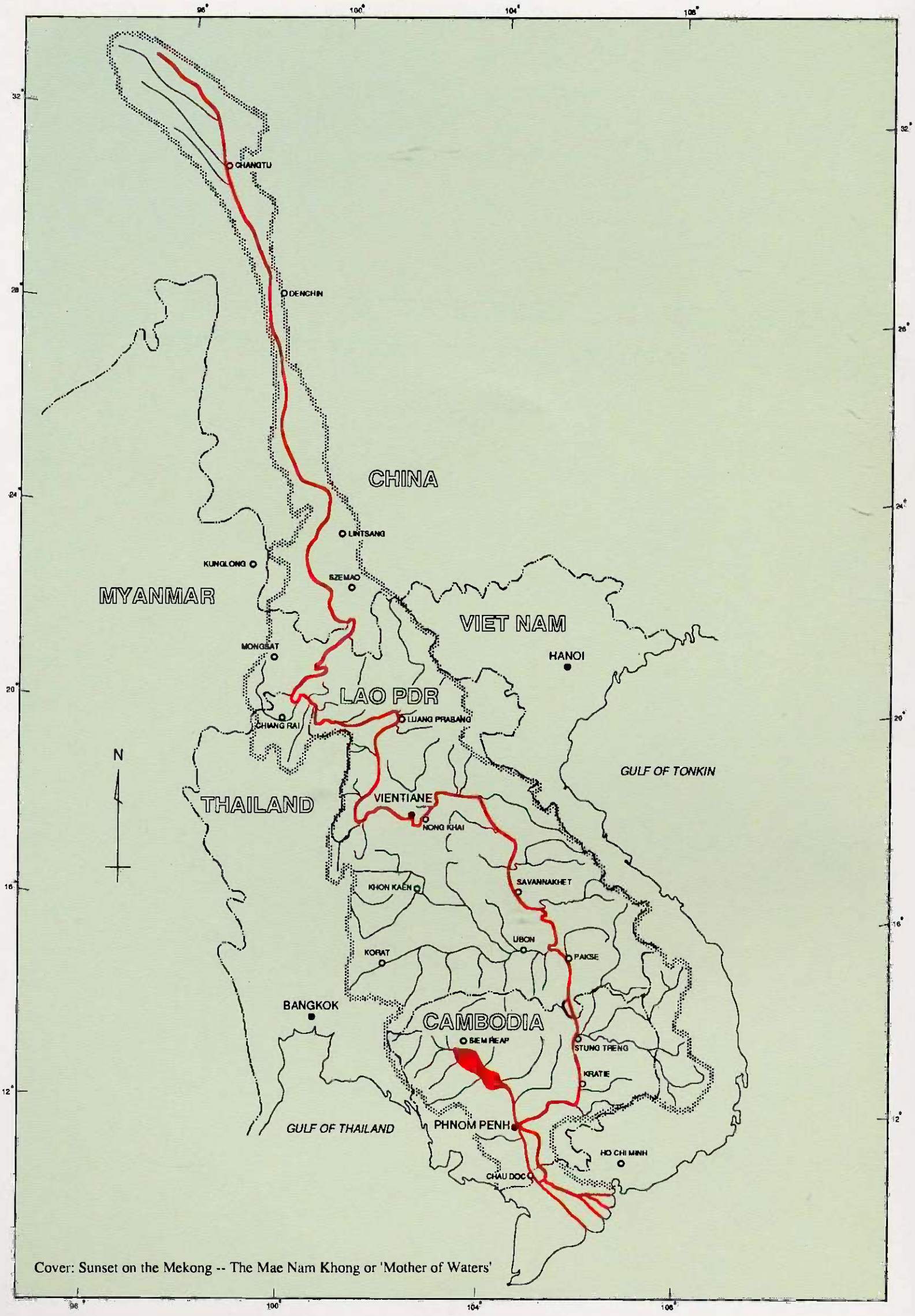
PREPARING FOR NEW CHALLENGES

THE INTERIM MEKONG COMMITTEE

Annual Report 1991

Review of Activities and Initiatives



Cover: Sunset on the Mekong -- The Mae Nam Khong or 'Mother of Waters'

LOCATION MAP OF THE MEKONG BASIN

Some 475,000 million cubic metres of water annually flows through the Lower Mekong Basin into the South China Sea. If used to generate power, this water could supply 500,000 Gwh electricity annually, enough to electrify all the Mekong riparian countries for decades -- or 25 cities the size of Bangkok. Some six million hectares of arable land might be irrigated, raising agricultural production. Such development would also include flood control, fisheries and navigation improvements.

The Interim Mekong Committee's Role and Activities

Our full name is 'The Interim Committee for Coordination of Investigations of the Lower Mekong Basin.' We commonly use Interim Mekong Committee or IMC.

The Mekong Committee is an intergovernmental regional organization established by Cambodia, Laos, Thailand and the Republic of Viet Nam in September 1957. In the mid 1970s Cambodia ceased participation in the Mekong Committee. Its absence led to the formation of the Interim Mekong Committee (IMC) in 1978. The IMC is a structure for cooperation and coordination in the use and development of the water resources of the Lower Mekong Basin. Our purpose is to work with member countries for maximum social and economic benefit by developing the Mekong's water resources for agriculture, energy, fisheries, flood control and navigation. Support for IMC activities, both financial and technical, comes from the member countries themselves and international sources, including governments and multilateral agencies.

The Mekong Secretariat oversees implementation of policies and projects with professional staff from member countries and international experts. The Secretariat also serves as a repository of physical data and studies conducted for the development of the Lower Mekong Basin. The Mekong Secretariat's extensive programme areas include:

o **Policy and Planning** dealing with strategic studies and basinwide planning

o **Technical Support** including data collection and information systems, remote sensing, mapping and environment

o **Resources Development** comprising water resources and hydropower, agriculture, irrigation, watershed and forestry, fisheries, riverworks and transport, and human resources.

Annual Report 1991

The purpose of this document is to present a concise review of Interim Mekong Committee (IMC) activities during 1991. Readers will gain an understanding of the IMC's organization, resources, activities and policies. This is an overview, with highlights of several IMC projects described. Further information about specific matters not in this text or its annexes is available by contacting the Mekong Secretariat.

Membership

The Interim Mekong Committee has three member countries:

o The Lao People's Democratic Republic
o The Kingdom of Thailand
o The Socialist Republic of Viet Nam

Each member country appoints a representative to the Interim Mekong Committee:

The Lao People's Democratic Republic
H.E. Dr Kithong Vongxay

Vice Minister
Ministry of External Economic Relations
Chairman, Lao National Mekong Committee
Vientiane, Laos
IMC 1991 Chairman

The Kingdom of Thailand
Dr Prathes Sutabutr

Director-General
Department of Energy Affairs
Ministry of Science, Technology and Environment
Member and Secretary
Thai National Mekong Committee
Bangkok, Thailand

The Socialist Republic of Viet Nam
H.E. Mr Phan Si Ky

Vice Minister
Ministry of Water Resources
Vice-Chairman
Vietnamese National Mekong Committee
Hanoi, Viet Nam

The Supreme National Council of Cambodia. Representatives of the Cambodian Supreme National Council (SNC) who participated in meetings with the IMC and the Mekong Secretariat in September and November 1991 are noted on page 6 under **'Cambodia: A New Beginning for Regional Cooperation.'**

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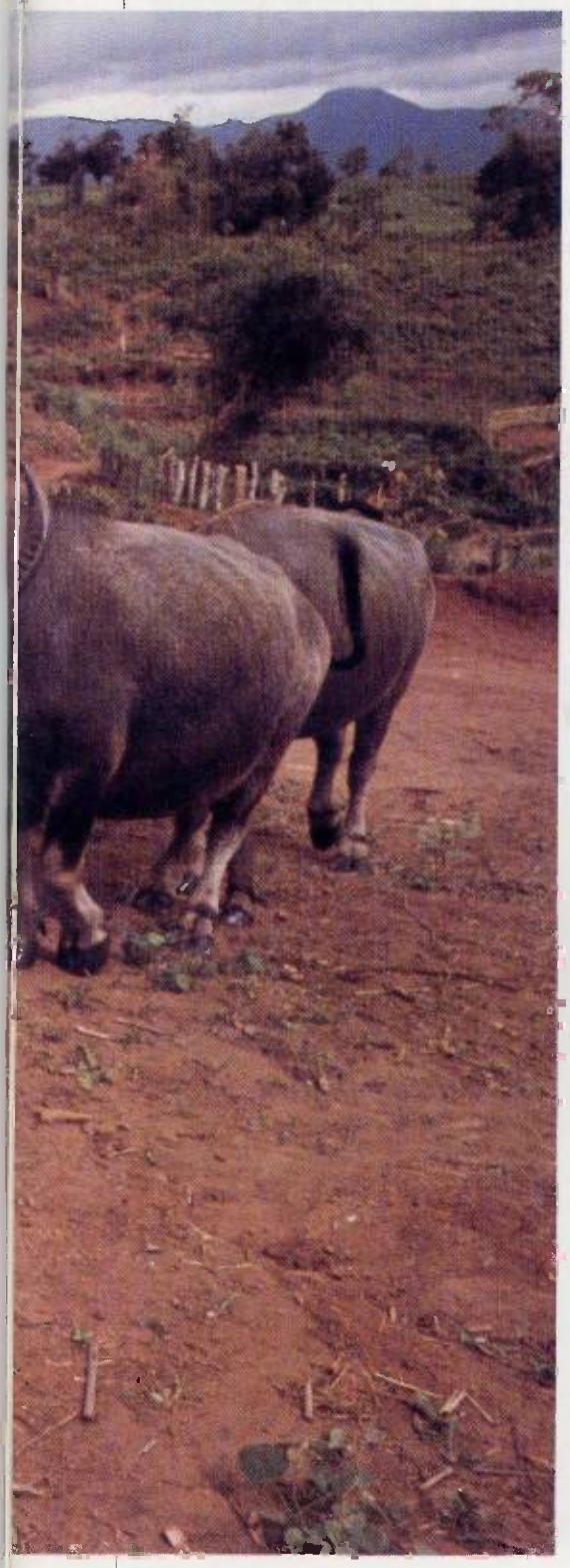
A Year of Accomplishment and Expectation

The year 1991 was filled with significant activity for the Interim Mekong Committee and the Mekong Secretariat. It was a year of accomplishment and expectation as we prepared for the re-emergence of the original Mekong Committee with all four members fully participating.

We especially commend the foresight and courage of the three members of the Interim Mekong Committee, who met in Luang Prabang for the 33rd session in February 1991 and formulated responses to the challenge of Cambodia's return. Following this action the IMC further demonstrated its leadership regarding Cambodia by investing staff time and reserve funds in preparing for Cambodia's return. One of the first acts of Cambodia's Supreme National Council on 24 June was to seek re-instatement of its position as a

member of the Mekong Committee. We are especially indebted to members of our donor community -- including Australia, Canada, France, Japan, the Netherlands, Sweden, the European Community and the United Nations Development Programme -- that provided financial aid for our startup activities including project formulation missions for 20 project proposals -- 16 new projects and four representing the Cambodian segment of ongoing projects.

Highlights of our 1991 accomplishments include:



-- **Flood Warnings.** The Mekong Secretariat provided daily flood forecasting for 15 locations along the Mekong River. We warned Vientiane, Nong Khai, Mukdahan and Pakse. During the flood several discharge measurements in areas along the Cambodia-Viet Nam border were conducted for the first time. In Laos the Secretariat coordinated use of European Community-donated sandbags, while in Cambodia, the Secretariat supplied sandbags for dike reinforcement. These modest efforts to provide equipment and materials were begun earlier than any other donor. Despite the Mekong Delta in Cambodia and Viet Nam experiencing one of the worst floods on record -- with 42,000 square km under water ---- few lives were lost and material damage was limited. The Secretariat later procured Bailey bridging units for critically damaged sections of highways in Cambodia with European Community assistance.

