

**Advice on Screening for SEA for
Lake Levels in the
Nile Equatorial Lake Region**

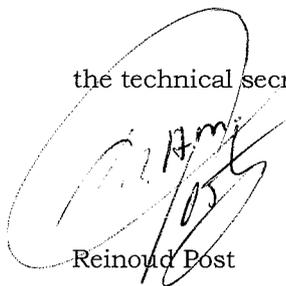
East Africa

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Advice on Screening for SEA for Lake Levels in the Nile
Equatorial Lake region, East Africa

Advice submitted to the Netherlands Embassy in Kigali, Rwanda by a working group of the Commission for Environmental Impact Assessment in the Netherlands.

the technical secretary

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Reinoud Post

the chairman

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Klaas Jan Beek

Utrecht, 19 September 2007

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ANNEXES

1. Letter of request (e-mail) d.d. 29 March 2006 asking NCEA to provide advice
2. Project information
3. Map

1. INTRODUCTION

The course of water levels of the Nile Equatorial lakes¹ shows much variation in time, illustrating the large influence of climate variability in the region. During the early sixties, water levels in nearly all Lakes have risen due to a number of consecutive wet years with abnormal high rainfall. In the course of time these elevated lake levels have been lowered by more normal (but variable) rainfall and increased natural outflow. By the beginning of 2005 Lake Victoria water levels reached the pre-1960 levels again. Since that time, however, levels dropped much faster due to a drought period, which ended by April 2006.

2. INITIAL REQUEST

In March 2006 the Netherlands embassies in the Nile riparian countries requested the Netherlands Commission for Environmental Assessment (NCEA) to analyse whether in the long run there is a problem with the lake levels (see annex 1 for the request). If the answer to that question would be affirmative, the embassies intended to invite riparian governments to formulate (with the help of a Strategic Environmental Assessment) a strategy to mitigate the problem and/or cope with its consequences.

3. APPROACH TAKEN

NCEA adopted the following approach for answering to the request:

- Analysing the request and breaking it down into sub-requests;
- Identifying the necessary data and tools (models), their availability and relevance and accuracy;
- Identify relevant knowledge institutes and individual experts;
- developing relations with regional institutions, notably the Nile Basin Initiative (NBI);
- Secure availability of data.

The item mentioned in the last bullet point proved problematic as under the NBI there is no agreement on data sharing (the NBI-website indicates specifically that data will not be provided to third parties). The unavailability of data implied a deadlock in responding to the request.

4. ENTEBBE WORKING CONFERENCE

On 13 and 14 March 2007, representatives of the Netherlands Embassies in the region met with the World Bank, NBI organs and other expert institutes

¹ The lakes in Burundi, the Democratic Republic of Congo, Kenya, Rwanda, Tanzania and Uganda that are part of the Nile Basin.

and discussed the deadlock with regard to the study on the dwindling lake levels. During the conference NBI indicated that the East African Community (EAC) has established the Lake Victoria Basin Commission and agreed on sharing of data under this Commission. Following that conference, the embassies invited the NCEA to see whether the question if, indeed, there is a problem with the lake levels can be answered with an acceptable level of accuracy on the basis of expert knowledge and without going into executing new model studies.

Upon this renewed request, the NCEA composed an expert team (see annex 2) and formulated this advisory report.

5. PROBLEM ANALYSIS

Lowering of water levels in Lakes can be attributed to two possible causes: a decreased inflow (or recharge) into such Lake or due to an increased outflow (or discharge) from the lake. Reduced inflow may be caused by changes in climate (precipitation) and management (land use in the catchment). Reduced outflow may also be by changes in climate (evaporation) or management (release of water for downstream use).

