

STATUS AND MANAGEMENT OF LAND BASED SOURCES OF POLLUTION TO THE MARINE ENVIRONMENT: **Tanzania Case Study**

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Presentation Outline

- ❧ Background (land-based sources of pollution, challenges in their management in the country)
- ❧ Any known consequences of such land-based sources of pollution
- ❧ Relevant policy developments in support of improved management
- ❧ Any specific and major interventions on ground work relevant (community and private sector involvement)
- ❧ Opportunities and any appropriate recommendations



Acknowledge

Salum Mohammed

Background

☞ The coastal area of Tanzania (Fig. 1) encompasses a number of habitats that include

- ☞ coral reefs,
- ☞ mangroves,
- ☞ seagrass beds,
- ☞ sand banks,
- ☞ wetlands and beaches, among others.



Figure 1. Map of Tanzania showing coastal districts

Background Cont'd

- ❧ Essential linkages in the overall functioning of the coastal areas
- ❧ These coastal habitats support various resources both living and nonliving.
- ❧ For generations the coastal area has provided life support to coastal communities
- ❧ Such activities as fisheries and related activities have played an important role in the social and economic development of local communities.

Background Cont'd

☞ The well-being of these natural habitats and resources and the various activities taking place within or near coastal waters depend, to a large extent, on

☞ good water quality.

Background Cont'd

- ❧ However, expanding coastal **populations and emerging industrial activities** are exerting ever increasing pressures on coastal waters thus negatively affecting water quality.
- ❧ As a result **coastal pollution is increasingly becoming a major issue in Tanzania.**
- ❧ Reports indicate that coastal waters fronting such cities and towns as Dar es Salaam, Tanga, Zanzibar, and Mtwara are grossly polluted.

Background Cont'd

⌘ Furthermore, land based activities such as;

- ⌘ Rapid Rate of Urbanization (leading to domestic wastewater/faecal discharge)
- ⌘ Improper/poor and disposal of solid waste into rivers (Msimbazi, Mlakuwa etc)
- ⌘ Agriculture,
- ⌘ Industry,
- ⌘ Mineral exploitation and
- ⌘ Oil and natural gas development

⌘ Have further contributed to the degradation of coastal water quality.

Known consequences of such land-based sources of pollution

- ❧ Several studies have shown that in general the coastal waters in many parts of Tanzania are in a relatively pristine condition.
- ❧ The exception is coastal areas bordering major towns and cities that are recipients of;
 - ❧ untreated municipal and industrial wastes and
 - ❧ those areas receiving agricultural wastes.

Known consequences of such land-based sources of pollution Cont'd

- ❧ These include the main coastal towns of Dar es Salaam, Tanga, Mtwara and Zanzibar.
- ❧ In Zanzibar, faecal coliform and total coliform levels of up to 70/100ml and numerous thousands per ml of seawater, respectively, have been reported in the waters fronting the Zanzibar Municipality.

