up a Programme Management Committee involving the different groups and institutions. This provides collaborative management and capacities, transparency, inclusion and participation. A board of directors gives policy direction and a Monitoring and Evaluation team brings sectoral knowledge into the project management. The steering committee meets monthly and the wider stakeholders meet quarterly. Reports from the local authority and community are discussed in monthly meetings, recommendations made and reports provided to stakeholders and the community (IWM, 2017).

The KISWMP demonstrates a Whole of Society approach, breaking silos to establish a system-wide, holistic approach to urban waste management. As a small town, Kariba has close links with community and its shared concerns, such as the elephant deaths noted earlier. Beyond their regular meetings, where needed participants use social media like the WhatsApp groups outlined earlier.



"Today we have done a good thing. This process of consulting us must continue like this because today we have actually done what we have always been asking for from the Authorities but we are always ignored, "

Participant, 2018 planning meeting

A unity dialogue meeting on KISWP S. Makunda, 2017.

Outcomes and future plans

The clean ups, education and awareness programmes have improved health literacy, public health and ecosystems and reduced waste-borne diseases (Municipality of Kariba, 2018). Production of locally produced affordable, safe and nutritious food has improved local food security, substituting ultra-processed foods which are increasingly being advertised and consumed. The KISWMP has led to regenerative agriculture and improved green spaces and bio-diversity, both of which act as carbon sinks and strengthen responses to climate change. KISWP has promoted recycling activities that relatively quickly support local incomes, reducing waste, clearing storm water drains and contributing to flood reclamation. The reduced waste reduces the prevalence of vectors such as mosquitoes, snails and some soil helminths and the fresh produce grown in gardens that is sold to local consumers who find this produce to be healthier and tastier (Municipality of Kariba, 2018).

"It is actually funny to imagine how much money one can get from recycling waste while a lot of people despise this work, "

Recycling project member. 2018.

In the future the Council plans to contract community organisations to green the town using the organic fertilizer from composting, providing a financial incentive for the total area greened. Various local groups are interested in establishing recreational parks in open spaces currently used as illegal dumpsites, and have cleared waste from these dumpsites. Council will also incentivize this if the parks use compost from food waste.

Capacities, challenges and responses

KISWMP benefitted from local capacities in the community and stakeholders and between the local authority and partners and through international links and networks, as earlier described. The passion and commitment participants bring fosters a mutual work ethic. This helped to address capacity deficits that naturally occur in a small border-town.

There are still challenges, however, such as lack of nearby markets for recyclable materials and organic fertilizer, and limited financial resources. KISWMP resources were used to build capacities to self-sustain, but this is still a challenge. New resources have been leveraged from international agencies and companies, linking to existing support and demonstrating the socio-economic and ecosystem value of interventions. The formation of a multi-stakeholder platform and local planning committee and links with international networks such as the Connective Cities Network has enabled the sharing of ideas, skills, experience and learning in the design and implementation of KISWMP.

The city faces unique challenges in securing activities from wildlife, and wider challenges such as vandalism and theft. Securing the plots and recycling shed, and enabling people to stay in adjacent rooms helps to reduce this. The informal nature of community processes reduces the bureaucracy for their start-up, but their lack of formal registration, including with tax authorities, can limit their sales to big supermarkets, hotels, hospitals and government departments. While the city establishes memoranda with these groups, it has not been able to overcome this nationally defined barrier.

Features and learning for holistic, integrated approaches

KISWMP programme demonstrates linkages that reflect inter-connectedness and interdependence of urban waste systems with healthy ecosystem components such as energy, water and green spaces and how these interact with the local economy and climate. *Figure 2* overleaf, shows the EQUINET conceptual framework, highlighting the areas that Kariba's practices address.

