WELL
WATER AND ENVIRONMENTAL HEALTH AT LONDON AND LOUGHBOROUGH

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

WELL Report

Urban Drainage Workshop – Uganda

Task No: 167

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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

Participant Name	Designation	Address	Country
Danford Banda	Technical Instructor	Copperbelt University PO Box 21692 Kitwe, Zambia	Zambia
PM Batumbya	Consulting Engineer	MBW Consulting Engineers Plot 4, Kanjokya Street PO Box 5493, Kampala Phone 540140	Uganda
Martin Bbuye	Town Planner	Mukono Town Council PO Box 201 Mukono	Uganda
Edmund Besigye	Student	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala	Uganda
Dirk van Bladeren	Principal Engineer, Water Department	SRK Consulting PO Box 55291 Northlands 2116	RSA
Agamile O. Gozan	District Water Officer/ Engineer	Water Department, Arua District Local Government, Box 1, Arua	Uganda
Lubinga Handia	Lecturer	Dept of Civil Engineering University of Zambia Box 32379 Lusaka	Zambia
Pius Isingoma	Student	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala	Uganda
Herbert Kalibbala	Student	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala	Uganda
Gerry Katusiime	Assistant Technical Officer	South Western Towns Water and Sanitation Project Box 75 Kabale	Uganda
David Kipsang	Town Engineer	Eldoret Municipal Council PO Box 40 Eldoret	Kenya
Robinah Kulabako	Asst Lecturer	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala	Uganda

Frederick Mubiru	Senior Executive Engineer	Kampala City Council, PO Box 24136 Kampala	Uganda
Donna Muwonge	Civil Engineer	MBW Consulting Engineers Plot 4, Kanjokya Street PO Box 8493 Kampala	Uganda
Fred Nuwagaba	Student	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala	Uganda
Herbert Nuwamanya	Deputy Project Coordinator/ Head Technical Section	South Western Towns Water and Sanitation Project Box 75 Kabale	Uganda
Albert Rugumayo	Lecturer	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala, Uganda	Uganda
Josiah Sserunjogi	Town Engineer	Mukono Town Council PO Box 201 Mukono	Uganda

Resource Persons	Designation	Address	Country
B.M. Kigguru	Professor (Head of Department)	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala	Uganda
Pete Kolsky	Associate Director	WELL Resource Centre, London School of Hygiene & Tropical Medicine, Keppel Street London WC1E 7HT e-mail: p.kolsky@lshtm.ac.uk fax: 44-171-636-7843	United Kingdom
A.W. Majugu	Principal Meteorologist	Department of Meteorology PO Box 7925 Kampala Fax: 525797	Uganda
Mai Nalubega	Lecturer	Dept of Civil Engineering Makerere University, PO Box 7062 Kampala	Uganda
Philip Pybus	Consulting Engineer	P.O. Box 273 Parklands 2121 Fax: 27-11-447-6763 e-mail: philipp@icon.co.za	Republic of South Africa
Wolfgang Schilling	Professor	Dept of Hydraulics & Environmental Eng'g NTNU 7041 Trondheim FAX: 47-73-50-56-35 e-mail: Wolfgang.Schilling@0499.ntnu.no	Norway
Geraldine Schoeman	Environmental & Community Psychologist	Afrosearch, Box 13540 Hatfield 0028 Fax: 27-12-362-2463 e-mail: gera@gem.co.za	Republic of South Africa

ANNEX B. PARTICIPANT FEEDBACK

B.1 The feedback form

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

LECTURES

Session Title	Overall Quality	Rele-vance	Remarks
Urbanisation & Impacts			
Env Health & Drainage			
Drainage Principles			
Drainage in Uganda			
Problem Identification			
Case Study Presentation			
Case Study Workshop			
Rainfall-Runoff Comps			
Rainfall Data Analysis			
System Data Needs			
Assessing Existing System			
Excursion to Namuwongo			
Local & Regional Climate			
Modelling Hydrology & Hydraulics			
Institutional & legal framework			
Integrated & Sustainable Concepts (I)			
Integrated & Sustainable Concepts (2)			
Infrastructure Project Management			
Operation and Maintenance			

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

	Sum of quality scores	Sum of relevance scores	No of responses	Average quality	Average relevance
Urbanisation & Impacts	83	89	18	4.6	4.9
Env Health & Drainage	87	87	18	4.8	4.8
Drainage Principles	83	84	18	4.6	4.7
Urban Drainage in Uganda	77	83	18	4.3	4.6
Problem Identification	83	89	18	4.6	4.9
Case Study Presentation	81	83	18	4.5	4.6
Rainfall-Runoff Computations	83	86	18	4.6	4.8
Rainfall Data Analysis	81	88	18	4.5	4.9
System Data Needs	79	83	18	4.4	4.6
Assessing Existing System	80	90	18	4.4	5.0
Excursion to Namuwongo	74	87	18	4.1	4.8
Local and Regional Climate	60	73	18	3.3	4.1
Modelling Hydrology & Hydraulics	69	84	18	3.8	4.7
Integrated & Sustainable Concepts	71	79	17	4.2	4.6
Social Aspects of Stormwater Management	76	81	17	4.5	4.8
Infrastructure Project Management	67	74	16	4.2	4.6
Operations & Maintenance	76	84	18	4.2	4.7
Institutional and Legal Aspects	Session was not held				
Overall quality of lecture sessions				**4.3**	**4.7**

B. CASE STUDY EXERCISE

	Total	No of responses	Average
Was exercise useful?	82	18	4.6

C. COURSE MATERIAL

Binder material	83	18	4.6
Storm Drainage	87	18	4.8

D. OVERALL ASSESSMENT

81	18	4.5

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

<u>Liked Least:</u>

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 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 chanllenges 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 beneficiai 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.