



## WATER EDUCATION IN GHANA: EMPOWERING PEOPLE FOR SUSTAINABLE DEVELOPMENT

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### Abstract

*The role of education in promoting Sustainable Development has been recognized globally, culminating in the United Nations Decade of Education for Sustainable Development. However, unlike Environmental Education, education about water resources is given less attention despite the escalating water challenges in the world. Water is barely considered in most research literature by environmental academics and teacher educators. Nonetheless, recently, there has been a renewed interest in Water Education in higher educational institutions such as universities as a tool for promoting water knowledge and participation in decisions. Ghana is not only endowed with water resources but also besieged with water challenges such as fallen groundwater tables, stressed surface water resources, transboundary water issues and hydrometeorological-related disasters. Therefore, the study intended to identify in Ghanaian public universities the nature of the existing Water Education programmes, the emerging water issues that need attention and the reasons for the absence of these programmes. Guided by expert responses of academics and researchers in water and its related fields, primary data were generated for the study. Also, a desktop review of policy documents, articles and programmes' information at universities' websites in Ghana provided useful secondary data. The study revealed that out of the ten Ghanaian public universities studied, five of them do not have programmes relating to the subject of water. Notably, two universities established to deal with the environment and natural resources are among the five universities without water related programmes. It emerged that issues such as coping with extreme hydrological disasters, water diplomacy, gender and water utilization need educational attention too. This notwithstanding, funding of water programmes has been identified as a major challenge that universities face.*

**Keywords: Water, Education, Sustainable Development, Universities, Ghana**

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### Introduction

The role of education in promoting Sustainable Development (SD) has long been recognised and promoted. For instance, the 1992 United Nations (UN) Conference on Environment and Development (UNCED) in Rio de Janeiro culminated in the declaration of the Decade of Education for Sustainable Development (DESD) from 2005 to 2014 with the aim of integrating the principles and practices of SD in education. However, specific focus on Water Education remains marginal in spite of its centrality in environmental sustainability.

Etgen et al. (2009) have established that education as a tool for building capacity to address water and its escalating problems has not been given requisite attention. Rhea (2018) opines that water is barely considered in most research literature by specialist environmental academics and teacher educators. Arguing for education as a tool for promoting change in issues relating to water, Pereira, Cordery and Iacovides (2009) explain that Water Education helps raise awareness, develop an attitude of care and responsibility and foster a sense of

ownership and protection of water resources. Water Education and/or literacy produces informed stakeholders, who are knowledgeable and skillful to support sustainability efforts including pollution control, waterbodies and watersheds conservation and strategic use. Salame and van der Zaag (2013) add that education fosters understanding and cooperation among multiple users. Thus, water literacy is important for tackling a plethora of SD challenges (Kitamura et al., 2015).

Subsequently, growing interest in Water Education according to Rhea (2018) is gradually filtering into academia, particularly in the field of education. Evidently, the United Nations Education and Scientific Organisation (UNESCO) provides leadership and support for the teaching of hydrological sciences, aim at increasing knowledge on water related issues (UNESCO-IHP, 2012). Universities have therefore, become one of the places for promoting Water Education. This is because universities “occupy a unique position within society. With the broad remit around the creation and dissemination of knowledge, universities have long been powerful drivers of global, national and local innovation, economic development, and societal wellbeing” (Sustainable Development Solutions Network (SDSN) Australia/Pacific, 2017:7). For such reasons, the Institute for Water Education, Delft has established the Institute for Water Education in the Netherlands, considered the largest international Graduate Water Education Faculty in the world.