-- **Resettlement Aid.** Some 370,000 Cambodian refugees are encamped near the Cambodian-Thai border. The Mekong Secretariat supplied critical data on land availability and suitability to the United Nations High Commission for Refugees (UNHCR) to help in the resettlement effort. A reconnaissance land use map of Cambodia for macro planning purposes using existing remote sensing data and a more detailed map of potential arable land in western Cambodia were prepared in support of the United Nations High Commission for Refugees resettlement programme using French SPOT images. To support various project activities in Cambodia, a programme of aerial photography will be implemented in 1992.

-- **Navigation Development.** The most important reaches of the Mekong along the Lao-Thai border and the two main branches in the Delta in Viet Nam have new hydrographic data from the most thorough survey operation since 1971. Additionally, a strategic study on the role of the Mekong River in regional and sub-regional transport development was completed.

-- **Lao-Thai Bridge.** 1991 saw the laying of the foundation stone of the Lao-Thai-Australian Mitraphab (Friendship) bridge across the Mekong River. The Mekong Secretariat initiated studies and prepared preliminary engineering designs for this bridge in the late 1960s. The project is the first of a number of transboundary projects that uses studies undertaken by the IMC.

-- **China.** Another trend for improved cooperation in the region is the growing intention of increased river trade between the People's Republic of China and the Lao People's Democratic Republic. China, among some others, participated for the first time in the 33rd IMC Plenary Session at Luang Prabang in February 1991, as an observer. The Secretariat's mission to China in November 1991, both in Beijing and Yunnan province, prepared for future cooperation.

-- **New Donors.** 1991 also gave us the pleasure of working with Canada and Denmark and preparing for collaboration with others, including Austria and the Republic of Korea.

-- **Catalytic Role.** This year confirmed that the Committee has a unique mission in providing a framework for regional cooperation reinforced by strong technical capability. For example, the Mekong Secretariat was associated with the World Bank on components of the Vietnamese Mekong Delta Master Plan, the first draft of which was completed in November 1991.

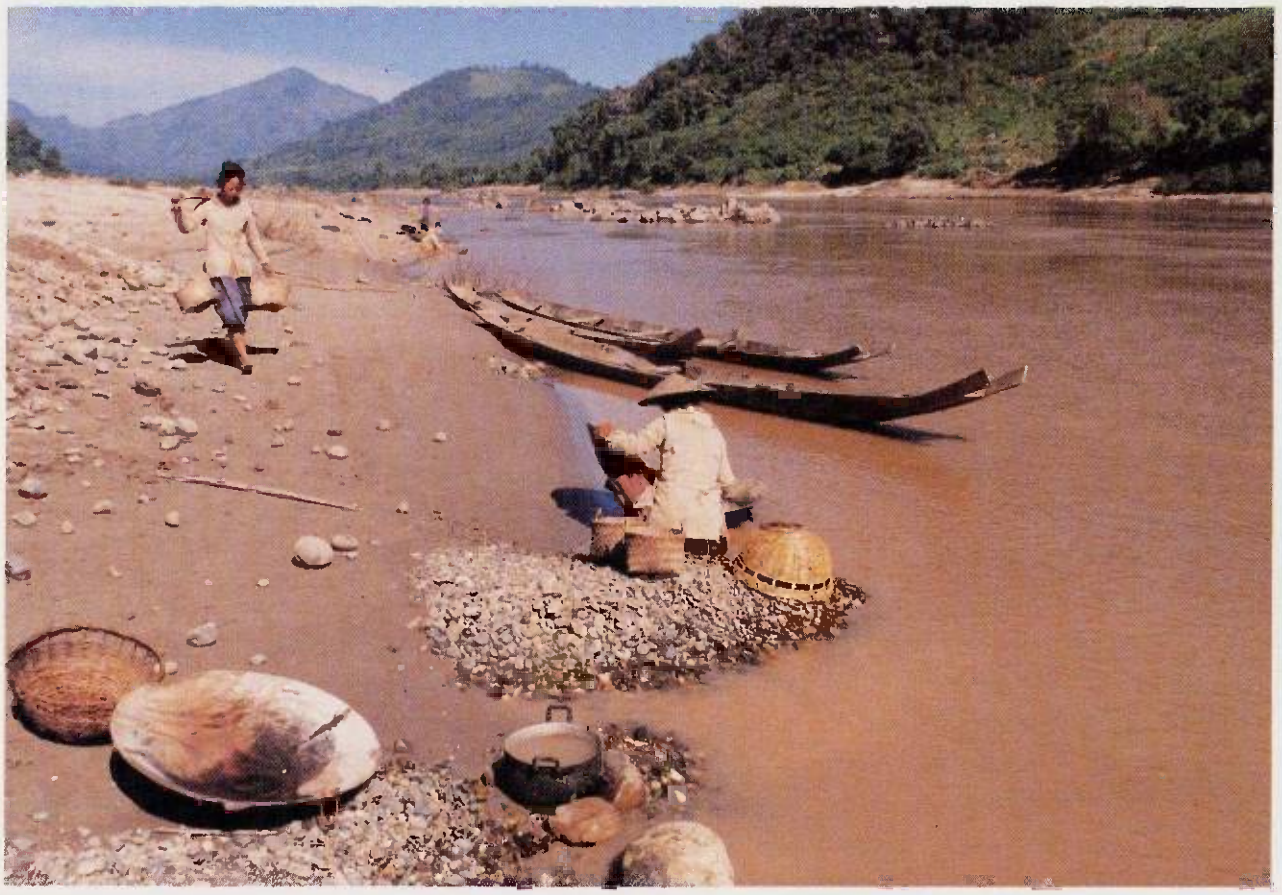
-- **Building for the Future.** The IMC 1992 Work Programme includes 28 new projects selected from among 38 proposed with combined budgets of $142 million.

-- **Building a Responsive Secretariat.** To make the Mekong Secretariat more responsive to the needs of its members, we have two new components -- a Policy and Planning Division and a Human Resources Development Unit. The Mekong Secretariat offers riparians (nationals of member countries) -- whether seconded, direct-hire staff, or government employees -- opportunities to enhance their technical skills. At year's end, some 60 per cent of Secretariat professional and technical staff were from the riparian countries, a percentage to be maintained for maximum benefit of transferring technology and skill throughout our staff and those member country organizations to which we relate. In 1991 the Secretariat organized and conducted 57 workshops, seminars or study programmes for 53 Cambodians, 278 Lao, 321 Thais, and 472 Vietnamese. The Secretariat continued to build its management team. The reorganization of late 1990-91 was completed. The decentralization of decision making was in process and early in 1992 we will assess the results. Areas where further change is expected are the Policy and Planning Division and the Environmental Unit.

-- **Restructuring the IMC.** Two consultants were engaged by the Mekong Secretariat and one by the Swedish International Development Agency to advise the IMC on how to meet longer term financing needs of the Mekong Secretariat; the future role of National Mekong Committees; and most important of all, the future role and responsibilities of the Mekong Committee itself. Preliminary results will be presented to the next session. The Mekong Secretariat will combine their recommendations into one position paper intended to result in clearer direction from members on how they wish operations to be conducted.

-- **Constraints.** Despite overall positive developments, we had some constraints, the most notable being the hard but necessary decision to implement a new salary structure for riparian staff. Due to financial difficulties, the new salary scale, however, was not up to the level expected by all staff. We have a small operating deficit for 1991, a reversal of the preceeding years, when the Mekong Secretariat built up its reserves. Our deficit is partly due to 1991 startup activities in Cambodia and the fact that no income may be realized from these preparations for another six to 12 months. Overall we experienced downward pressure on several of our income sources and upward pressure on our expenditures.

-- **Challenges.** In late 1991, efforts to formally admit Cambodia, thereby reconstituting the Mekong Committee, were stalled. The Mekong Secretariat believes that reactivation of the Mekong Committee will soon become a reality and the knowledge that management of the Mekong Secretariat will continue to serve the fundamental principles which govern the objectives and aspirations of the IMC members.



-- **Special Thanks.** Our special thanks go to our members for an exciting and constructive year of cooperation and to our donors for their continued support. It is the work of our loyal staff which assures that this unique inter-governmental organization can respond to whatever challenges arise in the months and years ahead.

Programme activities

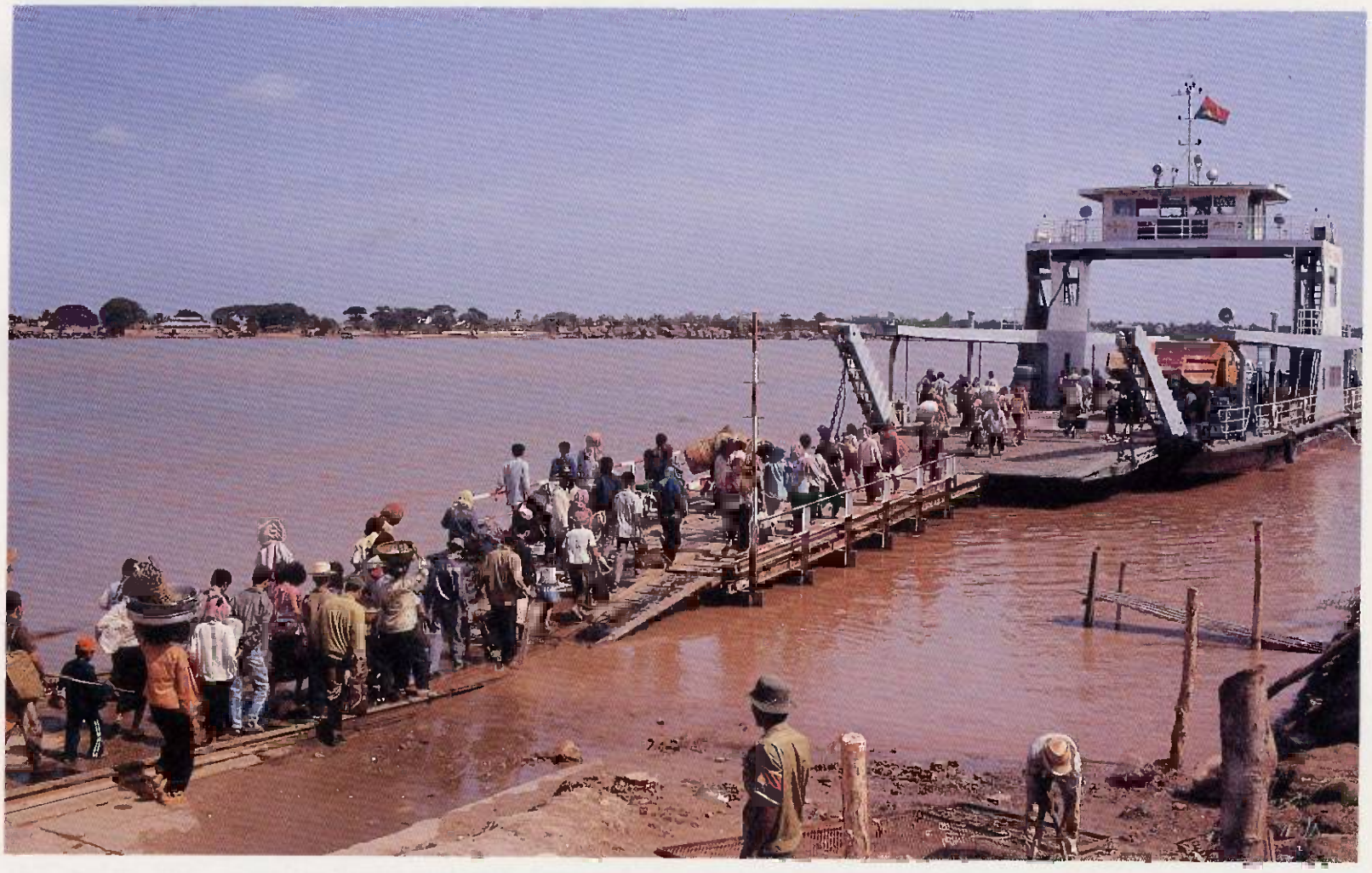
The accompanying table demonstrates a significant shift from 1985 to 1991 toward basinwide rather than national projects, ongoing and proposed (57 per cent of projects; 49 per cent of funding). This reflects our mandate as a regional entity. We primarily focus on multilateral activities. A list of ongoing projects appears as Annex II.

