



RWESCK **ANNUAL REPORT** 2021

SUBMITTED TO SECTOR ADVISORY
BOARD (SAB) AND INTERNATIONAL
ADVISORY BOARD (IAB)

RWESCK MANAGEMENT

TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
2.0 ENROLMENT OF POSTGRADUATE STUDENTS (DLI 3.1 & 3.2)..	2
4.0 DELIVERY OF SHORT COURSES (DLI 3.3).....	6
5.0 QUALITY OF EDUCATION AND RESEARCH (DLI 4).....	10
6.0 RELEVANCE OF EDUCATION AND RESEARCH (DLI 5).....	12
7.0 FINANCIAL MANAGEMENT (DLI 6).....	14
8.0 INSTITUTIONAL IMPACT (DLI 7).....	15
9.0 PARTNERSHIPS AND DEVELOPMENT IMPACT (DLI 2).....	16
10.0 CENTRE MANAGEMENT AND GOVERNANCE.....	19
11.0 WORKPLAN, BUDGET AND OUTLOOK FOR 2022.....	20
12. CONCLUSION.....	31
ANNEX: PUBLICATIONS IN THE YEAR UNDER REVIEW.....	32

RWESCK ANNUAL REPORT 2021

EXECUTIVE SUMMARY

The Regional Water and Environmental Sanitation Centre Kumasi (RWESCK) since its establishment, has been the home for excellence in the teaching, learning, and innovative research into water, climate variability and environmental sanitation not only here in Ghana but also in sub-Saharan Africa. This report covers the activities of the Centre from January 2021 to December 2021. It also covers academics, admissions, delivery of postgraduate courses, short courses, partnership, financial, and the 2022 Annual Workplan.

In the year under review, the Centre enrolled twenty-eight PhD students and forty-seven MSc students making it a total of seventy-four students. All enrolled students at RWESCK also went on internships to put into practice everything they had learnt while in school and also have a feel of the industry.

The indicative budget and work plan for the year 2022 are presented in the report. The planned activities in the work plan shall be undertaken by the Centre with the support of the Vice-Chancellor of the institution, Centre Staff and Partners. The Centre's budget for 2022 is USD \$ 2,325,225.66, and the Centre is expected to receive a total amount of \$ 1,715,859.15 for its operations for the year 2022. There is a financing gap of about USD \$609,366.51. The second building is also expected to come to completion in June 2022 for it to be handed over to the Centre while the commercialization of the Laboratory is also expected to start in 2022.

The Centre with the help of its staff has achieved its targets for the year under review. The Centre can be said to have performed well in the past year in the actualization targets for the year 2021. With the continual support of the Sector Advisory Board (SAB) and the International Advisory Board (IAB), the Centre will move on to greater achievements in the year 2022.

1.0 Introduction

The Regional Water and Environmental Sanitation Centre Kumasi (RWESCK) is one of the twenty-two African Centres of Excellence. Through the Government of Ghana, the Centre received funding of Eight Million Dollars from the World Bank to train postgraduates in water, environmental sanitation and hygiene. In 2019, the Centre received USD 5.5 million dollars as a renewal of the grant to channel into teaching and research under the ACE Impact programme. The renewal of the grant saw to the increase in the enrolment rate of Ghanaian and international students and building capacity in professional areas.

The development challenges confronting Ghana and the Sub-Saharan Africa are enormous, which include the inadequate access to safely managed water and environmental sanitation facilities, poor water resources management as well as the increasing threats of climate variability and water-food-energy insecurity. The Regional Water and Environmental Sanitation Centre Kumasi (RWESCK), seeks to address the water resources and environmental sanitation development challenges in Ghana and the Sub-Saharan Africa. In order for the region to make significant progress towards the attainment of the Sustainable Development Goals (SDGs) 6, 12, 13 and 15, the Centre has positioned itself to enhance teaching, learning and research.

RWESCK envisions to be a recognised fulcrum for advancing research knowledge, developing innovative technologies, providing high quality training in water resources, hygiene, water supply and environmental sanitation for the sustainable development of West Africa. Our areas of expertise include water resources, climate change, water treatment and supply, waste management and environmental sanitation. Our core mandate is to develop water and sanitation products, systems and innovative technologies as well as strengthen the human resource capacity in Ghana and the sub-region in WASH.

Centre's strategic objectives are to:

1. Build strong strategic partnership networks with national and regional partners in five thematic areas:
 - [Water Resources and Climate Resilience Network](#),
 - [Water Supply Network](#),
 - [Sanitation and Circular Economy Network](#),
 - [Sustainable water management \(Regional Net-Water, World Bank ACE Partners\)](#)
 - [Water science and technology \(NEPAD Western Africa Centres of](#)

Excellence Network)

2. Provide high quality postgraduate education (PhD and Masters) and professional training in water resources, water supply and environmental sanitation engineering,
3. Nurture early-career researchers and post-doctoral research fellows to develop skills in innovations, impactful research and publications,
4. Conduct innovative research with partners and research fellows under five research thematic areas:

Theme 1: Innovative Water Treatment Technology

Theme 2: Innovative Water Distribution and digital technology

Theme 3: Environmental Sanitation and Waste Management Technology

Theme 4: Climate Resilience and Water Resources Management

Theme 5: Water and sanitation governance

2.0 Enrolment of Postgraduate Students (DLI 3.1 & 3.2)

Enrolment in 2021

The Centre conducted competitive admission interviews in November 2021 and admitted twenty-eight (28) PhD students including three (3) regional females and two (2) regional males. At the Masters level, forty-six (46) students were offered admission including eleven (11) regional students. Both PhD and MSc students will commence face to face lectures in January 2022. Details of programmes and enrolment are summarised below.

Table 1: 2021 Enrolment Details

Programme	2021 Enrolment	Regional Students	Ghanaian Students
PhD Water Resources Management	11	3	8
PhD Environmental Sanitation and Waste Management	10	1	9
PhD Water Supply and Treatment Technologies	7	1	6
M.Sc. Water Resources Engineering and Management	22	5	17
M.Sc. Water Supply and Environmental Sanitation	24	6	18
Total	74	16	56

Scientific Article Writing and Publishing

The Centre held a webinar on Scientific Article writing and Publishing for the students and the international community. The webinar was delivered by Prof. Frederick Ato Armah from the University of Cape Coast. The webinar was very informative and equipping and we are confident that the knowledge shared will go a long way to prepare students in their future endeavours.

Training of Students

RWESCK also entered into a partnership with the University of Bologna (UNIBO), Italy where students of the Centre will benefit from some online courses from the UNIBO. Currently, twenty-one (21) students are participating in online courses such as Advanced Hydrosystems Engineering, Algorithms for Decision Making, Bioreactors and Downstream Processes, Data Mining, Groundwater and Contamination Processes, Sustainable Design of Water Resources Systems and Resources and Recycling.

