



## TARGETED TERMS OF REFERENCE FOR A DEMONSTRATION PROJECT

<b>KEY STRATEGIC AREA</b>	<b>KSA 9: Business Development and Innovation</b>
<b>THRUST</b>	<b>3: Business Development</b>
<b>PROGRAMME</b>	<b>13: SASTEP</b>
<b>TITLE</b>	<b>Large-scale demonstration of faecal sludge management and valorization technologies</b>

### Objectives:

- Upscale a sludge valorization technology that can address pit latrine and wastewater treatment sludge.

### Background:

The disposal of contaminated sludge to landfill can result in contamination of land and ground water resources. Sustainable waste management views disposal as a last resort/least favoured option in the waste management hierarchy. It is especially important to find ways and technologies to recover nutrients from faecal and sewage sludge. Sludge treatment and disposal methods range from simple dewatering and landfill burial to the use of emerging technologies that use various thermal processes such as incineration, hydrothermal carbonization, pyrolysis etc. to heat the sludge and produce products such as soil conditioners, briquettes, biochar, and so on. The conversion of faecal and wastewater treatment works (WWTW)P sludges to valuable products has many benefits and is an important step in closing the nutrients and carbon loop. This will not only reduce the environmental impact of waste created, but it also has an economic benefit in terms of job creation, sustainable energy generation, and/or material recovery.

Due to the size of the sludge problem at wastewater treatment works (WWTW)s across the country, the lack of viable methods for the management of faecal sludge from on-site sanitation systems and the Department of Environment, Forestry and Fisheries (DFFE) regulations which restrict disposal on landfills, the WRC has scanned the global and local environment for sludge technologies that address this challenge and provide sustainable solutions. The Water Research Commission (WRC) has invested research funds in supporting the academic partnership in developing two sludge technologies viz: Latrine Dehydration Pasteurization) technology (LaDePa) and the Enhanced Hydrothermal Polymerization Polymeric Carbon Solid (EHTP) (HTP-PCS). These technologies are attractive as they were developed by experienced local technology partners with requisite expertise and knowledge of local conditions to ensure appropriate and relevant solutions. It is envisaged that these technologies will be viable and will offer solutions to SA municipalities through traditional procurement processes, post proposed project. These technologies also offer technologies at a scale and capacity that is suitable for municipalities i.e., 5 to 30 ton/day processing of sludge waste. Furthermore, the technologies offer added value of producing sludge valorised products such soil conditioner or potential blend for fertilisers, biochar/coal substitute which could be used to power boilers in smaller industries or can be used to supplement energy needs of communities. The monetization of sludge valorised product offers

opportunities to offset some of the cost of the technology, and the cost of emptying the on-site sanitation systems and to provide and employment opportunities.

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, and contributing to South Africa's economic growth. The Programme is committed to testing and providing more technology options for municipalities to promote the circular economy. The programme is aligned to the Department of Trade, Industry and Competition (DTIC) Water and Sanitation Industrialization Master Plan, (not to be confused with the DWS Master Plan), to address viable solutions through localization, and manufacturing by bringing on board capable commercial partners to provide an industrial support base for the local and regional markets such as water sector institutions. Utilities, and private sector. 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 understanding of the market factors such as the policy and regulatory landscape will be looked at to ensure demonstration of these technologies that translate into effective technology transfer to end-users and alleviate service delivery challenges. The upscaling project is in partnership with eThekweni Water and Sanitation (EWS) and project scope includes the following:

- Evaluation and assessment of suitable sludge processing and valorization technologies.
- Testing suitable models needed to support sustainable operations and maintenance of the technologies.
- Testing and developing specifications of valorized products.
- Understanding usefulness and demand for produced valorized products from sludge management.
- Develop technology transfer package to support procurement of technology

***Specific Aims:***

1. Technical:

- a. To build, install, operate, and maintain sludge valorization technology at sites agreed with eThekweni Water and Sanitation (EWS) for an 18-month period.
- b. To evaluate and assess installed system as per SASTEP field-testing and demonstration guidelines. System to be assessed for functionality, performance, safety, and user acceptance.
- c. Characterize and test possible feed and product streams.
- d. Developing the O&M models that could be adopted by municipalities to support the process.
- e. To characterize optimum feed and final product to provide optimum performance as part of the evaluation. This should include but not limited to the development of a material safety datasheet (MSDS) for all product streams from the system.

