

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL
RESEARCH

TECHNICAL ADVISORY COMMITTEE

Eightieth Meeting, ICARDA, Aleppo, Syria, 26-30 March 2001

For Discussion

Agenda Item 9: Other Business
Report on Modelling the Management of Water Flows to
Optimise Aquatic Resource Production in the Mekong Basin

The Final Report on the ICLARM/IWMI/MPC collaborative Project on Modelling the Management of Water Flows to Optimise Aquatic Resources Production in the Mekong Basin has been submitted by ICLARM. It is one of the "Legacy" projects approved by TAC in 1999. The Committee is to take note on the final report and consider this model in the context of suggestions to move towards competitive grants.

TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

March 2001

MODELLING THE MANAGEMENT OF WATER FLOWS
TO OPTIMISE AQUATIC RESOURCE PRODUCTION IN THE MEKONG BASIN

FINAL REPORT
FOR THE TECHNICAL ADVISORY COMMITTEE

January 2001



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PROJECT SUMMARY

<u>Project Title:</u>	Modelling the management of water flows to optimise aquatic resource production in the Mekong Basin
<u>CGIAR Centres:</u>	International Center for Living Aquatic Resources Management (ICLARM, Penang, Malaysia); International Water Management Institute (IWMI, Colombo, Sri Lanka);
<u>Key Collaborators:</u>	Mekong River Commission (MRC, Phnom Penh, Cambodia); other institutes and national and regional agencies working in the riparian countries (Cambodia, Lao PDR, Thailand and Vietnam).
<u>Duration:</u>	One year from January 2000 to January 2001

OBJECTIVES:

- To evaluate the available data and refine or construct a hydrological model of the Mekong, focussing on the Lower Mekong Basin and the Great Lake of Cambodia.
- To match river hydrodynamics and flooding area patterns to estimations and evaluations of aquatic resource availability and use.

This project will work on existing data, either already or in the process of being published. The MRC has agreed to provide access to available data and expertise in fisheries ecology. IWMI is in charge of hydrological modelling. ICLARM is responsible for the statistical analysis of biological data. This project is also open to collaborations with other institutions or NGOs in the region.

EXPECTED OUTPUTS

- Application of hydrological models of the Mekong river and its pattern of flooding in the four countries of the lower Mekong Basin
- Analysis of the functioning characteristics of the Great Lake of Cambodia and the Tonle Sap River
- An evaluation, using the physical data derived from modelling and knowledge of fish habitat and species, of the potential aquatic resource yield of the wetlands of these countries and the consequences for this resource of altered flow rates and flooding regimes.
- A workshop bringing together biophysical modelling and fisheries expertise of the region in the validation of the report and recommendations for future research activities.

CONDUCT OF THE PROJECT

The project was conducted through an inception or planning workshop at the Mekong River Secretariat in Phnom Penh at which data and task identification was agreed with partners. ICLARM and the MRC had previously (September 2000) developed a Letter of Agreement to cover the conduct of the project. ICLARM appointed Dr Eric Baran, a fisheries biologist, to its staff to undertake the project and IWMI identified Dr Geoff Kite, an hydrological modeller to undertake the major modelling work. The ICLARM project scientist made several trips to the MRCS and the region to work with MRC fisheries staff and other suppliers of fisheries data or literature in the region with analysis being carried out in Penang or with MRC and members of the Cambodian Fisheries Department in Phnom Penh. The IWMI project scientist demonstrated a first stage hydrological model using public domain data at the inception meeting and returned in mid-year to demonstrate model updates to MRC and regional staff and separately to ICLARM in Penang. Both scientists contributed to an MRC regional workshop on hydrological modelling to share the preliminary outcomes of the two aspects of the project. This substituted for the planned training to

be offered by IWMI in modelling to MRC and regional staff since other commitments did not render this feasible. A report on the Cambodian "dai" fishery has been separately drafted by MRC and ICLARM staff. In November, a final workshop was also held at the MRCS at which the results of the two aspects of the project (earlier circulated in draft) were provided to all participants. The workshop set an agreed plan of action for the review and publication of the results of the project. Seven copies of the CD of the hydrological model were also contributed to the MRC for their use and the use of partners. The fisheries report was revised iteratively between ICLARM and MRC staff until January 2001.

OUTCOMES AND CONSTRAINTS

These are detailed in the following section. The project relied on available data and can be counted a success where the anticipated data was available or could be estimated. Factors governing the availability of the fish resource at the basin level are multiple, and it is necessary to take into account not only the annual fluctuation in hydrology, but also the habitat differences and the fishing effort. The work done so far has allowed the identification of the critical parameters to be included in an integrated fishery management model. The modeling efforts show how the collection of data in the future can fulfill the original project aims. However, the limitation in available and overlapping time series for data of different kinds (especially between fisheries and hydrological modeling on the basis of available climatic data) has limited the statistical power of the associations between flooding and fish production so far developed. Further, the lack of comprehensive digital elevation models for regions bordering the Mekong river outside the area of the Tonle Sap, have limited the ability to convert the hydrological model's flow rates into accurate estimates of flooded area (and thence to productivity) more widely. This remains the goal of future work as the relationship between flow-flooding and fish productivity per habitat is a key parameter in raising knowledge of the dynamics of the Mekong wetlands into a policy statement relevant to the protection of the wetlands and food security for the local populations.

FUTURE STEPS

Because of the agreed importance of this issue ICLARM, IWMI and the MRC are therefore continuing the collaborative arrangement (with unspent project funds and core funds whilst the necessary additional support is sought) to: a) extend the analysis of the dai (bag net fishery) catch data up to and including the 2000 season, to extend the significance of the fisheries observations, b) seek a sufficiently accurate means of determining a digital elevation model for the LMBC to allow full simulation of the annual flooding, and, c) develop probability models for the flow/flooding/habitat/fisheries relationships which can account for the differing types of data required and the confidence intervals in accommodating "hard" and "soft" science parameters into single models. The completion of a), combined with the work already undertaken, will lead to results which ICLARM, the MRC Fisheries Program and IWMI will develop as a technical report and as refereed publications.

OUTPUTS

HYDROLOGICAL MODELLING

A thorough analysis of available data has pointed out information gaps. Alternative data sources in the region and on Internet have been identified and used.

A final model has been released in November 2000. This is the only recent hydrological model of the whole Mekong River Basin, including the Tonle Sap system.

This basin model simulates the hydrological cycle from precipitation to runoff. It divides a basin into sub-basins using topography from a digital elevation map. The sub-basins are further divided into areas of different land covers using data from a digital land cover classification. Each land cover class has a distinct set of parameters. The hydrological model simulates the vertical water balance, transforming the daily precipitation into evapotranspiration, water retention and runoff separately for each land cover within each sub-basin. The outputs of each vertical water balance include evaporation, transpiration, runoff, groundwater flow and changes in canopy storage, snowpack, soil moisture and ground water. It potentially includes the effects of reservoirs, regulators and water extractions.

This hydrological model encompassing the Tonle Sap River reversing flow has resulted in a daily estimate of the Mekong discharge (from China to the upper non-tidal delta) and of the Tonle Sap River discharge. For the purpose of fishery-environment relationships modelling, it has been supplemented by the integration of a Digital Elevation Model and a GIS-referenced map of land cover of the Tonle Sap Great Lake zone, resulting in an assessment of the surface of each land cover flooded each year in this zone.

This modelling started with the year 1994, due to the absence of production monitoring in Cambodia before this date. It stopped in December 1998 due to the absence of rainfall data in 1999 (Kite 2000 c).

There are two limitations however to this type of model.

- the first is that the operating rules for dams on the Mekong and its tributaries are not available from the Internet or from the Mekong River Commission. There are nine dams planned in the Lower Mekong mainstream. If the operating rules for these dams were available, they could be incorporated into the model. However, this lack may not be too critical since, in 1991, the total area of the tributary basins that fed existing reservoirs was less than five percent of the total Mekong Basin area, and accounted for less than seven percent of the total annual flow.
- the second limitation is that the available data are not always accurate or sufficient. For example, the 30 arc-second (approximately 1km) resolution USGS DEM had to be modified before the topographic analysis software could correctly define the river channel in the delta area and in the mountain gorge area of Yunnan Province. Second, it was found that the climate stations available on the Internet were not well distributed across the basin. This may result in less than ideal simulation of runoff from those areas which lack data. The climate data available on the Internet do not include radiation or sunshine hours.

Partners from the Mekong River Commission have been trained to the use of this model during two sessions (September and November 2000)

Publications and presentations:

- Kite G. 2000 A hydrological model of the Mekong Basin. IWMI, 2 CD-ROMs.
- Kite G. 2000 Developing a hydrological model for the Mekong Basin. Impacts of basin development on Fisheries productivity. IWMI working paper n° 2, 141 pp.
- Kite J. 2000 Application of the SLURP Basin model. Pp. 22-29 in Al-Soufi (Ed.) Proceedings of the Workshop on hydrologic and environmental modelling in Mekong Basin, Phnom Penh 11-12 September 2000. MRC publications, 382 p.
- Kite G. Modelling the Mekong River using data from the Internet. Submitted to Journal of Hydrology.
- Kite J. 2000 Application of the SLURP Basin model. Presentation at the Workshop on hydrologic and environmental modelling in Mekong Basin, Phnom Penh 11-12 September 2000. MRC publications, 382 p.
- Kite G. 2000 A hydrological model for the Mekong Basin. Presentation at the Mekong River Commission, Cambodia, 28-29/11/00

FISH RESOURCE, HYDROLOGY AND ENVIRONMENT

A conceptual model of the factors affecting the annual and prospective variation in fish production has been established early as a guide to the collection of different types of available fisheries data. The collection of data has involved many visits to the region, and this has been valuable in bringing together previously disparate or unanalysed data sets, and establishing cordial relations through joint data analysis with scientists of the region.

Analyses of these data have shown the relationship between fish production and flood level, surface of floodplains and extend of flooded forest.

However the study was constrained by the paucity of usable data, and also by the short period of time in common between available data sets (three years): the monitoring of the Cambodian fisheries started in 1995, and the hydrological model cannot be run after 1998 due to the absence of rainfall data after this year.

Analysis of a reliable set of fishery data showed a strong correlation between catches in Cambodia and water level the same year. The total production of the Tonle Sap system has been amounted to 230,000 tons a year. The productivity reaches 230 kg per hectare of floodplains, which is among the highest rates worldwide. However comparisons with former estimates, when done on a standardised basis, show that the production per fishing inhabitant is much lower than 60 years ago. This can be considered as a warning signal of high exploitation rate.

The annual yields of the dai fishery in Cambodia are apparently correlated with the extent of floodplains, as far as three years of data allow any correlation. A detailed analysis of the dai fishery and surfaces of different land covers shows a positive relationship between the fish catch and the extent of flooded forest, as well as that of low vegetation.

Amongst other ecological factors, migrations are of critical importance in the Mekong basin. Although this qualitative factor is not easily integrable into quantitative modelling, available data demonstrate that the density of fish migration (more than 30 tons per hour in the Tonle Sap River) make fish ways an unrealistic mitigation measure against the negative effects of dams.

Other variables potentially impacting the fish production have been identified, however available data do not allow quantitative assessment of these issues.

Publications and presentations

- Baran E. 2000 Fisheries, hydrology and environment in the Mekong Basin. Final project report, 60 p.
- Baran E., Coates D. 2000 Hydro-biological models for water management in the Mekong River. Pp. 328-334 in Al-Soufi (Ed.) Proceedings of the Workshop on hydrologic and environmental modelling in Mekong Basin, Phnom Penh 11-12 September 2000. MRC publications, 382 p.
- Baran E., Guttman H. Tropical subsistence fisheries: importance and undervaluation. In prep.
- Baran E. 2000 Fish and environmental diversity of West-African estuaries. NAGA Vol. 23, no. 3. Oct. 2000.
- Baran E. 2000 Hydro-biological models for water management in the Mekong River. Presentation at the Workshop on hydrologic and environmental modelling in Mekong Basin, Phnom Penh 11-12 September 2000.
- Baran E. 2000 Fisheries, hydrology and environment in the Mekong Basin. Presentation at the Mekong River Commission, Cambodia, 28-29/11/00
- Baran E., Kite G., Choo P.S., Gardiner P., Grant S., Ahmed M. Torell M., Child S.E. and Williams M.J. Science in the Mekong River Basin: poverty, fish and floods. Presentation at the CGIAR International Centres Week, Washington, 23-27 October 2000.

