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**Report of the training workshop
on the use of**

M³WATER in Water Allocation and Investment Policies in the Volta Basin

– Focus on Ghana –



AT
CATTERS HOSTEL, EAST LEGON
6th to 8th July 2010



Introduction

The 3 day training workshop started at 9am with the arrival, introduction of participants and resource persons. Present at the workshop was Prof. P. L. Vlek, the Executive Director of WASCAL.

The aim of the workshop is to introduce participants the coupled hydrological-economic model M³WATER for the Volta River Basin, discuss policy scenarios, climate change scenarios and transboundary water allocation for the Volta Basin. Another aim was to receive feedback of stakeholders on the possible institutional implementation, data requirements, user friendliness, and required results options of the M³WATER model.

In an opening remark, Prof. Dr. Vlek refreshed the minds of participant on the GLOWA VOLTA Project and the fact that the output of some sponsored graduate students expertise and research work is what the participants are going to be exposed to during the workshop. According to him, there was the need to look critically at the allocation of water and the problems faced with the allocation of water of which he categorised as;

- Biophysical
- Productivity
- Nature
- Transport
- Ecological

Prof. Vlek said if the above stated problems are well understood, then we could better understand the need for appropriate water allocation and where to emphasis our research work. According to him, though the workshop is to sensitize participants on available models around the world out of which we could adapt to our region to help make improved decisions. He said we only develop insight by running such models in order to get ideas on how it's impacts is felt on resources and other sectors. He cited the case of the United States using Agent Based Modelling to predict the next location for epidemic outbreak as a golden opportunity of what modelling is doing for other countries. Though in our case, availability of data is a major obstacle, he insisted we could make a headway with the little we have and with the assistance of Donor Agencies and Sponsorships; we could be making appreciable impact in our country. He reiterated the need for the Socio-Physical aspect of the optimization. He blamed the loss of the social component/element of the Project on the changes in technology since the commencement of the Project and prayed it is time to get the social component to work in models that we seek to create or design. Prof Vlek took some time to introduce to the participant what the new project seeks to incorporate from the GLOWA VOLTA and requested that this is a perfect platform to get the needed resource ready for the upcoming project. He requested that participant get on board on the new project and bring their expertise to bear for critical discussions on the way forward in the world of modelling.

He ended full of hopes that this sensitization programme will ignite people's quest to get onboard on the modelling challenge to help solve the countries debilitating problems.

During the day, participant were taken through the general overview of the GAMS Software Platform, it tools, functions, and with the help of some existing models, participant familiarized themselves on the basic platform of the GAMS Software. Participant went through the Models Library and the Egypt Model was used as an introductory example. The Egypt Model according to the Resource Person was similar to the M³WATER and as such was relevant to play around it the more to understand its variables and components.

The attention was then directed at DEMO 1 and DEMO 7 in the GAMS Library for clarifications on how to get the extensions rectified before the commencement of modelling in the GAMS platform.

The lecture and experimental session was scheduled to the afternoon section. But before that, participant took some time to better familiarize themselves on the GAMS platforms. There was also a mini-question session on the general functionality of the GAMS platform before the break.

Dr. Amisigo set the tone for the afternoon session after he took some time to delve into the literature on availability of water in a catchment area and its relations with water allocation. In simple terms, he described water allocation as how much of water would go into household use, industrial use, commercial use, and for instance for small and large-scale irrigation. Important issues he tackled in his presentation touched on the rules for abstraction and allocation.

Through his presentation he came out for instance with these criteria as a possible means to allocate water:

- For social equity: e.g. for basic sanitation
- For Environmental Equity: e.g. for basic sanitation
- For Economic Efficiency: e.g. to optimize water for economic efficiency.

According to Dr. Amisigo, it is through this process that GAMS comes into play to do the optimization and assist in the distribution or allocation. In this regard, we'll look at how well it fits in our scheme of work and provide the input for MIKE BASIN

The following diagram (Figure 1) drawn out of Dr. Amisigo's presentation conceptualises this claim.

