Prepared on behalf of the Department for International Development (DFID)

WELL Report

Urban Drainage Workshop – Uganda

Task No: 167

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# TABLE OF CONTENTS

1. INTRODUCTION ............................................................................................................. 2

2. PARTICIPATION............................................................................................................. 3
   2.1. Teaching ................................................................................................................. 3
   2.2. Learning .................................................................................................................. 4

3. CONTENTS .................................................................................................................. 5
   3.1. Lectures ................................................................................................................. 5
   3.2. Case studies ........................................................................................................... 5

4. OUTCOME.................................................................................................................. 6

5. FUTURE..................................................................................................................... 7

ANNEX A. COURSE PARTICIPANTS ........................................................................ 8

ANNEX B. PARTICIPANT FEEDBACK ....................................................................... 11
   B.1 The feedback form ................................................................................................ 11
   B.2 Quantitative results ............................................................................................... 13
   B.3 Qualitative results ................................................................................................ 14
      B.3.1 Lectures ............................................................................................................ 14
      B.3.2 Case study exercise ......................................................................................... 14
      B.3.3 Comments on course materials ....................................................................... 16
      B.3.4 Overall assessment ......................................................................................... 17
1. INTRODUCTION

The Intensive Short Course entitled “Technology, Management and Operation of Urban Drainage Systems in Africa: The present and the future” took place in Kampala, Uganda from the 28th of March to the 2nd April, 1999. The course was developed by the Working Group on Technology Exchange, Transfer and Training (TETT Working Group) of the Joint Committee on Urban Drainage of the International Association on Hydraulic Research (IAHR) and the International Association on Water Quality (IAWQ).

The TETT working group has as its objectives:

- To exchange knowledge and experience of problems and solutions in urban hydrology and drainage between developed, developing and transitional countries. This exchange is intended to improve our understanding and ability to solve drainage and hydrology problems in the specific contexts of developing and transitional countries.
- To co-ordinate educational and training activities (courses, publications) tailored to the requirements of the Third World and of the countries in transition.

Given these objectives, it is not surprising that the Working Group has developed two short courses since its formation in 1997. The first course, entitled “Sustainable Urban Drainage for Central and Eastern Europe and Developing Countries”, was given in Budapest at the Hungarian Water Resources Research Centre (VITUKI) on May 7-13 1998. Due to difficulties in both logistics and funding, the participants at the first course were from Central and Eastern Europe; under these circumstances the course content by and large reflected the European agenda of surface water quality protection rather than alleviation of flooding.

It was decided that, just as the first course had a strong European flavour, the second one should focus on the issues of developing countries. Professor Wolfgang Schilling, Chair of the Joint Committee on Urban Storm Drainage of the IAWQ/IAHR, promoted the idea of the workshop in Uganda to make use of a strong collaboration between the University of Trondheim where he works, and Makerere University in Kampala.

This report describes the purpose of the course, who took part in the course, its content, its outcome, and its future. HPD and IUDD have each received a copy of the course materials.
2. PARTICIPATION

2.1. Teaching

Both Ugandans and expatriates were involved in teaching. Principal lecturers on the course included:

**Professor Wolfgang Schilling, University of Trondheim**
- Overview and History of Drainage
- Rainfall-Runoff analysis
- Formulation of design problems
- Introduction to case study problems

**Pete Kolsky, London School of Hygiene & Tropical Medicine**
- Health aspects
- System Evaluation
- Hydraulic and hydraulic modelling

**Philip Pybus, Consulting Engineer, Johannesburg South Africa**
- Appropriate technology
- Management issues and systems
- Institutional and legal frameworks
- Operations and maintenance

**Geraldine Schoeman, Environmental & Community Psychologist, Afrosearch, Johannesburg**
- Community development
- Participation and PRA methods
- Gender
- Environmental Perceptions

**B.M. Kigguru, Head of Department of Civil Engineering, Makerere University, Kampala, Uganda**
- Engineering implementation
- Regional (East African) Issues in drainage
- Local context of drainage in Kampala and Uganda
Mai Nalubega, Lecturer, Makerere University, Kampala Uganda
- Case study management
- Conference logistics
- Participant recruitment

A.W. Majugu, Principal Meteorologist, Dept of Meteorology, Kampala, Uganda
- Climate and weather
- Available weather data and analysis

Eng. Albert Rugumayo, Dept of Civil Engineering, Makerere University, Kampala, Uganda
- Operations & Maintenance in Kampala

2.2. Learning
18 individuals took part from Kenya, RSA, Uganda, and Zambia. As intended during the planning of the course, Ms Nalubega succeeded in recruiting widely among practicing municipal and drainage engineers. Five participants were students from the Department of Civil Engineering at Makerere, the others came from a wide range of backgrounds in town planning, consulting engineering, district water offices, and technical instruction. Accordingly, as intended, the course had a strong emphasis on the practical side of drainage analysis, design, and problem-solving. Details of all lecturers and participants are included in Annex A.
3. CONTENTS

The course consisted of essentially two components: taught lectures (some of which involved practical exercises) and case studies, which permitted participants to learn through problem-solving.