DATA COLLECTION AND COLLABORATIVE LINKS

To establish this new project with new partners and to seek out sources of relevant data amongst the range of holders, several trips were made to the region. This helped establish relationships with biologists of experience in the Mekong region, to invite them to provide data and relevant information, to contact fishery biologists outside the MRC when they had interesting data sets, and to work in collaboration with all for analyses. These missions are listed below:

To establish this project with new partners and to seek out sources of relevant data amongst the range of holders, several trips were made to the region. These missions are listed below:

1) Inception meeting (20-27 / 1 / 2000)

Presentation of the project to all partners; preliminary contacts and works in Phnom Penh.

2) Mission from 19/ 3 to 7/4/00 in Cambodia, Laos and Thailand

Cambodia:

- MRC Secretariat: hydrological and climatic data sets; bibliography
- MRC Management of the Cambodian Freshwater Capture Fisheries project (CCF): Mobile gears data set
- GIS and RS Application Center (GRAC): Tonle Sap GIS data on land cover and Digital Elevation Model

Laos:

MRC Assessment of Mekong Fisheries project (AMF): bibliography
GAPE (*J. Baird*): Southern Laos fisheries monitoring data set

Thailand:

MRC Assessment of Mekong Fisheries project (AMF): Mekong mainstream migrations data set.
T. Warren: reports and species life-history traits data set.

3) Mission from 17/4 to 22/4/00 in Bangkok

Asian Institute of Technology (*H. Guttman*): Contacts and literature gathering

4) Mission from 29/5 to 5/6 in Phnom Penh

MRC Management of the Cambodian Freshwater Capture Fisheries project (CCF): Dai fishery data set; two years of length frequency data for some species; bibliography

5) Mission from 11 to 16/9/00 in Phnom Penh

Presentation at the MRC "Workshop on hydrologic and environmental modelling in the Mekong Basin"; works at the MFCFP; work at the CCF.

6) Mission from 29 to 31/10/00 in Saigon

Presentation of works and discussions at R.I.A. n° II; collection of bibliographic data.

1) Final workshop meeting (28-29 / 11 / 2000)

Presentation of the project to all partners; preliminary contacts and works in Phnom Penh.

Annex I: COLLABORATIONS

International Water Management Institute (IWMI)

P.O. Box 2075, Colombo, SRI LANKA

Mekong River Commission Secretariat, Fisheries Unit

Mekong River Commission Secretariat, Hydrology Unit

Mekong River Commission Secretariat, Environment Unit

364, Preah Monivong Blvd., P.O. Box 1112, Phnom Penh, CAMBODIA

Management of the Freshwater Capture Fisheries of Cambodia Project

Department of Fisheries. 186 Norodom Boulevard, P.O.Box 582 Phnom Penh, CAMBODIA.

Assessment of Mekong Fisheries Project

Laos Aquatic Resources Research Centre (LARReC). Ban Kunta, Muang Sikhotabong. P.O.Box 7980 Vientiane, LAO PDR

Offices in

- 1) Udon Thani Inland Fisheries Development Center, Thailand,
- 2) Research Institute for Aquaculture no 2 (RIA2), Ho Chi Minh City, Vietnam;
- 3) Department of Fisheries, Phnom Penh, Cambodia.

Global Association for People and the Environment (GAPE)

20-3008 Quadra street, Victoria B.C., CANADA V8T 4G3. Fieldwork in Laos.