Ghana is endowed with enormous water resources (Forkuor et al., 2013). Groundwater resources are estimated to be about 26.3 Bm<sup>3</sup> (Johnson and McCartney, 2010) while surface water resources such as the Volta River Basin alone, drains about 70% of the total area of Ghana; covering an area of 165,830 km<sup>2</sup> (United Nations Environment Programme-Global Environment Facility (UNEP-GEF) Volta Project, 2013). These resources support domestic, industrial and hydroelectric activities in the country with groundwater serving as a major source of potable water supply for most communities, particularly rural communities (Ofosu-Addo et al., 2008). However, incidence

of fallen groundwater tables in the entire northern part of the country have already been recorded (Johnston and McCartney, 2010). Kankam-Yeboah et al. (2009) note that the country will become water-stressed by 2025. Moreover, transboundary water problems continue to emerge between Ghana and Burkina Faso. Hydrometeorological disasters in the form of floods have also become frequent and common, causing a great havoc to human lives especially in regions such as Bono, Ahafo, Central, Eastern, Greater-Accra, Upper East and Volta regions. Okyere et al. (2013), in their studies, document that flooding within the period 1968 and 2011 affected about 3.81 million people. In tackling these challenges, efforts including the design and implementation of water programmes in universities, have been made. Noteworthy, however, a review of the existing literature shows that there are few studies that focus on Water Education in Ghana. Therefore, the first objective of this article is to identify those public universities that offer water and water-related programmes in their areas of focus in the country.

Secondly, in recognition of Education for Sustainable Development (ESD), UNESCO (2017:7) explains that people ought to be empowered “to reflect on their own actions, taking into account their current and future social, cultural, economic and environmental impacts, from a local and a global perspective.” In addition, the WCED (1987) argues for the application of relevant knowledge, skills, sustainable practices, behaviour and values in using natural resources. Unfortunately, Professor Uwe Grünewald had remarked that “the general public is only aware of the natural resource ‘water’ if there is too little or too much of it or if its quality does not allow important uses” (German Commission for UNESCO, 2009: 20). This situation is no different in Ghana with the now perennial floods and droughts and their effects on the environment and human life. Increasingly, the state invests in water resources development without the complementary investments in water education for sustainable use and management. This article takes up that challenge by examining

emerging issues relating to sustainable water resources management and development for options and opportunities for water education.

Lastly, certain factors influence the absence or presence of some educational programmes at any given university. In Bermuda for instance, Bacon and Ziepbiewski (2017) have noted that the lack of staff and experts coupled with difficulty in teaching its content to reflect in human lives, values and practices affect the teaching of Environmental Education. Cheruiyot (2019) has indicated further that the teaching of Environmental Education in Kenya is difficult because of poor teacher attitude, ineffective administrative support for implementation and the absence of clear implementation guidelines. This article further assesses those factors that militate against the running of Water Education programmes in some public Ghanaian universities.

### **Existing literature about Sustainable Development, Education and Water Resources**

From a long history of lack of documentation, the concept SD has recently become a buzzword (Zikic, 2018). Nonetheless, its emergence in multiple fields of study, according to Gunter (1994), denied it of a uniform definition as each field brought its uniqueness to the term. This notwithstanding, the definition by the World Commission on Environment and Development (WCED) (1987:43), that “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” is common.

Critiquing the WCED (1987) definition as a Western perspective which fails to recognise how local people especially those in Africa draw from culture and local knowledge to interpret their lives and the natural environment, Dei (1993), re/envisions SD as development that allows local people to articulate their own needs. Guided by the literature so far, the concept SD would be applied in this article as development that hinges on locally defined needs with the consciousness of environmental protection.

To promote SD, education as a tool for socio-cultural and attitudinal change has been recognized. As Irina Bokova, the Director-General of UNESCO has noted: “now, more than ever, education has a responsibility to be in gear with 21st century challenges and aspirations and foster the right types of values and skills that will lead to sustainable and inclusive growth, and peaceful living together” (UNESCO, 2017:7). It is therefore not surprising that the UNESCO (2015) has long argued that education must contribute to a new vision of sustainable global development as evidenced in three seminal global SD summits; namely, (i) the 1992 UN Conference on Environment and Development (UNCED) in Rio de Janeiro; (ii) the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa; and (iii) the 2012 UN Conference on Sustainable Development (UNCSD), also in Rio de Janeiro, Brazil. Specifically on Water Education, the UNESCO-IHP (2012:1) has asserted that it is a “strategic entry point in developing a new ethic for water governance and management...Education about water should occur at all levels to equip people with the knowledge, skills and values to play a role in protecting the resource”. Concepts such as Integrated Water Resources Management have hence been embraced in recent times as tools to promote Water Education for sustainability. Thus, in assessing Water Education programmes attention is given to the following levels: tertiary education and professional development of water scientists, engineers, managers and decision makers; education and training of water technicians; water education in schools; community education; and water education for mass-media professionals (UNESCO-IHP, 2012). Nonetheless, the first level is of appeal in this article.

In Ghana, Water Education programmes seek to increase individual awareness about the environment and promote knowledge, skills, values and experiences meant to propel collective and individual actions toward solving present and future water problems (The Resources Centre Network Ghana, 2021). In Ghanaian schools, Water Education

programmes encompass the integration of water with sanitation and hygiene objectives. This notwithstanding, the Water Resources Commission and other state agencies of Ghana also promote Water Education through community level platforms such as workshops, festivals and durbars and the use of mass media campaigns (Water Resources Commission, 2011).

### **Methods, Materials and Study Area**

The study was conducted between April 2021 and December 2022. It focused on some public universities in Ghana. Ghana, a country located in West Africa has several public universities including private and foreign ones (have local campuses of foreign universities). These universities are accredited by the National Accreditation Board under the Ministry of Education, Ghana and offer degree programmes. For the purpose of the study, ten (10) public universities were purposely selected. These included: the University for Development Studies (UDS), University of Cape Coast (UCC), University of Professional Studies Accra (UPSA), University of Ghana (UG), University of Energy and Natural Resources (UENR), Kwame Nkrumah University of Science and Technology (KNUST), University of Mines and Technology (UMAT), University of Health and Allied Sciences (UHAS), University of Environment and Sustainable Development (UESD) and University of Education, Winneba (UEW). The choice of these public universities was premised on the fact that they are traditional institutions established, regulated and funded by the Ghanaian state. These public universities have large student populations pursuing a variety of programmes including those on water or water related ones.

In order to generate data for a broader contextual analyses of water programmes being pursued in Ghanaian public universities and the emerging water related issues that need educational attention, the following processes were used to generate data for the study. Firstly, an internet search of faculties and departments where water and water related programmes are pursued was conducted in the 10 universities.

From these departments 20 academics whose backgrounds relate to water resources and are in such departments were purposely selected. Questionnaires were then designed and sent via emails to the respondents in nine of the study universities (excluding UDS) which are all located in southern Ghana for the sake of time and convenience. Respondents were given two months to respond to the questionnaire. Since the author works at the University for Development located in northern Ghana, face-to-face interviews were conducted with the respondents there. Such interviews took place in the offices of the respondents. The interviews were recorded and later transcribed. Also, a desk review of policy documents, articles, books, magazines provided useful secondary data for analyses. Furthermore, a search was conducted at the websites of these universities to obtain information about the programmes that such universities run. Brochures, fliers, students' handbooks and other relevant documents that provide water related programmes information were sought and reviewed.

### **Results and Discussion**

#### ***Water Education programmes in Ghanaian Public Universities***

Water literacy is an important tool for addressing the many SD challenges in the world (Kitamura et al. 2015). As noted already, in Ghanaian schools, Water Education programmes exist across levels while the government has also often designed Water Sector Strategic Development Plans (see Ministry of Water Resources, Works and Housing, 2014) which have education components.

From the questionnaire and interview responses, Ghanaian public universities have programmes that focus on Water Education. Aspects of water resources considered included potable water supply, water as a raw material, water livelihood activities and water abodes/habitats like the oceans among others. Universities with these programmes are presented in Table 1. The KNUST is noted as the only university that runs both post graduate programmes on raw water resources and water

supply, treatment and management. The other universities programmes focus largely on raw water resources. In terms of methods and approaches to studying water as a subject, the

UDS and KNUST post graduate programmes have engineering components embedded in them.

