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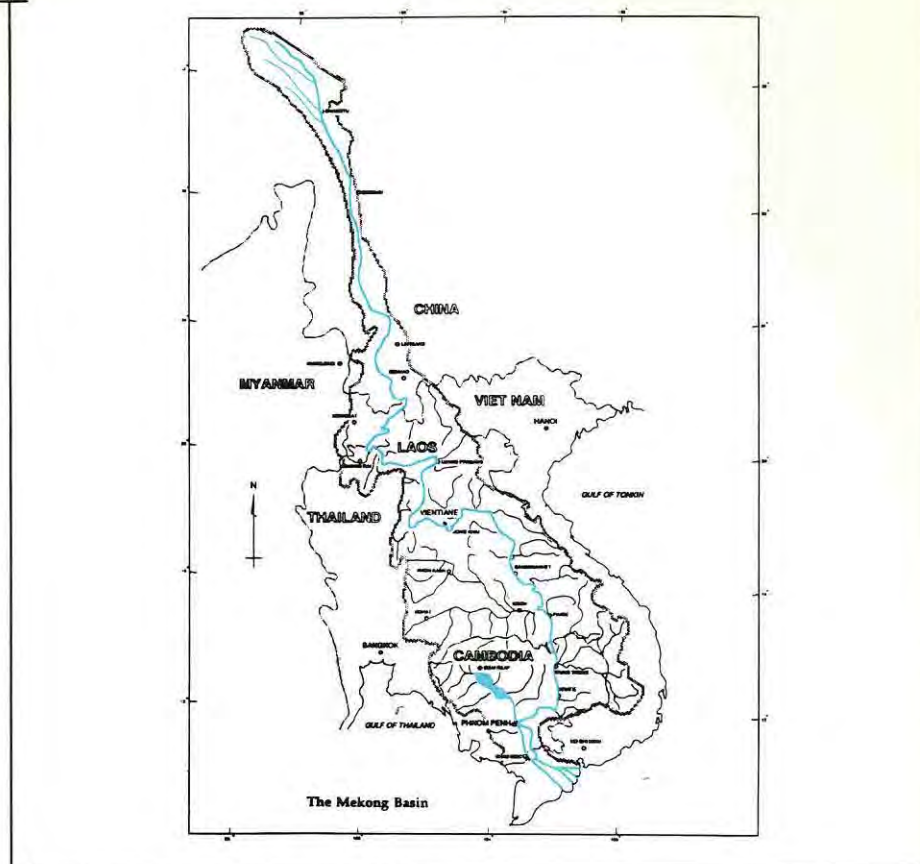


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PEEM RIVER BASIN SERIES NO.1



Incorporating a human health component into
the integrated development and management of the
LOWER MEKONG BASIN

A mission report prepared by

T.H. Mather
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1994
PEEM Secretariat
World Health Organization
Geneva



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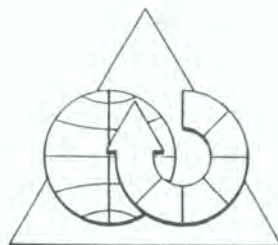
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PEEM River Basin Series 1

**INCORPORATING A HUMAN HEALTH
COMPONENT INTO THE INTEGRATED
DEVELOPMENT AND MANAGEMENT
OF THE LOWER MEKONG BASIN**

REPORT OF A PEEM MISSION TO
THAILAND, LAO AND VIET NAM

by

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About PEEM

The Panel of Experts on Environmental Management for Vector Control (PEEM) was established in 1981 as a joint activity of the World Health Organization, the Food and Agriculture Organization of the United Nations and the United Nations Environment Programme. The Panel's objective is to create an institutional framework for effective interagency and intersectoral collaboration by bringing together various organizations and institutions involved in health, land and water development and the protection of the environment, with a view to promoting the extended use of environmental management measures for disease vector control in development projects. The PEEM Secretariat is located in the Division of Operational Support in Environmental Health of WHO in Geneva, Switzerland.

In 1991 the three Organizations were joined by the United Nations Centre for Human Settlements (UNCHS/HABITAT) and the Panel's mandate was expanded to include health issues relating to human settlements in development and to the provision of drinking water supply and sanitation, and urban environmental management for disease vector control. The global PEEM network currently consists of 45 experts in relevant disciplines and twelve collaborating centres. The Faculty of Tropical Medicine of Mahidol University in Bangkok, Thailand, which contributed substantially to the success of the mission to the countries of the Lower Mekong Basin, is one of these collaborating centres.

The PEEM River Basin Series contains reports of assessment missions to major river basins on possibilities for the incorporation of a human health component in their integrated development planning and management. Reports on the Zambesi River Basin and the Senegal River Basin, which were also discussed at the 12th PEEM meeting in Aswan, are in print. Other missions will be carried out subject to the availability of financial support.

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PREFACE

The PEEM mission to the Lower Mekong Basin provides a case study of the status of health and environmental components in river basin development and management. It should be seen against the broad background of the objectives of the Panel, of the global issues that have contributed to the formulation of the PEEM Medium-term Programme 1991-1995 and of the programmes of the Organizations participating in PEEM. The UN Conference on Environment and Development (UNCED), with its concern for sustainability of the development and use of natural resources, has had a particularly strong influence on national and international perceptions of the need for environmentally sound management of land and water resources.

One of the areas of concern covered in the UNCED Report (Agenda 21) is *"Protection of the quality and supply of freshwater resources: Application of integrated approaches to the development, management and use of water resources"*. The recommended action contained in the chapter on this topic makes specific reference to human health, including drinking water supply and sanitation; to urban and rural development; to sustainable food production; and to the overall integration of sectoral programmes for water resources development and management.

The selection of the subject of the 1994 PEEM Technical Discussion (Incorporating a human health component into integrated river basin development and management) was an initiative in support of the field-orientation stressed in the Panel's Medium-term Programme 1991-95. Three case studies were prepared to provide a factual context for these discussions, and for two of these (Mekong and Zambesi) special fact-finding missions were organized. The United Nations Environment Programme provided the financial support which made these missions possible.

Contacts with the Interim Mekong Committee, national authorities, international agencies and regional networks in Southeast Asia have revealed scope for PEEM assistance in various rôles which are entirely in harmony with its mandate and policy orientations, within the context of **incorporating a human health component into integrated river basin development and management**. It is therefore sincerely hoped that there will be opportunities for PEEM support to the Interim Mekong Committee in its programmes for the Lower Mekong Basin.

The report of the 12th PEEM meeting (Aswan, 21-26 March 1994) will present the proceedings of the Technical Discussion, the conclusions made by the Panel and its recommendations for action as part of the 1994-1995 programme of work. It is scheduled to be published by the end of 1994.

ACKNOWLEDGEMENTS

An assignment such as the PEEM Lower Mekong Mission, covering a wide geographical range, and so broad a spectrum of disciplines and socio-economic circumstances, is very dependent on the goodwill and support of the national and international authorities and agencies in the region. Without exception, this was forthcoming in all three countries visited, and the enthusiasm of that support underlined local interest in the purpose of the mission. The team would therefore like to express its gratitude to all those officials and staff in the organizations listed in the appendix, who gave their time and expertise in support of the Mission.

There are some organizations and individuals whose assistance was outstanding, and without their input the mission could not have achieved its objectives. Among these, the Dean, Professor Tan Chongsuphajsiddhi, and staff of the Faculty of Tropical Medicine of Mahidol University, Bangkok (a PEEM collaborating centre), deserve special mention for their hospitality and for providing office facilities and transport in Thailand; Prof. Chamlong Harinasuta, Secretary-General of SEAMEO TROPMED, made it possible to visit Viet Nam; Dr Phadej Savisdibutr, Director of the Technical Support Division of the Mekong Secretariat provided invaluable advice and material on programmes and projects of the Interim Mekong Committee (IMC), and the officials of the IMC arranged contacts with National Mekong Committees and their staff in the riparian countries.

The Permanent Secretary of the Thai Ministry of Public Health, Senator Paichit Pawabutr, and many senior officials and staff of the Ministry, were most helpful, as too were the Deputy Secretary-General of the Office of Environmental Policy and Planning, Dr Saksit Tridech, and his senior officers. The same is true of the Energy Generating Authority of Thailand (EGAT), whose Director of the Environment Department and technical officers were generous with their time and documentation.

In Lao PDR, the Director of the Lao Mekong Committee, Mr Thevet Insisiemay, and the Deputy Director, Mr Sivixay Saysanavongphet, made all necessary arrangements for the visits to the national authorities, all of whom gave valuable assistance and advice. Particular mention should be made of the Director-General of the Dept. of Irrigation and senior officers of the Ministry of Health and its Institute of Malaria and Parasitic Diseases and Institute of Hygiene and Epidemiology.

In Viet Nam, Mr Nguyen Thanh Tin of the Sub-Institute of Water Resources Planning and Management (WPRM) kindly devoted most of his time to the team, escorting them in visits throughout Ho Chi Minh City, where officers of the WRPM and Agricultural Planning and Projection Sub-Institute and of the Community Health Department were welcoming and helpful.

Locally-based officers of various international agencies contributed greatly toward the team's investigations. Dr B. Doberstyn, WHO Representative in Thailand, provided valuable information on the region, and particularly on Cambodia which the team was unable to visit. Mr Cengiz Ertuna, Chief, Water Resources Section of the Economic and Social Commission for Asia and the Pacific of the United Nations (ESCAP), was generous with technical information and documents on the region, and Mr Orestes Gonzalez of the United Nations Children's Fund (UNICEF) gave the team invaluable background material on the Lao PDR, where the agency is so active in support of developments for community health and welfare, including the all-important provision of water supply and sanitation. In FAO Rome, prior to the field mission, useful background information on agricultural development and legislation was assembled with the help, in particular, of Mr R. G. Paterson and Mr A. Mekouar, respectively.

All the above, and many others not specifically mentioned, have the most grateful thanks of the PEEM Mission team, for making the assignment both possible and extremely enjoyable. It is hoped that we have truly reflected their concerns and their wishes in this report.

ACRONYMS

ADB	Asian Development Bank
AIT	Asian Institute of Technology
CGIAR	Consultative Group for International Agricultural Research
CNHE	Centre for National Hygiene and Epidemiology (Cambodia)
EC	European Community
EGAT	Electricity Generating Authority of Thailand
EPC	Environmental Protection Centre (Viet Nam)
ESCAP	Economic and Social Commission for Asia and the Pacific (UN)
FAO	Food and Agriculture Organization (UN)
GDP	Gross National Product*
GNP	Gross Domestic Product*
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (Germany)
IIMI	International Irrigation Management Institute (CGIAR)
IMC	Interim Mekong Committee
IMF	International Monetary Fund
IRRI	International Rice Research Institute (CGIAR)
MOH	Ministry of Health
MPH	Ministry of Public Health
MS	Mekong Secretariat
MSL	Mean sea level
MSTE	Ministry of Science, Technology and Environment (Thailand)
NEA	National Energy Authority
NGO	Non-governmental Organization
NRDC	National Rural Development Committee (Thailand)
NSO	National Statistics Office (Thailand)
NWRC	National Water Resources Committee (Thailand)
PEEM	joint WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental Management for Vector Control
UNCED	United Nations Conference on the Environment and Development
UNCHS	United Nations Centre for Human Settlements (HABITAT)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
WFP	World Food Programme (UN)
WHO	World Health Organization (UN)
WPRM	Sub-institute of Water Resources Planning and Management (Viet Nam)

* Gross National Product (GNP) is the sum of two components: the Gross Domestic Product (GDP) and net factor income from abroad. GDP is the final output of goods and services produced by the domestic economy, including net exports of goods and nonfactor services. Net fact income from abroad is income in the form of overseas workers' remittances, interest on loans, profits and other factor payments that residents receive from abroad less payments made for factor services (labour and capital).

