
CHAPTER ELEVEN

WATER EDUCATION AND CAPACITY BUILDING

11.1 Situation Analysis

11.1.1 Introduction

Basic education is a fundamental right for all human beings and one of the essential elements for ensuring successful implementation and sustainability of water sector activities and for combating poverty in general.

The process of developing, maintaining and disseminating knowledge on water in such a way that all stakeholders benefit and feel part of the process remains a big challenge to the water sector. The government of Uganda has however recognized the seriousness of this challenge and has embarked on the process of implementation of appropriate intervention measures to address the issue.

Although most of the water sector personnel are highly trained and have the requisite qualifications for their respective job assignments, many of them still require specialized refresher training to keep on-form with the rapid technological and scientific advancements. However, the major problem still remains the low priority rating given to training and capacity building activities by the policy makers, which is evident in the small budgetary allocations channeled to this area. In addition the high labor turn over amongst local government personnel who have under gone training continue to affect efforts to build capacity at that level. For example, in the 13 districts of Eastern Uganda covered by RUWASA project, practically all the six graduate district water officers moved to other employment after acquiring Masters degrees. Although the government training policy recommends bonding of staff for at least three years after completion of the course, lack of enforcement makes the policy ineffective. To a greater majority of the leaders therefore investment in capacity building is considered a waste of resources. As a result, funds are not readily provided for training, both at the central and local government levels.

11.1.2 Literacy Rate

According to the Uganda National Household Survey 2002/2003, the adult literacy rate in Uganda is estimated at 69%. The same survey indicated that 17% of the population aged 15 years and above have never had any formal education and 44% have not completed primary education.

Uganda's literacy rate has continued to rise over the years but there remains a gender imbalance as shown in the **Table 11.1** below.

Table 11.1 – Literacy Rate Trend

Population Category	1997			2003		
	Average	Male	Female	Average	Male	Female
10 years and above	65%	72%	58%	70%	77%	63%
18 years and above	62%	75%	51%	69%	80%	59%

(Source: Ministry of Education and Sports, 2004)

The observed increase in literacy rate is mostly attributed to the introduction of Universal Primary Education (UPE) in 1997. Despite this intervention, the literacy rate still remains low and therefore more resources have to be injected into the sector if the MDG targets are to be met.

11.1.3 Free Basic Education

Free basic education, popularly known as Universal Primary Education (UPE), is one of Government’s strategies to address the low literacy rates in Uganda. The strategy provides for free primary education for all children of school going age. This strategy emphasizes the role of education (literacy and numeracy) in human resource development and enhancing the quality of life for the poor in Uganda.

Since the introduction of UPE in 1996, the total enrolment in primary schools has risen from about 2.5 million in 1996 to over 7.3 million in 2003. **Figure 11.1** shows the distribution of primary school enrolment in the different regions in the country.