Graduation Rate

The year under review was a success as many students from all five programs at the Center graduated without many challenges. 29.17% of the MSc Water Supply and Environmental Sanitation students at the Center graduated in the year 2021.

MSc Water Resources Engineering Management, the other Master's program run at the Centre has a graduation rate of 58% for the year under review.

For the Doctor of Philosophy programmes, three students successfully graduated from the Centre. The Centre had a 100% graduation rate from the Ph.D. Water Supply and Treatment Technology programme.

For the year under review, the Centre also had a graduation rate of 86% for the Ph.D. programme, Water Resource Engineering and Management.

The graduation rate for the final Ph.D. programme run at the Center, Ph.D. Environmental Sanitation and Waste Management, is 73%

The students spent between three to five years to complete their programmes because of the effects of the Covid-19 pandemic.

Table 2: Graduation rates for 2017/2018 and 2019/2020 academic year.

Programme	Year of Enrolment	Total Number Enrolled	Number graduated
PhD Water Resources Management	Before 2017/2018	14	12
PhD Environmental Sanitation and Waste Management	Before 2017/2018	11	8
PhD WaterSupply	2017/2018	2	2
M.Sc. Water Resources Engineering and Management	2019/2020	19	12
M.Sc. Water Supply and Environmental Sanitation	2019/2020	24	7

Doctor of Philosophy

Table 3: Doctor of Philosophy Graduants

Programme	Name
Environmental Sanitation	Raphael Nsiah-Gyambibi
Water Resource Engineering and Management	Robert Kofi Yankey
Water Supply and Treatment Technology	Worlanyo Kwadjo Siabi

MASTER OF SCIENCE (WATER RESOURCES ENGINEERING AND MANAGEMENT)

Table 4: Master of Science (Water Resources Engineering and Management) Graduates

1.	20652930	PG9654919	Raphael Adzaku
2.	20678770	PG9655019	Samuel Kwaku Agbonoshie
3.	20671293	PG9655119	Portia Agyemang (Miss)
4.	20662688	PG9655619	Mike Fiifi Asamoah-Mensah
5.	20664156	PG9657719	Joshua Nana Asiedu-Bondzie
6.	20674305	PG9655819	Emmanuel Ayam
7.	20451731	PG9656019	Anita Baah (Miss)
8.	20594734	PG5073718	Samuel Gyadu
9.	20451694	PG9656519	Osman Koroma
10.	20451738	PG9657219	Levi Nya Paye
11.	20675051	PG9657419	Ama Akyema Sasu
12.	20450428	PG9657519	Wendyam NadEGE Yoni (Miss)

MASTER OF SCIENCE (WATER SUPPLY AND ENVIRONMENTAL SANITATION)

Table 5: Master of Science (Water Supply and Environmental Sanitation) Graduates

1.	20545152	PG1850717	Christiana Mintaah Asiedu (Miss)
2.	20664739	PG9653419	Nana Yaa Korankyewa Ayim (Miss)
3.	20450419	PG9653519	Amelan Paule Josephine Kouassi (Miss)
4.	20663494	PG9653619	Francis Naa-Inour
5.	20451723	PG9654019	K. Marvie Reed
6.	20450483	PG9654319	Carine Dit Sienyta Tiaho (Mis)
7.	20451634	PG9654519	Delwende GrACe Jokebed (Miss)

Doctoral Theses

1. Dwumfour-Asare, 2021. *Onsite treatment of Domestic Greywater using constructed Wetland in Ghana (Doctoral dissertation).*
2. Josephine Obodai, 2021, *Impact Of Illegal Small-Scale Mining (Galamsey) Activities On Water Resources In The Ankobra River Basin*
3. Worlanyo Kwadjo Siabi, 2021, *Optimization Of Iron And Manganese Removal On Point Water Systems Using Activated Carbon From Teak And Shea Wood*
4. Samuel Anim Ofosu, 2021, *Effects Of Land Use/ Land Cover Changes And Climate Variability On The Densu River Basin*
5. Awo Boatemaa Manson Incoom, 2021, *Climate Change Impacts On Agriculture In The Sada Zone Of Ghana*
6. Florence Nyieku, 2021, *Potential Of Constructed Wetland For Produced Water Management*
7. Oseke Ifie-Emi Francis, 2021, *Predicting The Impacts Of Water Diversion And Climate Change On Ecosystem Functioning And Hydrology In Gurara Reservoir Catchment, Nigeria*
8. Edward Kofi Ackom, 2021, *Assessing The Impact Of Changes In Climate And Landuse On Urban Flood Risk: A Case Study Of Odaw River Basin In Accra*
9. Courage Davidson Egbi, 2021, *Hydrogeochemical, Isotopic And Vulnerability Appraisal Of Groundwater In The Lower Volta River Basin, Ghana*
10. Frank Owusu Adjei, 2021, *Land Use And Land Cover Impact And Evaluation Of Potential Evapotranspiration Assessment Methods For Hydrological Modelling With Swat-Application In Data-Scarce Densu Basin In Ghana*

4.0 Delivery of Short Courses (DLI 3.3)

Professional Short-Term courses

RWESCK continually offers support to industry players by way of delivering short term courses to help build expertise. The Centre is committed to rendering professional training needs when the need be. In 2021, the Centre has undertaken five (5) regional and two (2) national short courses on GIS for Water Resources Management, Borehole Drilling and Construction, GIS Application in Water Resources and Environmental System, Non-Revenue Water Management, Digital Elevation Modelling using Drone and Satellite Images for Flood Management and one Risk-based Household Water Treatment and Safe Storage Training. In all, two hundred and twenty-four participants (224) attended including forty-one (41) National attendees. The Centre held a regional short course with the National Water Research Institute of Nigeria on Borehole Drilling and Construction which was targeted at introducing participants to key areas on borehole and its management.

National Professional Short Courses

RWESCK joined hands with Paris Institute of Technology for Life, Food and Environmental Sciences (AgroParisTech) of France and Ghana Water Company Limited (GCWL) to develop a professional development course on Non-Revenue Water Management. Twenty (20) selected workers of GWCL participated in the short course. The one-week training was held from 31st May to 4th June, 2021. The training was structured to equip participants with skills on how to manage Non-revenue water and asset effectively to reduce water losses.



Participant receiving certificate from Non-Revenue Water Management at RWECK



Lectures during the Non-Revenue Water Management Short Course

RWESCK collaborated with Ghana Standards Authority (GSA) to organize ISO training on ISO 30500 non-sewered sanitation systems and 24521 wastewater management to guide the design, development and operation of prefabricated toilets produced. The presentations on SO 30500 and 24521



An ISO Training with Ghana Standards Authority (GSA) at Coconut Grove Regency Hotel

for the design, development and operation of prefabricated toilets were discussed. Coconut Grove Regency Hotel in Accra was the venue for the programme and the dates were 23rd and 24th June, 2021.

