TERMS OF REFERENCE FOR A DIRECTED WRC PROJECT

KEY STRATEGIC AREA	**KSA 9: Business Development and Innovation**
THRUST	**3: Business Development**
PROGRAMME	**13: SASTEP**
TITLE	**Evaluation and assessment of Dry Sanitation Systems**

Objectives:

- Conduct a scan for available dry sanitation systems
- Develop a quality assurance protocol for dry sanitation systems
- Evaluate and assess dry sanitation systems in the SASTEP technology portfolio
- Compare against the requirements of SANS 30500

Background:

The world's six billion people produce over a million tons of faeces daily (Peasey 2000). Human waste collection, transportation, treatment, and safe disposal is essential to maintaining hygiene and preventing transmission of diseases through the faecal-oral route. Sanitation systems can be broadly classified into waterborne and dry sanitation systems. The former refers to systems that requires water to function while the later does not. While waterborne sanitation is perceived as the gold standards and usually preferred to dry sanitation systems, the reliance on water in view of water stress and climate change considerations makes this option unsustainable.

Dry sanitation systems are those that dispose of human waste without the use of water as a carrier medium. Often the by-product from these systems is then used as fertilizer (Pacey 1978; Lachapelle 1995). While several on-site sanitation solutions can fall under this category, in the context of this terms of reference, dry sanitation systems refer to systems that collect faeces and uses a conveyance system such as an auger or other means to move the collected waste to a separate compartment where it is desiccated or dried to remove moisture and odor. This excludes pit latrines and its other variants. The dried human collected is often used as compost or soil conditioner. The toilet may also use a binding or desiccating agent such as soil, saw dust, lime etc. Urine diversion is also used to limit the moisture content of the collected waste and this helps with the effectiveness of the drying process. Dry sanitation systems have a lot of potential, they are relatively cheaper than conventional waterborne systems, and it is less resource intensive, supports nutrients recovery and sanitation circular economy. Despite its clear environmental, social, and public health advantage, dry sanitation systems suffer from low user acceptance due to perception and preference for waterborne sanitation, conflict with cultural and religious beliefs about

defecation e.g. certain religions require the use of water for anal cleansing. It also requires more intervention compared to the "flush and forget" perception users have with waterborne sanitation systems. The efficacy of the systems at sufficiently reducing pathogens in the dried/treated faeces is also a challenge/debate and there is not a clear guidance on limits and whether these systems are able to consistently produce output that is safe for disposal. These points often omitted in pro-composting toilet literature. Hence, more research is needed about pathogen die-off and further understanding on the drying and pathogen reduction mechanism.

Despite these shortcomings, dry sanitation systems are vital for a complete sanitation technology toolbox. They find uses in remote or rural locations where water borne solutions is not possible. Especially in places with low water table where pit storage of faecal material could result in groundwater contamination. Also, it is safer than pit latrines that have the sludge storage underneath.

The 2018 General Household Survey issued by Statistics South Africa includes dry sanitation systems as ecological toilets. According to the survey, ecological toilets make up only 0.3% of South African households uses this form of sanitation systems which equates to about 48,000 households. The report also highlighted that given the scarcity of water in South Africa, this type of toilet is expected to become much more common in future. Interestingly, there are several local innovations in this area but there has been low adoption and uptake probably due to the shortcomings highlighted above. The viability of these dry sanitation system is questionable due to the emergence of non-sewer sanitation systems. Though still in the nascent stage of development and adoption, prefabricated non-sewered sanitation systems that adhere to the requirements of SANS 30500 is expected to render this category of technology obsolete especially when the cost of NSSS become comparative. NSSS that adhere to SANS are designed to adequately treat collected waste such that any effluent can be safely disposed to the environment without additional treatment. While dry sanitation may be relevant in the short-term, the long-term viability needs clarity in view of emerging technologies.

The South African Sanitation Technology Enterprise Programme (SASTEP), an initiative driven by the Water Research Commission (WRC) aims to foster a local sanitation industry (manufacturing and services) that would increase access to proper sanitation, reduce pollution, improve water security, support job creation and entrepreneurial opportunities, contributing to South Africa's economic growth. The programme is aligned to the Department of Trade, Industry and Competition (DTIC) Master Plan to address commercialization, localization, and manufacturing by bringing on board capable commercial partners to provide an industrial support base for the local and regional markets. The intent of the programme is to support and accelerate the application and uptake of the new sanitation technologies through demonstration, testing and science-based improvements towards localization and industrialization. The development of market intelligence, strategy and tactical plans are crucial to the realization of the SASTEP's goals and objective. The understanding of the market factors such as comparative pricing against other technology types, understanding of the market environment and other factors that affect the sanitation value chain are important to assisting SASTEP commercial partners in getting their innovations to the market.

Specific Aims:

1. Scan and identify all commercially available and developmental stage dry sanitation systems in South Africa and globally.

2. Evaluation and assessment of dry sanitation technologies in the SASTEP dry sanitation technology portfolio, using the SASTEP field-testing and demonstration guideline. see SASTEP dry sanitation technology portfolio list below.
3. Assessment of the operation and performance of identified technologies against the requirements of SANS 30500 and comment on the relevance of this group of technology in view of next generation NSSS.

4. Develop a testing and quality assurance protocol for dry sanitation system

5. Evaluation and assessment of some of dry sanitation products in the SASTEP portfolio. See list below. This will include monitoring, testing and evaluation against developed testing and quality assurance protocol. (contact SASTEP Programme Manager for further information and details on the location and logistical arrangements.)

6. Develop benchmark specification for dried faecal output from dry sanitation systems for use as compost and soil conditioner, and for safe disposal based on existing sludge guidelines and requirements.

Rationale:

The SASTEP platform supports technology and commercial partners with the commercialization of their technology and matchmaking with investors to empower the partners to manufacture their products locally. The platform provides support for each technology in its portfolio to be demonstrated in the field to ensure the technology is safe for use and performs optimally in the end-user environment. The partners are further assisted to develop market and revenue models, and a bankable business plan to enable matchmaking with suitable investors for commercialization and local manufacturer. This study will generate required market and commercial information necessary to provide business advisory support and to develop commercialization strategies for this technology category.

SASTEP dry sanitation portfolio:

1. The Lusec dry toilet
2. The Zerho dry toilet
3. Ecosan waterless toilet
4. SavvyLoo

Deliverables:

1. Compendium of dry sanitation systems that includes detailed description, technical information, value proposition, limitations etc.
2. Test plan for each system to be tested. Plan should be based on the SASTEP Field-testing and demonstration guideline.
3. Evaluation and assessment report for each system tested. This should include results and outcome of the testing as well as the detail process description of the waste treatment.
4. Technology brief on the future of dry sanitation systems given the emergence of next generation NSSS
5. Protocols for product and performance testing of dry sanitation systems based on general and technical requirements and specifications

6. Benchmark specification for dried faecal output from dry sanitation systems for use as compost and soil conditioner, and for safe disposal
7. High-level market overview and market entry strategy

Time Frame: 6 months

Budget: R600,000 (Including VAT)

Approved

On behalf of executive

Mr. Dhesigen Naidoo – CEO

Date: