VALLEY VIEW UNIVERSITY

Experience Sharing on Investing in Biogas System for Sanitation and Cooking

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At the 2nd Ghana Energy Renewable Fair,
Accra International Conference Centre

August 11, 2016

OUTLINE OF PRESENTATION

- Overview of eco development
- VVU’s biogas system
  - History
  - Wastewater and nutrient concept
  - Gas and effluent production and use
- Benefits
- Challenges
- Way forward

OVERVIEW OF ECO DEVELOPMENT

- Valley View University aims at becoming the first Ecological University in Africa

- The overall concept is integrated in an ecological master plan which aims at creating a sustainable campus

VVU’S ECOLOGICAL MASTER PLAN

VVU: AFRICA'S FIRST ECO-UNIVERSITY

HIGHLIGHTS OF THE MASTER PLAN

- Sustainable and resource-saving buildings
- Water and nutrient cycle management
- Ecologically sound treatment of landscape
- Large and connected green areas on campus with high biological activity
- Improvement of microclimate by means of bioactive zones
- Activation of bioactive zones using local plants, retention swales and ditches, and human fertilizer

- This intention led to the formation of an interdisciplinary team with a common goal to develop, implement and evaluate sustainable methods of urban planning, building, sanitation and agriculture over a decade ago

HISTORY OF VVU'S BIOGAS SYSTEM

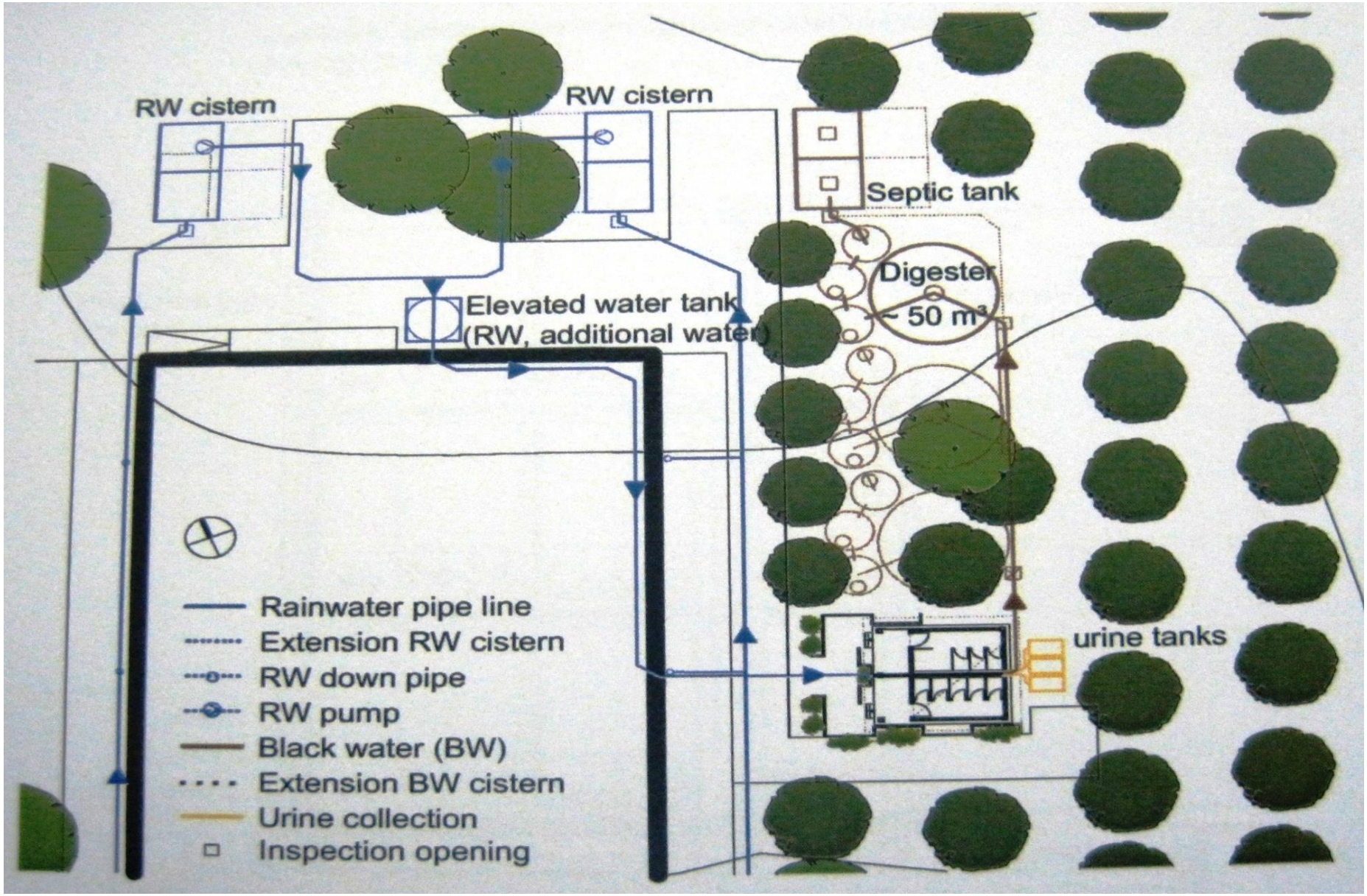
- The biogas plant was built as part of the University's efforts geared towards enhancing its ecological sanitation concept
- Construction started in November, 2004 and was completed in February, 2005
- Biogas Technology West Africa Ltd. was contracted to build the plant, which has been in use over eleven years now