Source: *World Resources 1992-1993*, WRI, Washington DC, page 243

EXECUTIVE SUMMARY

This mission report provided a case study for the PEEM Technical Discussion on *Incorporating a human health component into integrated river basin development and management*. The Technical Discussion was on the agenda of the 12th meeting of the joint WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental Management for Vector Control, held in Aswan, Egypt from 21 to 26 March 1994. Issues for discussion included a review of current water sector policies; mechanisms for national and local capacity building; the assessment, surveillance and monitoring of health risk factors; environmental measures considering water availability, water quality, disease vector habitats and disease transmission potential; strategies for people's participation in project development and management, as a basis for sustainability.

The Lower Mekong Basin, which exceeds 600 000km², includes almost all Cambodia and Laos, one third of Thailand and one fifth of Viet Nam. Some 50 million people live in the area. The climate is tropical and governed by two monsoons. Annual rainfall ranges from 1000mm in central northeastern Thailand to 4000mm in the mountains between Laos and Viet Nam, and while there is drought damage in much of the basin there is also severe flooding almost every year along the mainstream and major tributaries and in the vast plains of the Delta. The riparian states have widely differing populations and infrastructure, different levels of socioeconomic development and diverse capabilities in terms of skilled personnel and finance. In spite of these differences, the Interim Mekong Committee has achieved a degree of compatibility among the Lower Mekong Basin riparians, and maintains contact with China and Myanmar. China could have a marked influence on downstream water users, notably Viet Nam, depending on any future changes in the development and management of the upper catchment.

Tropical diseases are highly endemic in the Lower Mekong Basin, due to climate and geographical features. Among the most prominent diseases are those transmitted by mosquitoes, especially malaria, nutritional disorders and diseases linked to inadequate water supply and sanitation and poor personal hygiene. With the high proportion of rural populations engaged generally in agriculture, there is a strong relationship between land and water use and management, and changes to the environment and ecology arising from resource development will usually incur changes in the pattern of diseases. There is an acute awareness of the disease problem among the authorities directly concerned with human health in the region, both at national and international levels, but this does not extend to non-medical authorities and agencies. The creation of a general awareness of the linkages between health and development is therefore essential to the achievement of any real progress.

Institutional arrangements for water resources, the environment, settlement and health at national level vary in complexity and comprehensiveness among the riparian countries, being most advanced in Thailand. Environmental issues are receiving increased attention in all these countries, although guidelines and legislation are at a preliminary stage outside Thailand and Viet Nam, and the concept of human health in development is often absent, with limited evidence of any intersectoral institutional collaboration. There are, however, abilities and resources in environmental skills and

health personnel in both Thailand and Viet Nam which can be mobilized to help incorporate human health into basin development plans. These can be complemented by the resources of many international and multilateral organizations based in, or operating within the region of South-East Asia and the Pacific, with programmes on natural resources development, investment, health and the welfare of underprivileged groups. The Interim Mekong Committee, as a structure for cooperation and coordination of the planning and development of the water resources of the Lower Mekong Basin, is clearly the key to any integration of environmental and human health components in the Basin's development processes. This implies the collaboration of the riparian countries and investment and donor agencies in such integration.

While environmental issues are becoming prominent in the programme of the Interim Mekong Committee, there has been little progress toward the incorporation of human health components in ongoing and proposed projects. Concern for water-related diseases is, however, demonstrated in the proposal for a specific project in the 1993 Work Programme, with the long-term objective "*to build health planning into water resources development schemes, in order to ensure that the health of riparians is not impaired by water resources development activities*". Earlier activities for the survey and study of water-related diseases have been only partially successful, due largely to a lack of pre-implementation planning and design. The project now proposed, and seeking funds, has drawn on past experience, but it is considered by the PEEM mission that the lack of awareness of potential disease problems and their control among many of the authorities and agencies with responsibility for resource development is a major impediment to incorporating human health components.

Within the Lower Mekong Basin, the Interim Mekong Committee is in a unique position to develop this awareness among the non-health agencies. It could give greater prominence to human health within its programmes, at little extra cost, and it is probable that the subject would attract external support from the donor community. The particular problem of safe domestic water supply and improved sanitation is a severe health risk in many parts of the Basin, and inseparably linked to a number of the endemic diseases. One of the objectives of the ongoing and planned national water resources development programmes in the Basin must be the adoption and incorporation of suitable measures for the improvement of these services, otherwise an already serious health situation will deteriorate still further.

The mission has presented a series of recommendations, directed or related to the Interim Mekong Committee, as the appropriate authority to stimulate and coordinate the riparian members in the incorporation of a human health component into basin planning, development and management, in much the same way as this has been done with environmental issues with which health is so closely associated. In addition to recommendations aimed directly at Mekong programmes and projects, the mission presents a project proposal for *Capacity-building for the Incorporation of Health Safeguards in Lower Mekong Basin Development*. The elements of this proposal can be summarized as follows: i) increase awareness of potential health impacts of natural resources developments; ii) introduce and disseminate PEEM guidelines; iii) promote a Basin-wide health monitoring system with emphasis on water-related diseases and water quality; iv) apply specific disease protection and control measures where appropriate; v) where necessary, introduce periodic evaluation of the health and disease status of the affected population; vi) improve and ensure the distribution of relevant material from PEEM and its participating UN Organizations to the national, regional, bilateral and multilateral agencies concerned in the Lower Mekong Basin.

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THE LOWER MEKONG RIVER BASIN

PHYSICAL CHARACTERISTICS

The Mekong is the longest river in South-East Asia, and one of the largest rivers in the world. With a total drainage area of 795 000km², it ranks twenty-first in the world, and twelfth in terms of length, about 4 800km. Its annual runoff of 475 000 million m³ places it eighth in the world table. The Lower Mekong Basin catchment area exceeds 600 000km² and comprises almost all of Cambodia and Laos, 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), see Map 1. It is estimated that some 50 million people live in the Lower Mekong Basin area, representing more than 40% of the total population of these countries.

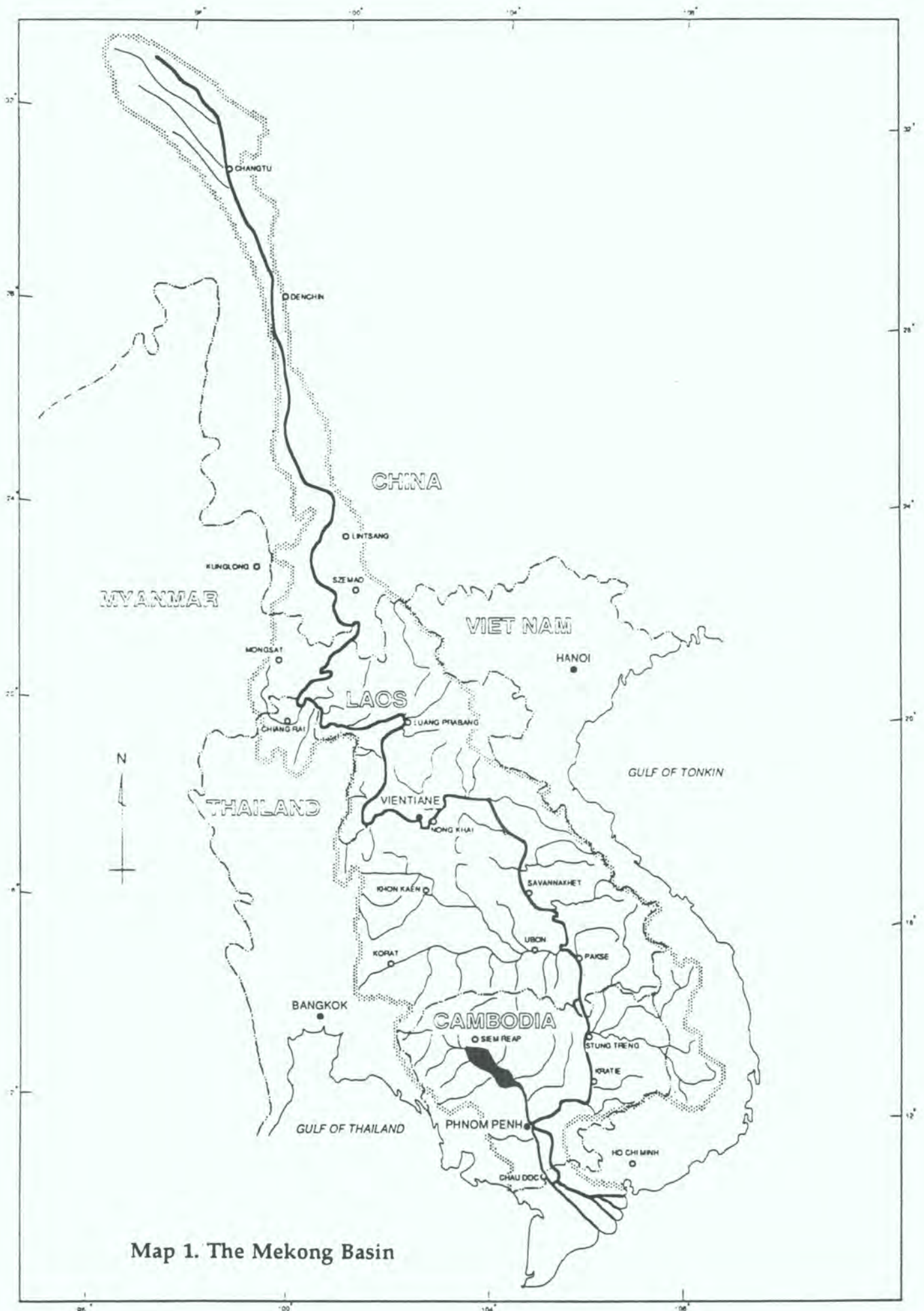
The climate of the Lower Mekong Basin is tropical, and is governed by two monsoons. The southwest monsoon begins in May and continues until September/October. Following a brief period of instability, it reverses, becoming the northeast monsoon from November to mid-March. During March and April, winds become light and variable. The south-west monsoon, passing over warm equatorial seas, brings the wet season, with 80 to 90% of annual rainfall, high humidity, cloudiness and tropical temperatures. Heavy rainfall and flooding also occur as tropical storms and typhoons enter the basin from the east. The northeast monsoon, originating in cold air masses of the Chinese and polar winters, is relatively dry. This dry season, from November to mid-March has little rainfall, low humidity, clear skies and relatively cool temperatures.