Ongoing projects

Year	Basin–wide		National		Total
	No.	%	No.	%	No.
1985	37	33	75	67	112
1991	45	57	34	43	79

Funding requirements for ongoing and proposed projects

	US$ M	%	US$ M	%	US$ M
1985	30.0	9	287.4	91	317.4
1991	52.5	49	55.3	51	107.8



Highlights of Events and Activities

Meetings

February	-- 33rd Session (plenary), Interim Mekong Committee, Luang Prabang, Laos (4-7 February)
March	-- 47th ESCAP Session, Seoul, Republic of Korea (1-10 April). H.E. Dr Kithong Vongxay, Lao IMC Member and IMC 1991 Chairman, presented IMC Annual Report
August	-- IMC Special session, Bangkok (30 August) -- Programming meeting: Supreme National Council of Cambodia (SNC) and Mekong Secretariat, Bangkok (31 August)
September	-- Private meeting: IMC and SNC, Bangkok (2 September) -- Mekong Priority Functions, first meeting: Senior Riparian Consultants Team, Bangkok (30 September-4 October)
October	-- Executive Agent meets NGO People's Forum, Bangkok (14 October) -- Pa Mong Technical Seminar, Bangkok (31 October - 1 November)
November	-- Private Meeting: IMC and SNC, Bangkok (4-7 November)

Key Personnel Changes

March	-- Mr Saykham succeeds Mr Somphong Mongkhonvilay as Assistant Executive Agent of Mekong Secretariat for Laos (15 March)
April	-- H.E. Mr Phan Si Ky succeeds H.E. Mr Dinh Gia Khanh as Member for Viet Nam (29 April)
October	-- H.E. Dr Prathes Sutabutr succeeds H.E. Mr Prapath Premmani as Member for Thailand (1 October)
December	-- Dr Prachoom Chomchai, Assistant Executive Agent of Mekong Secretariat for Thailand departs (31 December)

Other Notable Happenings

May	-- Programming reviews with donors: DANIDA - Denmark (1 May), SIDA - Sweden (1-3 May), FINNIDA - Finland (6-11 May), UNDP (14 May-6 June), and European Community (27 May)
August	-- Flood peaks at 11.77 m at Vientiane. 11.5 m is a flood alarm. (19 August)
September	-- 34th anniversary exhibition on the Mekong Committee, Vientiane (17-25 September)
October	-- Mekong Secretariat-Asian Development Bank Cambodia Review Mission debriefing (17 October)
November	-- Foundation ceremony for Lao-Thai Mittaphab Bridge, first permanent structure across Lower Mekong, Thanaleng, Laos-Nong Khai, Thailand (24 November) -- Mekong Secretariat mission to People's Republic of China (25-30 November)

Projects completed

April	-- Seed Multiplication Farms project, Vientiane (20 April), funded by European Community
May	-- Ban Houei Sai Port, Laos (1 May), funded by Australia
December	-- Yasothon Fish Seed Production Center, Thailand (20 December), funded by the Netherlands

Projects initiated. See Annex I.

CAMBODIA: A New Beginning for Regional Cooperation

In 1957, acting with hope, inspiration and pragmatism, Cambodia, Laos, Thailand and Viet Nam joined together to cooperate in an integrated development programme centered on the Mekong River -- their common resource. Cooperation among Mekong Committee members continued until 1975 when Cambodia ceased participation in the Mekong Committee. Cambodia's absence led to Laos, Thailand and Viet Nam reviewing their options and forming the Interim Mekong Committee (IMC) in 1978. The IMC retained the aims of the original Mekong Committee and continued its activities, although with a reduced programme, believing that one day Cambodia would rejoin the Mekong Committee and resume full participation.

The Interim Mekong Committee at its 33rd Session in Luang Prabang in February 1991 ,directed the Mekong Secretariat to prepare the way for IMC involvement in Cambodian development. On 24 June, during historic peace negotiations held in Pattaya, Thailand, the Supreme National Council of Cambodia (SNC), under the Chairmanship of HRH Prince Norodom Sihanouk, requested members of the Interim Mekong Committee to reactivate the Mekong Committee. The members welcomed this request and pledged to work toward its implementation. The SNC then sent two missions* to the Secretariat, the first from 31 August to 2 September, and the second from 4-7 November. Both visits involved private meetings of the IMC and the SNC, as well as Secretariat staff. Approval of 16 Cambodian projects in eight fields -- human resources development, hydrology, surveying and mapping, environmental, hydropower and water resources, irrigation, fisheries, and river works and transport -- plus four regional projects with Cambodian components was given by the SNC at the latter meeting. Donors -- including Australia, Canada, France, Japan, the Netherlands, Sweden, the European Community and the United Nations Development Programme -- as well as non-governmental organizations (particularly Australian Catholic Relief) were then able to help the IMC help Cambodia.

In an unusual example of creative emergency funding, the IMC aided Cambodia's Ministry of Agriculture maintain a critical hydrometerology programme, enabling operation of the weather station at Phnom Penh's Pochentong International Airport by channeling funds to former Soviet personnel whose support had ceased due to institutional changes in their homeland. Production of a Reconnaissance Landuse Map of Cambodia -- distributed to international organizations and all Cambodian factions -- was expected to assist in the resettlement of refugees.

* SNC delegates met with IMC members and Mekong Secretariat on:

31 August-2 September: H.E. Mr Ieng Mouly, SNC Member, Chief of Delegation, KPNLF; H.E. Ambassador Ing Kieth, Secretary-General, FUNCINPEC; H.E. Mr Kong Som Ol, Chairman, National Mekong Committee, SOC; Mr Sin Niny, Permanent Secretary, National Mekong Committee, SOC, and observing, Mr Penn Thol, Ambassador and Chief of Cabinet of the President, KPNLF.

4-7 November: H.E. Mr Hor Namhong, Minister of Foreign Affairs, SOC, SNC Member, Chief of Delegation; H.E. Mr So Khun, SOC; H.E. Ambassador Ing Kieth, FUNCINPEC; Mr Sin Niny, SOC; Mr Keat Sukun, KPNLF; and Mr Mak Ben, DK.

Contacts and Interaction with China

In recent years, the People's Republic of China has expressed a growing interest in sharing information on the Lancang Jiang (or 'Turbulent River' as the Mekong River is called in China) as well as possible participation in the Interim Mekong Committee and Mekong Secretariat activities.

Consequently, in February 1991, China attended the IMC's 33rd Plenary Session in Luang Prabang in an observer capacity. In March, provincial authorities in Kunming, Yunnan, requested further cooperation with the Mekong Secretariat, a request which led to a mission to China 25-30 November. The four-member Mekong Secretariat delegation, led by the Executive Agent, first met Chinese authorities in Beijing, with the Ministry of Foreign Affairs Department of International Organizations hosting a general meeting which included representatives of the Ministries of Water Resources, Energy and Communications, followed by meetings with each ministry. Traveling to Kunming, the team conferred with provincial authorities on several areas of potential cooperation, including the exchange of water flow data and flood forecasting; waterborne transport surveys and marking; river trade; power generation; and water storage for low-season (winter) release.

At year end, China's 1500MW Manwan hydropower dam was nearing completion on the Upper Mekong mainstream, with two other mainstream dams -- the 1300 Dachaoshan and the 4000MW Xiaowan hydropower projects -- having had feasibility studies completed.

China's interest in the Lower Mekong Basin is in part an outgrowth of trade and transport potential: in May 1990 an exploratory waterborne trade mission navigated the waters of the Upper Mekong River from Jinghong, Yunnan to Luang Prabang, and in October 1990 a fleet of four 60-ton vessels reached Vientiane, a distance of 1,100 km. The river is a cost-efficient means of transport, according to Chinese officials.

PROJECT OVERVIEWS

The following pages give an overview -- what we believe is a representative sampling of the many and varied activities of the Interim Mekong Committee. Our programmes and projects are presented in brief vignettes, reports, and impressions. Other ongoing projects are summarized in Annex I.

Low Pa Mong: Getting Up To Speed

Forty years of studies and evaluations have been invested in the Pa Mong dam, the project seen as the most likely lead-off in a series of projects comprising the Lower Mekong cascade, or series of mainstream dams, envisioned by the founders of the Mekong Committee. The Pa Mong has been seen as the core of an integrated development programme which is designed to sustain economic growth and raise living standards in the Lower Mekong Basin.

Pa Mong was first identified in 1951 as a means of meeting growing hydropower needs. In the 1960s the Mekong Committee planned for a high dam, 250 metres above sea level, 110 metres above its foundation, with an installed capacity of 4,800 MW. Current understandings of problems such as dislocation and unacceptable levels of required resettlement, plus a clearer understanding of the dam's environmental impact, have led to a reduction in the scope of the project.

Following revision of the Committee's Indicative Basin Plan in 1987, planners considered a Low Pa Mong alternative with a reduced elevation - 207.5 metres above sea level. Initial studies indicated this would lower resettlement requirements from 300,000 to 59,000 persons. Canadian funding enabled the Mekong Secretariat to complete and publish its Low Pa Mong Optimization Study in early 1992. At the same time, the Mekong Secretariat also carried out parallel studies during 1990-91 for inclusion in the optimization report, including:

o **Preparatory Resettlement Studies** (funded by Sweden) - Evaluating the socioeconomic and resettlement situation in the proposed reservoir area.

o **Sedimentation** (funded by UNDP) - Impact assessment on increased flood levels, reduced reservoir capacity due to sedimentation, as well as erosion and water fluctuation downstream.

o **Irrigation Prefeasibility** (funded by UNDP) - Investigation of irrigation potential and environmental impact in proposed areas.

o **Preparatory Environmental Assessment** (funded by Japan) - Identification of environmental issues and proposed mitigation measures

o **Power System Study** - Forecast of power demand and estimation of power benefits in the Thai system.

English, Lao, Thai and Vietnamese briefing notes on findings on the Low Pa Mong Optimization Study were published in October reviewing existing studies, in particular power production capacity. This information will help members decide whether to go ahead with a full feasibility study.

China's cooperation in providing up-to-date information and data could help make the Mekong Secretariat's planning more effective and benefits could accrue. For example, a combination Manwan-Xiaowan dam and reservoir system on the Upper Mekong in China would increase the power benefit and low flow of the Low Pa Mong Dam during the dry season.

Updating existing Pa Mong studies keeps IMC members in touch with information and data to make well-founded decisions. The key to the eventual decisions regarding the Low Pa Mong, besides increasing low flow for agricultural uses, is deciding that hydropower is the least ecologically and socially damaging alternative available to meet present and future demands for electricity, which is critical to economic development. The IMC will review all Low Pa Mong study information and determine what the next step will be.

Delta Master Plan: A Strategy for Mekong Delta Development

The Mekong River and its tributaries can contribute significantly to Viet Nam's development. The Mekong Delta is the most important rice-producing area of Viet Nam, accounting for 45 per cent of annual production and 15 million of its population. The Mekong Delta Master Plan (DMP) Project reflects the recommendations of the 1987 Revised Indicative Basin Plan. The objectives of the project include formulation of a sound and viable master plan for management and development of the Mekong Delta's resources in response to national development strategy, regional needs and environmental concerns; preparation of feasibility studies for five priority projects; and strengthening of the institutions entrusted with planning Mekong Delta development.

External funds of US$3.7 million were secured from UNDP, with Viet Nam's State Planning Committee as implementing agency. The International Bank for Reconstruction and Development (IBRD) and the Mekong Secretariat are executive and associated agencies, respectively. Implementation began in November 1990 and is scheduled for completion by the end of October 1993.