3.1. Lectures

Lectures covered the following topics

- Urbanisation and its impacts
- Urban environmental health
- Evolution and principles of urban drainage
- Urban storm drainage in East Africa
- Drainage problem identification (including evaluation)
- Rainfall data: needs, sources and processing
- System data: needs, sources and processing
- Rainfall runoff calculations
- Flow in open and closed conduits
- Institutional and legal framework
- Operation and maintenance
- Appropriate technology
- Community participation in water and drainage

3.2. Case studies

Approximately half of the course time was spent on field work, description, and analysis of drainage problems in two adjacent areas in Kampala: a flat informal settlement adjacent to a drain at the bottom of a steep hill, and a flat industrial catchment. Both areas experience regular flooding.

Participants were divided into four groups, with two groups assigned to the slum and the industrial catchment. Groups were provided with maps, and limited assistance in the preparation of preliminary design approaches to the solution of the drainage problems at each site. On the final day, each group presented its findings including:

- a description of the site
- a quantitative description of the area's drainage problems
- preliminary design concepts for solution to the problem.

The presentations, and cross-questioning by other groups, were to a high standard. Perhaps what was most impressive was the honest recognition by students that, particularly for the slum area, there was no clearcut "best" solution, as every option had real difficulties, often of a political or financial, rather than technical, nature.
4. OUTCOME

There are two principal gauges of the outcome of the workshop; the first was the review of the results of the final day's written assessment, and the second has been the anonymous feedback from the students themselves. The written assessment was generally successful in establishing that students had grasped the fundamentals of the lectures and the principles of drainage analysis.

Feedback from the participants, however, has been the most revealing indicator of success or failure of the workshop, including the most revealing question "Would you recommend this workshop to a colleague?". Annex C includes a full report on the participant feedback. The main points of their reactions, are, however, as follows:

- **The course was intensive**, and students wished for either more time or less material
- **The problem-based approach was popular for many reasons**, although students were frustrated by the limited time with which to engage problems they recognised as significant.
- **The written material (both in the binder, and the manual Storm Drainage) for the course was well-received**. There were some complaints about a European bias, but most felt the materials were good references.
- **Participants would recommend the course to others**. Responses on this point were entirely positive, although for a variety of reasons.
5. FUTURE

After the workshop, the facilitators (including Professor Kigguru, the head of the Department of Civil Engineering at Makerere University) met to consider its future. Professor Kigguru had no hesitation in committing the faculty at Makerere to repeating a similar workshop on drainage next year, and expressed the hope that some or all of the other facilitators could take part. The success of the course structure (lectures plus group work on real local problems) was agreed by all, and will serve as the basis for any subsequent courses at Makerere.

Apart from the success at Makerere, the facilitators were keen to convert the material from the ring binders into an appropriate course text to complement the continued use of *Storm Drainage: an engineering guide to the low-cost evaluation of system performance* in similar workshops and training programmes in other parts of the world. To this end, funds are being sought from the IAWQ to permit the facilitators to pull together and edit chapters or notes for the reader to be prepared by the various facilitators. It was agreed that Philip Pybus would be the editorial co-ordinator. Approximately £5,000 is sought for this work from the IAWQ.
## ANNEX A. COURSE PARTICIPANTS