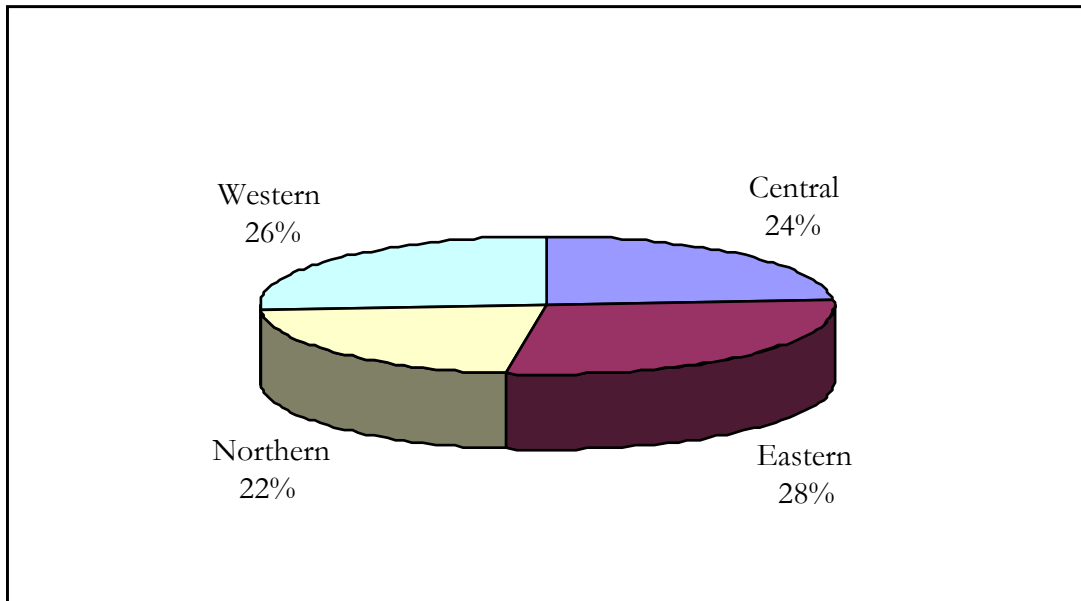


Figure 11.1 – Distribution of Primary School enrolment in Uganda

11.2 Water Education and Research

11.2.1 Water and Hygiene Education in the School Curriculum

One of the Government strategies to address the low levels of understanding of water and hygiene issues by the public is to integrate water, sanitation, hygiene and health education in the primary and secondary school curriculum as part of the basic science education at these levels. The aim of this initiative is to develop and inculcate positive knowledge and traits that will enhance healthy living and a sustainable environment not only in the schools but also at community level.

The education minimum standards and basic requirements document also spells out issues of water, sanitation and hygiene in schools and stresses the use of health clubs and societies in schools to enhance the knowledge and practice of sanitation and hygiene among learners.

11.2.2 Water and Hygiene Education and Research at University and Tertiary Levels

To ensure sustainable supply of manpower to the water sector, there are two universities in Uganda (i.e. Makerere and Kyambogo) offering degree courses in Civil Engineering, with options for students to specialize in Water Resources Engineering and other Water related Sciences. In the recent past Makerere University started offering Masters Degrees in Civil Engineering in general and Water Resources Engineering in particular. In addition to these two Universities, there are a number of Technical Institutes and Colleges offering Diplomas and Certificates, respectively, in Water Engineering related courses.

At Makerere University, the Faculty of Technology offers Bachelor of Science degrees in both Civil and Mechanical Engineering. Both these courses contain a significant water component. At Masters level, two water related options are offered i.e. Environmental Engineering and Water Resource Engineering. At PhD level, different water related research is being undertaken and to-date, there are a total of eight PhD candidates.

The Makerere Institute of Environment and Natural Resources offers Bachelors, Masters and PhD in water related subjects as well, mostly focusing on Environmental Management and Water Quality Management. Other departments offering water related courses at both Undergraduate and Graduate levels include the Departments of Geology, Geography, Botany and Zoology.

The combined annual intake of students into water related courses offered at the two Universities is about 500. The biggest challenge facing the two Universities is inadequate qualified staff. Due to the low salaries offered by the two Universities, it is difficult for them to attract and retain highly qualified staff who prefer to take on better paying jobs in the private and public sector.

Motivation to students pursuing water related courses has been greatly enhanced by the support of the Directorate of Water Development, National Water and Sewerage Corporation, Consultancy Firms and Manufacturers who are supporting a National Scheme

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run by the Uganda Institution of Professional Engineers of awarding Annual Prizes to outstanding Civil Engineering students at Makerere University. It is anticipated that this scheme will be expanded to benefit students from other tertiary institutions.

Table 11.2 shows the institutions offering training in water-related areas.