Risk-Based Household Training

The Centre organised a training session for Environmental Health Officers and relevant stakeholders in some selected municipalities. The five-day (5) training on Risk-Based Household Water Treatment and Safe Storage was held at Kwame Nkrumah University of Science and Technology (KNUST), Kumasi. The training was organised under the Denmark grant for seven selected Metropolitan and Municipal Assemblies (MMAs) in

the Ashanti and Greater Accra regions. The first three (3) workshop days was face-to-face whereas the remaining two (2) days was virtual. The workshop was facilitated by the Regional Water and Environmental Sanitation Centre Kumasi (RWESCK), KNUST.

Regional professional short courses

RWESCK collaborated with partners in Liberia (Monrovia City Corporation (MCC) and Liberia Hydrological Service (LHS)) and Nigeria (Forestry Research Institute of Nigeria, National Water Resources Institute) and other countries to deliver some professional courses to staff of national agencies.

Monrovia City Council- Liberia

RWESCK continually offers support to industry players by way of delivering short term courses to help build expertise. A short-term course on Sustainable Municipal Solid Waste Management was arranged with staff of Monrovia City Council (MCC) and the University of Liberia. 15th - 19th November, 2021 were the days for the short course.

Liberia Hydrological Services

RWESCK organised a short-term course on Integrated Water Resources Management with the Ministry of Mines and Energy Monrovia, Liberia and the Liberia Hydrological Services. There were 30 participants and the course was from 18th - 22nd October, 2021

Forestry Research Institute of Nigeria

Another regional short course was organised in Nigeria. It was on GIS Application in Integrated Water Resource Management. It lasted from 29th November - 3rd December, 2021 with 40 participants. The short course was organised with the Forestry Research Institute of Nigeria.

National Water Resources Institute, Nigeria

The Centre with the support of the National Water Resources Institute (NWRI) in Kaduna, Nigeria embarked on a short-term course on borehole drilling and construction. The course was from the 4th of October, 2021 to 8th October, 2021. There were 30 participants.

International Collaboration In Capacity Building

AgroParisTech collaborated with RWESCK-KNUST to run an extensive 2-week course from 13th to 25th September, 2021, for AgroParisTech International Executive Masters (Water-for-all) for 17 students from Palestine, Tanzania, Nigeria, Gambia, Zimbabwe, Sudan and Kenya. The training sought to achieve the following objectives: Strengthen managerial and operational expertise, Enhance water and



Participants for the AgroParis Tech International Executive Masters (Water-for-all)

sanitation sector knowledge, and build personal transformation to become leaders in the water industry and company. Among the courses considered for the training were: Human Resources Management, Pro-poor Water, Sanitation and Security, Customer Management and ICT/Digital Innovations in Water and Utility in Ghana and Africa, Energy and Carbon Credit, Sanitation Management.

ORGANISED SHORT COURSES IN THE YEAR 2021

Table 6a: List of short courses organised by the Centre in the year 2021 with the number of participants

SHORT COURSE TITLE	COUNTRY ORGANISED IN	NUMBER OF PARTICIPANTS(M/F)
1.Sustainable Integrated Municipal Solid Waste Management	Liberia	34 (26/8)
2. GIS Application in Integrated Water Resource Management	Liberia	29 (24/5)
3. GIS Application in Water and Environmental Systems	Nigeria	41 (21/20)
4. Borehole Drilling and Construction	Nigeria	50 (45/5)

Table 6b: List of short courses organised by the Centre in the year 2021 with the number of participants

SHORT COURSE TITLE	COUNTRY ORGANISED IN	NUMBER OF PARTICIPANTS(M/F)
5. Non-Revenue Water and Asset Management	Ghana	20 (15/5)
6. Risk-Based Household Water Treatment and Safe Storage Training	Ghana	45 (25/20)
7. Digital Elevation Modelling Using Drone and Satellite Images for Flood Management	Gambia	15 (14/1)
		Total=234 (170/64)

5.0 Quality of Education and Research (DLI 4)

National and International Accreditation (4.1)

Programme Accreditation Assessment Payment for (2) programmes have been made to National Accreditation Board for MPhil Water Resources Engineering and Management and MPhil Water Supply and Environmental Sanitation. This achievement is in-line with DLI 4. The Centre has submitted the following new programmes for national accreditation:

- MSc Water Engineering
- MSc Environmental Sanitation and Waste Management
- MSc Disaster Prevention and Management
- MSc Water Supply Engineering Management (Utility Management)

These new programmes will be submitted for International Accreditation.

Research and Publications (DLI 4.2)

- Out of a project target of fifty-two (52) publications, RWESCK has verified thirty-six (36) publications. Currently, faculty members are involved in various researches out of which papers will be published. The Centre has also initiated plans to develop policy briefs and research reports as part of research uptake.
- The Centre has entered into a collaboration with the Community Water and Sanitation Agency (CWSA), under Research Uptake, to develop a package plant for water treatment. The Centre is undertaking other joint projects in composting technologies, robotics and leakage detection in water distribution systems.
- Based on the outcome of the RWESCK partnership meetings, it has been recommended that RWESCK should support Metropolitan Municipal and District Assemblies (MMDA's) to develop a master plan. The proposal will involve RWESCK, the National Development Planning Commission (NDPC) and the MMDAs. It is hoped that the collaboration will yield results that will be relevant for development and policy.
- RWESCK had its maiden New Year Forum to bring together academia and industry. The forum was themed "Perspectives, Challenges and Emerging Research in WASH towards achieving the SDGs and Agenda 2063." Sector partners from the Water Resources Commission (WRC), CWSA and Kumasi Metropolitan Assembly (KMA) presented on current and emerging sector issues

Teaching and Learning Environment (DLI 4.3)

- The Centre has purchased and installed some state-of-the-art laboratory equipment like the AAS, GC and SEM. The Centre is in the process of procuring a PCR and XRD equipment to augment what is currently available.
- RWESCK is procuring equipment for E-learning studios to be installed in the Centre building to support the delivery of online courses.
- Ghana Standards Authority has been consulted to support the standardization of laboratory equipment as well as offer training to laboratory technicians and managers.