<table>
<thead>
<tr>
<th>Participant Name</th>
<th>Designation</th>
<th>Address</th>
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<tbody>
<tr>
<td>Danford Banda</td>
<td>Technical Instructor</td>
<td>Copperbelt University PO Box 21692 Kitwe, Zambia</td>
<td>Zambia</td>
</tr>
<tr>
<td>PM Batumbya</td>
<td>Consulting Engineer</td>
<td>MBW Consulting Engineers Plot 4, Kanjokya Street PO Box 5493, Kampala</td>
<td>Uganda</td>
</tr>
<tr>
<td>Martin Bbuye</td>
<td>Town Planner</td>
<td>Mukono Town Council PO Box 201 Mukono</td>
<td>Uganda</td>
</tr>
<tr>
<td>Edmund Besigye</td>
<td>Student</td>
<td>Dept of Civil Engineering Makerere University, PO Box 7062 Kampala</td>
<td>Uganda</td>
</tr>
<tr>
<td>Dirk van Bladeren</td>
<td>Principal Engineer, Water Department</td>
<td>SRK Consulting PO Box 55291 Northlands 2116</td>
<td>RSA</td>
</tr>
<tr>
<td>Agamile O. Gozan</td>
<td>District Water Officer/Engineer</td>
<td>Water Department, Arua District Local Government, Box 1, Arua</td>
<td>Uganda</td>
</tr>
<tr>
<td>Lubinga Handia</td>
<td>Lecturer</td>
<td>Dept of Civil Engineering University of Zambia Box 32379 Lusaka</td>
<td>Zambia</td>
</tr>
<tr>
<td>Pius Isingoma</td>
<td>Student</td>
<td>Dept of Civil Engineering Makerere University, PO Box 7062 Kampala</td>
<td>Uganda</td>
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<tr>
<td>Herbert Kalibbala</td>
<td>Student</td>
<td>Dept of Civil Engineering Makerere University, PO Box 7062 Kampala</td>
<td>Uganda</td>
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<tr>
<td>Gerry Katusiime</td>
<td>Assistant Technical Officer</td>
<td>South Western Towns Water and Sanitation Project Box 75 Kabale</td>
<td>Uganda</td>
</tr>
<tr>
<td>David Kipsang</td>
<td>Town Engineer</td>
<td>Eldoret Municipal Council PO Box 40 Eldoret</td>
<td>Kenya</td>
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<tr>
<td>Robinah Kulabako</td>
<td>Asst Lecturer</td>
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<td>Uganda</td>
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<tr>
<td>Frederick Mubiru</td>
<td>Senior Executive Engineer</td>
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<tr>
<td>Donna Muwonge</td>
<td>Civil Engineer</td>
<td>MBW Consulting Engineers Plot 4, Kanjokya Street PO Box 8493 Kampala</td>
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<tr>
<td>Fred Nuwagaba</td>
<td>Student</td>
<td>Dept of Civil Engineering Makerere University, PO Box 7062 Kampala</td>
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<tr>
<td>Herbert Nuwamanya</td>
<td>Deputy Project Coordinator/Head Technical Section</td>
<td>South Western Towns Water and Sanitation Project Box 75 Kabale</td>
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<tr>
<td>Albert Rugumayo</td>
<td>Lecturer</td>
<td>Dept of Civil Engineering Makerere University, PO Box 7062 Kampala, Uganda</td>
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<tr>
<td>Josiah Sserunjogi</td>
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<tr>
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<tr>
<td>B.M. Kigguru</td>
<td>Professor (Head of Department)</td>
<td>Dept of Civil Engineering, Makerere University, PO Box 7062 Kampala</td>
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<tr>
<td>Pete Kolsky</td>
<td>Associate Director</td>
<td>WELL Resource Centre, London School of Hygiene &amp; Tropical Medicine, Keppel Street London WC1E 7HT e-mail: <a href="mailto:p.kolsky@lshtm.ac.uk">p.kolsky@lshtm.ac.uk</a> fax: 44-171-636-7843</td>
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<tr>
<td>A.W. Majugu</td>
<td>Principal Meteorologist</td>
<td>Department of Meteorology, PO Box 7925 Kampala Fax: 525797</td>
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<tr>
<td>Mai Nalubega</td>
<td>Lecturer</td>
<td>Dept of Civil Engineering, Makerere University, PO Box 7062 Kampala</td>
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<tr>
<td>Philip Pybus</td>
<td>Consulting Engineer</td>
<td>P.O. Box 273 Parklands 2121</td>
<td>Republic of South Africa</td>
</tr>
<tr>
<td>Wolfgang Schilling</td>
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<td>Dept of Hydraulics &amp; Environmental Eng’g, NTNU 7041 Trondheim FAX: 47-73-50-56-35 e-mail: <a href="mailto:Wolfgang.Schilling@0499.ntnu.no">Wolfgang.Schilling@0499.ntnu.no</a></td>
<td>Norway</td>
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<tr>
<td>Geraldine Schoeman</td>
<td>Environmental &amp; Community Psychologist</td>
<td>Afrosearch, Box 13540 Hatfield 0028</td>
<td>Republic of South Africa</td>
</tr>
</tbody>
</table>
ANNEX B. PARTICIPANT FEEDBACK

B.1 The feedback form

Scores:  
5 = Very Good  
4 = Good  
3 = OK  
2 = Unsatisfactory  
1 = Very Bad

LECTURES

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Overall, how would you rate the quality of lecture sessions: (1-5)

Suggestions:
**CASE STUDY EXERCISE**

Which group were you in? (1, 2, 3, or 4):
Was this exercise useful? (Rank 1-5)

What did you like MOST about this exercise?