Known consequences of such land-based sources of pollution Cont'd

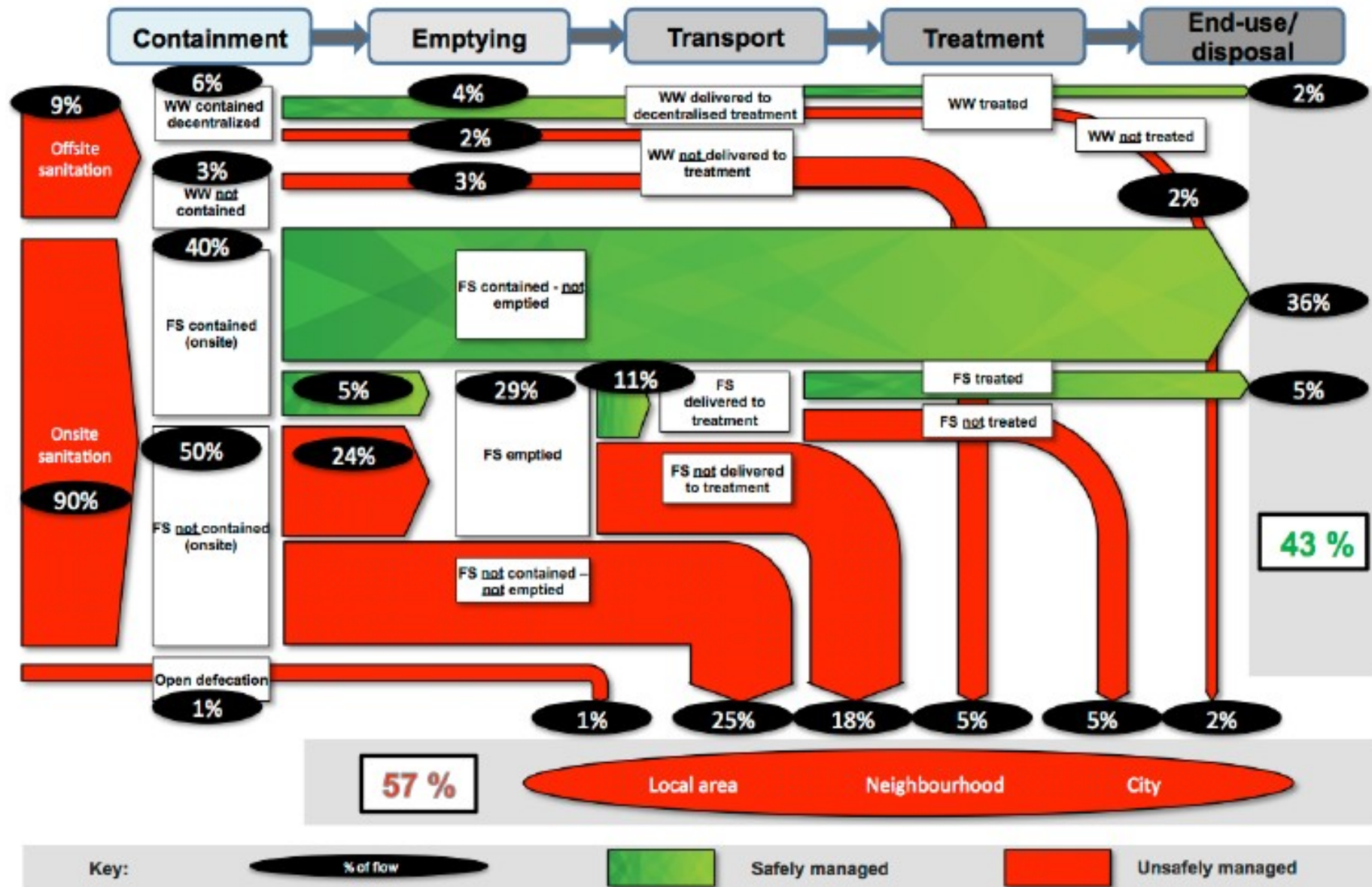
- ❧ Sewage pollution has been cited as being principally responsible for **increased cases of waterborne diseases on the islands.**
- ❧ These **include diarrhoea, gastroenteritis, cholera and dysentery**

Known consequences of such land-based sources of pollution Cont'd

- ❧ Likewise, it has been reported that there is a **proliferation of macroalgae** in Tanga coastal waters due to **excess nutrient loadings from discharges from a fertilizer factory** and from the municipality.
- ❧ Coastal pollution in Tanga is also attributed to discharge of effluents from sisal decorticating plants in the area.
- ❧ Up to 20 plants discharge their wastes onto the coast via the Pangani, Sigi, Mruazi/Mnyuzi, and Mkurumzi Rivers some of which are heavily polluted.

Known consequences of such land-based sources of pollution Cont'd

- ❧ In Dar es Salaam, domestic waste is the most serious source of pollution.
- ❧ 9% of Dar population is connected to sewerage system. 90% of residents use onsite sanitation system (pit latrine and septic tanks) producing huge volume of faecal sludge.
- ❧ Shit flow diagram study revealed that 57% of all wastewater and faecal sludge generated is unsafely managed.
- ❧ As a result coastal waters, are heavily polluted.
- ❧ Discharge of untreated sewage in Dar es Salaam has resulted in high faecal and total coliform levels in coastal waters



Note: Percentages do not add up to 100 due to rounding.

Known consequences of such land-based sources of pollution Cont'd

- ❧ The situation is made worse by a broken sewer pipe, which discharges untreated sewage on sandy-mud flats near the harbor and is said to threaten invertebrates and fish.
- ❧ It has also been reported that chlorinated organic compounds are present at alarming levels in the harbor areas as are heavy metals, e.g. Pb, Zn and Cu
- ❧ For many years, the harbor area suffered from oil pollution from the refinery at Kigamboni, and industrial wastes from Keko, Chang'ombe, Kurasini, Mtoni, and Temeke.
- ❧ These discharge heavy metal, pesticide, organic, and paint wastes into the nearby area.
- ❧ However, the refinery has now ceased operation.

Known consequences of such land-based sources of pollution Cont'd

- ❧ Msimbazi River and Creek are also among the most polluted waterbodies in Dar es Salaam.
- ❧ The river and creek receive large quantities of untreated domestic wastes from the city's residents in addition to industrial wastes from various industries.
- ❧ The river and creek receive such pollutants as dyes and paint wastes and strong alkalis (from textile factories), oil, and tars, (from vehicle depots and power stations), organic wastes (from breweries and meat plants).