6.0 Relevance of Education and Research (DLI 5)

Externally Generated Funds (DLI 5.1)

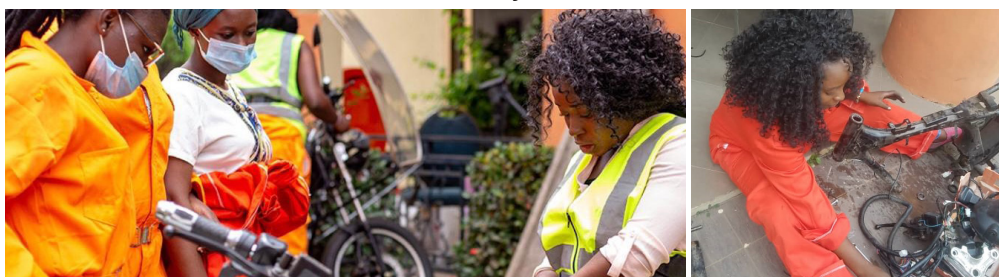
The Centre has maxed its DLI 5.1 target for externally generated funds, but continues to generate funds from external sources through research and capacity building initiatives for the faculty members.

Table 7: Externally Generated Funds

Funding Source	Amount	Purpose	PI/Co-PI
Real Water Project	\$18.9 million	To develop and evaluate strategies for expanding access to safe, equitable and sustainable rural water services	Prof K. B Nyarko
IWASH project	£120,040	The project focuses specifically on the creation of Do-it-Yourself (DIY) Handwashing stations during the COVID-19 Pandemic in Ghanaian Delta's	Dr Eugene Appiah-Effah and Prof Helen Essandoh
All for water and sanitation project	\$687,504	North-South-Alliance for inclusive water, sanitation, and hygiene (All4WASH)	Prof Helen Essandoh/ Prof Oduro-Kwarteng

Students Internships (DLI 5.2)

PhD and MSc students on the programme have successfully embarked on internships. In all, seventeen (17) PhD students and thirty-one (31) MSc students went on the internship (achieved 100% results). Students have submitted their internship reports as well as other documents. The Centre went on a monitoring exercise to interact with students and Heads of the agencies to dialogue on improving the internship and also areas for collaboration and joint research. This feeds into DLI 5.



RWESCK Student at her Intenship post

Internship and Monitoring

As part the requirements of the Centre, students undergo industrial attachment to gain pragmatic experiences away from their theoretical knowledge and to familiarise themselves with the job market. PhD students went on six weeks internship which started on 31st March, 2021. MScs commenced their internship on 30th August, 2021.

Entrepreneurship (DLI 5.3)

RWESCK in collaboration with KNUST Centre for Business Development organized Entrepreneurship Training for faculty members and postgraduate students in March, 2021 and launched a Call for business plan proposal on Digital Innovations in Water and Sanitation.



RWESCK Students participating in an Entrepreneurship Training

This digital innovation challenge is a driven force to encourage start-up companies towards Entrepreneurship and Digital Innovations within the water and sanitation sector.



Group Picture from the Entrepreneurship Training

Call for Innovation Business Idea

RWESCK launched a competition to encourage students to develop interest in entrepreneurship, innovation and business start-ups. A preparatory seminar was held and a competition to receive ideas was launched.

7.0 Financial Management (DLI 6)

RWESCKs' financial position was presented as follows:

Receipts and Payments as at 31st December 2021

Table 8: Receipts and Payments as at 31st December 2021

RECEIPTS:				
YEAR	2020	2021	DIFFERENCE	Y-T-D
	USD \$	USD \$	USD \$	USD \$
Funding from World Bank	687,866	1,742,350	(1,054,484)	2,837,263
TOTAL Funding from World Bank	687,866	1,742,350	(1,054,484)	2,837,263
PAYMENTS:				
REGIONAL CAPACITY TRAINING	120,463	303,281	(182,818)	817,270
LEARNING AND TEACHING ENVIRONMENT	117,754	910,200	(792,446)	1,049,067
REGIONAL RESEARCH CAPACITY BUILDING	105,502	89,861	15,641	226,816
ACADEMIC PARTNERSHIP	9,368	71,519	(62,152)	84,817
INDUSTRIAL PARTNERSHIP	85,048	21,598	63,451	137,586
GOVERNANCE AND ADMINISTRATION	98,478	114,378	(15,900)	285,156
CENTRE VISIBILITY	2,023	2,255	(232)	7,294
TOTAL PAYMENTS	538,636	1,513,092	(974,457)	2,608,006
SURPLUS (DEFICIT)	149,230	229,258	(80,027)	229,258

Notes:

1. Total funding from World Bank for the year under review is \$1,742,350 against year to date figure of \$2,837,263.
2. Total payment for the year is \$ 1,513,092 as compared to the year to date figure of \$2,608,006
3. The highest payment made was \$ 910, 200 as compared to the year to date expenditure of \$ 1, 049,067. Most of the payments are related to Learning and Teaching Environment, Regional Capacity Training, Governance and Administration and Regional Research Capacity Building.
4. The next highest expenditure was the Regional Capacity Training with end of year figure of \$303,281 compared to the up to date payment of \$817,270
5. Total grants receivable at the end of year 2021 stood at **\$357,288.08**

8.0 Institutional Impact (DLI 7)

The ACE of Excellence project at the Regional Water and Environmental Sanitation Centre Kumasi (RWESCK), has had a number of impacts at the institutional level. Apart from the obvious increase in the number of publication in world renowned peer reviewed journals indexed by Scopus, which has helped in improving on the ranking of KNUST as an institution, other significant initiatives have commenced.

Institutional Regional Strategy

To help meet the requirements of DLI 7, the university has constituted a committee to work on revising the university-wide regional strategy which is intended to increase the capacity of KNUST to attract and house foreign students. The revised regional strategy document will focus on student recruitment and retention, students' support services, financial matters, faculty members' recruitment and staff exchange, regional academic partnerships and research collaborations, regional industry engagement and internship placements, among others. Work on this strategy has advanced and the document will soon be forwarded to the academic board of the university for consideration. The Director of RWESCK is playing a key role in this initiative.

Institutional Accreditation

KNUST has started with the process of undergoing institutional international accreditation with the Quality Assurance Agency for Higher Education (QAA) of the

United Kingdom. QAA is an independent body that checks on standards and quality in UK higher education. It checks how universities, and other higher educational institutions maintain their academic standards and quality and does this through external peer review. KNUST is currently at the self-evaluation stage and will be going through the next stages after the self-evaluation stage. This process will help KNUST as an institution to benchmark itself against international best practices and make improvements where required to enable it meet the required standards.

Embedding of RWESCK (ACEs)

KNUST has constituted a committee to align the structures of RWESCK and the other ACEs with the structures of the university. The work of the committee is to ensure some form of semi-autonomy of the ACEs including RWESCK, and also ensure institutional commitment of the management team necessary to achieve excellence. The placement of the Centres as semi-autonomous units at the level of faculty will allow inter-departmental collaborations with faculty members from colleges and will also help promote academic excellence in the university.

9.0 Partnerships and Development Impact DLI 2

Partnership Meeting With Ghana Standard Authority, Gsa

RWESCK as a way of implementing a World Bank project under the African Centres of Excellence (ACE) for Development Impact project which is to strengthen the Academic and Research Excellence of Universities to in-turn support the sector to achieve global and country specific development objectives through professional development training in water resources, water supply and environmental sanitation , has agreed to have a meeting with Ghana Standards Authority, GSA to help the standardization of laboratory equipment at the Centre. The Centre has procured state-of-the-art scientific equipment for research and commercial use.