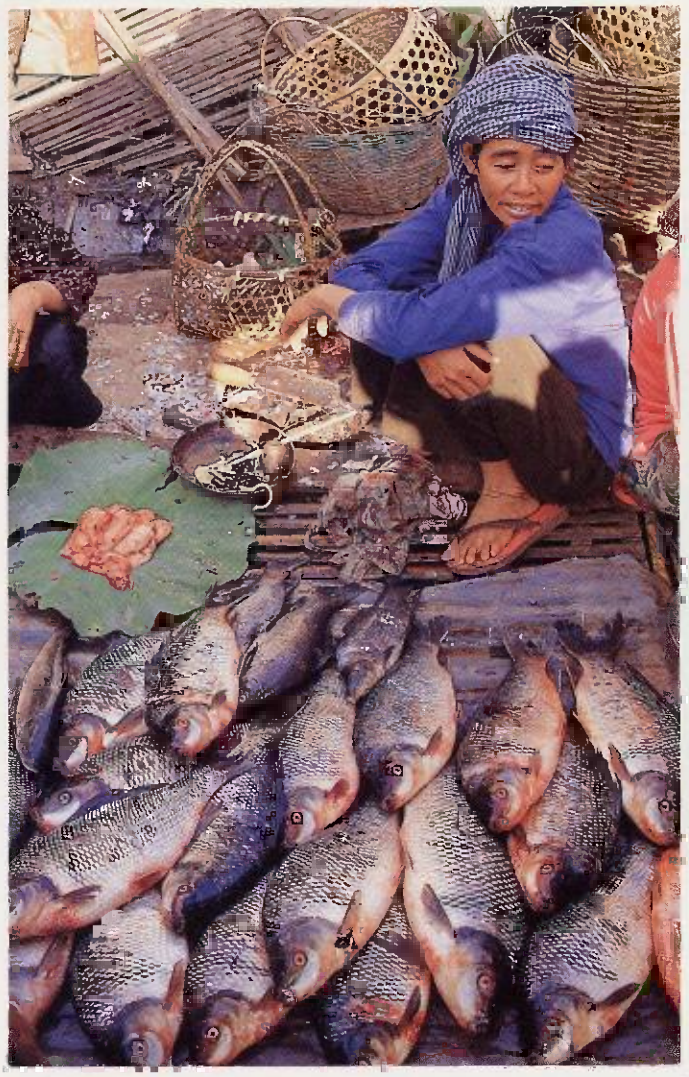
Major outputs include a detailed review and assessment of natural and human resources, including socioeconomic and environmental aspects for development of primary (agriculture, fisheries, and forestry) and non-primary sectors incorporated in twelve Working Papers; and The Outline Mekong Delta Master Plan which serves as the basis for further work to become the draft Master Plan. The Outline provides an integrated assessment of Delta resources and a framework for balanced development between primary and non-primary sectors and sustainable resource management. The Outline has also recommended steps on the 1992-2000 development scenario, including investment requirements, a list of projects and the related programme of work.

Other outputs are the completion of five feasibility studies and four thematic studies. The DMP aims to guide sustainable development of Delta resources, in particular food production, taking into account environmental impacts, while providing training in planning for continuing delta development beyond the time frame of the DMP.

Fisheries Supply Protein for Mekong Peoples

Fisheries are both a major source of protein and income for many people along the Mekong River, but fish stocks are threatened by growing populations, economic development and possible pollution. Careful planning must ensure that development along the River -- including agriculture, industry and power generation -- does not reduce the value of the Mekong as a food source and means of livelihood.

The fisheries sector includes conservation of fish stocks, as well as fisheries promotion. Potential negative impacts of any activities on the Mekong or its tributaries must be included in planning. In the past, natural abundance permitted exploitation of fisheries in the Lower Mekong Basin with little regulation.



In 1991, the Mekong Secretariat began a review of activities to develop a regional framework for coordinated fisheries development. A strategy study was prepared in consultation with member Government departments and agencies and the National Mekong Committees. Denmark provided technical and financial support. Danish consultants worked with experts from the Asian Institute of Technology (AIT) and Kasetsart University in Bangkok and conducted a survey mission to Cambodia, Laos, Thailand and Viet Nam. The mission also visited, reviewed and evaluated the Lam Pao fisheries station in Thailand, a project initiated and implemented earlier with Netherlands support. This resulted in a publication: Review of the Fishery Sector in the Lower Mekong Basin.

IMC fisheries-related activities includes work with Fishermen's Communities in the Nam Ngum Basin, Phase II, in Laos, and the Netherlands-funded Yasothon Fish Seed Production Center in Thailand. Formally opened in December, the Yasothon Center was already in operation, and by year's end, had produced more than 9,000 million fry/fingerlings of eight species.

Creating a Critical Planning Resource:

Remote sensing and mapping has been a basic function of the IMC for two decades. In 1991, the Mekong Remote Sensing and Mapping Unit (RSMU) boosted its professional capabilities substantially. Following a three-month evaluation the RSMU was reorganized, and the Mekong Geographic Information System (MGIS), was redesigned

and became operational in September. It is supported with funds from the Asian Development Bank, Switzerland and Sweden.

The primary aim of MGIS is to establish a basinwide databank using appropriate data. Geographically-related information categories, such as landuse, soil, geology, topography, for example, form parts of the databank. Satellite data is a prime source of information. The ADB believes that such resource information will enable donors to assess project proposals more rapidly by not having to duplicate data searches. The system is designed as a network within IMC member countries, with GIS capabilities to be installed at member organizations. Data will be collected, interpreted and digitized by member organizations. The Mekong Secretariat will function as a clearing house where all digital data produced will be retained.

Remote Sensing and Mapping Unit and Geographic Information System

With such a design concept, the MGIS will lead to an overall upgrading of map making and interpretation capabilities for member countries, particularly Cambodia and Laos. Technicians and scientists in the member countries receive on-the-job training and operate their own centers.

Using satellite, aerial and land survey data, the Mekong Secretariat provides members as well as international organizations and research institutions with information critical to the rational use of the Mekong Basin. Cambodian refugees now living in camps along the border with Thailand are expected to be resettled in their homeland with the support of data from the Secretariat at the request of and funded by the United Nations High Commissioner for Refugees.

Achievement of peace in Cambodia, however fragile, after 16 years of disruption reveals a serious shortage of information for the most basic social and economic planning. Satellite data is inadequate for more specialized implementation activities. Accordingly, in 1992 the Remote Sensing and Mapping Unit will contract for aerial photography over most of the country to allow detailed interpretation of landuse, including forest resources, infrastructure and population distribution.

Flood Forecasting, Bank Protection and Hydrographic Atlas Update

During the July through October wet season, the Mekong carries a huge volume of water that results in flooding and flood damage almost every year, especially in the Mekong Delta in Cambodia and Viet Nam. The silt-laden water renews the fertile flood plain, even as it threatens life and economic loss. The largest flood to date was in 1966, causing an estimated US$66 million in damage at that time.

Flood forecasters within the Hydrology Unit successfully warned areas threatened by flooding. Nearly 20 million people received such warning. While flooding of the Lower Mekong River cannot yet be controlled, it can be anticipated. In the 1970s, the Secretariat began installing a network of 15 forecasting stations in four countries. The stations -- one in Cambodia, five in Laos, five in Thailand, and four in Viet Nam -- receive data from dozens of reporting sites. Mekong riparian personnel radio it to Bangkok daily. After analysis of the data, locality-specific forecasts are broadcast from Bangkok. Stepping up these activities in Cambodia, following the mandate of the IMC, resulted in a riparian expert from Laos training Cambodians in discharge measurements and making bi-monthly follow-up visits.

Not only does the Mekong Secretariat provide flow measurement data, but we also provide such assistance as bank protection and reinforcement, and comprehensive technical survey data covering the bed, banks and immediate environs of the Mekong River.

Erosion at Thanaleng near Vientiane, for example, threatened to undermine the Lao capital's main highway link for heavy cargo. With financial assistance from Australia, the Mekong Secretariat completed Phase I -- 250 metres of bank protection. Phase II was begun in December and will be completed in 1992. Embankments protecting the Vientiane plain from flooding have been undertaken with European Community support to protect the weak sections of dikes surrounding Vientiane. Mekong riverine shipping in Laos, impeded by a nine-meter differential between high- and low-water and unprotected, eroded embankments causing loading and unloading difficulties at Ban Houai Sai, Pak Beng and Pak Lay was resolved with construction of concrete ramps alleviating steep and eroded slopes. The Australian government provided funding support.

With Finnish financial support and technical assistance, the Mekong Secretariat completed an update of the Hydrographic Atlas covering the Mekong River between the Myanmar, Lao, Thai and Cambodian borders using modern technology and surveying equipment, including aerial photography. The new atlas will facilitate further activities, including construction of river training structures, the aids to navigation programme, and general improvement of navigation.

Environmental and Financial Studies: Yali Falls

The Se San River rises in the Ngoc Linh mountains of the Truong Son range, flows westward, entering the Mekong at Stung Treng in Cambodia. Within Viet Nam the 360 km river is called the Upper Se San. It drains 11,000 sq km of a total catchment area of 18,000 sq km, descending 400-600 m, through rough terrain before entering the Cambodian plain. The Upper Se San has significant hydropower potential, and was determined to be most promising at the Yali Falls, located some 30 km downstream from Kontum with a drop in elevation of 60 m. Yali Falls offers power generation, irrigation, and flood control. Total power potential of the Upper Se San is estimated at 1630 MW.

In 1959 a team of Japanese experts undertook a reconnaissance survey of the Yali Falls area and submitted a preliminary feasibility report in 1964. The Mekong Committee sponsored studies of a Yali Falls hydropower project, beginning in 1985, with potential for power generation, but both studies were concerned with small scale projects from 6 to 24MW for supplying power to Kontum and Pleiku towns nearby. In 1990 Viet Nam's Ministry of Energy finalized the technical and economic components of the feasibility study for a large-scale 700MW project with technical assistance from Nippon Koei. The project is designed to provide power not only to the provinces in the Central Highlands but also to the central southern electricity grids; the main load centre in the South is Ho Chi Minh City.

The Yali Falls project will contribute significantly to meeting Viet Nam's development objectives. Detailed environmental studies are needed to identify possible negative impacts and to define mitigation measures. Central to the Secretariat's work on the Yali Falls project is assessing environmental impact and financing requirements. Switzerland has funded the project and work has been carried out since September 1991 by Swiss consultants in collaboration with local partners.

Development of the Yali project through stages will make the long-term project self-financing and provide cheap and reliable power for industrial development in the South. The environmental and financing studies are planned to be completed at the end of 1992. The next step will be seeking funds for detailed designs and subsequent project implementation.