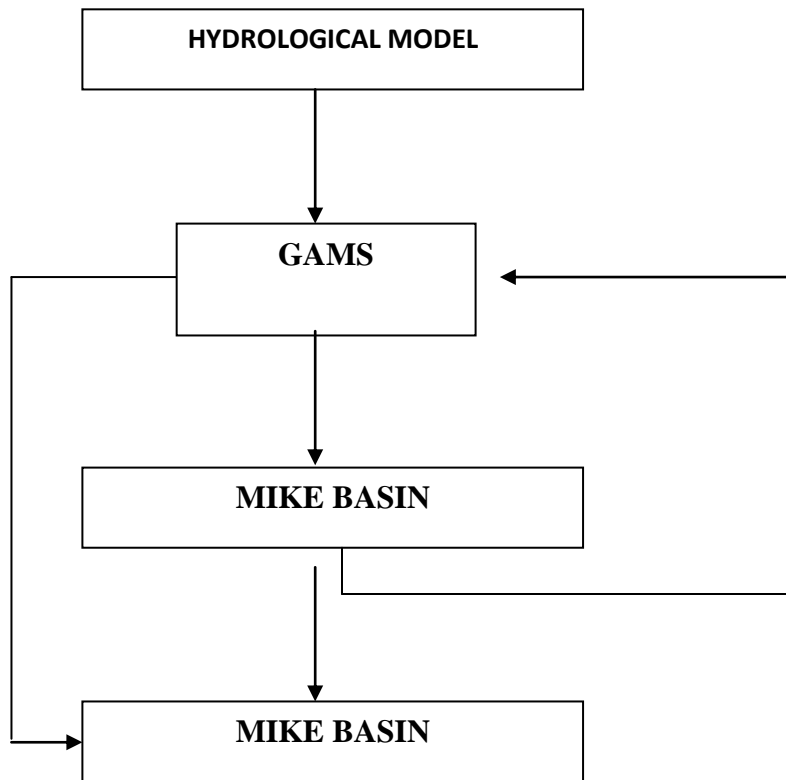


Figure 1: Procedure of Transformation and Interaction between MIKE BASIN & GAMS

Source: GLOWA VOLTA WORKSHOP, July, 2010.

Questions were welcomed from participants on Dr. Amisigo's presentation.

1. The first question was on the reasons why MIKE BASIN was used for delineation in terms of water independence in the catchment area.

According to Dr. Amisigo, we are looking at maximum available water in each catchment area irrespective of their location in Ghana or in Burkina Faso. Hence the adoption of MIKE BASIN to undertake the delineation of independent catchment areas.

2. The second question dwelled on the water concentration in the area under discussion. It is surface, interflow, or base flow.

Dr. Amisigo answered by saying that MIKE BASIN looks at surface, inflow and base flow water but the area under concentration is surface water.

The first phase of the presentation (literature review) by Dr. Amisigo ended after doing a little over fifteen minute of talk.



A section of the participants

Second phase of presentation

The second phase of the presentation was honoured by the resource person.

In his presentation, he declared that M³WATER will dwell more on the Equity Aspect primarily on Domestic Consumption. He broke down the meaning of the M³WATER as Multi Management of Water Allocation Technology for Effective Management of Resources.

The name according to him alludes to Cubic Metre of Water which is the common volumetric measure of water. In his presentation, he considered transportation as a variable but didn't include it because he felt there wasn't the need to for assessing transportation functions.

In his presentation he declares

“the more benefit to society, is where water will go”

to try to stage why there was the need to consider the allocation to water given its scarce nature.

He said the other use of a model is that you can experiment with it in the what – If situations. This helps to know what the situations will be like or to monitor its effect before one could carry out any meaningful policies are made given variations in variable data.

He emphasized the model should be looked at not on annual basis but after at least 5 to 10 year periods in order to inform policy makers on the changes that have occurred and make better policy changes to that effect.

Before ending his presentation, he declares that he doesn't believe his model is the full assurance of what exists, but he hoped policy makers adopt the model and make sense out of the policy implication therein.

He ended by making the provoking remarks to the effect that the more complicated a model, the more the questions arise, the more you answer imprecisely. This was quite a thought.

Day II (7th July, 2010)

The second day's session begun with a visitation to the previous days knowledge and specifically a brush over the literature behind the M³WATER.