The Centre would like the GSA to train our laboratory staff on the use of AAS, GCMS and laboratory management.

Under the year under discussion, the Centre signed an agreement with AgroParisTech from France for a sustainable workshop training for Executive Masters from various institutions globally.

RWESCK New Year Forum(Water Sector Dialogue)

RWESCK organised a New Year Forum on the theme, ‘Perspectives, Challenges and Emerging Research Fronts in WASH towards achieving the SDGs and Africa Union Agenda 2063’ to welcome students and affiliates of the Centre and deliberate on emerging researches to the WASH Sector. The programme was slated on Monday, 18th January, 2021 at the RWESCK Auditorium.

The Centre in collaboration with industry partners, held a maiden New Year Forum on 18th January 2021 at the Centre under the theme: “Water, Sanitation and Hygiene Challenges and Emerging Research towards achieving the SDGs and Africa Union Agenda 2063”, and the objective was for the postgraduate students and industry experts to engage and share ideas on how best to solve the challenges in the water and Sanitation sector.

The speakers from industry who made presentations were Engineer Siabi K. Worlanyo; the Chief Executive Officer of Community Water



Group Picture of RWESCK students at the New Year Forum

and Sanitation Agency, Mrs. Abena Dufie Wiredu; basin officer at the Water Resources Commission, Mr. Osei Asibey; Deputy Director for Waste Management Department at the Kumasi Metropolitan Assembly, and Mr. Don Awatungo; the Regional Director at the Regional and Environmental Health and Sanitation Department.

RWESCK Centre Fellows Inauguration and Academic Partners Meeting: The Centre held meetings with its local and international academic partners and inaugurated Fellows of the Centre on 29th April 2021 at the IDL Conference Room. The Fellows will contribute to research, activities of the Centre and also discuss current and future opportunities for mutual benefits while the local and international academic partners will concern themselves with issues relating training, research and collaborations.

Community Engagement

Global Handwashing Day

As part of the activities marking the Global Handwashing Day 2021, under the theme; “Our Future is at Hand – Let’s Move Forward Together”, Women in Water, Sanitation and Hygiene (WiWASH) group of the Regional Water and Environmental Sanitation Centre (RWESCK), in partnership with Community Water and Sanitation Agency (CWSA) organised a short exercise at Kwaso



Pupils demonstrating handwashing at the Global Handwashing Day



RWESCK students with diagrams showing proper handwashing

M/A JSS to create awareness through demonstrations on handwashing practices amidst the Covid-19 pandemic and good hygiene practices. The programme is celebrated every 15th October and this year's was colourfully marked.



Group picture of RWESCK and pupils of Kwaso M/A JSS at the Global Handwashing Day celebration



Student of RWESCK dancing with a pupil at the Global Handwashing Day

World Toilet Day

Women in Water, Sanitation and Hygiene (WinWASH) group of the Regional Water and Environmental Sanitation Centre Kumasi (RWESCK) teamed up to celebrate World Toilet Day 2021. Toilets and the sanitation systems are poorly managed or neglected in many parts of our communities. This celebration sought to draw the attention of the general public to the devastating consequences of this on health, economics and the environment. The programme was held on 19th November, 2021 at the Odaho M/A School in the Ejisu Municipality.



Headmaster of Odaho M/A JHS giving a speech at the World Toilet Day Celebration



Poetry recital by a pupil of Odaho M/A JHS during World Toilet Day celebration



Drama performance by pupils of Odaho M/A JHS during World Toilet Day celebration

10.0 Centre Management and Governance

RWESCK Centre Fellows Inauguration and Academic Partners Meeting

The Centre held meetings with its local and international academic partners and inaugurated Fellows of the Centre. The Fellows helped discuss issues relating to research, activities of the Centre and also current and future opportunities for mutual benefits. The local and international academic partners however concerned themselves with issues relating to research and collaborations. The inauguration took place on 29th April 2021 at the IDL Conference Room.



Centre Fellows inauguration

SAB Meeting

The Centre held its 2nd Sector Advisory Board meeting with key industry players on 11th May, 2021 at Coconut Grove Hotel, Accra with the Honourable Minister of Sanitation and Water Resources. The agencies present included CWSA, GCWL, representatives from ATU, UNICEF and ESPA. They deliberated on the following.

1. Update on Centre's activities
2. Review and comments on 2021 workplan
3. Board's inputs and strategies for strengthening the Centre

The Board members included Industry representatives, WRC, CWSA, GCWL, ATU, UNICEF and ESPA. The Board deliberated on the Centre's activities, review of 2021 workplan and provided inputs and strategies for strengthening the Centre.

International Scientific Advisory Board Meeting

As a requirement of the World Bank Africa Centres of Excellence project, the International Scientific Advisory Board (ISAB) of the Regional Water and Environmental Sanitation Centre Kumasi (RWESCK) has been instituted. They had a zoom meeting on 19th May, 2021 to discuss research and academic excellence and strategies to help strengthen the Centre's teaching and research. The International Scientific Advisory Board (ISAB) of the Regional Water and Environmental Sanitation Centre, Kumasi

(RWESCK), had a zoom meeting on 19th May, 2021 to discuss research and academic excellence and strategies to help strengthen the Centre’s teaching and research.

11.0 WORKPLAN, BUDGET AND OUTLOOK FOR 2022

Table 9a: Workplan, Budget and Outlook for 2022

Work Plan Activities	Estimated Budget(\$)
Action 2: DLI Action: DLI 2 Development Impact	
Activity 1: Tracer Study Report	1,000.00
Activity 2: Report on Community Engagement and World water days	5,000.00
Activity 3: RWESCK Learning Alliance & New year forum	10,000.00
Action 3: DLI Action: DLI 3 Quantity of students with focus on gender and regionalization	
Sub-Action 3a: DLI 3.1 New PhD	
Activity 1: 23 New PhD enrolment	137,886.79
Activity 2: Continuing PhD Students	61,056.60
Sub-Action 3b: DLI 3.2 New MSc	