AIT Aqua Outreach Programme

Asian Institute of Technology P.O. Box 4 Klong Luang 12120, Pathumthani, THAILAND

GIS and RS Application Center (GRAC)

31, Street 358, Sangkat Tolsvayprey I, Chamkarmon, Phnom Penh, CAMBODIA

Terry J. WARREN

P.O. box 44 Muang Nong Khai 43 000 THAILAND

Research Institute for Aquaculture no II

116 Nguyen Dinh Chiu St., D. 1, Ho Chi Minh City, VIETNAM

Annex II: PARTICIPANTS IN THE INCEPTION MEETING
(Phnom Penh, 20-21 /01/2000)

Name	Position/organisation/country
Peter Gardiner	ICLARM
Eric Baran	ICLARM
Geoff Kite	IWMI
Hans Guttman	AIT
Magnus Torell	ICLARM
Mahfuzzudin Ahmed	ICLARM
Dr. Hao	Research Institute of Aquaculture 2, Vietnam
Dr Chumnarn	Department of Fisheries, Thailand
Nao Thouk	Department of Fisheries, Cambodia
David Coates	Chief Technical Adviser, Assessment Component, Lao PDR (MRC)
Niek van Zalinge	Chief Technical adviser, Cambodian Component, Cambodia (MRC)
Theo Visser	Technical Adviser, Assessment Component, Thailand (MRC)
Niklas Mattson	Technical Adviser, Reservoir Component, Lao PDR (MRC)
Teng Peng Saeng	GIS & RS Technical Director, Min. Public Works and Transportation, Cambodia
Jorgen Jensen	MRCS, Chief of Fisheries Unit
Ngyuen Van Trong	MRCS, Project Officer, Fisheries Unit
Merete Villum Pedersen	MRCS, JPO, Fisheries Unit
Chaiyouth Sukshri	MRCS, Water Utilisation Programme team leader
Sok Saing Im	MRCS, Chief of Hydrology Unit
Choochart Proprasert	MRCS, Officer in Charge of Technical Support Unit
Jean Lacoursiere	MRCS, Chief of Environment Unit
Lieven Gerinck	MRCS, Chief of Navigation Unit
R. W. Al-Soufi	MRCS, Senior Environmental Adviser, Planning Unit

Annex II: PARTICIPANTS IN THE FINAL WORKSHOP
(Phnom Penh, 28-29 /11/2000)

Name	Position/organisation/country
Peter Gardiner	ICLARM
Eric Baran	ICLARM
Magnus Torell	ICLARM
Geoff Kite	IWMI
Ian Makin	IWMI
Dr. Hao	RIA II, Vietnam
Dr Chumnarn	Department of Fisheries, Thailand
So Nam	Department of Fisheries, Cambodia
David Coates	CTA, AMF, MRC Laos
Anders Poulsen	AMF, MRC Laos
Kavi Pouthavong	AMF, LARReC Laos
Niek van Zalinge	CTA, CCF, MRC Cambodia
Ngor Pen Bun	CCF, DoF Cambodia
Theo Visser	AMF, MRC Thailand
Jorgen Jensen	MRCS, Chief of Fisheries Unit
Ngyuen Van Trong	MRCS, Project Officer, Fisheries Unit
Vimol Hou	MRCS, Project Officer, Fisheries Unit
Chaiyouth Sukshri	MRCS, Water Utilisation Programme team leader
Sok Saing Im	MRCS, Chief of Hydrology Unit
Choochart Propprasert	MRCS, Officer in Charge of Technical Support Unit
Hans Friedrich	IUCN Thailand

AMF: Assessment of Mekong Fisheries project (MRC Vientiane, Laos)

CCF: Management of the Cambodian Freshwater Capture Fisheries project (MRC Phnom Penh, Cambodia)

ICLARM: the World Fish Center (Penang, Malaysia)

IUCN: the World Conservation Union

IWMI: International Water Management Institute (Colombo, Sri Lanka)

LARReC: Living Aquatic Resources Research Center (Vientiane, Laos)

MRC: Mekong River Commission (Phnom Penh, Cambodia)

MRCS: Mekong River Commission Secretariat (Phnom Penh, Cambodia)

RIA II: Research Institute for Aquaculture no II (Ho Chi Minh City, Vietnam)

Annex III: ICLARM - MRC L.O.A.