Known consequences of such land-based sources of pollution Cont'd

- ❧ Other industrial and agricultural chemicals that pollute the river and creek include heavy metals, PCBs, cyanides, pesticides, and detergents
- ❧ Table 1 and 2 give pollution loads in surface and ground water sources respectively in Dar es Salaam.

Table 1. Pollution load to surface water resources (kg day⁻¹) In Dar es Salaam.

Type	Industrial effluent	Pit latrines	Septic tanks	Without facilities	Total
BOD	28330	15282	3275	9897	56784
COD	29904	16131	3457	10447	49776
Suspended solids	47216	25 470	5458	16495	78429
Dissolved solids	83940	45280	9830	29325	138923
Total N	4145	2236	479	1448	6859
Total P	787	425	91	275	1302

Source: Sustainable Development Programme (1992)

Table 2. Pollution loads to groundwater sources (kg day⁻¹) in Dar es Salaam.

Type	No facility	Pit latrines	Septic tanks	Sewer domestic	Losses industry	Total (tonnes)
BOD	1100	15282	7641	1221	1899	27
COD	1161	16131	8068	1289	11994	29
Suspended solids	1833	6116	3832	2035	3148	18
Dissolved solids	3258	97 857	61128	3618	5596	196
Total N	120	4829	3018	3618	5596	10
Total P	23	915	572	34	52	2

Known consequences of such land-based sources of pollution Cont'd

- ❧ Vast amounts of sediment enter the coastal waters annually via the nation's river networks.
- ❧ Such inputs can be a result of natural events such as storm events and rains in upland areas, though poor agricultural practices have been known to play a leading role in water-quality degradation due to sedimentation.

Known consequences of such land-based sources of pollution Cont'd

- ✿ A direct consequence of sedimentation is the smothering of corals and other benthic organisms.
- ✿ Sedimentation also has a detrimental effect on social and economic potential of coastal waters causing the reduction of aesthetic value of the water thus making it less attractive for such activities as tourism as well as for general recreational activities.

Known consequences of such land-based sources of pollution Cont'd

☞ Mushroom of informal car wash

☞ Discharge of hydrocarbons

☞ Investigation and development of oil and natural gas e.g
Mtwara

☞ The land based solid waste pollution has its origin in inadequate disposal practices, such as using rivers and streams and mangrove swamps as dumpsites.

Known consequences of such land-based sources of pollution Cont'd

- ❧ Poorly managed landfills in coastal areas can also become sources of debris, especially in the rainy season, when runoff may wash wastes out to sea.
- ❧ At present there is little published information available about the amount of solid wastes generated

Relevant policy developments in support of improved management

☞ National Environmental Policy (1997)

- ☞ Policy that sets broad goals for environmental protection and committing Tanzania to sustainable development of its natural resources.
- ☞ The policy recognizes pollution in towns and countryside and loss of productivity of lakes, coastal and marine waters as a result of pollution among major environmental problems facing Tanzania
- ☞ Indiscriminate disposal of faecal sludge is one of the culprits of environmental pollution, particularly of aquatic and marine environment.
- ☞ One of the objectives of the policy is to prevent and control degradation of land, water, vegetation and air which constitute our life support systems.

Relevant policy developments in support of improved management

☞ National Water Policy (2002)

- ☞ Policy objective is to develop a comprehensive framework for the sustainable development and provides guidance on water resources management in the country.
- ☞ One of the policy objectives is to protect water quality and to control water pollution.
- ☞ The Policy specifically states that “Pollution from point and non-point sources of water resources is responsible for the deterioration of the quality of water, makes water unusable and its treatment very costly.

Relevant policy developments in support of improved management

☞ The National Land Policy (1995)

- ☞ The National Land Policy promotes and ensures a secure land tenure system, to encourage the optimal use of land resources, and to facilitate broad – based social and economic development without upsetting or endangering the ecological balance of the environment.
- ☞ The Policy also provides general land category including a category on ‘hazardous land’ (where development is likely to pose a danger to life, or lead to environmental degradation).

Relevant policy developments in support of improved management

☞ National Health Policy (2003)

- ☞ In line with the Government Development Vision 2025 goals, this policy strives to raise and improve the health status and life expectancy of the people of Tanzania by ensuring delivery of effective, efficient and quality curative, preventive, promotive and rehabilitative health services at all levels.
- ☞ Specifically one goal of this policy strives to ensure realization of provision of 'universal access of clean and safe water
- ☞ one objective of this policy is to 'reduce the burden of disease, maternal and infant mortality and increase life expectancy through the provision of adequate and equitable maternal and child health services, facilitate the promotion of environmental health and sanitation, promotion of adequate nutrition, control of communicable diseases and treatment of common conditions'

Relevant policy developments in support of improved management

☞ The National Gender Policy (1999)

- ☞ The key objective of this policy is to provide guidelines that will ensure that gender sensitive plans and strategies are developed in all sectors and institutions.
- ☞ While the policy aims at establishing strategies to eradicate poverty, it puts emphasis on gender quality and equal opportunity of both men and women to participate in development undertakings and to value the role-played by each member of society.