Table 9b: Workplan, Budget and Outlook for 2022

Work Plan Activities	Estimated Budget(\$)
Activity 1: 48 New MSc students	207,943.40
Activity 2: Continuing MSc Students	37,954.72
Sub-Action 3c: DLI 3.3 New Professional Short Courses	
Activity 1 3c: DLI 3.3 New Professional Short Courses	50,000.00
Activity 2: Delivery of face-to-face and online Regional Short Courses (70 Participants)	10,000.00
Activity 3: Training of Trainers for TVET Lecturers	30,000.00
Action 4: DLI Action: DLI 4 Quality of Education and Research through International Accreditation	
Sub-Action 4a: DLI 4.1 Programme Accreditation	
Activity 1: International Accreditation of programmes & Self Evaluation	40,000.00
Activity 2: NAB accreditation of 4 New MSc programmes	8,000.00
Sub-Action 4b: DLI 4.2 Research Publications	
Activity 1: RWESCK- Industry Partnership, Joint research Workshop	5,000.00
Activity 2: Publications and policy briefs, Scientific Reports	10,000.00
Sub-Action 4c: DLI 4.3 Teaching and Research Infrastructure	

Table 9c: Workplan, Budget and Outlook for 2022

Work Plan Activities	Estimated Budget(\$)
Activity 1: Procurement of Laboratory equipment	100,000.00
Activity 2: Centre Building Phase 2	600,000.00
Activity 3: Laboratory Certification & Audit	20,000.00
Activity 4: Procurement of Office equipment	20,000.00
Activity 5: Procurement of Teaching and e-studio learning IT equipment	30,000.00
Activity 6: Wireless and fibre optic	30,000.00
Activity 7: Laboratory Consumables & Maintenance	50,000.00
Sub-Action 4a: DLI 5.1 External Revenue/Staff capacity building	
Activity 1: Contract Research hunting and Grantsmanship	5,000.00
Activity 2: Staff development and skills training	20,000.00
Sub-Action 5b: DLI 5.2 Internships	
Activity 1: Staff and student internship	40,000.00
Activity 2: Internship monitoring	5,000.00
Sub-Action 5c: DLI 5.3 Entrepreneurship	

Table 9d: Workplan, Budget and Outlook for 2022

Work Plan Activities	Estimated Budget(\$)
Activity 1: Business start-up and Innovation week	40,000.00
Activity 2: Industry-RWESCK joint technology development	30,000.00
Activity 3: Marketing and Patenting of innovations	10,000.00
Action 6: DLI Action: DLI 6 Financial	
Sub-Action 6a: DLI 6.1	
Activity 1: Financial account preparation and auditing	10,000.00
Activity 2: Internal Audit Issues	5,000.00
Action 7: DLI Action: DLI 7 Management and Governance	
Sub-Action 7a:	
Activity 1: Management, Board and partnership meetings	30,000.00
Activity 2: Staff remuneration and compensation	100,000.00
Activity 3: Office consumables	15,000.00
Activity 4: Fuel , Repairs and Maintenance	50,000.00
Activity 5: Travel expenses (local and international)	30,000.00

Table 9e: Workplan, Budget and Outlook for 2022

Work Plan Activities	Estimated Budget(\$)
Action 8: DLI Action: DLI 8 Institutional Impact	
Activity 1: Institutional Accreditation	80,000.00
Activity 2: University Wide Departmental Ranking	10,000.00
Activity 3: Institutionalised Centres of Excellency within the University Statute	15,000.00
Action 9: Communication	
Activity 1: Call credit and Data to Project members	15,000.00
Activity 2: Visibility and Media presence	40,000.00
TOTALS	2,113,841.51
Contigencies-10%	211,384.15
Grand Totals	2,325,225.66

NOTE:

1. Total budget for the year amounted to \$ 2, 325, 225.66.
2. Out of this a total amount of \$950,000 will go into Learning and Teaching Environment and also \$508,345.07 into Regional Capacity Training.
3. A total figure of \$50,000.00 has been allocated to International Accreditation of Programmes & Self Evaluation.
4. An amount of \$603,901.60 has also been allocated to Governance and administration
5. A total figure \$211,384.15 has also being signed to future contingencies.

OUTLOOK.

1. The Centre is expected to receive a total amount of \$ 1,715,859.15 for its operations for the year 2022.
2. The second building is also expected to come to completion in June 2022 for it to be handed over to the Centre,
3. The commercialization of the Laboratory is also expected to start in 2022.

Professional short courses activities

As part of the Centres strategy for Development Impact, the Centre has initiated arrangements and invitation for registration of participants to build the capacity of MMDAs staff through professional development courses in the following technical areas;

- Sustainable Onsite-Sanitation and Faecal Sludge Management
- Sustainable Integrated Municipal Solid Waste Management
- Sustainable Drainage System and Water Sensitive Urban Designs
- Environmental Sanitation Master Planning, Monitoring and Evaluation (Integrated Master Plan, MESSAP, DESSAP) for MMDAs
- Drainage System Master Planning, Monitoring and Evaluation for MMDAs

Commercialisation of laboratory

The centre as part of its vision of self-sufficiency has in place a model of commercialising the laboratory services to students, faculty members and external clients. The resources of the laboratories align with the centre's research thematic areas of Innovative Water Treatment Technology, Innovative Water Distribution and digital technology, Environmental Sanitation and Waste Management Technology, Climate Resilience and Water Resources Management and Water and sanitation governance.

In the first and second quarters of 2022, RWESCK laboratories will have completed the full installation of all procured equipment with the required consumables. For optimum delivery, accountability and customer satisfaction, the laboratory management team has in place an email address and bank account for customer engagement and payment of laboratory services respectively. Some of the state-of-the-art laboratory equipment available include Scanning Electron Microscope (SEM), D2 PHASER X-ray Diffractometer, Gas Chromatograph Mass Spectrometer (GCMS), Atomic Absorption Spectrophotometer (Flame/Graphite Furnace Integrated) and Biogas analyser.



Installation of SEM at the RWESCK Environmental Laboratory

In conclusion, for competency-based service delivery, the centre has commenced plans of specialised factory training of its laboratory staff with support from Ghana Standards Authority (GSA) in calibration of basic laboratory equipment. The underlisted services will be rendered by the various laboratories:

Water Quality Laboratory

1. Drinking/portable water analysis
2. Wastewater analysis
3. Testing of treatment units
4. Mobile Laboratory kits

Environmental Quality Laboratory

1. Nanomaterials, soil, biosolids, compost analysis
2. Solid waste and wastewater analysis
3. Food and feed nutrients analysis
4. Biogas analysis

Hydraulics and Water Resources Laboratories

1. Groundwater measurement
2. Stream Flow measurement
3. Hydraulic studies
4. Borehole drilling and pumping tests

Contact

RWESCK email address: rwescklabservices@gmail.com

RWESCK telephone number: 0548079278

Bank account details

Account name: Regional Water and Environmental Sanitation Centre Kumasi

Account number: 0209556640001

Bank: CBG

12. CONCLUSION

The Centre has achieved most of its target despite the challenges faced in the year 2021. The Centre met its target and performed very well in the delivery of its mandate. The Centre with the help and support of the Sector Advisory Board (DAB) and the International Advisory Board (IAB), will do more to add to its achievements and manage challenges so it does not become an obstacle in the achievement of the Centre's goals and mandate.