**Table 1: Some Ghanaian Public Institutions that Offer Water Education Programmes**

Institution	Programme Focus	Faculties/Colleges	Degree/Specialization/
<b>KNUST</b>	Potable Water Raw water as a Resource	Faculty of Renewable Natural Resources  College of Engineering/ Regional Water and Environmental Sanitation	<ul style="list-style-type: none"> <li>Watershed Management (MPhil/PhD)</li> <li>Water Resources Engineering and Management (MPhil)</li> <li>Water Supply and Environmental Sanitation (PhD)</li> <li>Water Resources Engineering and Management (PhD)</li> <li>Water Supply and Treatment Technology (PhD)</li> </ul>
<b>UDS</b>	Water-related livelihoods activities	School of Engineering/West African Centre for Water, Irrigation and Sustainable Agriculture	Irrigation and Drainage Engineering (MPhil/PhD)
<b>UG</b>	Raw water resources	School of Physical Sciences	Hydrology (MSc)
<b>UCC</b>	Raw water resources	Africa Centre of Excellence in Coastal Resilience	Oceanography and Limnology (MPhil)  Oceanography and Limnology (PhD)
<b>UESD</b>	Raw water resources	School of Sustainable Development	Water Resources Development (BSc)

*Source: Extracted from the various universities' websites (2021)*

A review of the studied universities' documents and the search of programmes at the websites of the various universities in the country revealed that the following public universities did not have programmes about water and water related education programmes at the time of the study.

- University of Energy and Natural Resources
- University of Health and Allied Sciences
- University of Mines and Technology
- University of Education, Winneba
- University of Professional Studies

Considering the place of Water Education in academia (Rhea, 2018) of which Karleuša et al. (2009) indicted of such already taking shape in some Croatian universities such as Rijeka University, Ghanaian public universities are also mounting programmes and churning out water engineers, scientists, technicians, managers and decision makers who are contributing to promoting sustainable development in the country. However, these programmes are limited in number and in scope (Table 1) as eleven of them were graduate programmes with only one being an undergraduate programme from the UESD, a recently created university which is yet to

produce graduates in this programme. Though the situation in the UESD implies that it will take about three years to produce graduates in water resources, it is an indication that university managements and the government of Ghana are beginning to see the need to have undergraduate programmes in water resources. This notwithstanding, it is noted that none of the Water Education programmes being ran by these universities is exactly like the other; each programme is unique.

Interestingly, universities whose mandates focus specially on the natural environment are yet to mount water and its related programmes even though water resources form a significant component of the natural environment. For instance, the University of Energy and Natural Resources (UENR) and University of Mines and Technology whose mandates anchor on the sustainable exploitation, utilisation and protection of the environment including its resources are yet to run Water Education programmes at the time of the study.

From the results, it is evident that Water Education programmes exist in the country but their contributions to increasing knowledge and influencing attitudes and behaviour are yet to be subjected to any high-level debate in the country's sustainable development agenda as the challenges associated with water resources in the country continue to escalate with new ones emerging. Until such is done, the consideration of Ghana as one of the countries on the trajectory of promoting sustainable development in Africa (Bartniczak and Raszkowski, 2018) is far from reality as far as the role of Water Education in addressing water challenges in the country is concerned.

#### ***Water issues that need education and training to ensure sustainable development***

Kitamura et al. (2015) have noted that one way of reducing the severity and impacts of water-related disasters (including direct deaths and infectious disease casualties) is through water-related Disaster and Risk Reduction education. In Ghana, floods and flooding have become annual events affecting lives, livelihoods and settlements. With limited knowledge on adaptation and management, most people are

unable to respond appropriately and timeously. Hence, the interview responses revealed that coping with extreme hydrological disasters is an aspect of Water Education that needs immediate attention.