Strengthening the IMC's Environmental Programme

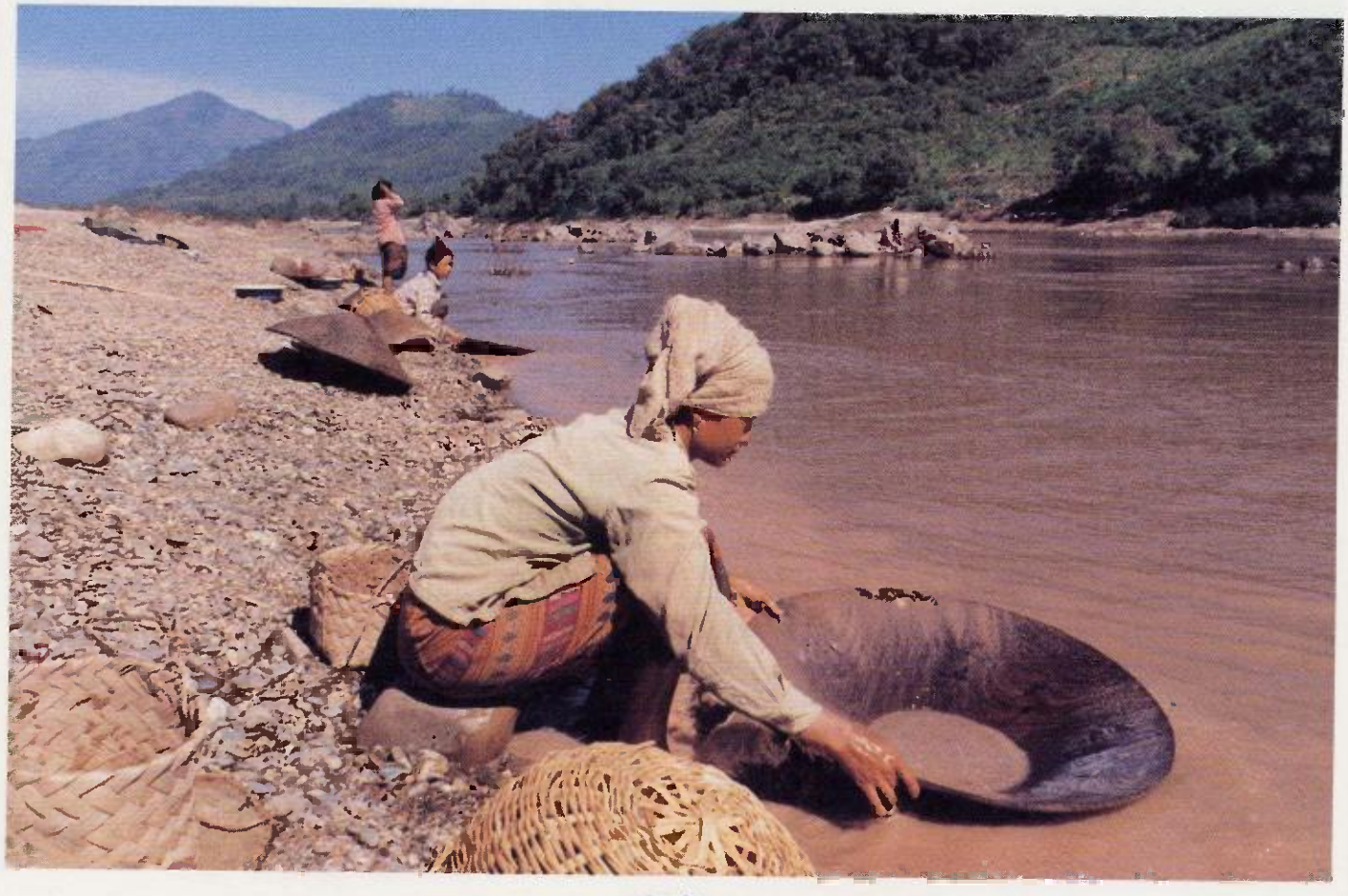
The Mekong River and its tributaries are a relatively virgin system with little pollution -- one of the world's cleanest. Its Delta is sensitive to many factors, including the sediment that the river carries from China. Ironically, if the water becomes too clean, fertility and productivity of the Delta's agricultural lands will suffer. Upriver dams must be built with consideration of the impact they will have on the volume of silt carried downstream. During the February through April dry season, the flow of fresh water decreases and drought visits much of the Basin. Salinity intrusion in the Delta means that 1.2 million hectares of potential agricultural land is affected by the sea.

This year the Mekong Secretariat devoted many resources to translating environmental concerns such as these into projects. As IMC programmes move closer to implementation, environmental issues grow in importance. Proposed environmental projects involve planning, data collection, surveys and resource inventories, training for environmental management to ensure that human resources will meet the need for properly qualified technicians and managers.

In 1991 the Mekong Secretariat established a separate Environment Unit within the Technical Support Division to help ensure a systematic and consistent approach to environmental issues, to serve as an information center, and to liaise with National Mekong Committees and relevant member-government agencies regarding environmental matters. The Unit assesses environmental aspects of projects, promotes environmental awareness and knowledge throughout the Mekong network in member countries, and helps ensure that environmental thinking is integrated into every IMC project. It will also help ensure that funds are available for proper environmental impact assessments.

Sweden began funding the environmental programme -- including a Water Quality Monitoring Network -- in 1985. The Network meant setting up labs and a monitoring network, as well as supplying equipment and training riparian personnel. Monitoring included groundwater and sedimentation.

Environmental concerns will become even more important as the number of projects moving closer to implementation increases, as each Mekong country seeks the greatest possible benefit from the river.



People: Building Human Resources

Qualified people are central to translating technical studies and plans into sustainable realities. During 1991, 57 training opportunities, including seminars/workshops and study tours, were offered to 53 Cambodian, 278 Lao, 321 Thai, and 472 Vietnamese participants, in addition to on-the-job training for riparian staff working at the Mekong Committee, who represent 78 percent of the total staff, or 60 per cent of professional and technical staff. Three kinds of training activities are currently undertaken by the Secretariat:

- o An activity supported by general funding
- o A funded component of specific ongoing projects
- o On-the-job training

The Secretariat and National Mekong Committees conduct courses and workshops for project personnel and other riparians involved in Basin development. In addition to project-specific training, human resources development programmes include broad-based training of riparians. The Mekong-Australian Development Programme, for example, offers fellowships for Master's and postgraduate training courses in or related to water resources development. The past year also saw three workshops on project management conducted in Laos and Viet Nam for riparians of all member countries.

The Secretariat currently has 17 persons from member countries working in temporary positions for on-the-job training. The intention is that riparians obtain necessary skills to use when they return to their countries. Training activities will strengthen the capability of the National Mekong Committees and associated Government agencies, so that they can successfully carry out the Mekong projects. The IMC is committed to human resources development for sustainable development by qualified people.

However, as the dimensions of projects and the range of activities assumed by the Secretariat increases with the ongoing development and economic evolution of Member countries, the need for a more sophisticated human resources management system within the Secretariat with both a long-range and horizon-to-horizon perspective has grown. The Secretariat has responded by establishing a new Human Resources Development Unit (HRD) headed by a riparian professional in November. This organization-wide Unit will provide guidance, coordination, structure and content for the human resources component in future projects.

It is planned to make training a component in most projects. Human resources development is an ongoing, evolving activity that provides the means for transferring specific knowledge and skills into the unpredictable complexities of real projects and programmes.

Administration and Financial Review

The day-to-day work of the Committee and its administration is carried out in Bangkok by the Mekong Secretariat. In 1991, there were 116 staff working at the Secretariat, including 49 professional staff and 50 general service staff, as well as 17 full-time trainees as "riparians on stipend" or "project fellows" from the Member countries.

Programme income and expenditures

The actual cash contributions for programme activities received during 1991 amounted to US$ 7,670,113. These funds were contributions paid to the Committee by cooperating countries and agencies in support of its development programme during 1991. The Committee continued to operate on a fully-funded basis whereby all project commitments are covered by firm undertakings given by the governments of cooperating countries. Annex II shows both the actual cash and in-kind contributions for programme activities received by the Secretariat during the years 1987 to 1991.

Programme expenditures for 1991 amounted to US$8,735,592. These funds were used for the procurement of goods and services in support of the Committee's development programme. As illustrated by the following table, this represents an increase in programme delivery from previous years.

	Total Programme Cash Contributions (US$)	Total Programme Expenditures (US$)
1987	6,347,071	7,323,872
1988	8,737,442	6,472,464
1989	6,595,696	7,701,579
1990	9,539,822	8,670,743
1991	7,670,113	8,735,592
Total	US$38,890,144	US$38,904,250

Secretariat income and expenditures

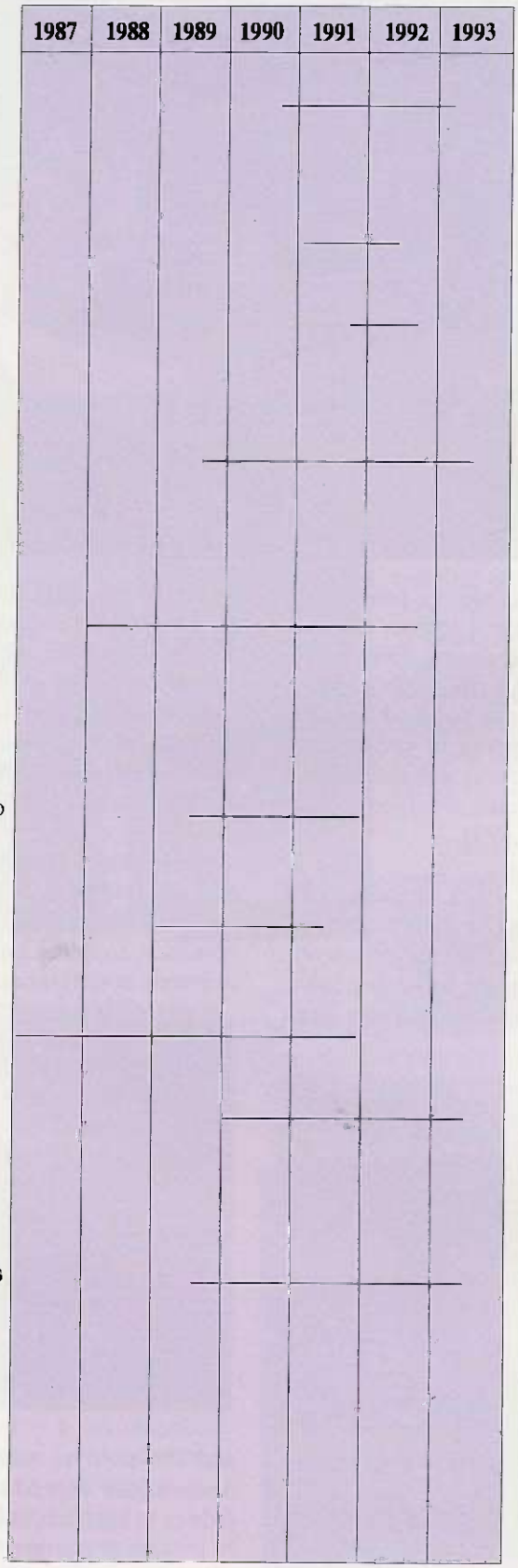
In addition to cash contributions that fund programme activities, the Secretariat has also generated income for the actual operations of the organization. The primary income sources include annual contributions from each of the three member countries, support cost charges for project implementation, and other income related to project services and treasury management. The Secretariat is developing its own income base to cover operational expenditures. Such financial autonomy will enhance the long-term sustainability of the Secretariat.

Administrative expenditures for the Secretariat during 1991 amounted to US$2,433,393. The primary components of these expenditures include costs related to staff, premises, supplies, equipment, and travel. Due largely to increases in staff salaries necessitated by market conditions and the need to attract and maintain quality staff, the Secretariat's expenditures rose in 1991. The Secretariat strives to keep administrative costs to a minimum in order to maximize resources going to projects.

ANNEX 1: PROGRESS OF ONGOING PROJECTS IN 1991

The project external funding, time frame and progress of ongoing projects are illustrated by the chart below.

PROJECT & EXTERNAL FUNDING	TIME FRAME	PROGRESS
I. Policy and Planning		
1. Preparatory organ./legal studies (EC 722,000) (UNDP $48,000) (ADB $295,000)		Several studies completed and two workshops and a training seminar organized.
2. Strategy for water pollution (Switzerland $54,000)		Work plan prepared for a workshop in early 1992.
3. Review of fisheries sector (Denmark $220,700)		Work started in September 1991 for completion in July 1992.
II. Technical Support		
4. Groundwater investigation programme (Sweden $328,000)		Monitoring of groundwater wells in 3 member countries. A workshop held in Vinh Long in November 1991 for monitoring and evaluation. Extended to June 1993.
5. Delta salinity studies, Phase III (Australia $457,000)		Activities continued in 1991 for completion in mid 1992,including training, data collection, salinity modelling, analysis of salinity instrusion and distribution of flow in delta.
6. Improvment of the hydrometeoro (New Zealand $144,000) (UNDP $212,100)		Hydrometeorological data collection lgical network continued
7. Salinity forecasting in the delta, Stage II (Australia $ 140,000)		Forecasting for 12 salinity stations
8. Flood forecasting (core support)		Forecasting at 15 locations on the mainstream
9. Geographic information system (ADB $600,000) (Switzerland $348,000)		Mekong Geograhic Information System and the Mekong Resources Information System began operation in February and June 1991 respectively.
10. Management of acid sulphate soils (Sweden $336,300)		Establishment of a conceptual model for acid substances in the Plain of Reeds. Measurement campaign in the Plain of Reeds in June 1991. Extensive training on chemistry and modelling in Sweden organized. Workshop in October 1991. Field and laboratory experimnts as planned. Progress as planned expect for modelling part. Extended to June 1993.



