

NATIONAL LABORATORY AND WATER QUALITY IMPROVEMENT IN ETHIOPIA

A WATERSHED MANAGEMENT, CAPACITY BUILDING, TRAINING AND NATIONAL QUALITY ASSURANCE DEVELOPMENT PROJECT

BACKGROUND

In 2010, the Federal Democratic Republic of Ethiopia created the Ministry of Water and Energy. Their mission is to “play a significant role in the socio-economic development of Ethiopia through development and management of its water and energy resources in a sustainable manner...”. As part of the 5 year Growth and Transformation Plan (GTP), developed by Ethiopia in 2010, the Ministry of Water and Energy aims to improve degraded land through integrated river basin approaches, such as watershed management activities, and water and soil conservation practices. In line with this agenda, The Texas Institute for Applied Environmental Research (TIAER) at Tarleton State University, Addis Ababa University, Aksum University, Bahir Dar University, the University of Gondar, Hawassa University, Haramaya University and The University of Mekelle, signed a Memorandum of Understanding (MOU) on Watershed Management Research and Capacity Strengthening on February 9, 2014. This consortium is intended to further contribute to research related collaborations, and focus TIAER’s support on watershed management and related capacity building activities.

In 2012, Tarleton State University and TIAER staff traveled to Ethiopia with the American based Sustainable Ethiopian Economic Development (SEED) consortium to explore partnership opportunities in Ethiopia. Upon return, TIAER developed a concept paper on building a watershed management capacity building and training consortium based on feedback from universities visited while in Ethiopia. The collaboration was established to address water quality capacity building needs at each partnering university in the country of Ethiopia. The capacity needs of each university vary. Some universities lack adequate laboratory facilities to conduct water quality related analysis, while others lack trained technicians to utilize and maintain their existing or antiquated water quality laboratory equipment. This collaboration intends to address capacity building in the areas of:

- laboratory equipment
- water quality laboratory and field technician training and certification
- establishment of quality control measures
- instrument maintenance, and
- laboratory standard operating procedures.

The group of university partners included in this watershed management consortium met in October 2013 to develop the consortium agreement and outline the specific capacity building activities to be addressed. The workshop was very productive in developing potential assessment tools and demonstrations of quality laboratory operations. The group discussed the needs to clearly identify the consortium’s focus and to make a partnership that will impact every region in the country. As a result of this developmental workshop, the group agreed to build the partnership around watershed management and related capacity building in Ethiopia. Currently, in Ethiopia,

there are varying types of watershed monitoring occurring at some level throughout the country. However, a major obstacle in effective watershed monitoring throughout Ethiopia is the inconsistency of capacity from region to region, university to university, and department to department for water quality testing and watershed pollution assessment. Laboratory instruments are often broken, missing parts, not maintained, calibrated inappropriately and lacking trained technicians to operate them. Ethiopia lacks a uniform standard operating procedure system, or quality control guidance, for sampling, laboratory analysis, and data analysis. Additionally, a national water quality database does not currently exist where data can be reviewed and approved to ensure only scientifically defensible and quality results are published.

PROJECT DESCRIPTION

PHASE I-LABORATORY CAPACITY BUILDING ASSESSMENT & RECOMMENDATIONS

Preliminary evaluation of several consortium facilities in Ethiopia revealed the need for each of the eight universities to receive some level of capacity building to standardize laboratory capabilities. For this capacity building to occur, our consortium must first develop a sound initial assessment. TIAER Laboratory Manager, Mark Murphy, will visit existing facilities and make recommendations based on each laboratory's individual needs. Mr. Murphy has over 30 years experience in developing and maintaining quality environmental laboratory programs in the United States, and has built a teaching laboratory, village water treatment system and sanitary landfill while overseas in Peace Corps. He has obtained national accreditation under several federal and state programs for such laboratories and is a recognized Technical Director for quality systems under the EPA's National Environmental Laboratory Accreditation Program. Once his assessment of the Ethiopian university laboratory capacities is complete, details of recommended equipment improvements and standardized program development will be conveyed to the consortium partners to review and approve. This first phase involves travel to the consortium universities and time for consultation with partners, auditing of existing equipment, developing methods and laboratory infrastructure or upgrades, and preparing the assessment reports for presentation to the universities and Ethiopian government.