Also, when water resources transcend local or national boundaries, water conflicts sometimes are inevitable. Water-diplomacy, also referred to as hydro-diplomacy, which denotes "all contact between (non) state actors and at least one state actor or international governmental organization over transboundary freshwater resources such as lake, river and aquifer" (van Genderen and Rood, 2011:10), is a necessary tool for water governance. With Ghana being part of the Volta Basin, governing water resources in the basin is necessary especially as Ghana is at the downstream and thus recipient of the yearly ejection of excess water from the Bagré Dam. The consequences of the inflow of excess water from the Bagré Dams has already been noted. Even though the Volta Basin Authority has been created with representatives or stakeholders from the riparian countries (Ghana and Burkina), there is still need for education on water diplomacy as a critical component of water education in Ghana. The Authority as an entity operated at national and transnational levels with communities and people in-between who suffer the direct effects of not just the spillage but also water and riparian land use conflicts. However, in some instances, the communities and people are usually left out largely during in country and cross border water related discussions and negotiations. Fishing, crop farming and animal rearing among neighbouring communities often generate conflicts and as such there is need for continuous engagements at the communal level. This requires the assistance of various categories of water and related professionals at all levels and also education.

Gender, access to and utilisation of water is yet but another area that needs attention in Ghana. From the interview responses, women, girls and children are at the forefront of domestic water provision and use yet, they are often missing in water decisions particularly at the community level. Water facilities in the form of boreholes are largely controlled by men even

though they are far removed from the daily challenges characterizing access to and utilization of water facilities. This finding is in line with Boateng et al, (2013) assertion that women's participation in Rural Water and Sanitation Programmes is low in some parts of the Ashanti Region. Kwoyiga and Apusigah (2021) reveal that women farmers in the Upper East Region have to negotiate for resources such as water and land as these are owned by men who are the elders and heads of families/clans. It is therefore, argued that emphasis should be placed on how to increase women access to water resources especially for livelihood activities as part of measures to achieve sustainable development.

In Ghana, it is noted that some communities particularly densely populated and/or poor urban areas in the country are underserved or unserved by water utility providers (Ministry of Water resources, Works and Housing, 2011) even though the country is endowed with both ground and surface water resources. According to the interview responses, one of the ways of addressing this situation is by focusing on 'source water development and water treatment'.

The interview responses also indicated that community participation and institutional development for understanding the socio-economic issues related to water production and distribution needs education. For instance, engineering and sustainable solutions need to reflect the needs of the people, the end users of water, their needs and purposes. The current disconnect creates unnecessary chaos and under-utilization or under/over-production. There is the need for water education of the stakeholders to foster community participation and institutional development. This will help promote the collective sense of ownership and the sustainable utilization of water resources/facilities among users.

As a result of the high cost involved in treating water and the fact that when treated water is efficiently used, less raw water will be exploited, some priority should be given to education on the handling of treated water. The interview responses showed that there is the need for continuous campaign/advocacy for the

sustainable use and protection of all our water resources in the country. Water conservation practices should be championed as there cannot be treated water or water to be supplied when there is no raw water. Consequently, Water Education focusing on all aspects of water is paramount to the sustainable use of water.

Lifestyles and consumption habits which hinder water sustainability is another area that needs education. The interview responses revealed that Ghanaians in general do not have the culture of resources conservation and as such they tend to waste natural resources including water resources. Further questionnaire responses cited that users sometimes take more than they can use, pollute water sources in the course of their livelihoods activities and may even misappropriate or misapply water purposes other than intended such as use of water bodies as defecation sites and washing or use of treated water for gardening. In the case of potable water, the issues are myriad including illegal connections, leakages and misuse. The interview responses additionally noted that the Ghana Water Company, which is solely responsible for urban water supply has been lamenting of high levels of unaccounted for water due to malpractices on the part of users and its own staff. Education will be an important avenue to effect change.