Mean annual rainfall ranges from 1000mm near central northeastern Thailand, to 4000mm in the Truong Son mountains between Laos and Viet Nam. The effect of relief 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 southwest monsoon. Wet season rainfall is usually sufficient to grow rice, the main crop, but is unevenly distributed during the growing season, causing drought damage throughout the Lower Mekong Basin most years. Where there is annual rainfall of 2000mm or more, there is little drought damage, but in most of the Basin rainfall is only 1000-1200mm. An adequate water supply could double paddy yields.

At Paksé, in the south of Laos, where the drainage area is 69% of the total Mekong Basin, the maximum discharge of 57 800 m³/sec is more than 50 times the minimum discharge (1600 m³/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, in April-May, reaching a peak in August, September or October. It then falls rapidly until December, and recedes slowly during the dry season, to reach its lowest level in March/April, just before the monsoon.

The excess water during the wet season results 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 shortage of water for domestic and industrial use. Most seriously affected during the dry season is the coastal plain of the Mekong Delta, where low flow results not only in a shortage of water for people and for agriculture, but also in the intrusion of salt water into the Delta. An area of up to 2.1 million ha is normally affected by salt water.

Tonlé Sap, the Great Lake of Cambodia, buffers water flow in the Delta downstream of Phnom Penh, by storing portions of peak flow from July to September, and releasing it from October to April. Excess water enters the Great Lake through the Tonlé Sap river, storing some



Map 1. The Mekong Basin

70 billion m³ in this natural reservoir. As the Mekong water level recedes, the Tonlé Sap reverses direction, and the Great Lake releases into the Mekong both the stored Mekong flood water and the yield of its own catchment area. In the Vietnamese Delta, the Mekong finally distributes its waters through eight branches into the ocean. Tidal influence contributes significantly to the extent of salinity intrusion, with a tidal range varying from 2 to 3 metres. The rôle of tidal forces is more prominent during the dry season, when the river discharge is only about 2000 m³/sec.

In several areas in the Delta, acidity of water is high at the beginning of the rainy season, when the first rain storms leach the highly acid soil. With subsequent rains, the soils become permanently saturated and subject to less oxidation, and the water is less acidic. However, this acidity may vary considerably along the course of the river, depending on local conditions of soil and inflow.

Table 1. Approximate Flow Distributions of the Mekong River

Country	Catchment area km ²	%	Average Flow m ³ /sec	%
China	165 000	21	2 410	16
Myanmar	24 000	3	300	2
Laos	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

Approximate figures from the Indicative Basin Plan, 1987.

RIPARIAN COUNTRIES OF THE LOWER MEKONG

Lao People's Democratic Republic

Geography and demography



Situated in the centre of the South-East Asian peninsula, the Lao PDR covers an area of 236 800km², of which 85% is in the Mekong Basin. The country extends over 1000km from north to south, and is 500km wide in the north and 150km in the south. The north is mountainous with several peaks over 2000m, and this high relief blends southwards into the Vientiane plain, which extends across the Mekong into Thai territory. In central and southern Laos the terrain is mountainous in the east, along the Annamite Chain, and descends through various plateaux to the vast plains which expand into North-East Thailand.

The population of Laos is about 4.5 million, increasing at almost 3% annually. More than 90% rely on farming, and the activities of these people depend on climatic conditions. The country as a whole is subject to the monsoon, which imposes a rainy season from May to September and a dry season from October to April. Annual rainfall varies from 1300mm to 3000mm, depending on exposure to the southwest monsoon. A short remission of rains during the wet season usually occurs around the end of July or the beginning of August. This may have disastrous effects if it lasts too long, as it coincides with the time of rice transplanting. The valleys where populations are concentrated are particularly susceptible to flooding.

An important aspect of Lao demography is the unequal geographical distribution of the population. This is related to the availability of good agricultural land and communication channels. In addition to geographical factors, historical causes contribute to the Lao PDR's current low population density. It has been estimated that, in addition to some 100 000 casualties of the Indochina war, 10 per cent of the population has fled the country since 1975. (Taillard 1989). This population loss has deprived the country of much of its technically trained labour, and has impeded changes needed for national development. Considerable time will be needed to rebuild this technical capacity through appropriate training.

Infrastructure

Due to the geographical features of Laos, and its population density, transport is underdeveloped. Improvements are taking place, as the government has put great emphasis on this sector. According to government figures, there were 13 700km of roads in 1989, of which 4 254km were under central management and 9 446km under local management by provinces or districts. Only 2 559km were tarmac roads, with 3 041km gravelled and the remainder dirt roads.

Another feature of this sparsely populated country is the low proportion of urban dwellers. The 1985 census reports a figure of 15%, but includes in this total all the district centres, which are little more than large villages. The situation is now changing with the increase in commercial activity attracting people to commercial centres located in towns. Due to deterioration and inadequate maintenance, the usable transport network is low. A number of projects are being undertaken with assistance from various multilateral and bilateral donors, with a view to providing Laos with a nation-wide network of main roads by the year 2000. Two bridges over the Mekong are planned or under construction: one near Vientiane, built with assistance from the Australian government, will open in April 1994, and the other, supported by the Asian Development Bank, will be at Savannakhet. It is expected that the demand for transport will increase with this improvement in infrastructure.

Most of the 1970km of the Mekong river flowing through Laos are navigable. The section between Luang Prabang and Vientiane is navigable with difficulty by larger boats from July to February. The remainder of the river is navigable all year, although during the dry season only boats of five to ten tons are able to pass some rocky sections. To ensure better coordination with the road network, international assistance (particularly from the Interim Mekong Committee and bilateral donors), has been provided to upgrade most of the main river port facilities. Tributaries of the Mekong provide an additional 3000km of navigable rivers where small boats and canoes are used for the transport of passengers and light consumer goods.

The vast majority of the rural population have access to traditional sources of water, from the Mekong river, its tributaries, streams, ponds and hand-dug wells. Few of these sources are sustainable to last throughout the dry season from October to May, and much of the water is unsafe for consumption. The water supply and sanitation situation is far better in urban areas, particularly the capital Vientiane and larger towns, where it is estimated that some 50% of the population have access to treated water supplies and the sanitation system has greatly improved. The towns receive the greater share of trained technicians and of equipment. Poverty is at the root of this disparity between urban and rural sectors (UNICEF, 1992).

The economy

According to the 1990 World Development Report of the World Bank, in 1988 the Lao PDR was the tenth poorest country in the world, with a per capita Gross National product (GNP) of US\$180. A more recent estimate by UNICEF is US\$216, with a note that there are major disparities between urban and rural areas (UNICEF, 1992). Literacy was estimated to have improved by 1989 to between 55 and 60%. The manufacturing sector accounts only for about 9% of GNP, and the economy is highly dependent on agriculture (mainly rice production with some livestock), and forestry, with a combined share of over 60% of GDP and about 90% of the labour force. The low population density has not encouraged high productivity in agriculture, or new employment opportunities, but this situation is rapidly changing.

With a population growth rate in 1990 only a little below 3% per annum, shortages of land for rice production are beginning to be felt. This is stimulating efforts towards more intensive land use, with increasing emphasis on irrigation, especially small pumped schemes, and an additional area of 31 700ha is planned by the year 2000 (Hunting, 1993). This will be largely dependent on the ability to mobilize a voluntary labour force from among the farmers, with the constraint that such communities have little time or energy to spare from their subsistence agriculture. An input of food aid would seem to be justified in support of this programme of irrigation expansion.

The Second Five Year Plan (1986-90), saw the introduction of the **New Economic Mechanism** (NEM) with more market-oriented economic, financial and fiscal regulations, and a view to stimulating and streamlining production for local consumption and export, and encouraging foreign investment. This Mechanism is inspired and monitored by the World Bank and the IMF, and is requiring some adaptation of existing systems linking central, provincial and district levels of organization, particularly in view of scarce material and human resources.

Agriculture is the main sector of the economy and some food crops such as rice, peanuts and soya beans are produced in surplus during favourable years. Most are, however, consumed domestically and only small surpluses find local market outlets. Local cash crops of cotton, tobacco and tea are produced by subsistence farmers in addition to their traditional food crops. Major cash crops are coffee, cardamom and sesame. The development of these crops will depend on higher producer prices, better trading policies and the improvement of transport and agricultural extension networks. The road construction programme for the next five years includes 1 943km of major works and the improvement of roads linking Laos with Thailand and Viet Nam, with port outlets in the latter country (Hunting, 1993).

Fishing is a common activity in all lowland areas, and in many locations provides the second most important source of protein after rice. The current production of 27 000t is estimated to meet only 33% of minimum requirements (Mekong Secretariat, 1992a). Fish are often eaten dried or in a salted, fermented form. About 2000t of fish are raised in ponds and paddy fields, and the construction of hydropower reservoirs offers new opportunities for fish production. This depends on careful management of the combined river/reservoir environment and of water quality, as well as the development of appropriate new methods and skills in the communities.

Forestry is of great importance to the country's economy, and it is estimated that the total wood volume of all types of forest is about 1200 million m³. In addition to high value tropical hardwood species, forests contain other exportable products and provide a wide variety of indispensable food resources to village households, as well as 80% of domestic firewood needs. The government believes that forestry can provide higher export earnings than in the past, particularly in view of the depleted forest resources of neighbouring countries. At present, timber and forestry products are estimated to provide about 40% of total export earnings.

Slash and burn cultivation (swidden) with reducing fallow periods, uncontrolled fires and land encroachment by lowland farmers are destroying some areas of forest. Several sustainable upland farming systems combining agriculture, forestry and animal husbandry are being studied and tested, including an approach to the sharing of responsibility between government and local people for the protection and use of forest land, with areas allocated for use by individuals, villages and enterprises.

The Lao PDR possesses the greatest hydroelectric potential of the countries in the Lower Mekong basin. The potential capacity is estimated at up to 13 000MW for Laos, compared with 2 500MW for Viet Nam and 350MW for Thailand. At present, electricity is principally generated by the Nam Ngum barrage in Vientiane province, with 100MW capacity, and up to 80% of the output is sold to Thailand, contributing 28% of the value of exports. The governments of Thailand and the Lao PDR have agreed that the former will purchase 10% of its electricity requirements from Laos by the year 2000. This means that Laos must develop a total capacity of about 1500MW to meet that demand (Hunting, 1993).

Laos receives external aid from a wide variety of sources. Donor agencies who responded to a UNDP questionnaire in 1990 included 16 multilateral agencies (11 in the UN system), 16 NGO's and 19 bilateral sources. Among various measures proposed to increase the efficiency of external assistance, one of the more important would be the encouragement of donor commitment to Lao PDR on a multi-year country programme basis, rather than on a project-by-project basis, thus allowing greater flexibility to plan development according to local capacity to use funds effectively.