Relevant policy developments in support of improved management

✧ The National Tourism Policy (1999)

- ✧ Under this policy protection of environment is given due consideration.
- ✧ The policy states that “The relationship between the environment and development of sustainable tourism is closely knit that the two cannot be dealt with in isolation.
- ✧ Protection, enhancement of various components of man’s environment are therefore among fundamental conditions for harmonious development of tourism”.
- ✧ Considering tourism as a key sources of income for Dar es salaam and Tanzania in general, therefore for sustainable development of this sector it has to go hand in hand with proper management and to prevent environmental pollution

Relevant policy developments in support of improved management

❧ The National Construction Industry Policy (2002)

- ❧ Among the major objectives of the policy, include the promotion and application of cost effective and innovative technologies and practices to support socio-economic development activities such as water supply, sanitation road-works, shelter delivery and income generating activities and to ensure application of practices, technologies and products which are not harmful to either the environment or human health

Relevant policy developments in support of improved management

- ✧ The National Fisheries Sector Policy and Strategy Statement (1997)
 - ✧ Among strategies being considered to manage this problem is to promote efforts that combat the spread of noxious-water weed e.g. water hyacinth.
 - ✧ Indirectly what this statement means is to control nutrient levels in water bodies.

Relevant policy developments in support of improved management

☞ National Integrated Coast Environment Management Strategy (2003)

- ☞ The strategy states that “Development activities including industries, agriculture, mar culture, tourism, urbanization and other activities are potential sources of pollution.
- ☞ Poor waste management (solid and liquid) from various institutions and residential areas has led to environmental pollution.
- ☞ Improper dumping has led to air pollution, and ground water pollution through seepage.
- ☞ Inadequacy of treatment plants of waste water in cities and towns along the coast has led to discharge of raw wastewater into rivers, eventually in the sea, therefore risking both human lives and coastal ecosystems”.
- ☞ The strategy provides several strategic options that can be used to protect the coast environment.

Relevant policy developments in support of improved management

🌀 Legislations - Laws and Regulations

- 🌀 The Environmental Management Act, Cap 191
- 🌀 The Environmental Impact Assessment and Audit Regulations (2005)
- 🌀 The Environmental (Registration of Environmental Experts) Regulations (2005)
- 🌀 The Water Resources Management Act No. 11(2009)
- 🌀 The Water Supply and Sanitation Act No. 12 (2009)
- 🌀 Dar es Salaam Water and Sewerage Authority (DAWASA) Act (2001)
- 🌀 The Energy and Water Utilities Regulatory Authority Act (EWURA) No. 11(2001)
- 🌀 Tanzania Bureau of Standards, Act No. 3 of 1975
- 🌀 The Local Government (Urban Authorities) Act No. 8(1982)
- 🌀 The Public Health Act No. 1 (2009)
- 🌀 The Occupational Safety and Health Act No. 5 (2003)
- 🌀 The Urban Planning Act No. 8(2007)
- 🌀 The Land Use Planning Act (2007)
- 🌀 The Land Act No. 4 (1999)

Any specific and major on ground work relevant

☞ Mlalakua River Restoration Project (MRRP)

- ☞ The Mlalakua River Restoration Project (MRRP) was a multi-stakeholder partnership that was initiated by GIZ's International Water Stewardship Programme from 2013 to 2016.
- ☞ Two years after its close, MRRP stakeholders are still seeing benefits of the initiative and continue to improve their waste management practices.
- ☞ The overall objective of the Mlalakua River Restoration Project (MRRP) was to restore the health of the Mlalakua River and to prevent further pollution on a sustained basis.

Any specific and major on ground work relevant

🌀 Mlalakua River Restoration Project (MRRP)

- 🌀 This could only be achieved through the collective engagement of all relevant stakeholders, restoring the river's natural functions, and building systems to ensure sustainable management of solid and liquid waste to prevent further pollution.
- 🌀 From the start, it was clear that experiences drawn from this initiative would be used to inspire and to inform actions aimed at improving the conditions of other rivers and streams in Dar es Salaam.

Any specific and major on ground work relevant

🌀 Mlalakua River Restoration Project (MRRP)

🌀 To assess impacts and lessons learnt in the MRRP, partners dedicated the last two steering committee meetings to ensure final commitments from each partner – i.e. what will they do to keep carrying out relevant activities after the project is closed – and to gather lessons learnt, which led to the publication of a jointly-written brochure on shared experiences.