CONSTRUCTION OF THE BIOGAS PLANT

Building site of the biogas plant, November 2004

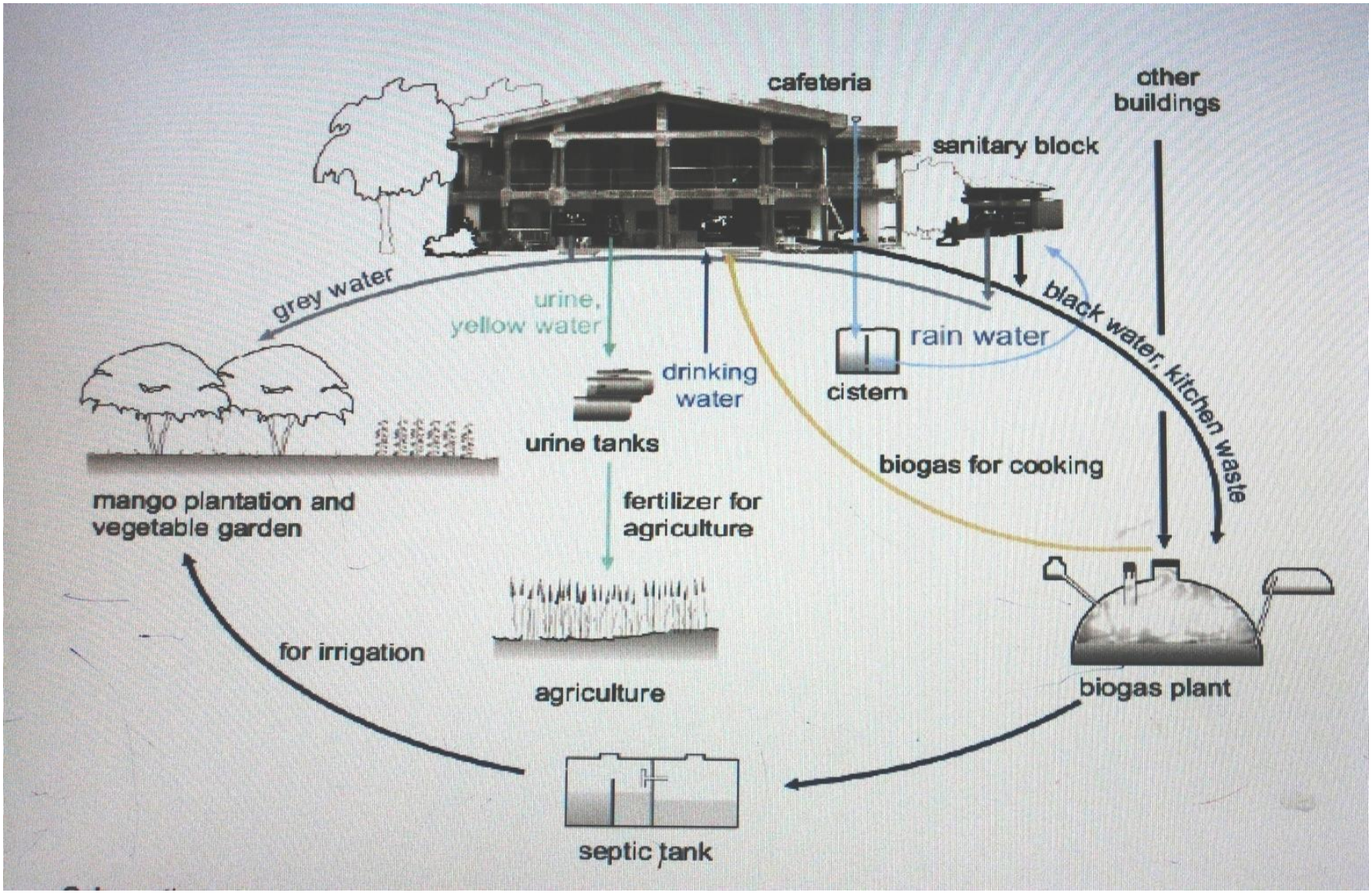
- The biogas plant was initially connected to the sanitary block and the cafeteria building