Table 11.2 - Institutions offering training in water-related areas

<i>Institution</i>	<i>Courses Offered</i>	<i>Applied Research Capacity</i>	<i>Regional functions</i>	<i>International Orientation</i>
Uganda Polytechnic Kyambogo	Certificate Ordinary Diploma in Water Engineering Higher Diploma in Construction	Relatively well equipped labs, qualified staff available but short of technicians and Phd. holders	Caters for the Region, including Rwanda and Congo	Has linkages with a number of institutes in the UK
Makerere University Department of Agricultural Engineering.	Under graduate: Soil & water Eng.; Hydraulics & Hydrology Climatology & Modeling Irrigation Post graduate course: Soil & water Eng; Water resource systems; Agricultural waste management	Have capacity to do research in; Surface run off management Appropriate. Irrigation technologies Soil drainage studies	-	University of Pretoria, Ohio State University and the Earth University of Costa Rica
Makerere University Institute of Environment & Natural Resources	M.Sc Environmental Science Research methods & Data management; Rural water management; Biodiversity and management; Urban & peri-urban management; IWRM	Does research in Ecotechnology Has a water analysis laboratory with basic equipment	Teaching and consulting Institution for local & International clients	Universities in Europe and U.S.A
Fisheries Research Institute (FIRI)	MSc Fisheries and Aquatic Science	Human resource available (25 research scientists) Has operational capacity Laboratories	EU - base for the Lake Victoria Research Project	E.g., Universities of Waterloo, Manitoba, Florida, Ohio; Wageningen; Hull, Limnology Institute, Austria. Malaysia
Makerere University Department of Civil Engineering	Undergraduate Courses: Fluid Mechanics; Hydraulics and Hydrology; Environmental Chemistry; Water Resources Engineering; Public Health Engineering; Graduate Courses in Water Resources and Environmental Engineering	Research on: Groundwater pollution, Industrial wastewater treatment, Stabilization ponds, Appropriate (low cost) water treatment, Influence of lake Victoria on the local weather, Remote sensed data use in lake model, integrated lake basin management, etc	Some students from Kenya Tanzania, and Sudan attend degree courses here	Collaboration with several European Institutions (Norway, UK, Italy)
Uganda Management Institute	Offers tailor-made Certificate training courses in General management, Project management, Financial management and Procurement.	-	-	-

11.2.3 Water Related Research

Due to lack of adequate financial and technical resources at most of the existing Universities and Research institutions, very little applied research has been carried out by these institutions in the past.

In the recent past however, the Directorate of Water Development signed a Memorandum of Understanding (MoU) with Makerere University for collaboration in applied research in support of the water sector activities. The MoU highlights the following areas of collaboration:

- (i) Technical information exchange,
- (ii) Utilization of physical facilities,
- (iii) Partnerships in applied research,
- (iv) Specific joint technical investigations of relevance to the water sector,
- (v) Tailor-made training for water sector personnel.
- (vi) Specialized raining.

As part of the implementation of the MoU, the two institutions have identified research projects shown in **Table 11.3**, which are current being implemented;

Table 11.3 – Water Research Projects

<i>Theme</i>	<i>Specific Research Topic</i>
<i>Water Lifting Devices</i>	<ul style="list-style-type: none"> ▪ Improvement of locally made Wind Pumping Systems ▪ A Foul Flush diverter for improved Rainwater Quality
<i>Water Quality</i>	<ul style="list-style-type: none"> ▪ Appropriate Technologies for Fluoride Removal in Rural Water Supply ▪ Appropriate Technologies for Iron and Manganese Removal in Rural Water Supply ▪ Evaluation and Operation of Bank Infiltration Systems – A case study of Kayunga Water Treatment Plant.
<i>Water Resources</i>	<ul style="list-style-type: none"> ▪ Flood Analysis for use in Design of Valley Dams and Assessing Ground Water Recharge ▪ Dedicated Procedure for Planning and Management of a Valley Dam Scheme

Other additional research topics include;

- Assessment of Desirable Water Source Characteristics for Sustainable Water Supply: With Application of GIS
- Renewal Energy Water Pumping Systems
- Gravity Flow Schemes (GFS)

In addition to the above collaborative research, the University has also initiated its own water related research projects, which are being implemented by PhD graduate students in the Civil Engineering Department. These include:

- (i) Development of Water Resources Engineering and Management Decision Support Systems;
- (ii) Analysis Of Impact Of Anthropogenic Pollution Loading And Mitigation Measures On Shallow Groundwaters (Case Of Informal Peri-Urban Settlements - Bwaise III In Kampala, Uganda);
- (iii) Natural Organic Matter Removal And Trihalomethanes (Chlorinated Organics) Control In Water Treatment;
- (iv) Development of holistic Ecological Sanitation (Ecosan) Systems in Uganda.

SIDA is also funding a research project in Makerere Faculty of Technology, which is meant to strengthen the capacity of Makerere Staff to supervise at PhD levels through joint research between Makerere University and Universities in Sweden. A second component of the funding aims at fostering regional collaboration for research and engineering education between the institutions responsible for engineering education in the Universities of Makerere (Uganda), Dar Es Salaam (Tanzania) and Eduardo Mondlane (Mozambique).