Figure 2: The EQUINET conceptual framework with areas addressed in Kariba's KISWMP

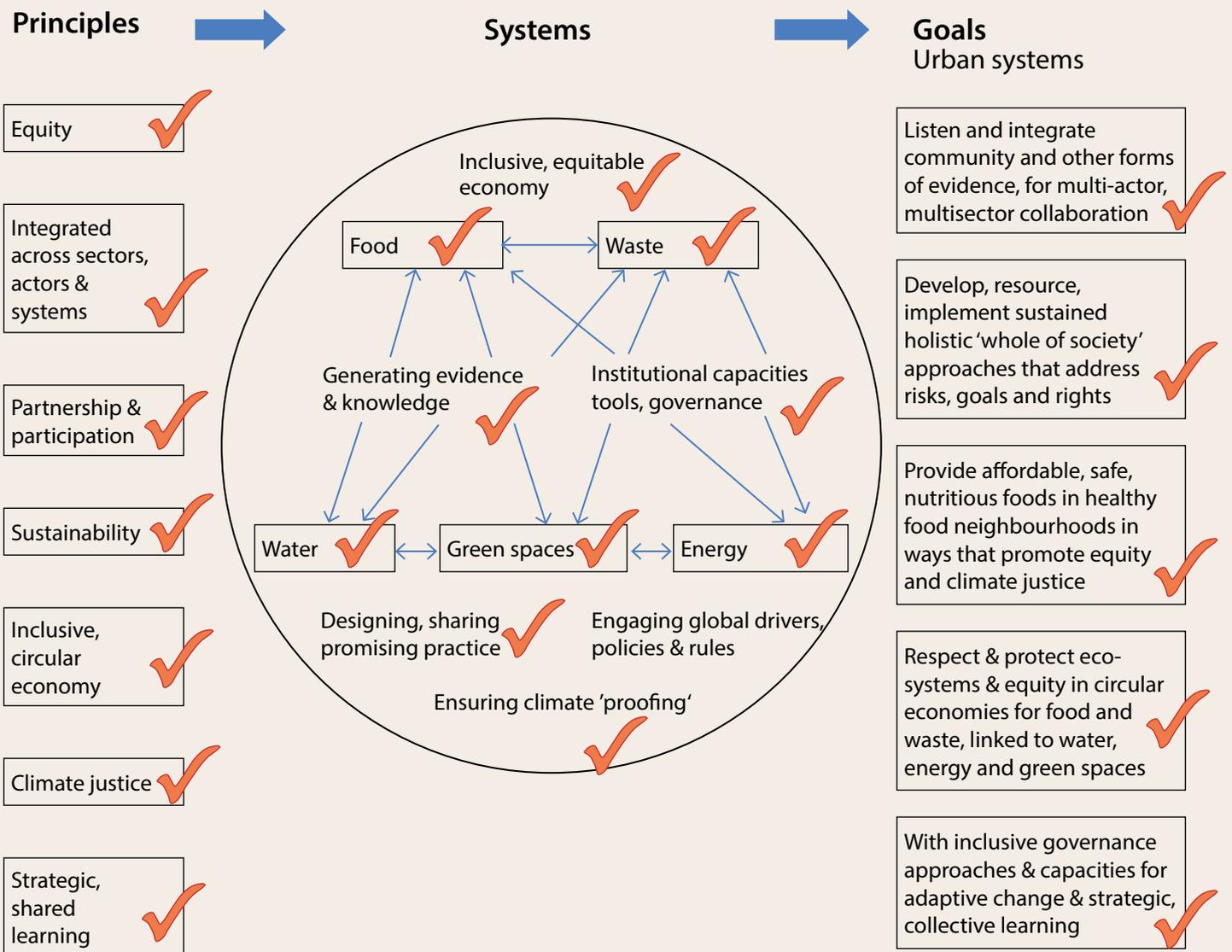


Figure source: EQUINET, 2023

Waste management is closely linked to food production in the composting project with low income communities, promoting health equity and healthy ecosystems, with links across the different elements, education and training generating a holistic system,. The partnership and participation in these initiatives generate capacities, evidence and shared learning.

As an inclusive circular economy, waste is brought back into the economy for food production, new products and income generation. Recycling reduces material losses from the economy, reducing extraction which consumes and wastes energy and produces greenhouse gasses. Composting of waste and recycling positively impacts on the green spaces which are a carbon sink, and with the involvement of all in planning and providing practical ways of protecting valued natural resources and animals, promotes respect for ecosystems and biodiversity.

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