- a. The hydrological balance of Lake Victoria (and most probably the other lakes in the NEL region) is mainly determined by two factors: precipitation in the basin including the lake itself and evapo(transpi)ration in the basin and on the lake itself. The natural yearly outflow from Lake Victoria basin is the precipitation excess. This is only 9% of the precipitation, which makes the system very sensitive to small changes in climate.
- b. During years with a high precipitation, about 30% of the precipitation falls on the lake itself (analysis of TRMM satellite data). During dry years, only about 20% of the total precipitation falls directly on the lake. Lake precipitation is not recorded, but mainly estimated on the basis of extrapolation or calibration using balance- and model calculations.
- c. For Lake Victoria, which is about 1.7 times the Netherlands, it seems plausible that with the prevailing eastward wind direction, precipitation on the lake will be higher than on its catchment. Better climate models to estimate precipitation on a meso-scale are available, but application is time consuming.
- d. Uncertainties as indicated here illustrate the necessity of more profound analysis of meteorological and hydrological data (as far as available). This is necessary to calibrate the models before reliable forecasts can be made.
- e. The Global Circulation Models (GCMs) indicate that East Africa can expect a minor increase in precipitation as well as a significant increase in temperature. The models agree on an increase of precipitation during the "short rains" (October-February) but disagree on the development of precipitation during the "long rains" (March-May). Also, the models predict an increase in the already considerable variability in precipitation and temperature. For meaningful forecasts, however, the GCM's are not detailed enough (The grids are so large that Lake Victoria is represented by one or two grids only). Downscaling model results in combination with a detailed analysis of historical data is a prerequisite for an assessment of future lake level fluctuations for the region. This activity is underway by a research institute in Germany.
- f. The transformation of precipitation to drainage to the Lakes is influenced by the land use in the basin. The projected population growth will influ-

ence water use for both domestic consumption and agriculture. In Lake Victoria Basin, agriculture is mainly rain-fed and already suffers from the variability of the climate (droughts and floods). In the future, drainage (the quantity of water drained) to lake Victoria will largely depend on the development of further water storage and water use in the basin. Water storage will probably increase due to increasing water demands and includes aquifer replenishment (for irrigation in drought periods) and small and middle scale dam construction for aquifer replenishment and direct irrigation purposes.

- g. Scenario and model studies can be used to analyse the consequences of both climate change and changes in land and water use on the lake levels
- h. Hydrological consequences and options for adaptation to these consequences should be analyzed in combination with their socio economic and environmental effects since water demands will continue to rise and hence vulnerability to climate change will increase as a consequence.
- i. Information on Costs and Benefits of measures to adapt to the hydrological consequences of climate change should be collected and analysed.

6. COMMENTS ON THE PRESENT SITUATION

NCEA interprets the present situation as follows:

1. on the basis of data it has available, NCEA cannot draw conclusions on whether the recent low levels of the Nile equatorial lakes are within the normal range of variability of the levels of the lakes. Time series over a much longer period would be needed to draw reliable conclusions with regard to this question. Indeed, for purposes of designing future water management strategies for the NEL-region, NCEA considers it necessary that long term variability should be studied;
2. the uncertainty on the expected future precipitation in the NEL region will continue, even if a perfect downscaling method for the climate models would be applied. There is, however, a higher level of certainty that temperature and evaporation will increase. Also certain is that the variability (roughness) of the climate will increase in future resulting in a higher occurrence of both extreme floods and droughts. The forecasted increase in population and, inherently, the water needs, will further increase the vulnerability of the NEL region for climate variability. This will affect the poor and underprivileged most;
3. in appraising investments in development of long term land and water management strategies, we should first of all verify whether such strategies, whatever their scope, lead to a decrease in vulnerability for climate variability. Alternative: A decrease in climate vulnerability should therefore be included in all proposed long term water strategies in the NEL region;
4. in assessing the validity and robustness of long term water management strategies under changing climatic conditions (or investments in water management infrastructure), it might be prudent to assess what extent of climate change would make you decide to stop developing strategies (or stop investing). If only a small change in climate can largely increase vulnerability and can negatively influence the benefit to cost ratio of planned investments, uncertainties related to the effectiveness of planned invest-

ments become unacceptably high and in some instances it is better not to start developing the strategies (or investing in infrastructure). Additional information is required on the costs and benefits of strategies and detailed information on thresholds above which certain strategies are no longer effective;