11.3 Capacity Building in the Water Sector

The water sector in Uganda recognizes the importance of capacity building in the successful and sustainable implementation of sector activities. To this effect, a Water Sector Human Resource Management unit has been established to address the capacity requirements for the sector. The role of the unit is to identify staff training needs relevant to the sector, implement relevant training for sector staff at various levels, and ensure that strategic capacity building programs are in place to address the capacity needs of the sector. The current water sector strategy demands that capacity building be considered an integral part of all water sector programs and projects to ensure their sustainability.

11.3.1 Water Sector Capacity Building Programs

For the past many years, the tradition in the water sector has been that individual water sector programs and projects include training and capacity building as one of their components to meet their specific needs. This approach has proved ineffective and has often led to duplication and wastage of resources. What has been lacking is a comprehensive sector-wide capacity building program to address all the capacity building needs for the sector in a holistic manner.

In order to address the above weaknesses, the Directorate of Water Development (DWD), in 1994, prepared a comprehensive Training and Human Resources Development Plan for the water and sanitation sector for the period 1995 – 2000. The five-year plan formed the basis for implementation of all capacity building activities in the sector during that period. Given the success of the Plan, DWD adopted this sector-wide approach to capacity building, which is the capacity building model that has been adopted by the water sector.

This sector-wide approach to capacity building mainly focuses on equipping the sector personnel with the relevant skills, knowledge and attitudes in the management of water and sanitation programs through specific tailor made training courses. In addition, staff, mainly from the center, and a few from the districts are also funded to participate in relevant short training courses, Masters and PhD programs conducted both within the Africa region and abroad.

The current Water Sector Human Resources Development Programme is being implemented under the Policy and Sector Capacity Development (PSCD) Component of the Joint Partnership Fund, funded by Danida , Sida and DFID.

11.4 Water Sector Data and Information Management

11.4.1 Data Collection and Management

The Management Information System (MIS) for the water sector was established in 1998. The unit was set up with the sole purpose of monitoring financial and physical sector activities and therefore facilitating efficient management and decision making. Since its inception, the MIS function has progressed through a series of design reports that have culminated into databases that constitute the archives for the sector today.

Over the years the MIS unit of the DWD has developed data collection procedures that are currently used in all the districts of Uganda, and these include: -

- (i) Data collected on a quarterly basis from water sector programs implemented under DWD, which are later compiled into an annual document. This information is sent to the Ministries of Finance, Planning & Economic Development and the Prime Minister's Office. In this way the information sharing with other stakeholder ministries is enhanced.
- (ii) Data collected on a quarterly basis by the districts on various water and sanitation related aspects such as data on rural and urban water supply, O&M, conditional grants and other NGO's in the districts. This information is initially processed in the district, and later transferred to the centre for analysis and thereafter feedback given to the districts.
- (iii) The districts also collect data on new safe water sources, which are then updated bi-annually. This data is processed and shared with other water sector stakeholders.
- (iv) The Water Authorities unit of the DWD also collects specific data on functioning urban water supply systems. This information is later with other stakeholders through reports, intranet and the DWD website.

The problem however is that some districts in Uganda do not have computers, while others may have the computer hardware but do not know how to use the available soft wares. As a

measure to address the above problem, the Directorate of Water Development came up with a strategy to digitize all data and information in the 56 District Water Offices. Prior to the digitization, the districts that did not have computers and photocopiers could send their data/information in hard copies to DWD and this slowed down the data processing and information sharing process.

The digitization program was however packaged to include training in the relevant computer software for the district personnel involved in the exercise. This involved training in the use of packages such as MS Word, MS Excel and MS PowerPoint. This intervention has gone a long way to bridge the big gap that existed between DWD and the districts.

WATER RESOURCES DATA COLLECTION

In addition to the above water sector data and information, DWD, through the Water Resources Management Department, also collects specialized water resources data and information used for planning and management purposes. This includes;

- (i) ***Hydrological data*** – This includes routine measurements of lake levels and river levels and discharges. This is done through a network of 70 surface water monitoring stations installed on all major rivers and lakes in the country.
- (ii) ***Hydrogeological data*** – This includes routine measurements of groundwater levels in different parts of the country. This is done through a network of 16 groundwater observation stations installed in different parts of the country.
- (iii) ***Water Quality data*** – This includes routine measurements of different water quality parameters on both surface and groundwater in different parts of the country. This is done through a network of 119 water quality sampling sites that have been established countrywide.
- (iv) ***Water use data*** – This includes information and data submitted by the different regulated water users who hold water use and waste discharge permits. This data and information is used for assessing the level of compliance of the different water users and also the level of commitment of the different water sources.
- (v) ***Spatial (GIS) data*** – This includes soils data, land cover, topographic data, administrative boundaries, catchment boundaries and infrastructure data used in production of maps.