2. Commercial:

- a. Desk top market analysis of the viability of the technology equipment and circular economy analysis of valorised products.
  - i. Understanding the legislative, regulatory landscape to support the sustainability of the model proposed.
  - ii. Estimate and establish market size, demand, and competitive pricing for this group of technologies. This should also include the development of value proposition and selling point.
  - iii. Document and benchmark capital and operation expenditure for the technology.
  - iv. Propose operational and business model needed to ensure commercial viability of technology and valorized products.
  - v. Estimate demand and price point for produced valorized products.
  - vi. Estimate revenue from projected product sales.
3. To manage risk of the projects at the inception, during and post project closure and alert both the WRC and eThekweni of any changes that may occur.
4. To provide the necessary reports to the WRC and to provide support to 3 to 4 high value knowledge transfer and dissemination activities during the project.
5. Upon successful completion of the project the tech developer is expected to handover the technology to eThekweni with all necessary reports and documents as agreed and provide necessary technical training.

#### **Rationale:**

The SASTEP platform facilitates a rigorous technical evaluation and assessment of innovative and appropriate technologies that can transform the current sanitation landscape and assist with improving sanitation service delivery. The SASTEP evaluation and assessment process focuses on functionality, performance, and safety, as well as user and social acceptability. In addition to the technical aspects, the platform also assesses the commercial viability of the technology through assisting the technology developer in articulating a clear value proposition, developing business and revenue models, bankable business plans and matching to institutional investors that can support full scale adoption of the technology.

SASTEP also facilitates a sociotechnical ecosystem that brings together the technology developer and the municipal partner or an end-user (e.g., DBE and other sanitation implementation agent through a demonstration platform that not only introduces new innovation to the end user organization but fosters a cocreation process that provides valuable feedback to the technology developer, provides a low-risk environment to showcase the technology to the end-user and fast tracks adoption and commercialization through capacity transfer.

This study will also generate high level market information necessary to understand appetite for uptake and the demand of valorized products.

#### **Deliverables:**

1. Inception report (to include comprehensive project schedule, testing plan and site preparation plan, risk plan, technology transfer plan (to include list of handover document) and training plan)
2. Detailed design package (to include detailed process description, process flow diagrams, layout drawings, fabrication drawings, equipment list, site development plan, bill of materials, critical spares list, operating and maintenance manuals, and training manuals.
3. Commissioning and Inspection certificate – this will be issued by EWS after the installation and construction phase - This will represent acceptance by EWS and license for the plant to commence operation. *(EWS will provide checklist and other requirements for certificate to operate)*

4. Monitoring and operations report (Quarterly report on performance of the installed unit) report should include but not limited to operation monitoring parameters, systems, and product testing report as per testing plan etc.)
5. Valorized product characterization and MSDS.
6. Desk top market analysis of the viability of the technology equipment and circular economy analysis of valorized products.
7. Final report

**Time Frame: 18 months (3-6 months for construction, 12 months for demonstration)**

**Note:**

- Project will be required to indemnify eThekweni against operational safety losses of the installation prior to commencing project.
- Technology developer/s to comply to all rules & regulations of working on eThekweni Municipality sites
- All equipment, installation, and operation personnel to be insured against theft, damage, or loss.
- No possible cost extension, and commercial partners need to ensure they get the costing right.
- Asset will be transferred to eThekweni Municipality asset register upon successful completion and conclusion of demonstration.
- Training and documentation handover to EWS is mandatory and should be included in budget.
- Plant throughput (ton/day) must be agreed during proposal phase.