Thailand

Geography and demography



The total area of the country is 513 115km². To the north and east it is bounded by Myanmar, Laos and Cambodia. As with the Indochina peninsula in general, the climate of Thailand is mainly governed by the southwest and northeast monsoons. Tropical depression storms originating in the South Pacific or the South China Sea also bring heavy rainfall during the period from June to October.

The area within the Mekong basin comprises the entire Northeastern Region, of 168 846km² and a small proportion of the Northern Region, 15 647km² (National Water Resource Committee - NWRC, 1990). The population of the Northeastern Region in 1991 was 18 893 000, compared with the Kingdom total of 46 917 000, in the Key Statistics of Thailand (National Statistics Office - NSO, 1992). The total population within the Mekong Basin is therefore about 20 million, of which some 12% is classed as urban and located mostly in the regional centre of Khon Kaen. The rural population density varies from less than 100 people per km² in the hilly areas and on the poorer land, to more than 270/km² around Khon Kaen. Generally the highest concentration of rural dwellers is along the Chi Valley and to a lesser extent the Mun Valley.

The Mekong provinces are mainly lightly populated. Employment is dominated by subsistence agriculture, constrained by climatic uncertainty and related rainfall variability and flooding, and by soil limitations.

The major part of the northeastern Region is an elevated saucer-shaped plateau, which is divided by the Phu Phan range into the Korat Triangle in the south, and the Mekong Provinces to the north. The plateau is bordered by hills to the west and south and by the River Mekong to the north and east. It is an area of low relief, sloping gently to the east. The Korat Triangle is drained by the Chi and Mun rivers, with annual runoffs of 8 000 and 22 000 million m³ respectively. The other, smaller tributaries contribute about 16 000 million m³.

Average rainfall in this part of the Mekong Basin ranges from 1100mm in the southwest to 1650mm in the northeast of the Region, of which 800mm and 1300mm, respectively, occur in the rainy season from mid-May to mid-October. Mean annual potential evapotranspiration exceeds rainfall over almost the entire area, ranging from 1660mm in the northwest to nearly 1800mm in the east.

The Mekong tributary valleys are subject to flooding from the main river at high stages and are poorly drained, making wet season cropping hazardous in these areas. All of the rivers are highly seasonal in their flow patterns, with 90% of natural runoff occurring in the wet season in direct response to rainfall. Only with reservoir storage can there be significant dry season water use.

Groundwater in the northeastern Region as a whole is generally of poor quality, and aquifer yields are low. High concentrations of chloride, sulphate and iron are common, and many wells are biologically contaminated, but there is good groundwater in some areas, though in small quantities. Shallow dug-wells are a common and preferred source of drinking and domestic water, and an estimate of the total annual amount of groundwater presently abstracted is 248 million m³.

Infrastructure

The northeastern Region is well served by an extensive network of good quality highways linking the main urban centres, and with local roads to the lesser towns. The road to Laos will be completed with the opening of the bridge across the Mekong in April 1994. The railway connects seven Provincial centres with Bangkok, bringing in machinery, industrial supplies and petroleum products, carrying out agricultural produce, and providing passenger services. Air links from Bangkok to five provincial centres are well utilized.

A dense power distribution network serves the entire country, and in the Northeast Region, covers almost all the villages. Within the Region, energy is generated by 5 hydropower plants with a capacity of 108MW and two thermal (gas turbine) plants. Thailand imports additional energy from Lao PDR via a 100MW interconnector. While the installed capacity of hydropower, country-wide, was 21.88% of total installed capacity in 1992, this source generated only 8.04% of total energy generated (EGAT, 1993). This reflects the operation of the multipurpose reservoirs for the primary use of irrigated agriculture, in circumstances of erratic seasonal rainfall. One further hydro station is under construction at the Pak Mun dam, but this is a low head run-of-river facility which has no significant storage or discharge regulation function.

The economy

The 1990 per capita GNP of Thailand, at current market prices, was US\$1419 (NSO, 1992) which, together with a growth rate of more than 7% (World Resources Institute, 1992), illustrates the Kingdom's strong economic position within the Indochina region.

The northeastern Region of the country, however, falls well below the average national level. Whereas a country-wide 45% of all households had a monthly income of 1000 baht or more (US\$472 per year), only 24% of northeastern households attained this level (NSO, 1992). On this criterion, it is by far the poorest region in the country.

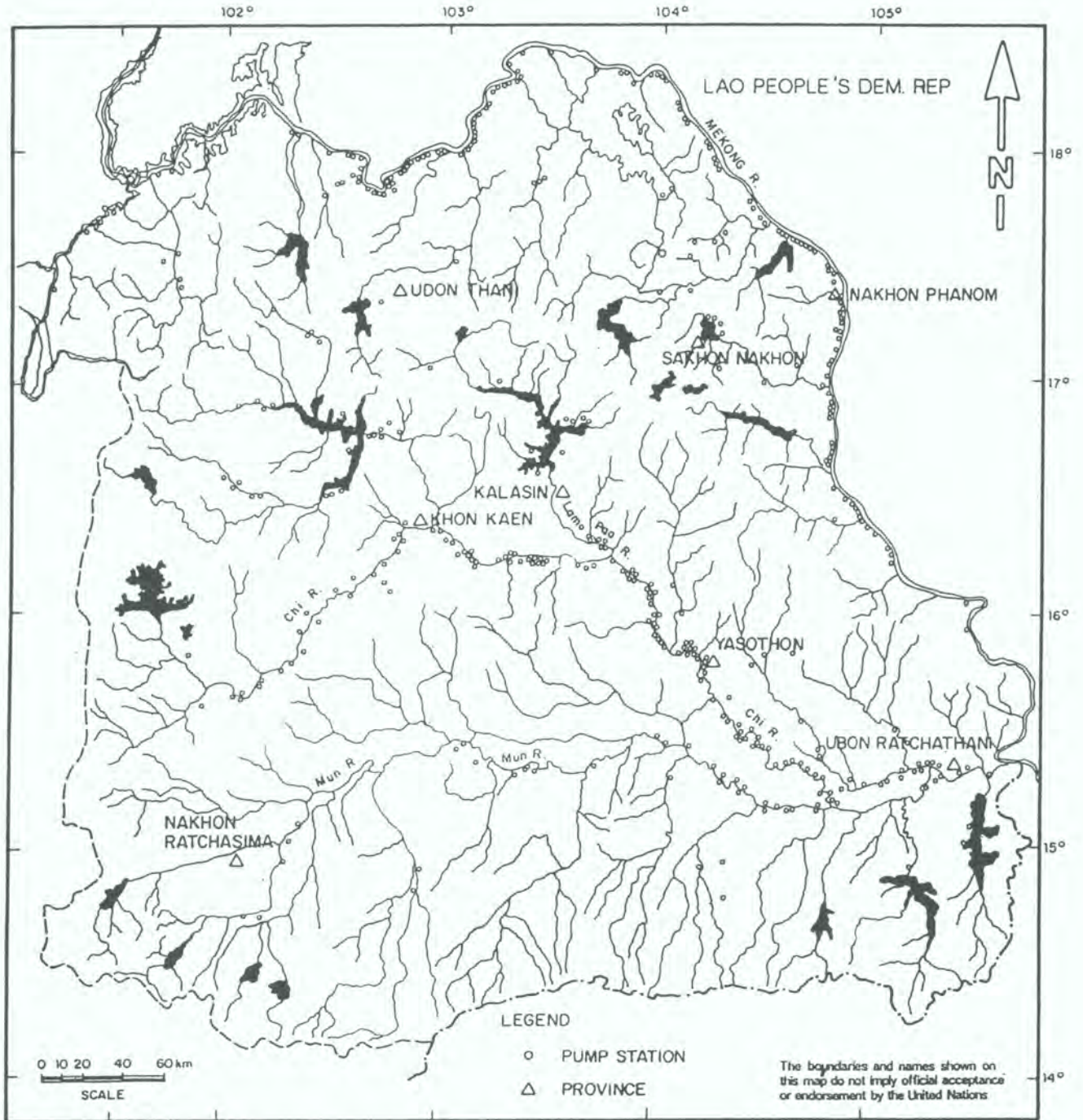
Nationally, agriculture occupies 22.1 million ha, with 4.18 million ha irrigated. All products (crops, livestock, fisheries and forestry) contributed 12.5% of the 1990 GNP, with crops accounting for 7.3%. The largest sectors were manufacturing (26%) and wholesale and retail trade (15%). In the Northeastern Region, agriculture, while providing employment for 80% of the population and occupying a cultivated area of 8.4 million ha, some 10% irrigated, contributes 29% of the regional product from crops. The 5.8 million ha under paddy produces 46% of the national total, but about 70% of this is of the glutinous variety favoured in the region but with little export potential. Cassava, sugar cane and maize are other major crops. The improvement of rainfed farming is considered to be an important component of future development in the region, through reducing farming risks and promoting farming systems with higher incomes by diversifying crops away from rice and incorporating a fish/paddy culture, where appropriate, with on-farm ponds to conserve water.

The irrigated area in the Region is made up of approximately 240 000ha of large scale projects (9000-50 000ha), 160 000ha medium scale (160-8000ha) 200 000ha of small scale projects, and 200 000ha of pumped irrigation. These last are mostly located on the Chi River, and also on the Mun River and on the bank of the Mekong, (Map 2). Their size is typically about 500ha, served by an electrically powered, pontoon-mounted pump. This appears to offer the only means of increasing irrigation water supply in the region, as there is little prospect of augmenting storage capacity. Most of the suitable reservoir sites in the Northeastern Region have been developed, and those remaining tend to be large and shallow, causing high evaporation losses, inundation of productive land and resettlement problems. Under these conditions, further abstraction from the Mekong can be predicted.

Livestock, mostly on a small farm basis, is an important component of the Region's agriculture. In 1987, there were 3.72 million buffalo, (77% of the national total), 1.48 million cattle (34%), 1.03 million pigs (18%), and 29 million poultry (27%). Increasing mechanization is tending to reduce the numbers of buffalo and cattle, as their draft power is no longer needed, and with a declining area of natural pasture, the feed base is limited.

Annual fish production in the northeastern Region is estimated at 320 000 tons, with only 6% from aquaculture. This total is only 72% of the estimated minimum requirement (Mekong Secretariat, 1992a). Aquaculture lags behind the rest of Thailand because of the lack of perennial sources of water, the poor retention qualities of ponds and the high costs of feedstuffs and fertilizers in the Region.

Over the past 25 years, it is estimated that forest areas in the Region have been reduced from 7 million ha to 2.3 million. Causes include population increase and resulting local demands for fuelwood and wood products; encroachment on the land for food production; and commercial exploitation. The Royal Forestry Department proposes to raise the proportion of forest land from the present 14% to 25%, an increase of 1.9 million ha. To attain this target, 1.2 million ha of marginal agricultural land would be taken back into forestry. The timber industry comprises 70 sawmills and 200 wood processing factories employing 30 000 people. There is a major pulp and paper factory at Khon Kaen producing 70 000 tonnes of pulp annually. Another important local activity is sericulture, and there are good prospects for increasing silk production as a cottage industry.