ELECTRONIC DATABASES

At the moment DWD has electronic databases in all district water offices into which data is collected, analyzed and exported to the head office manually or through electronic mail.

In the future there is a plan of having local area networks in all districts and linking them up to a central database so as to facilitate collection and dissemination of data/information at a touch of a button. At the moment the National Water and Sewerage Corporation already possesses a linked database that collects data from all cities/towns under their operation to one central database at the head office operation.

In addition to the above databases, the Water Resources Management Department (WRMD) also operates four databases established for storage of surface water, groundwater, water quality and water permits data and information. The databases have been upgraded and are

now compatible with the Management Information System (MIS) design for the water sector. WRMD also has a GIS database for storage of all the spatial data acquired by the department.

INFORMATION NETWORKS

The Network for Water and Sanitation (**NETWAS**) is a Non Government Organization involved in capacity building efforts for the water sector and collaborates with several national, regional and global networks. The major ones being ITN Africa Network, Streams of Knowledge, Water Supply and Sanitation Collaboration Council (WSSCC) & Water and Sanitation Program-Africa (WSP-AF). NETWAS is a portal linking up Uganda, Kenya and Tanzania. These networks mainly assist Uganda in capacity building in water and sanitation as done by ITN Africa & WSSCC and WSP-AF specializes in water and sanitation capacity building for the poor, through policy development, sustainable investments, and learning and dissemination. These networks work closely with governments, NGOs, private sector, and civil society in formation gathering and sharing.

11.4.2 Indigenous Knowledge in Water Management

There is no deliberate effort to document the contribution of indigenous knowledge to water management in Uganda. As a result, there is limited and scanty literature in the subject area. This probably arises from the negative attitude policy makers have on rural communities as custodians of indigenous knowledge, and therefore their contribution in this area is more often neglected. In a few cases however, hydro geologists have utilized the knowledge of local communities while investigating the potential for under ground water and the viability of spring wells. In some instances local communities have advised on the management of water sources that are considered sacred.

11.5 Water Information Dissemination

The importance of an effective IEC (Information, Education, and Communication) component for the success of Water supply and sanitation programs cannot be underestimated. The experience of the past decade clearly demonstrates that even the best designed programs failed or produced minimal results, because decision makers and intended beneficiaries were not adequately informed, educated or mobilized.

Communication or public awareness is therefore very vital in planning for safe water supply, sanitation and behavior change. The water sector uses the following strategies to disseminate information, raise awareness among the public and mobilize communities to participate in water and sanitation activities;

- (i) **Newsletters, Journals, Magazines and Annual Publications** – These are periodic (Quarterly, Bi-annual, or Annual) publications by the water sector giving a comprehensive assessment of the performance of the sector during a specific reporting period and highlighting the major achievements and key events during that period.