Any specific and major on ground work relevant

🌀 Mlalakua River Restoration Project (MRRP)

- 🌀 The project was officially closed and handed over to the public sector and partners during the final learning event on 18 March 2016, held at the Ministry of Water and Irrigation (MOWI) and chaired by the Permanent Secretary of the MOWI.
- 🌀 This was the occasion to present the partnership approach and the lessons learnt to a wide number of stakeholders, including community members, local government authorities, CSOs, water resources management authorities, and development partners.

Any specific and major on ground work relevant

☞ Mlalakua River Restoration Project (MRRP)

- ☞ In terms of scaling up, the Mlalakua partnership experience inspired at least three initiatives replicating the spirit of the project, i.e. the
 - ☞ Cleanest Mtaa Competition,
 - ☞ the Neighborhood Solid Waste Practice, and
 - ☞ a decentralized faecal sludge treatment plant.

- ☞ It was also the starting point of broader discussions on Dar Es Salaam industrial waste water management.

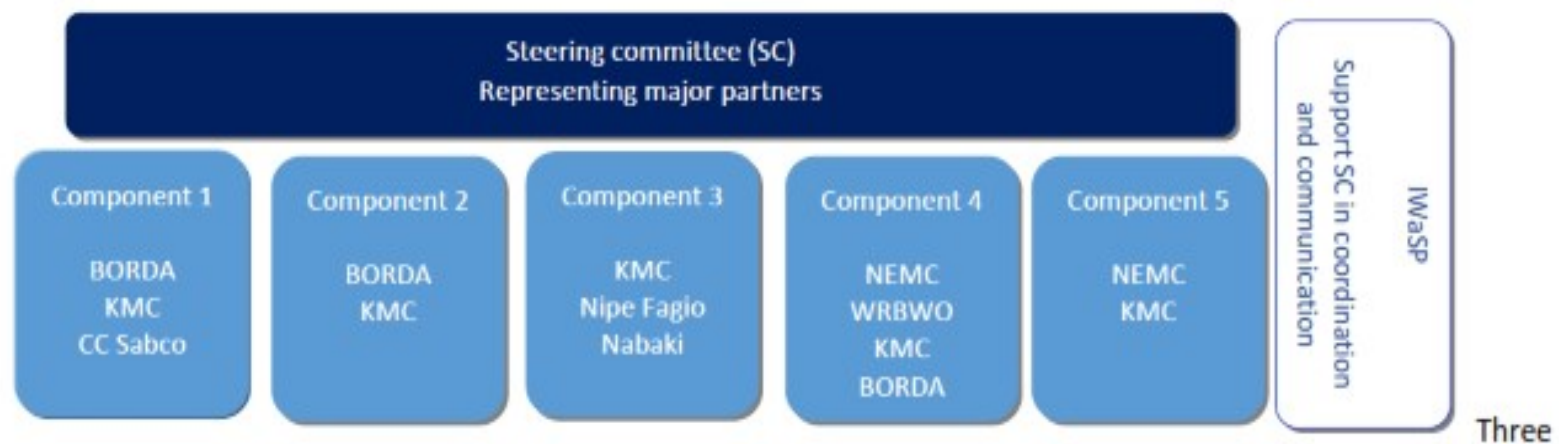
Mlalakua River Restoration Project Partners



Sustainable Restoration of the Mlalakua River in Dar es Salaam



The following organisational chart outlines the eight partners, the project components and the respective working groups:





public sector institutions:

- Wami Ruvu Basin Water Board (WRBWB)
- National Environmental Management Council (NEMC)
- Kinondoni Municipal Council (KMC)

Two private sector organisations:

- Coca-Cola Kwanza Ltd (CC Sabco)
- Nabaki Afrika Ltd

Two NGOs:

- Bremen Overseas Research Agency (BORDA)
- Nipe Fagio

One coordinating partner:

- International Water Stewardship Programme (IWaSP-GIZ)
- 

Cash and in-kind contribution by partners 2013-2015 (estimates)

Each partners contributed cash and in-kind to the project activities through time, human resources, expertise, equipment, studies etc..

WRBWB	14,500,000 TZS
NEMC	32,117,300 TZS
KMC	36,600,800 TZS
BORDA	60,000,000 TZS
NIPE FAGIO	54,800,000 TZS
NABAKI	56,307,500 TZS
CC Sabco	9,175,000 TZS
IWaSP	700,000,000 TZS



Figure 2: River at Mlalakua bridge before project and any cleanup



Figure 3: River at Mlalakua bridge after clean up

Success Story

Let the community leaders be responsible to supervise the removal of illegal dumps surrounding community area and the installation of penalty sign boards saying: 'Don't dump here'