PROJECT & EXTERNAL FUNDING	TIME FRAME							PROGRESS
	1987	1988	1989	1990	1991	1992	1993	
11. Inventory and management of wetlands in the lower Mekong basin (Sweden $425,000)								One training course organized. Field work completed for Tram Chim bird santuary and Mekong areas near Vientiane. Extended to June 1993.
12. Management of problem soils (Sweden $270,000)								Project delayed due to late start but progress is satisfactory. Soil surveys and soil mapping in Vietnamese delta completed. Established of two soil laboratories at Universities of Can Tho and Agriculture and Forestry (Ho Chi Minh City) completed. Three experiment areas arranged. Workshop planned for May 1992.
13. Water quality monitoring network in the lower Mekong basin, Phase II (Sweden $1,861,000)								Network extended to Long Xuyen Quadrangle with 14 stations and 5 in the Lao PDR. Two pesticide laboratories established in Vientiane and Ho Chi Minh City. Measurement campaign completed for sediment and flood investigation in the delta during the flood season. Training in Sweden for 4 officials. Modelling of movement of acid water in canals in the Plain of Reeds stared. Workshop held in April 1991; a final one planned for October 1992. Several publications and extensive training, Project extended to June 1993.
14. Integration of environmental components (Sweden $630,000)								Engaged consultants and procurement of equipment for environmental projects including formulation mission for Quang Lo/Phung Hiep (Phase II), Sesan Srepok river basin mission and Low Pa Mong environmental studiesû TOR. A riparian earned her MSc in Natural Resources at AIT. Extended to June 1993.
III Resources Development								
15. Yali falls environmental and financing studies (Switzerland $1,090,000)								Work started in September 1991 for completion in 1992.
16. Master plan for the integrated development of the Mekong delta (UNDP $3,737,000)								Outline Master Plan completed. Five feasibility and four thematic studies will be carried out in 1992-1993.
17. Integrated development of the lower Mekong basin (UNDP $2,032,681)								Progressed in accordance to plan for completion in 1992. Some projects such as Low Pa Mong, Mekong cascade studies, Mekong delta hydrological databank and network rehabilitation completed.

PROJECT & EXTERNAL FUNDING	TIME FRAME							PROGRESS
	1987	1988	1989	1990	1991	1992	1993	
18. Huai Pa Thao multipurpose project supervision (Thailand) (Switzerland $1,390,000)								Construction of two dams and powerhouse completed. Irrigation facilities will be completed in 1992.
19. Low Pa Mong multipurpose project (Sweden $190,000) (UNDP $220,000) (Japan $250.000) (Canada $550,000)								Optimization and parallel preliminary studies on environment, irrigation, resettlement and sedimentation completed.
20. Major hydropower projects (UNDP $327,000) (Sweden $227.800)								Reconaissance environmental studies for Luang Prabang, Pak Lay and Upper Chiang Khan projects completed. Updating of Nam Theun I prefeasbility study will be finalized in 1992.
21. Mekong Irrigation Programme (Netherlands $4,136,000)								Final reports for MIP I completed in May 1991. Activities for the transitional phase started then for completion in September 1992.
22. Sandy soils (UK $294,000)								Due for completion in February 1992.
23. Nam Houm irrigation system (Lao PDR) (Italy $1,750,000)								Construction of lateral and drainage canals continued for completion in 1992. Water management training will be carried out in 1992.
24. Mekong watershed assessment (Switzerland $519.000)								Design of methodology and training for counterparts (2 workshops in Vientiane and Hanoi); negotiation with Switzerland underway for project extension.
25. Application for reforestration and agro-forestry to soil management (basinwide) (Japan $297,000)								Studies for Korat Plateau started in 1991 for completion in mid 1992.
26. Control of soil erosion, sedimentation and flash flood hazards (Sweden $630,000)								Measurement of Nam Ngum reservoir sedimentation and run-off movement in Nam Ngum basinûs slopes completed. Assessment of erosion for some areas in Thailand and the Lao PDR started. Extended to June 1993.
27. Fishermenûs communities in the Nam Ngum basin (Switzerland $225,900)								started in September 1991 for 2 years. Socio-economic surveys completed, a workshop held in Vientiane to discuss the outcome. Phase I to be completed in Feburary 1992.
28. Community fisheries (Yasothon) (Netherlands $1,939,400)								Phase I completed at the end of 1991.

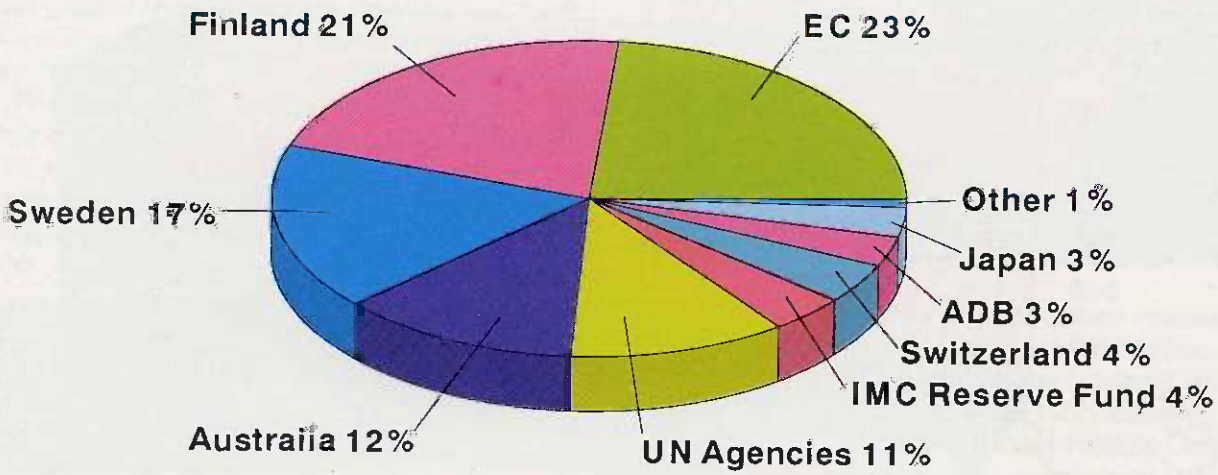
PROJECT & EXTERNAL FUNDING	TIME FRAME							PROGRESS
	1987	1988	1989	1990	1991	1992	1993	
29. Concrete ramps at Pak Beng, Pak Lay, Houei Sai (Australia $580,000)								Ramp at Ban Houei Sai completed. Preparation for ramp at Pak Lay underway.
30. Southern Lao-Thai Mekong bridge crossing (ADB $1,500,000)								Draft Feasibility report completed.
31. My Thuan bridge (Australia $71,000)								Study on international aspects of the bridge started for completion in early 1992.
32. Mekong river bank protection, Stage II (Australia $320,000)								First phase of bank protection work at Tha Deua (Vientiane) completed. It is expected that the second phase will be completed in 1992.
33. Updating of the hydrographic atlas (Finland $2,700,000)								Ground control and hydrographic surveys in Laos and Thailand com pleted. Works in Viet Nam started in 1990 continued and will be completed in 1992. Funding for work in Cambodia is not yet available.
34. Environmental training fund (Sweden $130,000)								Riparians trained at MS and study tours organized (an ongoing-rolling programme). Extended to June 1993.
35. Water resources training programme (Australia $2,292,000)								Considerable funds received in 1991. Three master degree and six graduate students enrolled at Australian universities.
IV Programme Support Projects								
36. Australian Consultancy Fund (Australia $393,000)								Fund used for My Thuan bridge study, Forestry-based development on the Long Xuyen Quadrangle and review of Foreign Exchange Operation.
37. Consultancy Fund for studies, investigations and training (Sweden $500,000)								Funds allocated for several studies including the updating of the Nam Theun I Prefeasibility, International Workshop on Flood Mitigation, Emergency Preparedness and Flood Disaster Management in Vietnam, Prefeasibility study on electrification of isolated Lao border areas and four Mekong project management workshops.

Annex II

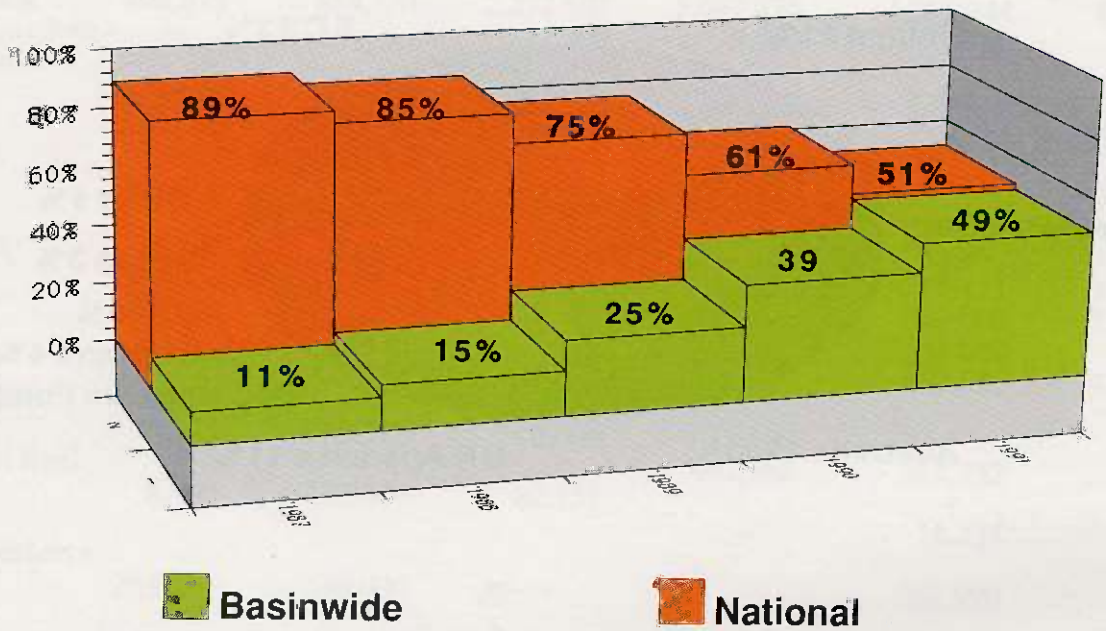
Cash and in-kind contributions received for programme activities
From 1 January 1987 to 31 December 1991
(In U.S. Dollars)

Donor	1987	1988	1989	1990	1991	Total
A) CASH CONTRIBUTIONS						
Australia	2,292,154	3,190,310	924,186	672,596	915,898	7,995,144
Canada	-	-	-	-	43,976	43,976
EUROPEAN COMMUNITY:						
Belgium	-	-	400,000	-	-	400,000
Denmark	-	-	-	-	130,000	130,000
France	48,725	105,668	-	56,092	247,674	458,159
Germany	-	-	-	212,041	(24,957)	187,084
Italy	-	1,250,000	-	-	-	1,250,000
Netherlands	498,675	854,144	2,272,407	2,077,876	1,225,944	6,929,046
United Kingdom	-	-	27,704	5,590	1,199	34,493
Commission of EC	573,610	393,104	293,696	684,376	139,214	2,084,000
Sub-total	1,121,010	2,602,916	2,993,807	3,035,975	1,719,074	11,472,782
Finland	-	373,134	262,084	1,192,284	1,572,952	3,400,454
Japan	-	50,000	75,000	172,000	200,000	497,000
New Zealand	36,827	47,137	77,693	22,519	34,851	219,027
Sweden	609,022	917,447	946,393	1,649,542	1,280,121	5,402,525
Switzerland	450,000	145,000	18,000	1,700,000	300,000	2,613,000
ADB	-	-	-	95,000	252,000	347,000
UNDP	1,474,895	1,133,393	1,205,276	521,644	478,621	4,813,829
UNDP/ESCAP	12,424	-	3,106	-	-	15,530
UNDP/OPS	78,145	88,105	10,000	15,500	-	191,750
UNDP/World Bank	-	-	-	462,762	312,932	775,694
UNEP	8,000	120,000	80,151	-	-	208,151
UNHCR	-	-	-	-	16,234	16,234
Programme Reserve Fund	264,594	70,000	-	-	307,990	642,584
TOTAL	6,347,071	8,737,442	6,595,696	9,539,822	7,670,113	38,890,144
B) IN-KIND CONTRIBUTIONS (Estimates)						
Canada	-	-	-	-	430,000	430,000
EUROPEAN COMMUNITY:						
Belgium	-	-	-	-	82,500	82,500
France	48,000	48,000	48,000	30,500	15,000	189,500
Netherlands	30,000	60,000	60,000	45,000	90,000	285,000
United Kingdom	127,367	-	113,945	53,251	51,413	345,976
Sub-total	205,367	108,000	221,945	128,751	238,913	902,976
Finland	-	31,500	36,000	58,500	10,500	136,500
Japan	120,000	120,000	120,000	187,500	270,000	817,500
Sweden	-	345,456	307,955	266,119	248,200	1,167,730
Switzerland	120,000	80,000	85,000	90,000	90,000	465,000
TOTAL	445,367	684,956	770,900	730,870	1,287,613	3,919,706
GRAND TOTAL	6,792,438	9,422,398	7,366,596	10,270,692	8,957,726	42,809,850

Programme Support
1991 Cash Contributions: US$7,433,207



Basinwide Projects Increase; National Projects Decrease



Training Activities

Policy and Planning

Lower Mekong basin International Legal Framework. 20-25 March, Bangkok

Legal and Institutional Aspects of Water Resources Development (International Water Law and External Financing of Water Resources Development Projects). Rome, 1-11 May. ***Workshop on National Water Laws and Institutions***, Hanoi, 2-8 October. ***Workshop on Adaptation to Impacts of Global Climate Change on Mekong Water Resources of the Lower Mekong Basin***, Bangkok, 26-28 June (organized with the University of Colorado, Boulder).