Map 2. Location of pump-irrigation projects of the National Energy Administration, northeastern Thailand (NEA, 1990)

Cambodia

Geography and demography



Cambodia has a total area of 181 035km², of which 86% lies within the Mekong Basin. The remainder is mostly between the Cardamom Mountains and the Gulf of Thailand to the southwest. In common with other countries in the Indochina peninsula, its climate is governed by the two monsoon seasons, and annual rainfall in the central lowlands averages about 1000-1400mm and variability gives rise to droughts and floods. Temperatures range from 21°C to 35°C reaching a maximum in March and April and average relative humidity is about 80% throughout the year.

The main geographical features are the Tonlé Sap (Great Lake) in the central plains, the Mekong River and the Cardamom and Elephant Mountains which separate the coastal region from the rest of the country. During peak flow periods, the Mekong floodwaters back up along the Tonlé Sap river and fill the Lake to a depth of more than 10 metres, compared with a dry season depth of about 2.2m, and expanding its surface area from a minimum 3000km² to as much as 7500km². By the end of November, this enormous buffer storage flows back into the Mekong as main river levels fall. At periods of low river discharge the tidal effects of the South China sea may reach as far as Phnom Penh.

In the centre of Cambodia, around the Great Lake and the upper Mekong Delta, is a low-lying alluvial plain. Extending outward from this plain are thinly forested transitional plains with elevations up to 100m above sea level. The country is bounded by highlands on the northern border with Thailand and on the northeast border with Viet Nam.

Accurate demographic data are not presently available, but the population is estimated at about 9 million, and increasing at some 2.8% yearly, with approximately 1 million in the capital Phnom Penh. Two thirds of the people live in the central plain area south of the Tonlé Sap, where the population density is around 100/km². Otherwise, rural populations average about 45 persons/km², down to as little as 6/km² in some of the mountainous areas.

Infrastructure

The devastation of 20 years of war, varying economic models of development, lack of resources and international isolation have severely affected the maintenance and development of the country's communication and transport infrastructure. Before 1975 there were some 11 000km of motorable roads and 1375km of railways. Now, even major roads are in disrepair, and many are impassable because of broken bridges and land mines. Some parts of the country are now accessible by road only during the dry season. Due to damage to track and shortage of rolling stock, rail services are highly unpredictable.

However, the past two years has seen an increasing level of external assistance for the restoration, repair and rehabilitation of infrastructure, and of data collection to support such developments. The EC has funded the replacement of highway bridges destroyed by floods in

1991, mapping and photo interpretation have been carried out with assistance from various European countries, the ADB and the Mekong Secretariat, and repairs and rehabilitation of irrigation infrastructure are being implemented with support from UNDP and the Mekong Secretariat.

Water transport is again assuming greater importance and the port areas of Phnom Penh and Kompong Som are becoming overcrowded with vessels bringing in consumer goods. The upgrading of ferry facilities at four river crossings, a key requirement in the reconstruction process, forms one of the projects in the Mekong Work Programme for 1993, with funding of US\$8.1million from Denmark.

The urgent need for the restoration and extension of water supply and sanitation is recognized by the Ministry of Health, and programmes are being implemented in rural areas by the Centre for National Hygiene and Epidemiology (CNHE), and in urban centres by municipalities, with considerable assistance from UNICEF and NGO's. The 1991 achievements included 546 new tubewells, 556 shallow wells, 1221 new handpumps installed and 1215 old pumps repaired. This did not meet the targets set, because of lack of fuel and equipment, as well as the 1991 floods (MOH Cambodia, 1992).

The economy

Until recently, Cambodia has considered financial and economic information as confidential, for reasons of security. It has therefore been difficult to obtain reliable data (where these exist), especially without visiting the country. The GNP is estimated by UNICEF at US\$160 per capita, ranking Cambodia in a position of 195 out of 203 countries. Other surveys indicate a far lower value. Average professional salaries are quoted at about US\$10-20 per month (omitting potential private income).

While the economy has made some recovery from the worst effects of the late 1970s, its productive capacity remains far below the levels achieved in the 1960s. With low outputs from industry and mining, the country is essentially sustained by subsistence agriculture and external aid. However, it has the potential for being a net exporter of food, mainly rice, and fisheries, with the Tonlé Sap as a major source of the 81 000t of freshwater capture fish and aquaculture. The total marine and inland fisheries annual production of 100 000t produced and consumed in Cambodia is only 60% of the current minimum requirement (Mekong Secretariat, 1992b). Forestry and mining could also become good foreign exchange earners. The industrial sector is still underdeveloped, and is adversely affected by deficiencies of energy, raw materials, machine spares and, above all, by shortages of trained technicians.

About 80% of the population is employed in agriculture, fishing or forestry. Rice, the main crop, is grown on 85% of the cultivated land, which totals 3 056 000ha (FAO, 1991). Most regions produce only a single crop as the area served by an irrigation infrastructure is limited to 3%. Peasants supplement this crop by cultivating fruit and vegetables and fishing, which produces the single most important source of protein in the Cambodian diet. Other agricultural products include rubber, maize, sugar, soya beans, tobacco, coffee and kapok. Livestock production on peasant farms is considerable, national totals for 1990 being estimated as 2 017 000 cattle, 1 545 000 pigs, 16 000 equines, 727 000 buffaloes and 7 million chickens (FAO, 1991).

Economic liberalization began in the late 1980s with official recognition of a re-emerging private sector, followed in 1989 by an increasing acceptance of the right to private ownership of land and privatization of production. But, in all sectors, two human resources issues will be crucial to the success of rehabilitation and development efforts in the immediate future. The first is the under-employment of the majority of the working-age population; the second is the extreme shortage of educated and skilled workers.

Viet Nam

Geography and demography

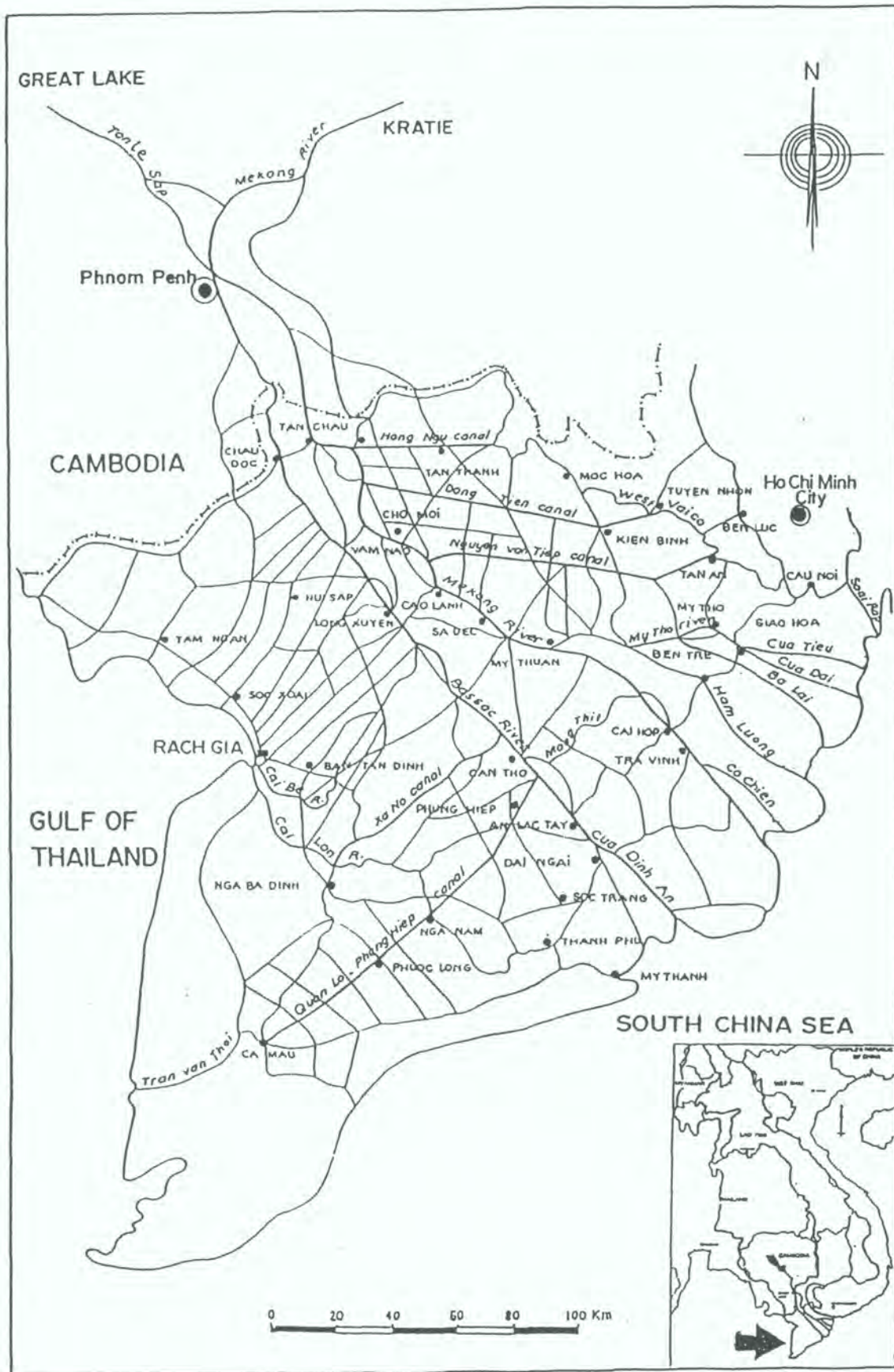


The country's land area is 329 566km², and it stretches more than 1600km along the eastern coast of the Indo China peninsula, from 8°34'N to 23°22'N. With the wide range of latitudes and altitudes, the climate is very diverse, but is still determined by the two monsoons. Two areas of Viet Nam lie within the Mekong Basin: 26 000km² of the Central Highlands and their western foothills, and 39 000km² in the Mekong Delta. The Central Highlands are sparsely populated (about 2 million people), and have areas of rainforest, fertile plateaux, and coffee plantations. The high rainfall of this region (2000 to over 4000mm), makes a considerable contribution to the Mekong flow in relation to the surface area, and management of the natural cover, including restoration of some forest, is an important issue in maintaining flow régimes and controlling sediment loads.