PHASE II-TRAINING/CERTIFICATION PROGRAM AND EQUIPPING OF LABORATORIES

The second phase of this project comprises the largest part of the project budget. The main focus of this phase will be the purchase and installation of scientific equipment based on the assessments of laboratory conditions/ needs and the training and certification of technicians on analytical and maintenance abilities. While the laboratory assessment and technical report of recommendations are being finalized, TIAER will work to develop a curriculum for a laboratory and field technician training and certification program. The laboratory certification element will properly prepare technicians to operate, care for and troubleshoot equipment, as well as analyze data results obtained through water quality laboratory analyses. Managers or supervisors will be trained in quality control systems for data and technical operations that include maintenance, access control and security, analytical ethics, data integrity and review. The field technician certification element will enable technicians to collect water quality samples and conduct watershed monitoring activities using internationally standardized methods. The goal is for each university to have at least two trained and certified laboratory/field technicians to operate laboratory equipment and collect field samples. These certified technicians will be responsible for oversight and assurance that proper quality control measures were adhered to during the sampling and analysis processes.

PHASE III- SUSTAINABILITY OF TRAINING/CERTIFICATION PROGRAM

In order for this type of training and certification to become sustainable in Ethiopia, the focus will be to ensure there are qualified individuals to continue carrying out the training of technicians throughout the consortium partnership and into the future after project funding has expired. TIAER will work with consortium partners to develop a “train-the-trainers” program that will include a separate certification process than what was described in Phase II. This program will offer training and certification programs at each of the partnering universities, when needed. This third phase will address sustainability despite turnover in field and laboratory technicians participating in the program. The location of the training program is currently undetermined. Possible locations include Addis Ababa as well as TIAER headquarters in Stephenville, Texas.

QUALITY CONTROL & STANDARDIZATION

The goal of this consortium is to improve overall capacity of water quality research in Ethiopia. This is to be accomplished through establishment and improvement of facilities and equipment, training of laboratory and field technicians, and the implementation of quality control methods and standard operating procedures. This initial capacity building program is focused on standardizing fundamental water quality monitoring capabilities at all eight partnering universities. Quality assurance of analytical measurements will provide credible data to stakeholders and agencies. This data will be significant for establishing informed policies, identifying funding priorities and determining research needs across the country. TIAER will assist in establishing all quality control guidelines pertinent to data collection and capacity for laboratory activities. A data hub with standardized manuals and reports for easy online access will be created. This hub will provide an industry example that may be adopted outside of our consortium. The group will also work to adopt and implement current standard methods for field collection of water quality samples, storage and transport of samples to laboratory facilities, and analyses of those samples. As each university will be operating with nationally uniform standards, data generated by each will be reliable for use in developmental and policy making decisions.

NATIONAL WATER QUALITY DATABASE

Currently, Ethiopia does not have an accessible, central resource (data clearinghouse) for all of the water quality data in the country. This database will be a premier and practical tool to assist policy makers, researchers and funding agencies in identifying priorities, developing guidelines and establishing baseline data for all surface waters in the country. Water bodies such as the Blue Nile and Omo Rivers, Lake Tana or Lake Chamo cannot currently be properly preserved or remediated from impairments that threaten aquatic life and safe drinking water sources due to lack of understanding about the environmental chemistry and current conditions. This will help identify and emphasize key water bodies to focus on as strategic priorities for preservation or restoration of endangered water resources. The consortium intends to assist in development of a national water quality database, as well as, train a permanent quality assurance officer to manage the data submitted for inclusion into the site.

GOALS

- Improve overall capacity of water quality research in Ethiopia by
 - Establishing a uniform water analysis laboratory facility at each partnering university in Ethiopia
 - Developing a water quality training/certification program for laboratory/field technicians from consortium universities

- Establishing quality control standards and publish a printable manual for use by all related researchers
- Establishing a national water quality database that is available to the public and contains only approved data collected utilizing quality assurance and standardized methods.