ANNEX: PUBLICATIONS IN THE YEAR UNDER REVIEW

Theme 1: Innovative Water Treatment Technology

1. Siabi, W.K., Owusu-Ansah, E.D.J., Essandoh, H.M.K. and Asiedu, N.Y., 2021. *Modelling the adsorption of iron and manganese by activated carbon from teak and shea charcoal for continuous low flow. Water-Energy Nexus, 4, pp.88-94.*
2. Bartels, D.A., Johnson, R., Bayor, M.T., Ainooson, G.K., Ossei, P.P., Etuaful, R.K. and Buamah, R., 2021. *Formulation of Suppositories of Alum Produced from Bauxite Waste in Ghana for the Treatment of Hemorrhoid. The Scientific World Journal, 2021.*
3. Nti, S.O., Buamah, R. and Atebiya, J., 2021. *Polyaluminium chloride dosing effects on coagulation performance: case study, Barekese, Ghana. Water Practice & Technology, 16(4), pp.1215-1223.*

Theme 2: Innovative Water Distribution and digital technology

1. Appiah-Effah, E., Ahenkorah, E.N., Duku, G.A. and Nyarko, K.B., 2021. *Domestic drinking water management: Quality assessment in Oforikrom municipality, Ghana. Science Progress, 104(3), p.00368504211035997.*

Theme 3: Environmental Sanitation and Waste Management Technology

1. Oduro-Kwarteng, S., Addai, R., & Essandoh, H. M. (2021). *Healthcare waste characteristics and management in Kumasi, Ghana. Scientific African, 12, e00784.*
2. Senanu, B. M., Boakye, P., Oduro-Kwarteng, S., Sewu, D. D., Awuah, E., Obeng, P. A., & Afful, K. (2021). *Inhibition of Ammonia and Hydrogen Sulphide Using Plant Waste Materials for Faecal Sludge Odour Control in Dry Sanitation Toilet Facilities.*
3. Asilevi, P. J., Boakye, P., Oduro-Kwarteng, S., Fei-Baffoe, B., & Sokama-Neuyam, Y. A. (2021). *Indoor Air Quality Improvement and Purification by Atmospheric Pressure Non-Thermal Plasma (NTP).*
4. Acquah, M. N., Essandoh, H. M. K., Oduro-Kwarteng, S., Appiah-Effah, E., & Owusu, P. A. (2021). *Degradation and accumulation rates of fresh human excreta during vermicomposting by Eisenia fetida and Eudrilus eugeniae. Journal of Environmental Management, 293, 112817.*
5. Nkansah, J. B., Oduro-Kwarteng, S., Essandoh, H. M. K., & Kuffuor, R. A. (2021). *Enhancing food waste compost quality with nutrient amendments. International journal of recycling organic waste in agriculture.*
6. Nyieku, F.E., Essandoh, H.M., Armah, F.A. and Awuah, E., 2021. *Environmental conditions and the performance of free water surface flow constructed wetland: a multivariate statistical approach. Wetlands Ecology and Management, 29(3), pp.381-395.*
7. Osei-Marfo, M., Oteng-Peprah, M., Awuah, E. and de Vries, N., 2021. *Characterisation of Wastewater and Treatment Efficiency of Biogas Plants: Effluent Discharge Quality. Journal of*

Energy Research and Reviews, pp.15-28.

8. Imoro, A.Z., Mensah, M. and Buamah, R., 2021. *Developments in the Microbial Desalination Cell Technology: A review. Water-Energy Nexus*.
9. Imoro, A.Z., Mensah, M. and Buamah, R., 2021. *A Factorial Study of the Effect of Rhamnolipid and Stirring on the Electricity Production, Desalination, and Wastewater Treatment Efficiencies of a Five-Chamber Microbial Desalination Cell. Journal of Renewable Energy and Environment*, 8(2), pp.54-60.
10. Abubakari Z. I. Mensah. M. and Buamah R. (2021) *A Factorial Study of the Effect of Rhamnolipid and Stirring on the Electricity Production, Desalination and Wastewater Treatment Efficiencies of a Five-Chamber Microbial Desalination Cell. Journal of Renewable Energy and Environment: JREE-2008-1137 (R4)*
11. Abubakari, Z. I. Mensah, M. and Buamah, R. (2021) *Assessment of the electricity generation, desalination and wastewater treatment efficiencies of a microbial desalination cell operating with electrolyte dilution as pH control measure. Journal of Fundamental and Applied Sciences 2021*, 13(1), 185-198. ISSN 1112-9867
12. Appiah-Brempong, M., Essandoh, H.M.K., Asiedu, N.Y., Dadzie, S.K. and Momade, F.Y., 2021. *Optimization of Coagulation-flocculation Process for Pre-treatment of Artisanal Tannery Wastewater Using Response Surface Methodology*.
13. Enyemadze, I., Momade, F.W., Oduro-Kwarteng, S. and Essandoh, H., 2021. *Phosphorus recovery by struvite precipitation: a review of the impact of calcium on struvite quality. Journal of Water, Sanitation and Hygiene for Development*, 11(5), pp.706-718.
14. Amenyeku, G. and Essandoh, H.M., 2021. *Anaerobic Co-Digestion of Faecal Sludge with paper or Fruit Waste for Biogas a case in Kumasi, Ghana (Doctoral dissertation)*.
15. Osarenotor, O., Essandoh, H.M. and Tito Aighewic, I., 2021. *Removal of pollutants by mycelium colonized sawdust. Water Practice and Technology*.
16. Nsiah-Gyambibi, R., Essandoh, H.M.K., Asiedu, N.Y. and Fei-Baffoe, B., 2021. *Valorization of fecal sludge stabilization via vermicomposting in microcosm enriched substrates using organic soils for vermicompost production. Heliyon*, 7(3), p.e06422.

Theme 4: Climate Resilience and Water Resources Management

1. Siabi, E. K., Kabobah, A. T., Akpoti, K., Anornu, G. K., Amo-Boateng, M., & Nyantakyi, E. K. (2021). *Statistical downscaling of global circulation models to assess future climate changes in the Black Volta Basin of Ghana. Environmental Challenges*, 100299
2. Osiakwan, G. M., Appiah-Adjei, E. K., Kabo-Bah, A. T., Gibrilla, A., & Anornu, G. (2021). *Assessment of groundwater quality and the controlling factors in a coastal aquifers of Ghana: An integrated statistical, geostatistical and hydrogeochemical approach. Journal of African Earth Sciences*, 104371
3. Awotwi, A., Anornu, G. K., Quaye-Ballard, J. A., Annor, T., Nti, I. K., Odai, S. N., & Gyamfi, C. (2021). *Impact of post-reclamation of soil by large-scale, small-scale and illegal mining on water balance components and sediment yield: Pra River Basin case study. Soil and*

Tillage Research, 211, 105026.