The Delta area of the Mekong, within Viet Nam, is 12% of the country's land area. Below the confluence of the Mekong and the Tonlé Sap River, the main river divides to form the Mekong and Bassac rivers, before entering Viet Nam. Some 70km further downstream the Mekong branches out to form its estuary (Map 3). Apart from some isolated rock outcrops to the west of Long Xuyen, the relief of the Mekong-Bassac alluvial plain is flat. Only along the northern border with Cambodia are land levels in the order of 1.5m above Mean Sea Level. The average elevation of the Vietnamese part of the Delta is about 0.8m above MSL. A number of differences in micro-relief nevertheless affect the drainage conditions significantly. The rivers Mekong, Tonlé Sap and Bassac flow within natural levees flanked by depressions which serve as vast flood storage lakes. During a high flood, the upper part of the Delta is submerged in places to depths of up to 4.5m. The combined action of river sediment deposition and the tide have produced a slightly higher coastal belt in which flooding is less severe.

Annual rainfall in the Delta ranges from about 2400mm in the west to 1300mm in the centre and 1600mm in the east, with a wet season from April to November in the west and May to November in the remainder. During high discharges, the river banks are overtopped with 1.2 to 1.4 million ha being inundated to depths of up to 3 metres. Since the Mekong flood coincides with the wet season, many areas not affected from the river can suffer serious waterlogging from local rainfall. This is especially the case in the Ca Mau peninsula and, in total, the waterlogged area may amount to 1.0 to 1.2 million ha over a period of 2-4 months each year.

Mean dry-weather flow from December to June is about 6000m³/sec, but in March to May this can fall below 2000m³/sec. The tide has amplitudes of 2.5 to 3.0 metres, and during these low flows its effect may extend 400km upstream, causing salt concentrations of 4g NaCl/litre at 50km from the sea, and at 15km at the end of the flood season. Salt water intrusion is said to affect some 1.7 to 2.1 million ha for periods ranging from 1 to 8 months. Another serious water quality problem arises from the acid sulphate soils. When these are exposed to the air, oxidation of the pyrite layer forms acid which moves by capillary action to the surface and is flushed into the water courses at the start of the subsequent rainy season.



Map 3. The Mekong Delta

The safe yield of groundwater under the Delta is estimated at 1.0 million m³/day, compared with the present abstraction of 165 000m³/day for urban and rural water supply. This source should be reserved for the inevitable future demands of rural populations.

The population of Viet Nam is approaching 70 million, and that in the Delta about 16 million, with a growth rate of 2.2% per annum. About 85% are classed as rural, the remainder living in settlements of at least 4000 inhabitants. Average household size is 5.4 persons. The settlement pattern is determined by the slightly higher terraces and the levees along the rivers. With the excavation of canals, people settled on the canal banks (which also provide road access), resulting in a ribbon development which sometimes stretches over tens of kilometres. Urban population is concentrated in a limited number of centres. The labour force is estimated at 40% of the population, but underemployment is high.

Infrastructure

Cargo-flows in, to and from the Mekong Delta are transported by inland water transport, coastal shipping and by road. The Mekong and Bassac rivers would be navigable for larger vessels if entrances were improved and channels properly marked. The rivers also provide access to Cambodia and the port of Phnomh Penh. Most international shipping related to the Delta now takes place through the port of Ho Chi Minh City, some 200km from the Delta's centre Can Tho, with an annual volume of 4 million tonnes. Some 3.1 million tonnes of cargo were transported by road in 1991, and 31 million passengers (about 75% of all passenger traffic in the Delta).

The road network in the Delta has a total length of some 5200km, made up of 1000km of national roads (including 286 bridges and four ferry crossings), 1800km of provincial roads (including 520 bridges), and 2400km of rural or feeder roads. Apart from the national roads, the others are generally in poor condition and can be used only in the dry season. A reconstruction programme is under way to make all national roads accessible for trucks of 25t payload.

Domestic water supply is still very problematic, and will remain so for a long time. Water quality rather than quantity is the key problem. Water consumption per capita, supplied either by wells in the rural areas or through piped systems in urban areas, is very low. Most of the population make use of the river or canal network for bathing, washing of food and clothes. The risks of these practices are reflected in the high incidence of water-borne diseases. In the urban areas, most of the organized water supply is at present from surface sources. Most of the treatment plants were built in the 1930's and are in poor condition due to lack of maintenance. Clean water production for 15 towns in the Delta was 142 000m³/day in 1990, of which 40% was unaccounted for. Groundwater took a share of 41 000m³/day. Urban demand is estimated at 245 000m³/day, and industrial water use, entirely from groundwater, at 34 000m³/day.

In the rural area, some 19 000 small wells have been drilled, with an abstraction capacity of 90 000m³/day, for supply to about 2.6 million people. For the majority of the rural population, no organized supply is available. People depend on storage of rainwater in cisterns. At the end of the dry season, the stocks will deplete and it is estimated that more than 8 million have to obtain their drinking water from distances of over 10km. For the rural areas, development of groundwater resources is practically the only alternative to storage of rainwater, and it is to be expected that the number of small wells will increase dramatically in the near future. Knowledge of the groundwater resources is still limited, and a monitoring programme is essential. The draft Master Plan for the Mekong Delta, in its proposed first phase rural water supply project in 11 provinces, draws attention to its close relationship to such a monitoring programme and to the need for integration with improved sanitation and the participation of women in the overall project.

In 1990, the Delta had an installed energy generating capacity of 33MW (diesel-fired) in Tra Noc in Can Tho province. This provided 35% of the Delta's electricity. A coal-fired plant of 200MW is planned, as are additional substations and transmission lines. Electricity consumption has grown at nearly 15% annually, from 87GWh in 1976 to 560GWh in 1990. Average consumption is still very low at only 38kWh per capita. Consumption is expected to grow at a rate of 10-20% per annum.

The economy

Until 1986, the economy of Viet Nam was controlled strictly centrally. The Sixth Party Congress of 1986 decided on reforms across the full range of the national economy, its management and institutions, and adopted its "Doi Moi" policy of deregulation and liberalization of the economy, with its inherent encouragement of private sector development and market orientation. The Delta responded rapidly and positively, with an initial economic growth rate of about 10% per annum, later slowing to 6-9%, but continuing vigorously. This growth has resulted from i) some expansion, but mostly intensification of the area cultivated; ii) a doubling of fisheries output; iii) a concurrent increase in primary sector output processing; and iv) greatly increased national and international trade and transportation. So far, growth has been relatively easy, tapping latent resources. Future growth will need more effort and increasing technological and managerial sophistication (NEDECO, 1993).

The GDP for the Mekong Delta in 1990, was estimated at US\$2 300 million, of which US\$1 550 million was attributed to the rural population, giving a rural per capita GDP of US\$126, and US\$750 million to the urban population, with per capita GDP of US\$326. The average GDP for the Delta was US\$156.

Within a gross area of 3.9 million ha, 2.46 million is classified as agricultural land. For the most part, this is under double or single crops of rice (1 750 000 ha). There is a small area (78 000ha) of triple rice cropping, some of the riceland is also cultivated to upland crops and 144 000ha devoted entirely to upland crops. Perennial crops occupy 346 000ha, and lands classified as forest cover 377 000ha, although only 200 000ha are actually under forest. Water surfaces "for agricultural uses" are estimated at 145 000ha, and other areas, including waste lands, waterways and unclassified lands, total 1 118 000ha (data based on figures from the Sub-National Institute for Agricultural Planning and Projection).

Agricultural production is based on private small-holdings averaging about 1 hectare. The Delta provides some 50% of total national paddy production (9.7 million out of 19.2 million tonnes in 1990), and in that year it contributed 85% to rice exports. As a result of continuing irrigation and drainage development, there has been an expansion of Winter-Spring and Summer-Autumn rice, mainly at the expense of main season rice, with an increase in yields which has raised production in the decade to 1990 from 5.3 to 9.7 million tonnes. The major upland crops include soya bean, mung bean, groundnut, maize, sesame and jute. Perennial crops include coconut, pineapple, sugar cane and fruit trees. There is a vast potential for production increase, but the focus on rice has drawn attention, support and labour away from these crops. The devolved structure for development, from centre to province to district level, and beyond, means that farmer participation is a major component, but there is cause for concern that the farmers' low economic status denies them the capability to meet the demands on them, and a number are reported to be abandoning the area. Most farmers keep some livestock as an integral part of the crop production system. It is estimated that in 1990 there were some 0.45 million cattle and buffalo, 2 million pigs and 27 million duck and poultry in the Delta.

Fisheries play a central rôle in the human nutrition pattern in the Mekong Delta, where fish is the main source of animal protein. The current average annual consumption of fresh fishery products is 21kg per capita, which is high compared to the Mekong Basin areas of the neighbouring countries, but still lower than the 26.9kg recommended by the National Institute

of Nutrition. The fisheries production of the Delta in 1991 amounted to 46 000t of freshwater capture, and 167 000t freshwater and brackish water culture. Sea fisheries totalled 267 000t. The export of aquatic products, mainly frozen shrimp and prawn, was valued at US\$120 million in 1991. There is now a tendency for some of the aquaculture projects to be managed by absentee entrepreneurs from Ho Chi Minh City, employing low-paid labour on site.

Of the 200 000ha of forestry, 173 000 are classified as production forest, including *Melaleuca*, mangrove, *Nypa* palm and some *Eucalyptus*; 27 000ha are Protection and Special Use Forests. Today, hardly any forest is left, and its destruction has caused serious erosion problems. Mangrove forest generates the largest variety of products, including firewood and charcoal. Since the mangrove is highly susceptible to changes in its environment such as those that may arise from extensive shrimp culture, land reclamation, salinity control, agricultural development and pollution, measures must be introduced for its protection and rehabilitation. *Nypa* palms provide material for housing, baskets and mats; *Melaleuca* forest provides poles and stakes as well as firewood, and is the most appropriate crop for the more highly acids sulphate soils. Forest by-products include ropes made from climbers, and medicinal plants are collected from all forest types. The production of by-products is difficult to assess.

Annual production of existing forest is estimated at 0.3 million m³ of fuelwood and 0.2 million m³ of small timber. Provided that the existing production forests are properly managed, and not destroyed by fires or illicit fellings, they could provide a sustainable yield of 0.5 million m³ per year over the next 10 to 15 years. In the next rotation cycle, it is estimated that this could rise to 3 million m³ per year. The "Scattered Tree Planting" programme, aimed at promoting private homestead planting of various timber, fuelwood and fruit tree species, has been quite successful. It is now largely a self-propelled activity, providing considerable quantities of timber and other products. With an estimated annual production of 1.9 million m³, it is now the major source of firewood in the Delta (NEDECO, 1993).

ENVIRONMENTAL HEALTH IN THE LOWER MEKONG BASIN

Tropical diseases

In the countries of the Lower Mekong Basin, tropical diseases are highly endemic due to climatic and geographical features. With the high proportion of rural populations engaged in agriculture, there is a strong causal relationship between land and water use and management, and changes to the environment and ecology. These, in turn, will usually incur changes in the pattern of diseases among the associated populations. This may result from impacts directly affecting the etiological agents of disease or the vectors transmitting infections. It may also arise from increased contact between humans and sources of disease risk through new settlement or employment patterns, or from variations in human susceptibility to disease in the case of migration to development areas and expanding population centres, or the resettlement of displaced communities.