What did you like LEAST about this exercise?

Other comments?

**COURSE MATERIALS**

Overall, evaluate the value to you of the material in the binder (1-5)

Overall, evaluate the value of the book “Storm Drainage” (1-5)

Any comments or reasons for these assessments?

**OVERALL ASSESSMENT**

Taking everything into account, how would you rate the course (1-5):

What did you like MOST about the course?

What did you like LEAST about the course?

What SURPRISED you most about the course?

Would you recommend the course to a friend? Why or why not?
How well were your expectations met?
Other comments?
## B.2 Quantitative results

### A. Lectures

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### B. CASE STUDY EXERCISE

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### C. COURSE MATERIAL

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### D. OVERALL ASSESSMENT

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B.3 Qualitative results

B.3.1 Lectures

Suggestions for improvement:

*Time*
In case this course is to be organized again, each session should be given more time.
The course does not give time to relax – too “intensive”. Maybe reducing hours by 1 per day.
Increase the course time (to say, 2 or more weeks.)
Maybe if some time would be provided (say by extending the course by a week or so) more explanation work would be done. (elaborating some of the topics for more understanding.) Some of the lectures involving computations should have long time allocations
Should give lectures more time to top up the 45 minutes for each paper, which leads to summarising almost every aspect. Enough time could lead participants to have more time for sharing different experiences from their homes.
More time to be available on hands-on practice on case-studies and possibly designing using the software

*Handouts (which went into binder)*
I suggest that all handouts are given out on the 1st day so that participants can study them before presentation since the time allowed for the presenter was not enough.
Find out all lecture material in time, so that those facilitators who are not able to come should send at least hand-outs.

*Other suggestions*
It’s better not to have case studies as the experience is similar in many African countries. It is better to present experience and conclusions for several cases.
Next course can focus on other issues
You need people with good experience more in the field, not in the theoretical part in the case of Ugandan lecturers.
Two field trips, one before the social aspects lecture, and one after, would help in formulation of solutions. Thanks a lot!

B.3.2 Case study exercise

Liked Most:

*Group work:*
Working with people from different backgrounds and sharing different views and experiences.
Sharing real-life experiences
Exchange of ideas
Team work and problem solving/ many issues were exposed as a result.
Group work and the opportunity to simulate real-life problem solving in a drainage project.
The internal group work
Share experiences from our areas of origin and more particularly in drainage for urban areas.

Technical approach
It lets you look at many alternatives
It exposed us to a quick approach to drainage problem identification and probable solution (quantitatively)
Calculations and design proposals

Practical and ‘real-world’ situation
Relating what I actually learn in theory with an actual situation or problem
Made me understand the contents of lectures through the practical work
The practical part of the exercise which included the design (solving apparent problems.)
The opportunity to practice what was taught during the lecture hours
Integrating the practical situation & to solve it theoretically.
Solutions to a real situation

Other
The challenge and the fun

Liked Least:

Time
The time constraint could not allow us to give realistic views.
Doing work hurriedly without concrete analysis.
Time was too short to come up with some more realistic solutions
Important sections very short
The time required to make the designs was minimal. Short duration of field visit.
It was very short time, but good at forcing discussion of many issues
Inadequate time for the site visit
The time given is too little hence more time should be given in future workshops.
Time allocation for the group work was quite limited
No problem
Four participants explicitly wrote that there were no aspects they did not like

Other aspects
Inability to access the Nakivubo channel (which is not the fault of anyone)
The problem itself.

Other Comments:

Time
More time would be required to solve engineering problems of the Namuwongo case type, so this course should be at least a 2 week one.
Make the exercise just a little bit longer (eight hours more)
I suggest that the duration of the course next time should be increased to allow for more innovate designs based on the gathered information.

Other
The data used was not sufficient.
Everything was successful
Two site visits could have been better OR one after the lecture on social aspects.
The site visit did not allow groups to cover site on their own

B.3.3 Comments on course materials

They are applicable and give experiences.
The presenters were precise and concise; it depicted their long experience in the problem area.
They will help me in the future in as I am confronted with a problem.
Examples given are biased to European systems being better than systems in Africa.
Most solutions do not hold in African cities.
Many practical examples have been used to illustrate the materials
(An additional check above 5 for Storm Drainage)
(Two additional checks above 5 for Storm Drainage.)
Everything has been meticulously useful.
Well-presented and valuable material
All this material is very relevant to our current problems and hence will aid a lot in problem-solving
It is difficult to find comprehensive material regarding urban drainage in developing countries. (From an individual who had rated both binder and Storm Drainage very good.)