LETTER OF AGREEMENT

**between the
International Center for Living Aquatic Resources Management (ICLARM)
and the Mekong River Commission Secretariat (MRCS)**

Context: This Letter of Agreement (LoA) relates to the collaborative project "Modelling the Management of Water Flows to Optimise Aquatic Resource Production in the Mekong Basin". It is formulated under the general Partnership Agreement between (ICLARM) and the Fisheries Unit of the MRCS of the same date. It has been developed further to the concept note: "Proposal for collaborative work between the MRC, ICLARM and partners in modelling the extent of annual flooding of the Mekong River to determine the extent of fish habitat and the subsequent productivity of wetland fisheries" of the 19th of September 1999.

The starting date: (as per the date of signature of the LoA)

Duration: Anticipated to be 12 months.

Cooperation: Between the Fisheries Unit of the MRC and its internal and external partners, and ICLARM, including hydrological modelling expertise of the International Water Management Institute (IWMI).

Objectives:

1. To evaluate the available data and to refine or construct a hydrological model of the water resources of the Mekong, focusing on the Lower Mekong Basin Countries and the Great Lake of Cambodia
2. To predict the extent (habitats, timing, duration and depth) of inundation/flooding of the Lower Mekong River Basin floodplains and associated habitats
3. To match the flooding patterns to estimations and evaluations of aquatic resource availability and use by habitats

Outputs:

The project is anticipated to develop:

- A hydrological model of the Mekong river and its pattern of flooding, including the extent of inundation/flooding by areas/habitats (timing, duration, depth), in the four countries of the lower Mekong Basin.
- A more detailed analysis within the model of the hydrological characteristics of the Great Lake of Cambodia and the Tonle Sap River including the annual reversal of flow and flooding cycles.
- A report providing an evaluation of the potential aquatic resource yield of the wetlands of these countries, using the physical data derived from the hydrological modelling and the habitat based fisheries information. In addition, the report will include an analysis of the consequences for this resource production of altered flooding/inundation regimes, and of downstream effects of already existing water management schemes.
- Staff of the MRC trained in operation and future refinement of the SLURP hydrological model.
- A workshop bringing together biophysical modelling and fisheries expertise of the region in the validation of the report and recommendations for future activities.

Activities:

- A critical review of available hydrological and related models applied to the Mekong.
- Identification of available data for the modelling approach to be utilised.
- Model development and review (especially with respect to the flow reversals affecting the Tonle Sap/Great Lake system).
- Training of two technical staff of the MRC at IWMI in the SLURP hydrological modelling technique and aspects of GIS and the use of remotely sensed images for modelling.

- Identification and consolidation of available data on fish species and fisheries production/catch by habitat/area.
- Fitting of the habitat-based fisheries data to the hydrological model of flooded/inundated habitats.
- Review of outputs and inferences by the MRC, ICLARM and partners.
- Publication of model and reports.

Tentative Time Schedule:

January 2000: Project Initiation Workshop, MRCS, Phnom Penh, Cambodia. Demonstration of draft model using Internet data.

January/February: Follow up contacts between ICLARM, IWMI and MRC staff on data identification and collection.

February to June: Stage II hydrological model construction and collection and analysis of existing fisheries data.

March/April: Visit of MRC staff to IWMI, Colombo, Sri Lanka to assist in model development and for training.

End June: Mid year report to donor (the Technical Advisory Committee of the CGIAR)

July/September: Adjustments to model and overlay of habitat-based fisheries data.

September: Draft model and potential fisheries data overlay for inclusion sent as a report to partners.

October: Review of model and fisheries data by all partners.

November: Review workshop of outputs at the MRCS, Phnom Penh with all partners (likely to be on or after the 14th of November for two to three days).

December: Revision of outputs as necessary and development of model and written technical report for publication. Submission of model, final technical and expenditure report to donor.

January 2001: Publication of report, preparation review and submission of agreed scientific papers arising from the project.