These changes in disease patterns may be detrimental or beneficial. This depends to a great extent on the foresight applied to development processes, and on the lifestyle of the communities involved, which in turn is closely related to the ability of those communities to adopt a lifestyle which reduces the risks of disease. There has recently been considerable attention to the prediction and reduction of those risks, particularly in relation to land and water resources development in the tropics, and with special relevance to the region, and PEEM has been instrumental in undertaking many of these studies (Birley, 1989; Tiffen, 1989; IRRI/PEEM, 1988).

The mission to the Lower Mekong Basin showed that there is certainly an acute awareness of the disease problem among the authorities directly concerned with human health in the region, particularly health ministries and international agencies such as WHO and UNICEF. They are also aware of the defects of current systems of health data collection, monitoring and analysis, which limit the quality of their assessment of health problems, and even more conscious of the constraints to national abilities for the incorporation of desirable measures to control the existing and potential disease risks in the countries of the Basin.

There is a notable variation of life expectancies and mortality rates among the four riparian countries, although the accuracy of information must also be considered as variable. In Cambodia and Laos, for example, there is no effective registration of births and deaths, surveys depending largely on the memory of such events by village chiefs. With this proviso, the recent estimates are given in Table 2. It should be recognized that most health and disease data are nationally based, with in-country variations that usually favour urban centres where health services are more accessible to the people than in rural areas.

Table 2. Estimated Mortality per 1000 Population & Life Expectancies

	Infant mortality rate	Under-5 mortality rate	Life expectancy at birth
Cambodia	127	199	49
Lao PDR	117 ^a	170 ^a	49
Thailand	38	49	65
Viet Nam	63	88	62

Source: UNICEF, 1990, from 1988 data, except ^a MOH Lao PDR, 1990

The diseases commonly found in South-East Asia in relation to land and water development have been classified by Santasiri Sornmani and Chamlong Harinasuta (1988) and are presented in Table 3.

Table 3. Land & Water Related Diseases in South-East Asia

1. Snail-transmitted diseases	4. Food and water-transmitted diseases
· Nematode infections Angiostrongyliasis	· Bacterial infections Cholera <i>Vibrio parahaemolyticus</i> infection Shigellosis Salmonellosis <i>Escherichia coli</i> infection
· Trematode infections Schistosomiasis Liver fluke infection Intestinal fluke infections Lung fluke infections	· Spirochete infection Leptospirosis
2. Mosquito-transmitted diseases	· Protozoal infection Amoebiasis
· Malaria	5. Other insect-borne disease
· Dengue/Dengue haemorrhagic fever	· Scrub typhus
· Japanese encephalitis	6. Nutritional disorders
· Filariasis	
3. Soil-transmitted diseases	
· Hookworm infection	
· Ascariasis	
· Trichuriasis	
· Strongyloidiasis	

Snail-transmitted diseases

With few exceptions, perhaps the sole example being *schistosomiasis*, snail-transmitted diseases occur throughout the countries of the Lower Mekong Basin, although with varying severity. The endemic area of *Schistosoma mekongi* is found in southern Laos, close to Cambodia, and particularly in Khong Island and adjacent banks of the Mekong River. Recently, the Government of Laos and WHO have been active in the control of schistosomiasis in this area, using periodic chemotherapy with praziquantel⁸. The preliminary report showed promising results. A workshop on these results was held shortly after completion of the PEEM Mekong mission, and is expected to be published shortly.

Although the focus of schistosomiasis is localized, the planned extension of irrigation development in this general area will call for continued monitoring of the situation, to anticipate any risks of increased disease transmission and to reduce those risks by appropriate environmental measures, sanitation, education and periodic treatment of affected communities.

Of the other snail-transmitted diseases, the most common in the riparian countries is **liver fluke infection (opisthorchiasis)**, particularly prevalent in northeastern Thailand, where infection rates range from 10% to 90% in the high endemic areas. It also occurs in Laos, in the vicinity of the Nam Ngum dam, and down to central Viet Nam where local prevalence rates of 37% have been recorded, though not in the Delta, where it has apparently not been investigated. The infection is acquired by eating uncooked fish, containing infective metacercariae.

Various species of freshwater snails belonging to the genus *Bythinia* act as the first intermediate host, in which the cercariae of *Opisthorchis viverrini* develop. Dogs and cats are reservoirs, and humans are the definitive host. The main factors contributing to the propagation and prevalence of the infection are: habitual diet of uncooked fish; lack of latrines, resulting in defecation polluting water bodies with parasite eggs; and an abundance of snails and freshwater fish to complete the life cycle of opisthorchiasis.

Mosquito-transmitted diseases

Throughout the Lower Mekong Basin, the mosquito-transmitted group of diseases is generally regarded as presenting the most serious health problems, although some areas are relatively free. However, due to the mobility of both vectors and populations, and the changes to ecology and potential vector habitat resulting from development (particularly water development and modifications to vegetation), this group of diseases calls for continued vigilance.

The most widespread is **malaria** which, although with a marked seasonality in some areas, occurs all year round in others, such as Laos and the Mekong Delta, and is one of the greatest causes of ill health and loss of productivity among agricultural communities. All riparian governments have made malaria control a major feature of their public health programmes, which generally operate both at MOH central and provincial levels. In all countries, hyperendemicity is commonest in forested areas, as for example on the adjacent borders of Thailand, Laos and Cambodia, where the main vectors are *Anopheles minimus* and *A. dirus*, usually transmitting *Plasmodium falciparum* and *P. vivax* in ratios that vary from place to place, but with a high proportion of *P. falciparum*. This falciparum malaria frequently causes serious or fatal complications, in contrast to the relatively mild, but chronic manifestations of vivax malaria. People who work in forested areas, or on forest fringe with encroachment into forest are most at risk, although frequent exposure results in a certain level of acquired immunity.

In Laos, at the fourth party congress in 1986, malaria control was confirmed as the highest health priority, and according to the Ministry of Health (MOH) the percentage of persons suffering from malaria in the country decreased from 26% in 1975 to 14-15% in 1990. The MOH Institute of Malaria, Parasitology and Entomology gave figures for the period October 1992 to October 1993 of 23 000 hospitalized cases, which is considered to represent only 20-30% of the total, and 493 deaths reported, again only a small proportion of the probable total.

The MOH in Cambodia ranks malaria as the major health problem, considering it "reasonably certain that 2.5 to 3.0 million people are affected throughout the country". Hyperendemic areas are mainly on the forested borders with Viet Nam and Thailand, whereas there is little transmission in Phnomh Penh and around Tonlé Sap Lake. *Plasmodium falciparum* is found in up to 90% of cases, and is resistant to chloroquine but sensitive to quinine, tetracycline and mefloquine. *P. vivax* is found in few confirmed cases, mainly in coastal and plains areas, and is always sensitive to chloroquine. In 1990, over 123 000 cases of malaria were diagnosed microscopically, but actual numbers are certainly much higher, as also is the number of deaths, compared with those reported - 1163 in 1991. An estimate of around 500 000 cases, with up to 10 000 deaths is quoted (MOH Cambodia, 1992)

Viet Nam too gives prominence to a programme for malaria control, the Institute of Hygiene and Public Health reporting a fairly constant 1 million cases countrywide, annually, with deaths over 3300 in both 1989 and 1990. Within the Delta, the number of patients in 1987 and 1988 averaged 350 000, with almost 300 reported deaths each year. The border zones near Cambodia are hyperendemic areas, with *P. falciparum* transmitted by *A. dirus* and *A. minimus*. In the coastal provinces, where sea water mixes with freshwater from the river and rainfall, the vectors are mainly *A. sundanicus* and *A. subpictus*, transmitting both *P. falciparum* and *P. vivax*.

With the prospect of development increasing socioeconomic activity in the Delta through agriculture, reforestation and aquaculture, and a population growth of about 1 million every 3 years, there is clear need for concern over the status of malaria.

Dengue/Dengue haemorrhagic fever, (DHF) is an important arthropod-borne, viral disease, transmitted mainly by *Aedes aegypti*, and sometimes by *Aedes albopictus*. The first breeds around houses, especially in artificial containers such as used car tyres, discarded tins and other solid waste, and this accounts for dengue/DHF being labeled an urban disease. *A. albopictus* breeds in natural containers such as tree stumps, coconut shells etc. The disease is becoming more and more apparent in small settlements and rural communities within the Lower Mekong Basin. It usually appears in sporadic epidemics, which in Viet Nam are said to occur every other year, with up to 100 000 cases and 2600 deaths, mostly children, based on 1985-1988 data (Le The Thu *et al.*, 1989).

In Cambodia, dengue/DHF has become a serious problem. It is one of the ten principal reasons for child hospitalization in Phnom Penh, where the number of children at risk is probably more than 300 000. In the epidemic of 1987, 3694 cases were recorded in Phnomh Penh, with over 300 deaths. Major outbreaks in Laos began to be recorded in Vientiane in 1985, and in the worst of these, in 1987, there were 5233 cases and 87 deaths (Phommasak, 1990).

Japanese encephalitis (JE), another arthropod-borne virus infection, has manifestations ranging from mild to fulminating fever with severe encephalitis and a mortality rate among clinical cases in the order of 30%. Survivors are sometimes permanently disabled, especially children under 10 years of age. The vectors are *Culex gelidus* and *Culex tritaeniorhynchus*, which breed readily in paddy fields and similar water bodies. Birds provide animal reservoirs and pigs are amplifying hosts of the virus; both are present in the rural environments of the riparian countries and likely to increase with the expansion and intensification of agriculture. There is no specific treatment. Prevention and control of the disease can be successfully achieved by a vaccination programme, but wide-spread use of the vaccine has been hampered by its high cost and sub-optimal delivery systems. The control of *Culex* mosquitoes can therefore contribute to the interruption of transmission, but this is difficult due to the extent of their breeding areas.

Research into the possibility of vector control through water and crop management practices has produced the conclusion that this is not generally feasible in tropical conditions (Mogi, 1988). Personal protection is the most effective way of avoiding infection, especially through the use of treated bednets. Outbreaks may occur at any time, following an increase in numbers of *Culex* mosquitoes (Sornmani & Harinasuta, 1988). Few data have been acquired on Japanese encephalitis during the mission, but it has been reported in northern and northeastern Thailand, and the Viet Nam Centre for Health Statistics recorded 1141 cases in 1991, with 70 fatalities. *Culex tritaeniorhynchus* is found in three of the nine provinces of the Mekong Delta (Le The Thu *et al.*, 1989).

No statistics have been acquired of **filarial infections** in the riparian countries, although the disease exists in South-East Asia in both urban and rural forms, transmitted by species of *Anopheles*, *Culex*, *Mansonia* and *Aedes* mosquitoes.