Technical Support

Water Quality Data Evaluation Training and Workshop, Vientiane, 16-26 April. ***Training course in Hydrometry***, Vientiane, 20-25 May. Meteorological training course, Phnom Penh, 11 September to 10 December. ***Workshop on Groundwater Monitoring and Evaluation***, Vinh Long, Viet Nam 20-27 November. ***On-the-job training on remote-sensed image interpretation and thematic mapping at the Mekong Secretariat***, Bangkok, 4-22 November.

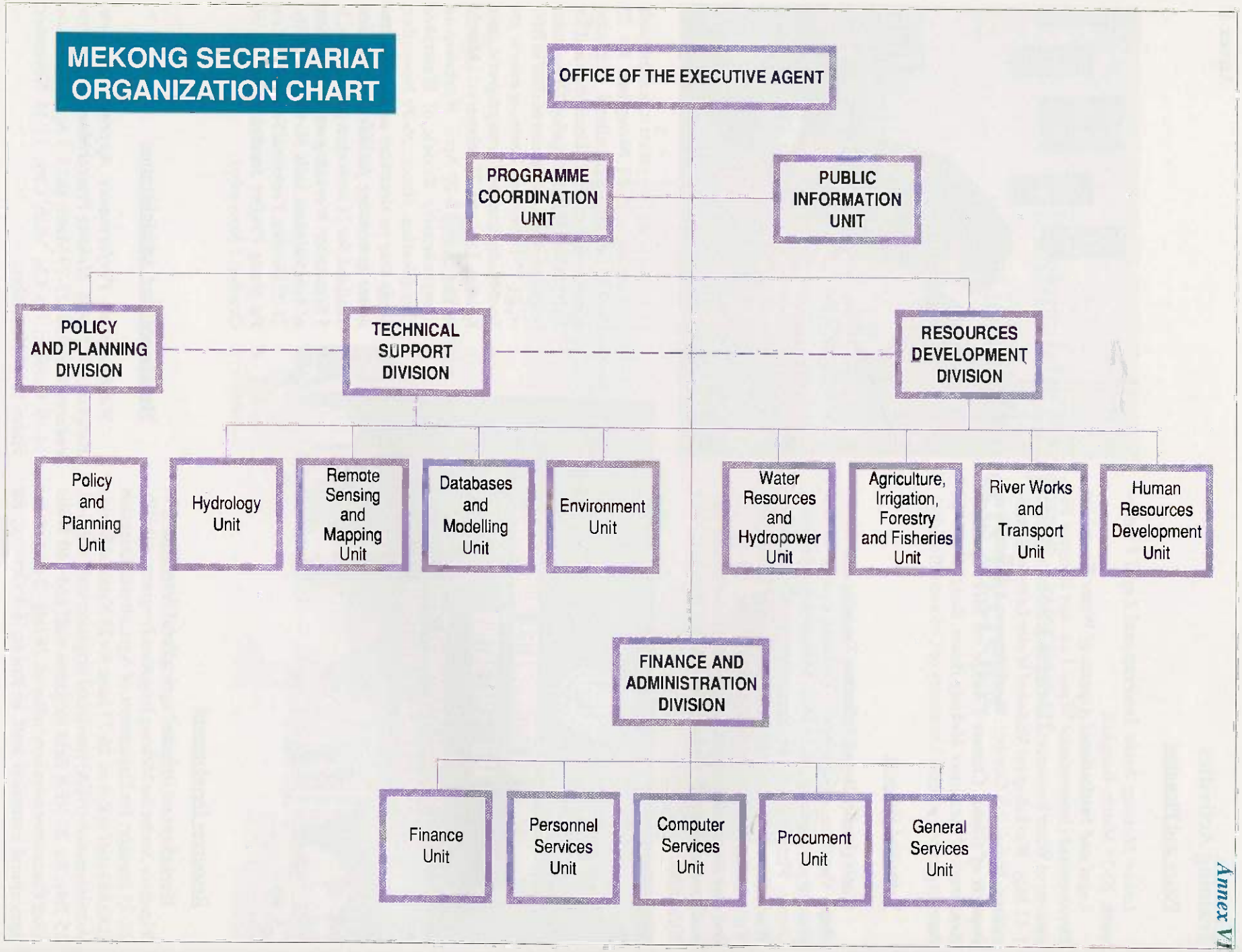
Resources Development

Workshops on irrigated agricultural development in Vientiane, under the Mekong Irrigation Programme (MIP), 21-25 January; for Department of Agricultural Extension (DOAE) staff in Roi-et, 26-27 June; for 25 National Energy Administration (NEA) provincial irrigation staff in Roi-et, 15 July; for 20 NEA field irrigation staff and 240 Water User Committee members in Roi-et, 28 July - 2 August; for agricultural extension staff in Roi-et, 3-4 October; for agricultural and irrigation extension staff in Vientiane, 25-29 November; for 25 DOAE irrigated agricultural extension agents in Roi-et, 23-27 December; and for 20 NEA and Royal Irrigation Department irrigation water management staff in Roi-et, 24-25 December. ***Training course for Seed Multiplication Farms project*** (Laos), Kalasin, Thailand, 27 February-11 March; in Vientiane, 18-20 April. ***Workshop on Comprehensive Review of Watershed Classification***, Hanoi, 26-29 November; ***Study tour to electricity authorities and power generating facilities*** in Laos and Thailand, for 7 Cambodian participants, 3-5 September. ***Workshop on Management of Acid Sulphate Soils***, Ho Chi Minh City, 21-25 October. ***Technical Seminar on Low Pa Mong Project Studies***, Bangkok, 30 October-1 November.

Management and Administration

Workshop on Performance Appraisal Review, Bangkok, 13-20 May. ***Mekong Project Management Procedures***, Bangkok, 27-29 March and 1-3 April; Vientiane, 14-19 October; Ho Chi Minh City, 11-16 November; Hanoi 18-23 November.

MEKONG SECRETARIAT ORGANIZATION CHART



Annex VI

General Characteristics of the Mekong River Basin

The Mekong is the longest river in Southeast Asia and one of the largest rivers in the world. In terms of drainage area (795,000 sq km), it ranks twenty-first in the world and twelfth in terms of its length (4,200 km). However, its large runoff (475,000 million cu m) places it eighth in the world table of great rivers. Starting at an elevation of some 5,000 m in the Tanghla Shan Mountains on the Tibetan plateau, the Mekong flows south, cutting through southern China, and becomes the Lower Mekong River Basin at the common Myanmar-Laos-Thailand boundary. It then flows a further 2,400 km to the ocean.

The Mekong drains a total catchment area of 795,000 sq km. The Lower Mekong Basin catchment area exceeds 600,000 sq km, and comprises almost all the Lao PDR and Cambodia, one third of Thailand (its northeastern region and part of its northern region), and one fifth of Viet Nam (the Central Highlands and the Delta). It is estimated that some 50 million people live in the Lower Mekong Basin area, representing about one third of the total population of these countries.

The climate of the Lower Mekong Basin is tropical and is governed by two monsoons: steady winds that blow alternately from the northeast and the southwest, each for about six months. The southwest monsoon begins in May and continues until September/October. Following a brief period of instability, it reverses its air stream, becoming the northeast monsoon, from November to mid-March. During March and April, winds become light and variable.

The south-west monsoon passes over warm equatorial seas and is consequently heavily laden with moisture. It is termed the wet season, and is characterized by heavy and frequent rainfall, high humidity, much cloudiness and tropical temperatures. A short dry period of one to two weeks is typical June and July due to high-altitude anticyclonic circulation. After the dry period, rainfall is more frequent, and heavy rainfall occurs as tropical storms and typhoons entering the Mekong Basin from the east during the wet season. Flooding usually results when several such tropical storms occur in rapid succession or when the Equatorial Trough Zone, which is the forward edge of the southwest monsoon, has passed into one of its more active stages and a tropical storm follows. The northeast monsoon, originating in the cold air masses of the Chinese and polar winters, is relatively dry. During this monsoon, the dry season (November to mid-March), there is little rainfall, humidity is low, the sky is clear and temperatures are relatively low.

Mean annual rainfall ranges from 1,000 mm near central northeastern Thailand, to 4,000 mm in the Truong Son mountains between Laos and Viet Nam. 80 to 90 per cent of rainfall occurs during the wet season. At that time the atmospheric dew-point is only a few degrees below the air temperature and a moderate uplift of the air caused by topography or convection can induce precipitation. The effect of topography is seen in rainfall distribution over the basin and adjacent areas, being highest on the windward side of mountain ranges lying across the path of the south-west monsoon, such as the Cardamom Range along the coast of Cambodia and southeast Thailand, and the Truong Son Range across Laos, eastern Cambodia and adjacent areas in Viet Nam.

High rainfall on the eastern slopes of the Truong Son mountains is caused by tropical storms and typhoons entering the basin from the east, most frequently via central Viet Nam. Rainfall is lowest on the leeward side of these mountains, in the Great Lake Basin and northeast Thailand. Here rainfall is intense, brief, and mainly during thunderstorms affecting limited areas. Wet season rainfall is usually sufficient to grow rice, the main crop, but rainfall is unevenly distributed during the growing season, causing drought damage throughout the Basin nearly every year. Where there is annual rainfall of 2,000 mm or more, there is little drought damage. But in most of the the Basin, rainfall is only 1,000-1,200 mm/year. An adequate water supply could double paddy yields.