Binder material: Very good reference
Storm Drainage: A tool for a drainage engineer
Other comments: I already used it in the design of the drainage system.
Some of the material cannot be used as future reference material because it is too brief.
They help in the reflection of the true Course picture.
The materials available are very enlightening on the subject of urban drainage: its objectives as well as remedial measures for poor drainage.

**B.3.4 Overall assessment**

**Liked Most:**

*Lectures & materials*
Good presentations & course material
I liked the way the lectures were being conducted
Very knowledgeable course facilitators and the course content
The quality of presentations
The lectures (short time lectures) followed by the discussion provided further clarification on the subject.

*Group work and exercise*
Group work
Team participation in situation of engineering problems
The fact that there’s a practical exercise on an apparent (existing) problem.
Case study

*Both Lectures and Groupwork*
The well-prepared and presented lectures, plus the practical exercise

*Shared experience*
The experience of group discussion on aspects of drainage
Experience sharing
Well represented from different countries. Good facilitators
Share of experiences

*Other*
Time keeping (punctuality).

The relevance

It was well structured, and provided good material for future reference

The concepts that were never considered by myself before due to the environment I am working in

**Liked Least:**

*Time and intensity*

Too intensive for 5 days

Too intensive to allow time to accomplish all the objectives of the course

Time for the course was too short

Time limitations

Passing through some sections without detailed analysis

Short duration allocated to the site visit

*Nothing specific*

2 participants explicitly wrote that there was nothing they disliked, and one wrote that there was no single issue to address

*Other*

Gender imbalance

A lot of academic work which is irrelevant to solution of engineering problems at hand

Local resource persons did not seem to have anything new to offer

**Surprised:**

*Responses to this question were hard to categorize, so the responses are just given below:*

Fewer African foreigners {Ed. Low presence from outside Uganda?}

Poor attendance, yet the course was an international one

It is rare to hold such a course in this environment.

Findings during the excursion.

Drainage problems are almost similar world over.

How little I knew about the subject area.

The level of experience of the lecturers

Nothing
That actually engineers could go in and carry out some activities in the field (sociological.)
I hadn’t thought about the environmental/public health issues but I now realise how vital they are in this subject
All course facilitators, some of whom are authorities in their subjects behaved like simple people.
New approaches to flood control and the quality of material, especially the book!
A lot was delivered.

**Would you recommend to a friend? Why or why not?**

Yes, it is useful for application in the field
YES, it is relevant and appropriate to current problems of urbanisation.
Yes: enhances drainage knowledge to a great extent.
Yes, One gains a lot within a short period.
Yes, because big challenges can be given a heavy blow with backing from international team. (groups from different backgrounds).
Yes, because we need many more actors in urban drainage management
Yes, because of above (referring to previous comments on experience-sharing, and similarity of problems world-over).
Yes, it is very interesting and relevant
Yes, because of the problem approach of the course.
Yes, because it was beneficial to me.
Yes, it addresses problem solving not necessarily technical recommendations
Yes, it is a topic that is largely rushed or handled without the significance it deserves. All topics were relevant and covered very well.
Yes, a MUST attend!
Yes, gather information on new approaches to urban drainage and case study based approach to solution of problems.
Yes, I found it relevant.
Yes, as it addresses the major urban problems esp. storm drainage.
Yes, because it is very educative.
Yes, the subject is pertinent to our local situation.

**How well were your expectations met?**

Very well (6)
Very Well Indeed (1)
Very fine (1)
Fully (1)

Truthfully, my expectations were met very well.
90%…really missed the GIS component!
4 by above rating (i.e. 4 out of 5)
Satisfactorily
I got more than what I even expected.
I can say it was 50/50.
Partial. The turnout was a little low.
My home town has storm drainage problems, and this workshop’s theme has been focusing on the same.

Other Comments

Other or future courses
More such courses should be arranged for different fields of interests, say water supply and others.
Please fund more of these courses in other areas.
Need to organise similar courses for other areas of engineering concern.
Organise more such courses and invite more practicing engineers and related professionals.
It should be organised again next year.

Other comments
Would be better if donors would look into sponsoring some few people who would be very interested in courses on topics dealt with at a particular workshop. Two out of very many people could be chosen for example by using criteria like best performance.
I thank Professor Schilling for his able handling of the course. I am grateful to faculty of technology MKK for this course.
Time management could be improved. I enjoyed the friendly atmosphere.
The course programme and other information was not clear (beforehand). This is important for visitors from outside Uganda.
Very useful course.
Propose to reduce the number of days to 3 or 4.