4. Egbi, C. D., Anornu, G. K., Appiah-Adjei, E. K., Ganyaglo, S. Y., & Dampare, S. B. (2021). *Trace Metals Migration and Contamination Assessment of Groundwater in the Lower Volta River Basin, Ghana. Exposure and Health*, 1-18.
5. Awotwi, A., Annor, T., Anornu, G.K., Quaye-Ballard, J.A., Agyekum, J., Ampadu, B., Nti, I.K., Gyampo, M.A. and Boakye, E. (2021). *Climate change impact on streamflow in a tropical basin of Ghana, West Africa. Journal of Hydrology: Regional Studies*, 34, p.100805.
6. Darko, S., Adjei, K.A., Gyamfi, C., Odai, S.N. and Osei-Wusuansa, H., 2021. *Evaluation of RFE Satellite Precipitation and its Use in Streamflow Simulation in Poorly Gauged Basins. Environmental Processes*, 8(2), pp.691-712.
7. Logah, F.Y., Adjei, K.A., Obuobie, E., Gyamfi, C. and Odai, S.N., 2021. *Evaluation and Comparison of Satellite Rainfall Products in the Black Volta Basin. Environmental Processes*, 8(1), pp.119-137.
8. Antwi-Agyei, P., Dwumfour-Asare, B., Adjei, K.A., Schelbert, V., Meili, D. and Lüthi, C., 2021. *Shared Sanitation in Low-income Urban Settlements in Ghana. ETH Zurich*.
9. Oseke, F.I., Anornu, G.K., Adjei, K.A. and Eduvie, M.O., 2021. *Assessment of water quality using GIS techniques and water quality index in reservoirs affected by water diversion. Water-Energy Nexus*, 4, pp.25-34.
10. Kwarteng, E.A., Gyamfi, C., Anyemedu, F.O.K., Adjei, K.A. and Anornu, G.K., 2021. *Coupling SWAT and bathymetric data in modelling reservoir catchment hydrology. Spatial Information Research*, 29, pp.55-69.
11. Boakye, E., Anyemedu, F.O.K., Donkor, E.A. and Quaye-Ballard, J.A., 2021. *Variability of suspended sediment yield in the Pra River Basin, Ghana. Environment, Development and Sustainability*, pp.1-18.
12. Gyamfi, C., Tindan, J.Z.O. and Kifanyi, G.E., 2021. *Evaluation of CORDEX Africa multi-model precipitation simulations over the Pra River Basin, Ghana. Journal of Hydrology: Regional Studies*, 35, p.100815.
13. Darko, S., Adjei, K.A., Gyamfi, C., Odai, S.N. and Osei-Wusuansa, H., 2021. *Evaluation of RFE Satellite Precipitation and its Use in Streamflow Simulation in Poorly Gauged Basins. Environmental Processes*, 8(2), pp.691-712.
14. Gyimah, R.A.A., Gyamfi, C., Anornu, G.K., Karikari, A.Y. and Tsyawo, F.W., 2021. *Multivariate statistical analysis of water quality of the Densu River, Ghana. International Journal of River Basin Management*, 19(2), pp.189-199.
15. Gyimah, R.A.A., Gyamfi, C., Anornu, G.K., Karikari, A.Y. and Tsyawo, F.W., 2021. *Multivariate statistical analysis of water quality of the Densu River, Ghana. International Journal of River Basin Management*, 19(2), pp.189-199.

Theme 5: Water and sanitation governance

1. Agbotui, P., Anornu, G., Agbotui, T., Gyabaah, F., Amankwah-Minkah, A., Brookman-Amissah, M., Blankson-Darku, D. and Sallah, J. (2021). *Risk-based contaminated land management policy mindset: a way out for Ghana's environmental challenges*. *African Geographical Review*, pp.1-14.
2. Oduro, C.Y., Appiah-Effah, E. and Nyarko, K.B., 2021. *Assessing policymaker and taxpayer attitudes towards public finance for urban sanitation: the case of sanitation surcharges in two Ghanaian municipalities*. *International Journal of Urban Sustainable Development*, 13(1), pp.83-96.
3. Quarshie, A.M., Gyasi, S.F., Kuranchie, F.A., Awuah, E. and Darteh, E., 2021. *Conceptual Behaviour Underpinning the Occurrence of Nonfaecal Matter in Faecal Sludge in Some Urban Communities, Ghana*. *Journal of Environmental and Public Health*, 2021.
4. Osei-Marfo, M., de Vries, N.K. and Awuah, E., 2021. *People's perceptions on the use of human excreta for biogas generation in Ghana*. *Environment, Development and Sustainability*, pp.1-25.
5. Asare, W., Oduro-Kwarteng, S., Donkor, E. A., & Rockson, M. A. (2021). *Incentives for improving municipal solid waste source separation behaviour: the case of Tamale Metropolis, Ghana*. *SN Social Sciences*, 1(5), 1-33.

PARTNERS



ENVIRONMENTAL PROTECTION AGENCY



COUNCIL FOR SCIENTIFIC INDUSTRIAL RESEARCH GHANA



GHANA WATER COMPANY LIMITED



CLEAN TEAM GHANA



GHANA IRRIGATION DEVELOPMENT AUTHORITY



WATER RESOURCES COMMISSION



GHANA NATIONAL DISASTER MANAGEMENT ORGANIZATION



EARTH OBSERVATION RESEARCH AND INNOVATION CENTRE



UNIVERSITY OF EDUCATION, WENMBIA



NATIONAL WATER RESOURCES INSTITUTE, KADUNA (NIGERIA)



UNIVERSITY OF BENIN (NIGERIA)



ACARP ACCRA COMPOSIT CYCLING PLANT



SEWERAGE SYSTEMS GH. LTD. Clean Environment - Green Energy SEWERAGE SYSTEMS GHANA LTD.



UNIVERSITY OF CHEIKH ANTA DIOP



UNIVERSITY OF CAPE COAST



COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH GHANA



NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEx)



UNIVERSITÉ FÉLIX HOUPHOUËT-BOIGNY (UFHB)



MINISTRY OF HIGHER EDUCATION THE GAMBIA



SUNYANI MUNICIPAL ASSEMBLY



KUMASI METROPOLITAN ASSEMBLY



COMMUNITY WATER AND SANITATION AGENCY



FOURAH BAY COLLEGE UNIVERSITY OF SIERRA LEONE

IMPLEMENTING PARTNERS



THE WORLD BANK



ASSOCIATION OF AFRICAN UNIVERSITIES



MINISTRY OF FINANCE AND ECONOMIC PLANNING GHANA



National Council for Tertiary Education



rwesck_knust



rwesck



rwesck_knust



rwesck_knust



rwesck_knust

www.rwesck.org

+233 (0)548079278

rwesckmedia