Figure 5: Community leaders putting up no dumping signs



Figure 6: Waste collection service providers at work



Figure 7: Community clean-up in the River, at Mlalakua bridge

Any specific and major on ground work relevant

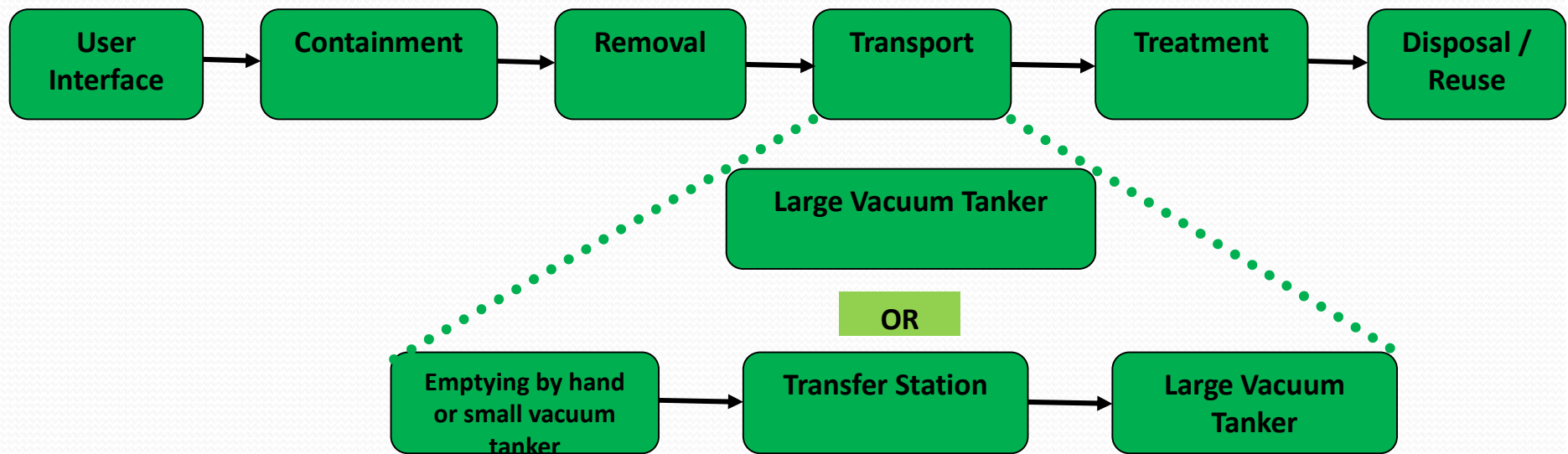
☞ Feasibility Study for Faecal Sludge Treatment Facilities in Areas With No Sewer and With Poor Sanitation in Dar Es Salaam

- ☞ To carry out a feasibility study for septic tank sewage treatment facilities in areas with no sewer and with poor sanitation in Dar es Salaam
- ☞ 90% of Dar es Salaam population use onsite sanitation system (15% ST and 75% pit latrine)
- ☞ Poses huge environmental and public health concern

Any specific and major on ground work relevant

Feasibility Study For Faecal Sludge Treatment Facilities In Areas With No Sewer And With Poor Sanitation In Dar Es Salaam