Responsible persons and inputs: ICLARM will provide project coordination (through Dr Peter Gardiner, DDG-Programs) and has principal responsibility to the donor. ICLARM will also provide the services of Dr Eric Baran, Research Scientist in the Biodiversity and Genetic Resources Research Program to coordinate the fisheries data collection and analysis aspects for the project. Dr Geoff Kite, Basin Planner/Hydrologist of the Research Division of IWMI will have principal responsibility for the coordination of data collection and the development of the hydrological model.

Mr Jorgen Jensen, Head of the Fisheries Unit, MRCS will coordinate contributions from the MRCS related to staff, data etc. Other units within the MRCS will contribute: The Hydrological Unit and Technical Support Unit will provide available data and staff for training, and participate in project-related review and analysis. The Environment Unit will contribute with wetland data and information e.g. classification systems, as well as participate in project-related review and analysis. Other Units may contribute as well.

The staff time and travel of ICLARM and IWMI personnel will be met in whole or in part from project finances which will also cover the costs of data gathering, training of MRC staff, non-MRC participants' costs at the two planned workshops and contribute to publication costs. Additional staff time from the participating institutes will be met from matching contributions from the individual institutes.

Data: The project will largely focus on extant, published data. In cases where the MRCS may hold data useful for the hydrological model construction and/or for evaluation of Mekong flood plain habitats and fisheries, written application will be made through the head of the Fisheries Unit, MRC. In principle, all data will be for public use. However, in cases where data is provided by the MRCS from unpublished or unfinished studies, the data will be provided on the understanding that it is employed for the use of the current project only, and not for other uses.

Following review and agreement from the partners it is anticipated that the tangible products will be published. The model and the data utilised in its construction will be lodged with the MRC and other partners at the end of the project.

Signed by Mr Joern Kristensen
Chief Executive Officer
On behalf of the MRCS
Dated:

Signed by Dr Meryl Williams
Director General
On behalf of ICLARM
Dated:

INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT, INC. (ICLARM)

GRANT TITLE	Optimising The Use Of Water For Food Security: Sustaining The Production Of Living Aquatic Resources
PROGRAM	BGRP
PROJECT LEADER	Dr Peter R. Gardiner
DONOR	TAC/CGIAR
DURATION	January to December 2000
TOTAL GRANT	US\$134,980

**FINANCIAL REPORT
AS OF DECEMBER 31, 2000
IN US\$**

	BUDGET YEAR 1	TOTAL EXPENSES AS OF DECEMBER 31	BALANCE
Personnel	70,000.00	82,494.37	(12,494.37)
Supplies & Services	2,000.00	3,396.45	(1,396.45)
Travel	5,000.00	9,779.10	(4,779.10)
Publications	5,000.00	18.73	4,981.27
Facilitation, Coordination Workshops	15,000.00	1,925.54	13,074.46
Overhead(34.4%)	32,980.00	33,579.28	(599.28)
Contract research	5,000.00	0.00	5,000.00
Grand Total	134,980.00	131,193.47	3,786.53

CERTIFIED BY:

APPROVED BY:

EDWARD SAYEGH
Associate Director General
Corporate Services

DR STEWART GRANT
Program Leader
BGRP

INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT, INC. (ICLARM)

GRANT TITLE	Optimising The Use Of Water For Food Security: Sustaining The Production Of Living Aquatic Resources
PROGRAM	BGRP
PROJECT LEADER	Dr Peter R. Gardiner
DONOR	TAC/CGIAR
DURATION	January to December 2000
CONTRACT PRICE	US\$134,980

STATEMENT OF FUND STATUS
For the Period January 1,2000 - December 31,2000
IN US\$

Funds Received	OR# 9540 dated July 23,1999	170,000.00
Less Expenses Incurred:		
Personnel		82,494.37
Supplies & Services		3,396.45
Travel		9,779.10
Publications		18.73
Facilitation, Coordination Workshops		1,925.54
Overhead(34.4%)		33,579.28
Contract research		0.00
		<hr/> 131,193.47
Fund Balance as of December 31, 2000		<hr/> <hr/> 38,806.53

CERTIFIED BY:

EDWARD SAYEGH
Associate Director General
Corporate Services

APPROVED BY:

DR STEWART GRANT
Program Leader
BGRP