Time was also made for assessing the GAMS Library to better familiarize the participant and get the tone set for the day's activities.

The resource person declared that the strength of GAMS is in defining one's dimensions in terms of Sets, Variables, Equations, and the Objective Function.

Participants were taken through a session of experimentation on the GAMS platform, writing codes, and setting the required parameters for running models in GAMS. Issues tackled also dwelt on correcting error bugs or messages. This lasted for 35 minutes after which there was a break (coffee) for 15min. The lesson on debugging and correcting first errors and subsequent errors were revisited. This ushered in the discussion into DEMO 1 where participant were taken though how they could write or define their variables in the GAMS Platform

According to him, the review and practise on the DEMO 1 was relevant because the M³WATER takes some clues from that demo and also for its relevance to policy makers and analyst.

AFTERNOON SESSION

The afternoon session commenced with a sharp look at A transportation Model designed in Excel using GAMS on a VB Interface.

The M³WATER Model was brought to the floor, and assessed. Its parameters and variables were looked at in full detail. This wasn't done without problems though. Problems encountered were associated with program debugging. This exercise lasted till the end of the second day's session.

Day III (8th July, 2010)

To commence the day, participants were given copies of a running model to be installed on the laptops.

The day's activity dwelled mostly on defining baseline scenarios, climate scenarios, and policy scenarios to assess results that come out of different scenarios in order to make meaningful policy recommendations to policy analyst.

It was noted that for transboundary water, irrigation changes should be done on Burkina Faso and not in Ghana.

Dr. Amisigo took time to explain the concept of Environmental Flows before the coffee break.

After getting themselves abreast and familiar with the M³WATER model, participants wanted to know from the resource persons view what he thinks are the limitations to his model.

According to him,

1. His model is static and optimises every year.
2. It gives no clue about the part of the country where one could undertake a specific crop production though it suggests the type of crop to produce.
3. There's no energy side to his model. The energy side is felt on how much of water could be used to optimize production at the expense of Dam irrigation.

The platform was opened for question and answer sessions.

Question 1: Can the model give annual crop productivity or it could do so after say 40 years?

Answer: Yes, the model can give you annual crop yield.

The question and answer session brought to an end the day's activities and eventually the end of the Three (3) day GLOWA VOLTA WORKSHOP (M³WATER).

Open Forum

The open forum discussed briefly the following:

1. A development handout or manual to serve as a practical tutorial to the use of the software and to learn how the coding system is undertaken in the GAMS platform.
2. Long period training of interested institutions and individuals who wish to use the model for effective use and applicability.

After the open forum the workshop came to a close at 2pm and participants left for their respective place of origin.

List of participants of the training workshop

No	Name	Institution
1	Boateng Ampadu	UDS FAS, EES, Navrongo
2	Philemon Yankson	GIDA, Accra
3	B.O. Antwi	CSIR-Soil Research Institute, Kumasi
4	Asare Gyasi-Doku	WD/MWRWH, Accra
5	Theodore Kpodonu	UDS, Tamale
6	Wilson Agyare	DAE, KNUST, Kumasi
7	Raymond Kasei	UDS FAS, EES, Navrongo
8	Enoch Ofosu	WD/MWRWH, Accra
9	Frederick Logah	CSIR-Water Research Institute, Accra
10	Barnabas Amisgo	CSIR-Water Research Institute, Accra
11	Edwin Afosah-Anim	Water Resources Commission, Accra
12	Adelina Mensah	University of Ghana, Accra
13	Justice Inkoom	UCC, Cape Coast
14	Enoch Tagoe	Institute of Mathematical Sciences
15	Harris Andoh	CSIR-Soil Research Institute, Kumasi
16	Joseph Essandoh-Yeddu	Ghana Energy Commission, Accra
17	Abakah Jonathan	GIDA, Accra
18	Josuah Owusu Sekyere	Dept of Agric Engineering, UCC, Cape Coast
19	Kwaku Waife	VRA, Akuse
20	Emmanuel Obuobi	CSIR-Water Research Institute, Accra
21	Benjamin Kofi Nyarko	UCC, Cape Coast
22	Nicos Perez	Philippines