Analysis of Technologies



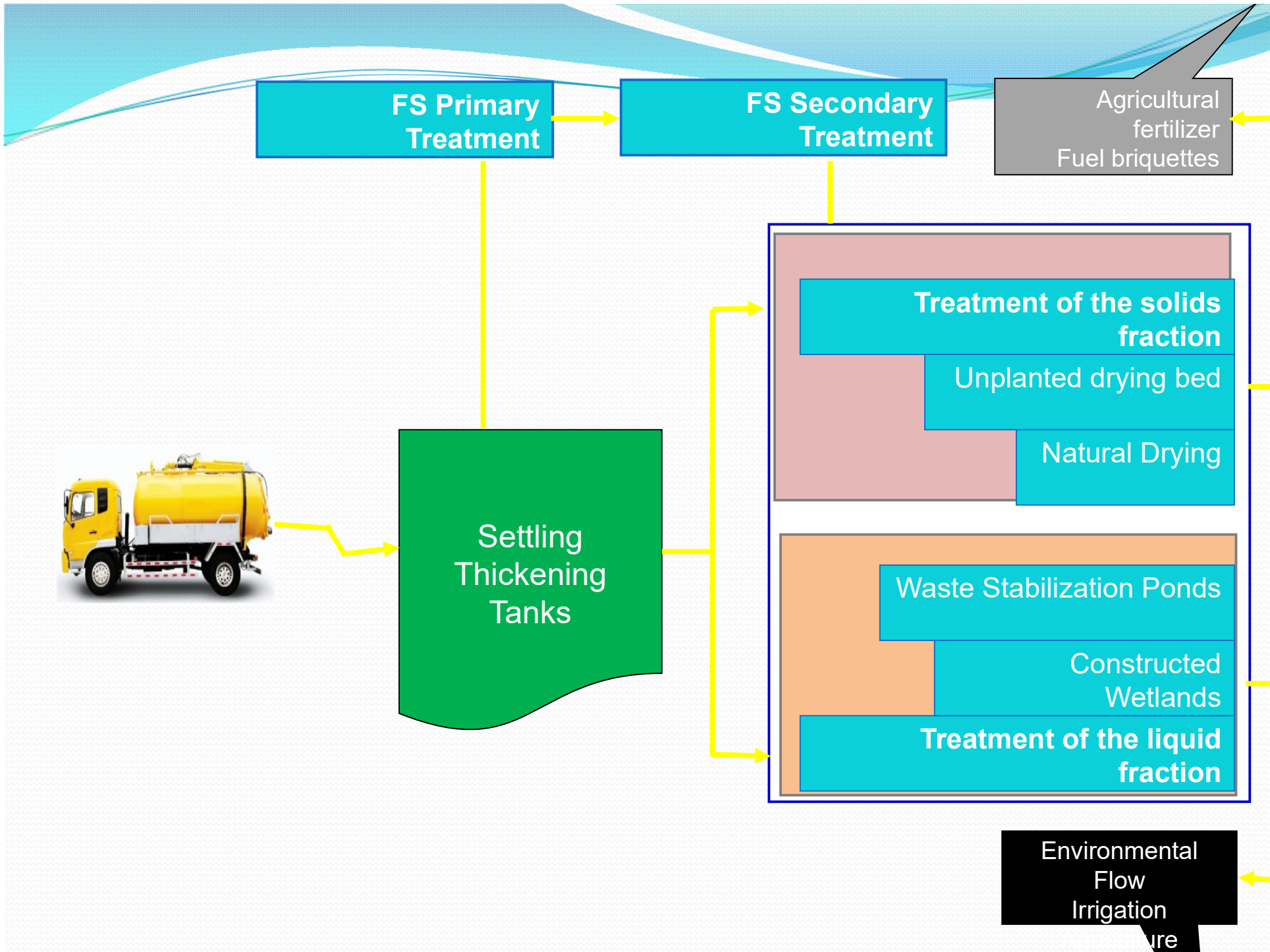
Any specific and major on ground work relevant

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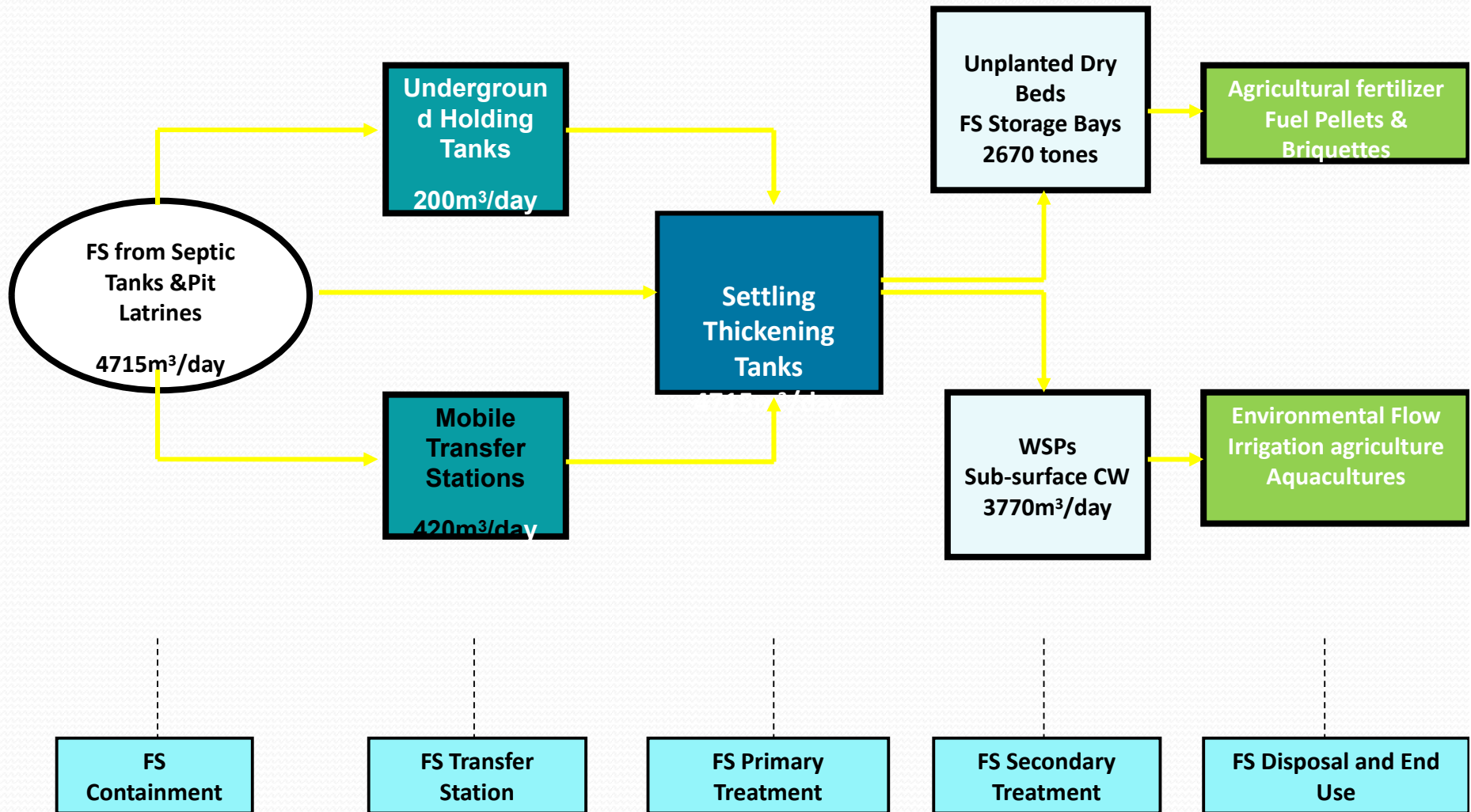


