Rural Water Supply in Developing Countries

Proceedings of a workshop on held in Zomba, Malawi, August 1980
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Proceedings of a workshop on training held in Zomba, Malawi, 5–12 August 1980

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Training of Water Technicians in Tanzania

M.M. Kivugo

Training of water technicians in Tanzania started a long time ago in the form of on-the-job training. In 1957, a small group of in-service trainees was selected to undergo short courses related to water resources development. Subjects taught included mathematics, building construction, technical drawing, surveying, river gauging, irrigation, and water supply.

In 1971, the Government of the United Republic of Tanzania decided to embark on a 20-year program of rural water supply; envisaging supplies of clean and potable water within easy access to every Tanzanian household by 1991. (Tanzania was, thus, a decade ahead of the United Nations Water Decade.) The execution of this massive program of water-supply schemes demands a vast force of technical manpower, the bulk of which is made up of middle-level technicians. In order to create this category of technical manpower in a relatively short time, the Water Resources Institute was set up in 1974, under the Ministry of Water, Energy and Minerals.

Development of the Water Resources Institute

With the completion of the first few buildings in 1974, the institute commenced with an initial enrollment of 32 students in that year. As further construction of classrooms and hostel facilities continued, the yearly enrollment increased to 62 in 1975, 82 in 1976, and has continued at the equilibrium level of 120 since 1977.

Although the institute has been serving, essentially, national needs, the interests of neighbouring countries are not forgotten; as evidenced by the fact that 12 students from countries outside Tanzania have, so far, been admitted to the institute (one from Botswana in 1975, two from Sudan in 1976, and nine from Burundi in 1979).

The present objectives and functions of the institute can be summarized as follows: (1) to conduct training programs leading to the full technician certificate in water resources engineering, with particular emphasis in hydrology, hydrogeology, and water supply; (2) to arrange and provide opportunities for ministerial in-service and upgrading courses; (3) to act as ministerial examining body for various courses conducted by the regional water engineers in the country; (4) to arrange and provide facilities for seminars and conferences on matters related to water development; and (5) to provide consultancy services to the different technical departments of the ministry and other interested national institutions as required.

The Full Technician Certificate Training Program (FTC)

The institute offers a 3-year, full-time, residential course leading to the full technician certificate in water resources engineering. To qualify to join the institute

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directly from school, a candidate must pass the national form IV examination or equivalent and have credits in mathematics, physics, and chemistry and/or engineering subjects. Special entrance arrangements do exist for employees of the Ministry of Water, Energy and Minerals.

The course combines theoretical instruction, laboratory, and practical work as well as on-the-job training (field training). Each academic year consists of three terms: the first term runs from mid-May to the end of July, the second term from the beginning of September to the end of November, and the third term starts at the beginning of January and continues to the end of March. The first 2 years of the present FTC program deal with basic subjects in civil engineering, with the third year providing more specialized training in subjects dealing with water resources engineering, centering primarily on hydrology, hydrogeology, and water supply. In the second term a period of 17 weeks, beginning in August and continuing until the end of November, is spent on intensive practical on-the-job training in the field, under the direct supervision of the regional water engineers. The field training is an integral part of the curriculum of any engineering course and, therefore, cannot be overemphasized. A system of close liaison between the institute and field staff of the ministry has been developed for the purpose of this program through field visits by institute staff. In the third year, a period of 4 weeks at the beginning of the third term is allotted for students to work on practical project assignments, either individually or in small groups.

Upon graduating from the institute, the graduates are absorbed essentially as senior water technicians into the water sector of the Ministry of Water, Energy and Minerals. Graduates who have taken the works option (water supply) are deployed to work on investigations, design, construction, and operation and maintenance of water supply schemes; those with the hydrology option work on hydrological problems as well as meteorological data observation, collection, compilation, and analysis; and those who have taken the hydrogeology option work on exploration for groundwater and drilling and construction of wells.

In 1977, the institute took another step forward by introducing a 3 year laboratory water technician course, with an annual maximum enrollment of 15 candidates. Entry requirements are the same as for the FTC course. Upon completion of the course, the graduates are posted as senior water technicians in charge of water quality testing at major water supply plants within the country. They will also man proposed zone water laboratories.

In-Service and Upgrading Courses

The institute also runs short-term in-service courses for craftsmen. Such courses include draftsmanship, surveying, motor and pump mechanics, building construction, and drilling and well construction. The institute will be able to handle at least 60 candidates in this program at any given time. Course duration varies from 1-6 months. More in-service and upgrading courses are conducted during the period when the FTC students are away, undergoing fieldwork or during vacations.

Review and Verification of Regional Training

To facilitate the in-service training programs of the ministry, regional on-the-job training is encouraged. An on-the-job training syllabus for water technicians has been worked out. The institute coordinates the program for training craftsmen in different trades such as carpentry, masonry, plumbing, and pump mechanics and carries out periodical evaluation of the courses.

The Curricula

As mentioned earlier, the teaching program consists of a common core of basic science and civil engineering subjects during the first 2 years, followed by branching out
into the three options in the third year, i.e., civil engineering works (as applied mainly in water-supply schemes), surface-water hydrology, and hydrogeology (groundwater hydrology).

The present curriculum, worked out in 1974, is an adaptation of the courses required for the full technician certificate at the Dar es Salaam Technical College, which itself was patterned after the curricula of the City and Guilds Institute, London.

The relative proportion of students allowed to choose the works, hydrology, and hydrogeology options is maintained at 50, 25, and 25 percent respectively; roughly based on the demand for technicians in these disciplines under the ministry.

The institute is presently busy trying to review the current training program. It is felt that some courses, particularly the course for the hydrogeology option, are unbalanced, with as much as 70 percent of the total time devoted to the study of civil engineering subjects, whereas hydrogeology and related subjects make up only a small part of the overall program. Tentative proposals for a revised curriculum have already been worked out. Under the new proposals, the hydrogeology option is separated from the other options in the first year, whereas the branching out of the other two options takes place at the end of the second year of study as at present. The subjects, their relative emphasis, and the sequence in which they are taught are all sought to be modified so as to make the whole program more intensive and effective.

Program Features

The Water Resources Institute in Dar es Salaam is the only institute in Tanzania providing facilities for training technicians in water resources. It is directly administered by the Ministry of Water, Energy and Minerals and functions as a centre for producing middle-level technical manpower for the ministry. Candidates, once admitted into the FTC course, are, effectively, employees of the ministry, with the exception of students from outside Tanzania. At the same time, the FTC course of the institute is recognized by the Ministry of National Education and the final examination for the award of the certificate is conducted and evaluated by the National Examination Council.

As the preservice training centre of the Ministry of Water, Energy and Minerals, it is the duty of the institute to offer a program which imparts enough theoretical knowledge to the students while preparing them fully for the practical skills that will be demanded of them when they enter service as technicians of the ministry. On the other hand, as an instrument of national technical education, the institute has not only the responsibility of producing technical manpower suited to national needs, but also of promoting technical education per se; in other words, of making the training program a link between secondary school and university levels of technical education, so as not to deny opportunities of advanced education to students.