Sanitary block, January 2005



Schematic site plan of sanitary installations of the sanitary block and the biogas plant

WASTEWATER AND NUTRIENT CONCEPT



Schematic water and nutrient concept of the sanitary block and the cafeteria building

Cafeteria building, VVU

Sanitary block, VVU

- Wastewater and nutrient concept for the sanitary block includes the separation of the different flow streams, such as urine, urine-water mixture, black water and grey water, in order to optimize the system design and to improve the function of the biogas digesters

SOME SANITARY INSTALLATIONS

Dry urinal

Separation toilet

Urine storage tanks at the sanitary block

Urine storage tanks with adapters and level metres

COMPONENTS OF THE BIOGAS PLANT

- sewage collection system
- anaerobic digestion system
- gas use
- effluent storage and use

THE BIOGAS PLANT

The simple and robust dome biogas system consists of

- Loading point
- Two digesters
- Three expansion chambers
- Modular tank system

GAS PRODUCTION

- Black water together with other organic materials is treated anaerobically in two digesters each with a volume of $36m^3$ to release the biogas which is then piped into the kitchen for use
- From the digesters, the overflow goes into three expansion chambers from where the treated wastewater goes into a special modular tank system

- The effluent is then drawn from the last of the six chambers for use as valuable fertilizer and for watering or stored in an overhead tank and later applied to the agricultural land at an appropriate time as a fertilizer

BENEFITS

- Cost savings; over GH¢50,000 has been saved in terms of faecal waste management and gas production
- Very important for the University's ecological sanitation systems, is the hygienic point of view
- Incidence of diseases such as cholera, dysentery and others associated with improper handling and disposal of human excreta have been reduced significantly

- As a renewable energy, our system has contributed immensely to reduction of greenhouse gas emissions since methane is captured and used as a fuel
- The use of firewood and charcoal with their associated health hazards has been completely discouraged
- Proper application of the digester effluent reduces the likelihood of surface or groundwater pollution
- The biogas system reduces offensive odours

MAJOR CHALLENGES

- Our digesters were primarily built as a treatment system for black water and gaining biogas is merely a secondary benefit

- Besides, many buildings on campus are not connected to the plant due to the small sizes of the digesters so gas production is not enough for cooking at the University's kitchen

- Accordingly, LPG gas is purchased regularly to support food preparation at the kitchen
- Again, gas production reduces significantly during vacations where the number of the main users, the students, reduces drastically

WAY FORWARD

- Expansion of our renewable energy systems to help contribute meaningfully to the renewable energy policy initiatives
- Construction of bigger biogas plant to contain faecal waste from all other buildings on campus to produce more gas for use and to boost crop production and enhance environmental sanitation

Thank you