5. under the uncertainties with regard to climate change, one should apply and additional cost-benefit analysis (CBA) to assess whether the dimension of structures like e.g. the Bujugali Dam is economically viable. Current cost benefit analysis focus largely on short term energy demand-supply components related to the planned power plant. An additional CBA would provide an insight in the cost effectiveness of hydropower under long term trends including climate change, land use change and socio economic developments in the region. Such analysis would provide an insight at which point certain strategies are no longer economically viable²;
6. the present problem of low lake levels has a high level of political sensitivity. It is not prudent and productive to stress the need for in-depth analyses of the underlying causes. Such analysis would probably lead to reports that cannot be published and would possibly stir up conflict. However, it would probably be acceptable if the problem could be addressed under the flag of harnessing the region against climate change. This flag would allow for doing the right analyses and for the development of improved water management strategies without accusing any party.

7. CONCLUSIONS

The NCEA concludes:

1. that, due to lack of data, NCEA cannot answer the question whether recent low water levels of the Nile Equatorial Lakes have remained within the range of their historical variability;
2. that the question whether there is a problem with the lake levels can, indeed, be answered with a for the specific purpose³ acceptable level of accuracy on the basis of expert knowledge and without going into model studies;
3. on the basis of present runs of the GCMs for the East African region, NCEA cannot make reliable statements on whether precipitation will increase. It is needed to downscale climate models to suit data demands;
4. the GCM"s provide more consistent results on evaporation, which will increase;

² This would be a similar analysis as the Centraal Plan Bureau (CPB) has done for investing in high water protection in the Netherlands. The approach boils down to designing the structure in its initial form to the average forecasted development of water flows and then, when the actual development of the water flows differ from the forecasted development, adapt the structure. As initial investment is huge, this approach generally yields the best economic results (the size of which depends of course of the investment cost of the adaptations).

³ or deciding whether the issue needs further attention

5. hydropower will remain an important water using sector in the future (hydropower master plan). A continued influence of hydropower production on Lake Levels can therefore be expected in the future as well;
6. seen the presently forecasted population growth and its assumed continued dependence of the increased population on agriculture, it is expected that water use in the basins will increase;
7. more frequent droughts caused by increased climate variability and greater water needs (as addressed under point 5) will increase the need for water retention in the basins. This will negatively influence the drainage to the lakes;
8. based on expert judgement, taking into account the previous points 3 to 7, the NCEA concludes that the present problem with the extremely low level of the Nile Equatorial Lakes will prove to be persistent.

8. RECOMMENDATIONS

8.1 Strategy development

1. Historic analysis of lake levels should reveal whether recent lake level fluctuations are within the boundaries of natural variability of lake levels. Therefore, the NCEA recommends that east African lake levels should be assessed within the context of long term historical time series (>500 years) using paleo proxy data and long term historic simulations of climate models.
2. Apart from the –partly existing- analysis of reservoir management options, the NCEA recommends to do an integral analysis of water management options in the region. This analysis will provide insight in the options for more efficient water use in the sub-basins and in the drainage area of the lakes as a whole.
3. The NCEA recommends to subsequently develop water management strategies, based on combinations of forecasted trends in climate change, socio-economic development (population growth, development of agricultural markets and energy use), land use developments etc. and apply impact assessment in order to document the social and environmental impacts of the proposed strategies.
4. Subsequently, the NCEA recommends apply a robustness analysis by evaluating the different water management strategies against the scenarios (using e.g. CBA) with the emphasis on detecting
 - a. the frequency and magnitude of extreme situations under which water is not available to different users
 - b. thresholds above which management strategies are no longer effective.
5. NCEA also recommends to develop guidelines on how climate change should be included in Impact Assessment for water management strategies and (or) in the design of water management structures in large rivers.

8.2 Institutional

The NCEA recommends

1. to develop within a relevant structure (most probably the Lake Victoria Basin Commission) a sufficient level of awareness on the probable problem as to raise interest and ownership for the development of a strategy (or strategy options) to manage future water levels of the lakes in relation to future water availability in the region
2. to implement background studies by researchers from the NEL region, supported by foreign knowledge institutes.