Any specific and major on ground work relevant

- ✧ Feasibility Study For Faecal Sludge Treatment Facilities In Areas With No Sewer And With Poor Sanitation In Dar Es Salaam
 - ✧ Analysis of Technologies



The General Flow Diagram



Proposed FS Treatment Facilities in DSM

Municipality	Site	Settling Thickening Tank (M ²)	Unplanted Drying bed (M ²)	Constructed Wetlands (M ²)	Others (M ²)	Total Area Provided (Ha)	Proposed services areas (Wards)
Kigamboni	Kisarawe II	100	1100	750	400	0.25	Mjimwema, Tungi, Pemba Mnazi, Kigamboni, Vijibweni, Kibada, Kisarawe II, Somangila and Kimbiji
Temeke	Kurasini WSP	360	3900	0	400	0.50	Kurasini, Gerezani, Kivukoni, Keko, Chang'ombe, Mchafukoge, Miburani
	Mtoni	400	4450	3000	400	0.85	Mtoni, Azimio, Tandika, Temeke and Kijichi
	Toa Ngoma	400	4300	2900	400	0.85	Toangoma, Mbagala, Mbagala Kuu, Chamazi, Charambe, Mianzini, Kiburugwa, Kibondemaji and Kilungule
Ilala	Vingunguti WSP	1400	15200	0	500	17.50	Vingunguti, Buguruni, Yombo Vituka, Buza, Ilala, Makangalawe, Kiwalani, Kipawa, Tabata, Liwiti, Minazi Mirefu, Mnyamani, Sandali and Kilakala
	Kinyerezi	700	7600	5200	400	14.00	Kinyerezi, Ukonga, Segerea, Kimanga, Kitunda, Kipunguni, Bonyokwa, Kivule and Kisukulu
	Chanika	240	1580	1800	400	4.20	Gongo La Mboto, Pugu, Chanika, Msongola, Majohe, Buyuni, Mzinga, Pugu Station and Zingiziwa

Municipality	Site	Settling Thickening Tank (M ²)	Unplanted Drying bed (M ²)	Constructed Wetlands (M ²)	Others (M ²)	Total Area Provided (Ha)	Proposed services areas (Wards)
Kinondoni	Kinondoni	670	7350	5000	400	13.50	Upanga, Magomeni, Kinondoni, Tandale, Makumbusho, Kigogo, Mwananyamala, Kijitonyama, Mburahati, Manzese, Makurumla, Kisutu, Kariakoo, Jangwani, Mchikichini, Hananasif, Ndugumbi and Mzimuni
	Mbezi Beach	400	4300	0	400	5.20	Kawe, Mikocheni, Kunduchi, Msasani and Mbezi Juu
	Mabwepande	215	2350	1600	400	0.50	Wazo/Tegeta, Bunju, Mbweni and Mabwepande
Ubungo	Makuburi	1050	11600	7900	400	21.00	Sinza, Mabibo, Makuburi, Ubungo and Kimara
	Kwembe	200	2200	1500	400	0.45	Kibamba, Mbezi, Saranga, Kwembe and Msigani
	Mpiji Majohe	155	1700	1175	400	0.35	Mbezi, Makongo and Goba

Opportunities and any appropriate recommendations

- 🌀 Harmonize and Review of existing policies
- 🌀 Learn from past success projects/stories
- 🌀 Piloting new technologies (transfer stations)
- 🌀 Partnership
- 🌀 Build on existing initiatives