- (ii) **“Open Days”** – These are special days (say once a year) where the general public is invited to DWD premises and led through guided tours of the different sections of the directorate. During these tours, the public is exposed to the different activities in the directorate including some of the key outputs. Following the guided tours, the public is also treated to an exhibition demonstrating some of the products of the directorate and later to a series of lectures on specific topics relevant to the theme of the day.
- (iii) **Workshops, Seminars and Conferences** – The Directorate of Water Development organizes regular workshops, seminars and conferences to sensitize the public on the different activities in the sector, to train stakeholders on different water and sanitation related issues, and provide information to the general public on specific water sector programs.
- (iv) **Newspapers** - Supplements in the national Newspapers are regularly used to disseminate water, sanitation and hygiene information. Through the local newspapers, the sector also publishes supplements/articles on specific sector activities. This may be done on a quarterly basis or in response to specific events such as World Water day, or even to update the public on the status of progress of sector activities and thereby enforce accountability and transparency with the stakeholders.
- (v) **Printed Booklets** – These are used to present specific information targeting specific groups e.g. Mary and Ben for primary school behavior change, the caretaker’s and Water user committee booklets among others.
- (vi) **Flyers and Posters** – These are used to convey specific messages targeted at schools, communities and the public. A number of posters and flyers on school sanitation, O & M and community hygiene and sanitation improvement have been printed by the sector and distributed to the primary schools at no cost.
- (vii) **Television** - These mainly apply in the urban and semi-urban areas where the target audience can afford the costly equipment/technology and electricity.
- (viii) **Electronic media** - The Directorate of Water Development maintains a website which is updated on a regular basis. Through this channel the sector provides relevant information on sector activities to the entire international community. The website address is www.dwd.co.ug.
- (ix) **Radio spot messages** - These short messages of between 1 to 3 seconds or minutes are aired on regular FM stations in all the regions of the country to communicate specific messages to the target audience. E.g. “Wash your hands after latrine use to prevent disease transmission” or “Cholera kills, therefore ensure proper hygiene”.
- (x) **Radio talk shows:** In this strategy, specific topical areas related to water and sanitation are selected and discussed at the local FM stations. In some cases opinion leaders are hosted in the talk shows, and members of the public are given opportunity to ask questions. The language of communication will normally depend on the target audience, but in most cases the local language spoken in a particular region is used for communication.
- (xi) **Radio drama /Serial drama and traditional media/drama** - This strategy has proved very effective amongst rural communities with limited formal education. In

- this strategy, information depicting day to day hygiene and sanitation practices in the rural community, including operation and maintenance of water facilities are relayed to the communities through drama, which is either aired on the local FM stations or village drama performances, with the local community as the target audience. In most cases local cultural performing groups are contracted from the particular communities to develop and perform the plays.
- (xii) **Annual Calendars** – Besides the calendar itself, these also contain specific information and pictures depicting specific aspects of different water sector activities and programs.
 - (xiii) **Home and environment improvement campaigns** - This strategy is used to inform, motivate, persuade and educate local communities to improve their sanitation and hygiene in their homesteads. It uses an integrated approach and different strategies such as hygiene and sanitation competitions, media, home visits and drama.
 - (xiv) **Video Shows** - The sector also uses video facilities especially during formal training of district water office staff and DWD staff and the film van services for the communities. These services were usually hired from Ministry of Health and used to sensitize and mobilize target communities to respond to certain weak situations. E.g. payment of community contributions, O & M of water source and sanitation & hygiene improvement

11.6 Challenges and Constraints

11.6.1 Challenges

One of the major challenges for water education and research arises from competition for the limited resources between hardware and soft ware activities. Because of the high demand for water installations, there is a tendency for policy makers to channel more resources into construction activities at the expense of software activities like capacity building, community mobilization and research.

The other challenge is the long time it takes to realize tangible benefits from investments in water education and research. Sensitization of the community may not immediately translate into behavioral change and change in people's attitude. Learning is a very slow process that needs a lot of patience and dedication, which facts policy makers are not willing to accept since they are under pressure to deliver tangible results in a very short time.

11.6.2 Constraints

The efforts of government in addressing the problem of literacy and capacity building for the population continue to be hampered by the following constraints;

- (i) Inadequate financial resources;

- (ii) High poverty levels amongst the rural population;
- (iii) Low literacy levels making communication both difficult and expensive;
- (iv) Poor educational facilities, especially in the rural areas; e.g. School buildings, training materials, quality of teachers etc.
- (v) Lack of adequate social infrastructure such as roads, electricity, telephones etc to enable the rural community benefit from advancements in modern technology.

11.7 Future Outlook

Despite the current low literacy rates in the country, the future looks more promising, especially if the current Government interventions are successfully implemented. Universal Primary Education presents one good opportunity to ensure that all Ugandan children have a chance to learn how to read and write.

It is envisaged that, with the big success of UPE, the Government will consider introducing Universal Secondary Education to complete the basic education cycle. With all these developments at macro level, the water sector is positioning itself strategically to ensure that water related issues are incorporated into the entire school curricula from primary to university level.

Building adequate and sustainable capacity for the water sector and raising the level of awareness of the public on water issues is a slow and continuous process, which requires substantial financial input as well as commitment by all the stakeholders.

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