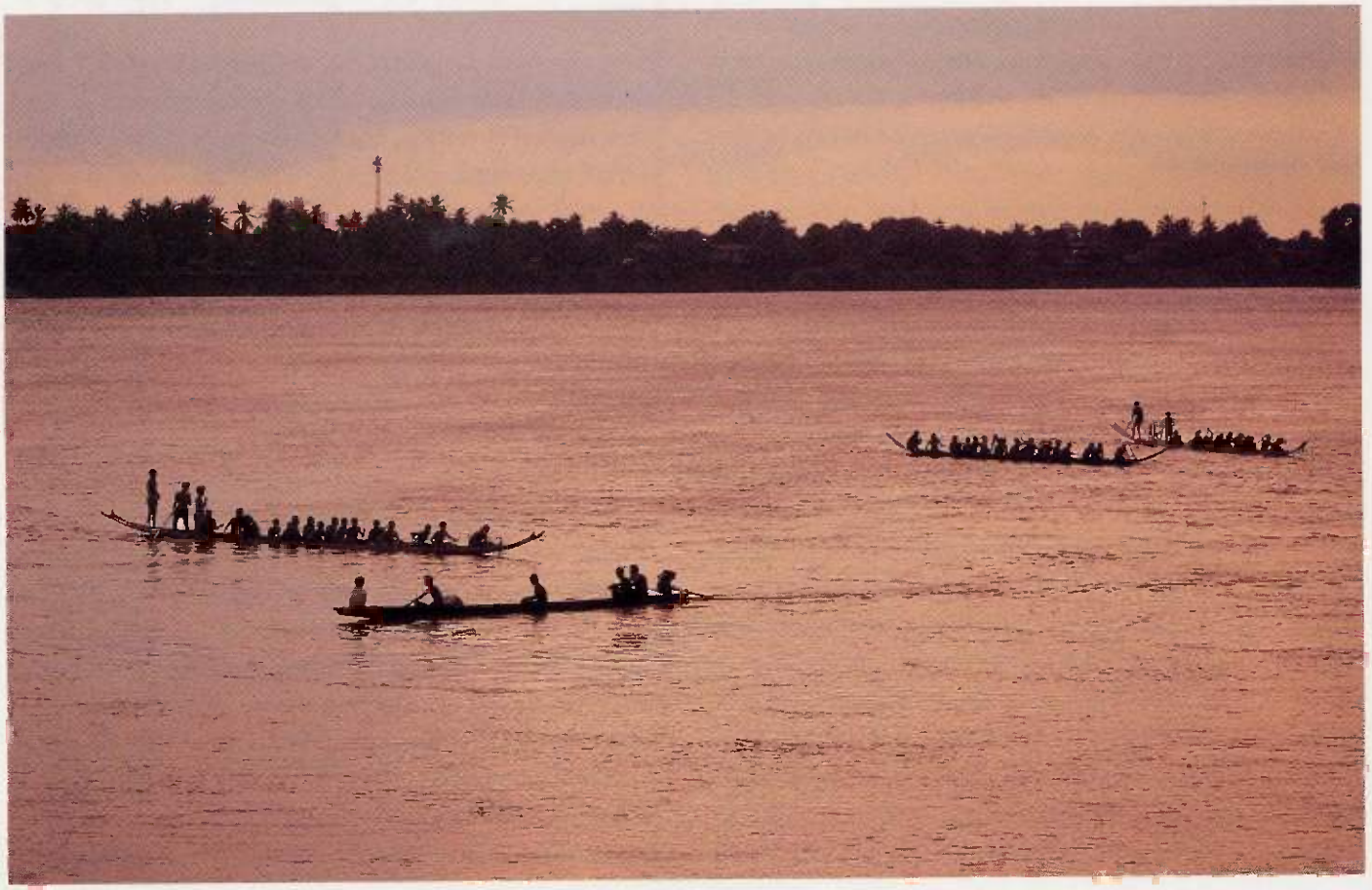
Each year about 475,000 million cu m of water empties into the South China Sea off the Mekong Delta. At Paksé, for example, the drainage area accounts for 69 per cent of the total area while maximum discharge (57,800 cu m/sec) is more than 50 times the minimum discharge (1,600 cu m/sec). The flow of the Mekong and its tributaries is closely related to the rainfall pattern. The water level starts to rise at the onset of the 'wet season' (April-May), reaching a peak in August, September or October. It then falls rapidly until December, and afterward recedes slowly during the annual

dry period, or 'dry season', to reach its lowest level in March/April, just before the monsoon.

The Mekong carries an enormous volume of excess water during the wet season, resulting in severe flooding and substantial damage almost every year in the fertile flood plains along the mainstream and the major tributaries, as well as in the vast flood plains of the delta. In contrast, during the dry season a serious reduction in flow often leads to drought, with a resultant shortage of water for domestic and agricultural use. Most seriously affected during the dry season is the coastal plain of the Mekong delta, where low flow not only results in a shortage of water for both people and agriculture, but also results in deep intrusion of salt water into the delta. An area of some 2.1 million ha is normally affected by salt water.

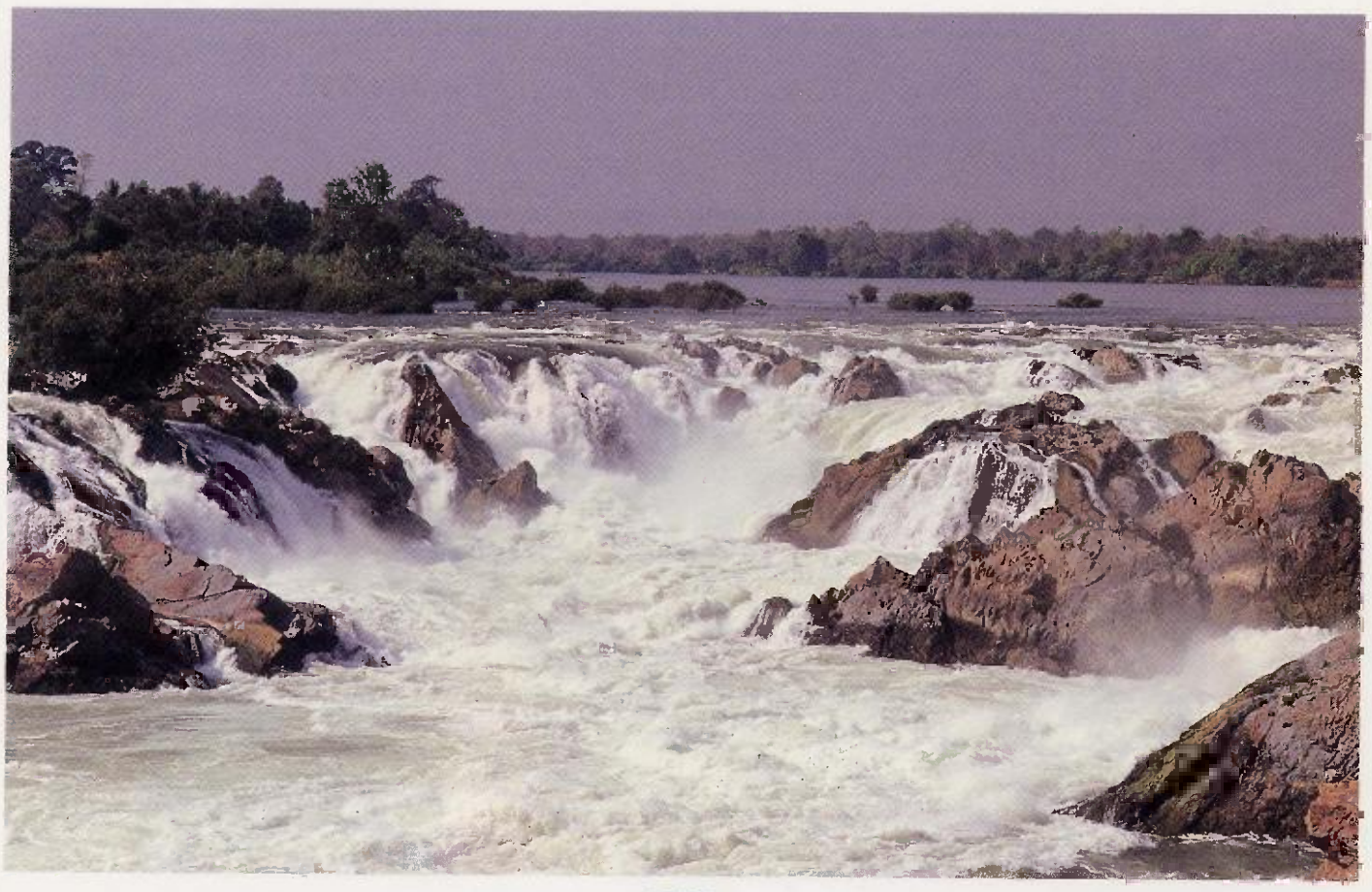
Tonlé Sap, the Great Lake of Cambodia buffers waterflow in the delta downstream of Phnom Penh by storing portions of peak flow in July, August and September and releasing it from October to April. During the flood season, water level in the Mekong rises faster than in the Tonlé Sap. Excess water enters the Great Lake through the Tonlé Sap river, storing some 70 billion cu m in this unusual reservoir. As the Mekong water level recedes, the Tonlé Sap reverses direction and the Great Lake releases water into the Mekong - both stored Mekong flood water and the yield of its own catchment area. The seasonal flood of the Mekong comes chiefly from the tributaries that join the mainstream along its lower course. At a flood peak, there is generally extensive flooding in lowland areas which can cause considerable damage to crops and property. The lack of water during the dry season imposes severe constraints upon crop production and also limits the navigable depth in the mainstream. The Mekong finally distributes its waters through eight branches in the delta, in Viet Nam, into the ocean. Tidal influence contributes significantly to the extent of salinity intrusion; tidal range varies from 2-4 m. The role of tidal forces is more prominent during the dry season when the river discharge is normally about 2,000 cu m/sec.

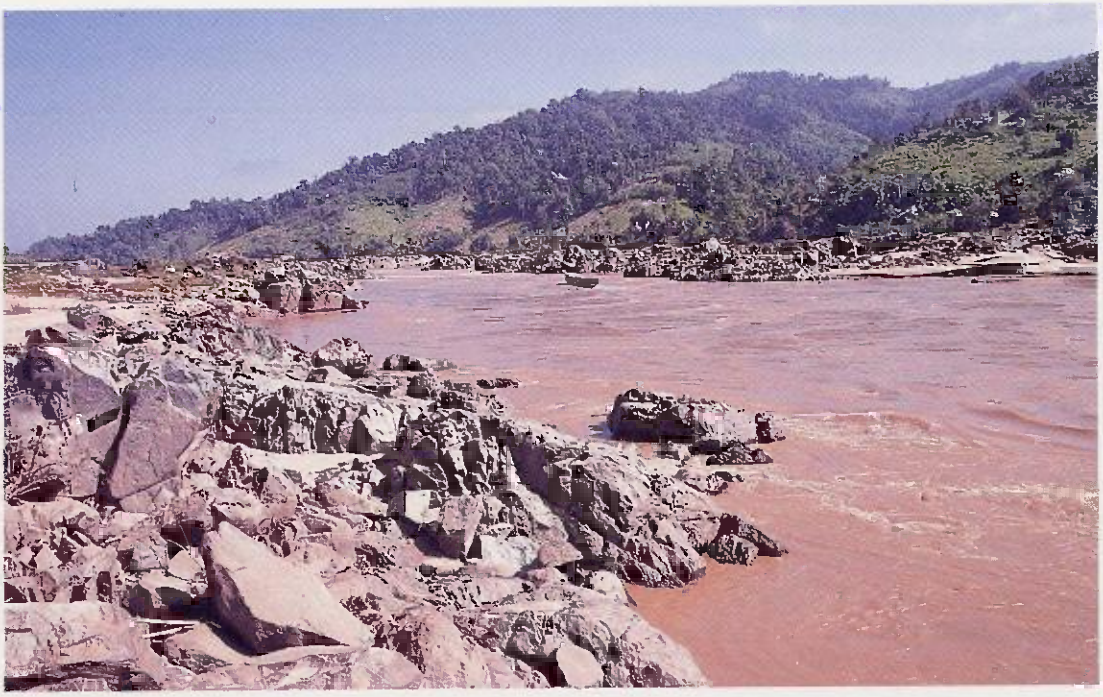
Acidity of water is normally high (pH is low) at the beginning of the rainy season when the first rain storms leach the highly acid soil. When rain becomes more and more regular, the soils become more permanently saturated and subject to less oxidation and less acid, and the water becomes less acidic. However, the acidity of water may vary considerably along the course of the river depending on the soil conditions of each reach and local inflow and is therefore sometimes difficult to monitor.



Approximate Flow Distributions of the Mekong River				
Country	Catchment Area sq. km.	% Total	Average Flow cu.m./sec	% Total
China	165,000	21	2,410	16
Myanmar	24,000	3	300	2
Lao PDR	202,000	25	5,270	35
Thailand	184,000	23	2,560	18
Cambodia	155,000	20	2,860	18
Viet Nam	65,000	8	1,660	11
Total	795,000	100	15,060	100

Note: Approximate figures from Indicative Basin Plan, 1987





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