Hydrometeorological disasters such as floods need educational attention as noted from both the questionnaire and interview responses. It is worth noting that some universities' programmes already contain aspects of disaster management, however it is argued that, if possible, most of the water education programmes should contain topics relating to disaster management so as to inculcate in all graduates, knowledge, skills and methods of managing flood disasters. It was noted that special attention be given to swimming, early warnings of flood disasters among others while engineering methods of harvesting and storing flood water for purposes such as irrigation be promoted. It is expected that increasing the number of experts and graduates as well as universities themselves working and

researching in the areas of floods management especially of rural communities will contribute to building local communities' resilience to the floods that engulf the country annually and averting situations that calls for adhoc measures to addressing disasters in the country.

### ***Reasons why some universities do not have water education programmes***

From the interviews and questionnaires, Water Education is considered a specialized field under Civil/Environmental Engineering, Agriculture (e.g., Soil and Water), Environment, Natural Resources, or General Sciences like Chemistry. However, due to limited job opportunities in the country, people prefer programmes that are general or broader in scope to specialised programmes. That is to say many graduates prefer a degree that can fit them in several fields upon graduation to one that is highly specialised. As such one finds that those institutions that offer water and water related programme concentrate at the graduate levels, where professionals in fields and public and private sectors who seek additional higher education qualifications in the water sector can specialise.

Secondly, the funding of training and research in water and related fields is expensive. The expert responses indicated that few public universities have been able to attract enough funding to support the training of students who want to go into water as a specialty. The existing water education programmes in the country all started with donor financial support or international funds. For example, one of the most popular Water Education programmes in Ghana is the KNUST's Department of Civil Engineering's Water Resources and Environmental Sanitation Programme (WRESP), which begun in 1998 as a project to strengthen higher education in water supply and environmental sanitation with funding from the government of the Netherlands. In 2004, under phase two 'Water Resources and Environmental Sanitation' (WRED), the Project was expanded to offer two masters programmes in water. As a result of the funding availability, the programme thrived and was able to train over 250 masters (MSc) and five doctoral (PhDs) students over the period. The

programme has now metamorphosed into the Regional Centre for Water and Environmental Sanitation, Kumasi (RWESCK) with external funding (once again) but this time from the World Bank under the Africa Centre of Excellence (ACE) programme.

There were also challenges associated with the accreditation of some water education programmes submitted by some Ghanaian public universities to the regulator, Ghana Tertiary Education Council (GTEC). The process of getting programmes accredited is costly, bureaucratic and long-suffering. It takes at least one year for a university programme in Ghana to be approved or accredited by the GTEC due to the scrutiny and diligence that programmes must undergo.

Finally, some respondents through the interviews and questionnaires hinted that some public universities in Ghana tend to exercise monopoly over some programmes, thus hinder the accreditation of such programmes elsewhere. For instance, programmes in Medicine, Law and Civil Engineering remain limited to a few institutions, which have produced both the academic and professional association leaders' core to the accreditation process. By virtue of their positions and leadership, the exercise of their roles in the accreditation process have been queried for reflecting bias and gatekeeping tendencies.

### **Conclusion**

The article set out to examine Water Education in Ghanaian public universities and determine the gaps therein. Concentrating on five Ghanaian public universities which have Water Education programmes, it was found that existing programmes on offer focused on potable water, raw water resources and water supporting livelihoods. These programmes are largely at the graduate level and the programmes depended on external sources for funding. Beyond the five, it was also found that some two other public universities whose mandates hinged on natural resources exploration and development had no programmes relating to water resources and education. An examination of the gaps for Water Education from the perspective of



academics revealed that there was limited knowledge among riparian communities of the Volta Basin regarding coping strategies and disaster management. Water diplomacy, coping with hydrometeorological disasters, gender and water resources access and utilization were also the issues noted by the academic as deserving attention too. Again, the backdrop to global policies and national (Ghanaian) exigencies, Water Education needs to be given a priority place in our educational system and community/national development effort. Water is essential to life and livelihoods and cuts across multiple sectors of the Ghanaian economy. Consequently, Water Education cannot be left to chance but require concerted and continuous efforts both at the formal and non-formal levels in order to promote sustainable management, livelihoods and peace. Above all, there is the need for government to consider investment in water education in its ongoing investments in infrastructure, policy and programmes.

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