OBJECTIVES

Phase I

- Conduct assessments of existing water testing laboratory facilities/equipment at each of the eight partnering universities
- Develop a recommendation report for both capacity building needs and uniformity of water laboratory quality assurance programs at each of the eight partnering universities

Phase II

- Develop quality control measures to be adopted and utilized by all university partners in Ethiopia for water quality sampling, laboratory analysis and data analysis
- Develop standard operating procedures for water quality sampling, laboratory analysis and data analysis
- Establish a nationally recognized water quality database to house scientifically defensible data that:
 - utilizes the recognized standard procedures, and
 - adheres to quality control measures developed by the consortium
- Purchase, ship and set up necessary equipment with consumable supplies and restocking logistics
- Establish and/or build capacity of existing water quality laboratory facilities at each of the eight Ethiopian university partner campuses
- Develop a training and certification program for water quality laboratory/field technicians to become effective and efficient at equipment maintenance, instrument operation and analyses of water quality samples

Phase III

- Develop a “train-the-trainers” certification program to provide trainers in Ethiopia who are skilled and certified to continue laboratory technician certification beyond the term of this grant based project
- Establish a water quality database, accessible to the public, which will provide peer reviewed, approved data collected using the consortium’s standardized methods and quality control measures. This database will be intended to serve as a scientifically defensible informative site that can help policy makers, researchers and others make informed decisions and policies on water quality needs throughout Ethiopia

TIMELINE

March 2015: Inventory compilation of laboratory equipment, consumable supplies and auxiliary labware by each university.

April 2015: Assessment of existing human resources within partner university laboratories including current training and abilities of staff.

April 2015: Examination of water quality needs by region and area of concern, in order to determine what monitoring and water quality determinations best profile requirements of each partnering university. Determine existing capabilities for such studies.

May 2015: Onsite visit of individual laboratories to assess power, infrastructure, facilities and other analytical requirements. Meet with partner laboratory teams to discuss challenges, expectations and opportunities.

June 2015: Determination of appropriate field and laboratory analyses (from industry accepted standard methods) to use for water quality data based on requirements, equipment and consumable availability, and staff experience.

June 2015: Complete an inventory of necessary equipment and supplies. Develop a supplier list for purchases that can reasonably be expected to ship to the areas of need. Determine logistics of resupplying consumables.

July 2015: Develop initial and ongoing operational budgets. Begin to purchase and secure shipping equipment and supplies for individual laboratories.

July 2015: Develop standard operating procedures for specific equipment, sampling and testing at Ethiopian universities.

August 2015: Develop training program for trainers and technicians, including maintenance and troubleshooting of equipment, consumable and stock management, safety and quality control measures.

September 2015: Onsite visits to individual universities to set up and troubleshoot equipment and analytical processes. Implement procedures and training. Conduct training on field collection, transportation, handling times, data acceptance criteria, performance assessment and quality assurance.

November 2015: Begin data collection activities and database compilation.

2015-2018: Continued follow up between TIAER and Ethiopian university partners to ensure smooth transition of knowledge transfer and troubleshooting. Assess success of the program throughout the year.

2015-2018. Annual consortium conferences to present lessons learned, data collected and path forward in watershed management research.

ANTICIPATED OUTCOMES (BENEFITS)

Upon completion of the initial three years of capacity building activities, the perceived outcomes are expected to be:

- Measurable and defined by the quantity and quality of data produced,
- The continued ability of each laboratory to operate and perform at a high standard demonstrated by internal and external audits, and
- Ultimate improvements of water bodies through changes in policy and approach to environmental conditions or pollutants measured. The advancement of obtaining quality laboratory facilities and trained technicians improves the ability for future research partnerships on a larger scale.

The establishment of a national water quality database provides one central and nationally recognized location where water quality data will be housed. With appropriate review approval, this site will become a valuable tool for forming policy decisions and directing financial resources toward national initiatives. Additionally, the accumulation of data concerning precious water resources will prove invaluable in the preservation and protection of safe drinking water sources. Determination of impairments and degradation rates will allow for development of aggressive management changes and restoration efforts.

BUDGET*

Phase I: Travel- \$66,250

Salaries- \$62,260

Total Phase I- \$128,510

Phase II: Equipment and consumables- \$1.4M

Travel- \$71,500

Salaries- \$63,500

Total Phase I-\$1.535 million

Phase III: Travel- \$51,800

Salaries- \$45,406

Total Phase I-\$135,010

Total Cost for Phase I – Phase III (including laboratory equipment and consumables) = \$1,798,520**

*Justification for budget costs available upon request

**Total cost is subject to change

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