Soil-transmitted diseases

The soil-transmitted helminths which cause diseases are hookworm, *Ascaris*, *Trichuris* and *Strongyloides*. Hookworm infection, mainly from *Necator americanus* and partly from

Ancylostoma duodenale is widespread among rural populations, since most of the people earn their living in the fields, growing rice and other crops, which facilitates maintenance of the parasite's lifecycle. Ascariasis (roundworm infection) is more prevalent in children in areas with poor hygiene and sanitation, while trichuriasis (whipworm infection) is prevalent in places with a warm and humid climate and abundant rainfall. Strongyloidiasis is considered to be of least public health importance since its prevalence is low in comparison with the other soil-transmitted helminthiases. Hookworm infection is the most important of these diseases among farmers, since it reduces their working ability and causes symptoms of fatigue and weakness. In a heavy infection of long duration, the patient becomes markedly anaemic with mental and physical retardation.

Socioeconomic and environmental factors contribute to the high prevalence of hookworm infection through factors such as low educational level and poor personal hygiene; poor environmental sanitation the habit of defaecating on the ground in the absence of latrines; walking with bare feet in a humid climate and moist soil.

Ascariasis is caused by *Ascaris lumbricoides*. There is a higher prevalence in children than in adults, since the infection is associated with poor personal hygiene. The incidence of infection is particularly high in communities with poor sanitation. Infection is by ingestion of embryonated infective eggs developed in soil contaminated with human faeces. Uncooked vegetables from fields and gardens where night soil is used as fertilizer are an important source of infection, although this does not appear to be a common practice in the region. Even a single worm may cause symptoms resulting in jaundice by obstruction of the bile duct, appendicitis or perforation of the bowel. Partial or complete intestinal obstruction may occur in heavy infestations.

Trichuriasis is caused by *Trichuris trichura*, commonly found in children. Symptoms include intermittent diarrhoea for a long duration, abdominal pain, anaemia, weakness and weight loss. Some children may be acutely ill. This is also a result of ingestion of infective eggs developed in the soil from the faeces of infected children. **Strongyloidiasis infection**, from the worm *Strongyloides stercoralis*, is transmitted through penetration of the skin by infective filariform larvae which have matured in faeces-contaminated soil. This infection is considered of lesser public health importance among the group of soil-transmitted diseases, since the overall incidence is low.

These diseases are not required to be notified, and data are scarce, but surveys under the Water-borne Diseases Project, 1991, in Cuu Long province in the Mekong Delta in Viet Nam indicated that 240 of 1059 samples (22.7%) were infected with *Ascaris lumbricoides* and 496 (46.8%) with hookworm, confirming poor sanitation in the community.

Food- and water-transmitted diseases

Bacterial infections causing gastroenteritis or diarrhoeal disease form an important public health problem in South-East Asian countries, accounting for high morbidity and mortality in children. They are prevalent in low socioeconomic groups of people with a poor standard of living. **Cholera** is an acute infectious epidemic disease, characterized by profuse diarrhoea. Although the mortality rate may be very high in untreated cases, prompt treatment to replace lost fluid and electrolytes, together with antibiotics, will yield excellent results and save the lives of the patients. The infection is spread rapidly by water, and is usually observed as epidemic outbreaks in areas with limited environmental sanitation poor personal hygiene and inadequate basic health services. Thailand has suffered a great deal from cholera. The last major epidemic occurring in 1980, but the disease has persisted in the form of sporadic cases and small intermittent outbreaks in rural areas (MPH Thailand, 1985).

Other diseases in this group include **shigellosis** (or bacillary dysentery), **salmonellosis** and ***Escherichia coli* infection**. All can be transmitted through faecal contamination of food or water, which presents a serious risk to health where water sources such as irrigation canals are used for bathing, washing clothes and foodstuff.

In Cambodia, **diarrhoea** remains one of the leading causes of illness among children, and the underlying cause of most cases of malnutrition. It reflects the poor hygiene conditions and, in particular, the continuing non-availability of potable drinking water to the population (MOH Cambodia, 1992). Surveys in Laos in 1982 and 1985 showed mortality rates from diarrhoea varying from 0.5/1000 in Vientiane to 6.6/1000 in a rural area of Champassak. Fresh outbreaks first coincide with the onset of the rains, which confirms the importance of hygiene and sanitation in relation to the water cycle. In rural areas, rain washes wastes from forest latrines into badly sealed wells which become contaminated. The second peak is in December and January, possibly explained by the increase in consumption of fresh and raw vegetables and greens at that time, and these are washed in unhygienic conditions (UNICEF, 1992). Reports from the Lower Mekong Basin in Viet Nam based on records of 1985-88 give morbidity and mortality rates of 497 and 1.74 per 100 000 for diarrhoea.

Leptospirosis (or Weil's disease), a spirochete infection, is an acute febrile illness, which may be accompanied by various complications, including nephritis, hepatitis, gastroenteritis and meningitis. It is a zoonosis, affecting man as well as animals, and man becomes infected by contact with the urine of infected mammalian hosts, either directly through open skin lesions or through contaminated water, food or soil. The natural reservoirs of the infection are rodents, especially rats, and also some domestic animals and wildlife. With the increased crop production planned in most of the Lower Mekong Basin countries, and the rise and concentration of rural populations, the corresponding rise in numbers of rodents will pose a greater risk. Prevalence of the disease is not recorded, but there are many illnesses that may be associated, such as hepatitis, meningitis and others.

Nutritional disorders

The two most common public health problems in developing countries tend to be communicable diseases and **malnutrition**, especially among children. The latter condition is more severe when both occur concurrently. This is the case in a number of areas in the countries of the Mekong Basin, where there are numerous examples of **protein-energy malnutrition**, shown by clinical syndromes of low body weight and, in severe cases, **kwashiorkor** and **marasmus**. These clinical manifestations indicate the deficiency of protein and calories in their food intake. In Laos, chronic malnutrition varies significantly among the provinces surveyed, the most severely affected being the smallest and least populated of the provinces inhabited by a majority of hill tribes. It should further be emphasized that in the most important of surveys which included remote provinces, data collection was restricted to accessible areas where Lao Loum (lowland dwellers) are concentrated, and where health facilities are more available (Vijayaraghavan, 1988). Sharp differences also arise inside urban areas. Pediatricians working in Mahosot hospital in Vientiane confirmed that children admitted for marasmus or kwashiorkor usually come from very poor families where the mother is overworked.

Most farmers living in mountainous areas do not harvest enough rice for their own consumption. Estimates from a number of sources indicate the following ranges for the usual adequacy of the rice harvest by main ethnic group, depending on the quality of the season; 8 to 16 months for the Lao Loum, 5 to 11 months for the Lao Soung (living at middle altitudes), and 3 to 10 months for the high mountain dwellers, the Lao Theung. Most Lao people live in a family subsistence economy, and given the very weak transportation network they are often susceptible to food shortage. Food security is a major concern of all Lao citizens, and any progress towards the improvement of availability, stability and accessibility to food products

can have immediate effects on the level of malnutrition, which seems to affect a large part of the population (UNICEF, 1992).

The MOH in Cambodia refers to nutritional problems of women and children, and remarks that diarrhoea is the underlying cause of most cases of malnutrition. Statistics on locations and severity of the problem are inadequate, but information on child nutrition shows some improvement in the last few years. Recently though, chronic malnutrition was found in 22% of children under 5 years in Phnomh Penh city, and 32 % in other areas.

Implications and perceptions of health in development

In general comment on the diseases listed above, all of which have some relationship with the development or management of land and water resources, the risk, magnitude and severity of the diseases depends on many factors: the location; the vectors; susceptibility of the population; human behaviour; and the environmental conditions favourable to the propagation of disease. General baseline features indicative of risk can be identified through suitable surveys into the above factors, but with the introduction of development processes involving physical change; modification of vegetation; new patterns and locations of settlement; and shifts of population; the dynamics of community health require the introduction of a system of monitoring, in order to reveal both positive and negative trends, and to react to these with appropriate and timely measures.

It is also commonly anticipated that better economic status and improved availability of food will automatically ensure health benefits in the community, and this view has been expressed in many of the organizations visited during the LMB mission. Unfortunately, it is not always true, and in some projects within the region there has even been an increase in malnutrition. Factors contributing to such negative impacts lie in the ignorance and poor nutritional knowledge which still exist in many rural communities, regardless of economic development. They can earn more by working harder, but if the added income is not used for food to raise energy values, their nutritional status is unchanged. Furthermore, if parents must work longer, with less time to care for their children, then the children are likely to suffer malnourishment. The development process must therefore be complemented by community education, aimed especially at the women, to enable the community to benefit in terms of health as well as production.

This lack of awareness of health risks in development is not limited to the rural communities, but is generally evident in the countries of the Lower Mekong Basin among non-medical authorities and agencies, showing little apparent advance since the Ninth Meeting of PEEM studied the policies and programmes of governments, bilateral and multilateral agencies, relating to health and natural resources development (Mather and Bos, 1989; PEEM, 1990).

In the absence of a national understanding of the health problems that may be introduced in their programmes for economic development, authorities seldom make provision for appropriate measures to avoid or to mitigate health risks to the populations. Neither is there any formal machinery for the necessary interagency collaboration among development, health and environmental agencies from the earliest phases of project planning, through construction to operation and subsequent monitoring of community health. In the few examples where health issues are taken into account, this is usually at the prompting of an external agency, probably an international development bank, and for a specific project.

The creation of a far more general awareness of the linkages between health and development, among the entire resource development and management community in the region, both national and international, is therefore basic to the achievement of any real progress in the foreseeable future. The PEEM mission has therefore devoted much of its attention to more detailed study of this issue.

INSTITUTIONAL ARRANGEMENTS FOR WATER RESOURCES, THE ENVIRONMENT, SETTLEMENT AND HEALTH

National level

Water resources and the environment

Thailand. The cross-sectoral nature of water resources development and management, and the complexity of interagency responsibilities, even within sectors, is well illustrated by the example of Thailand (ESCAP, 1992). Throughout the country, eight ministries are involved in various rôles, and their responsibilities for water development activities are distributed among 25 departments, authorities or offices (Table 4).

Table 4. Agencies involved in water development activities in Thailand

<i>Ministry/Department</i>	<i>Activities</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>
Ministry of Interior										
Dept. of Local Administration				x					x	S
Public Works Dept.				x						S
The Office of Accelerated Rural Development				x						SM
The Community Development Dept.				x						S
The Metropolitan Water Works Authority*				x		x				-
The Provincial Water Works Authority*				x		x				S
Bangkok Metropolitan Administration				x		x			x	-
The Provincial Electricity Authority*			x							S
Ministry of Public Health										
Dept. of Health				x			x			S
Ministry of Industry										
Dept. of Mineral Resources				x						S
Dept. of Industrial Works						x	x			-
The Industrial Estate Authority of Thailand*				x		x				-
Ministry of Agriculture and Cooperatives										
Royal Irrigation Dept.	x		x	x	x	x	x	x	x	SM
Land Development Dept.	x									S
Dept. of Fisheries	x						x	x		-
The Royal Forest Dept.	x									S
Dept. of Agriculture	x									-
The Cooperative Promotion Dept.	x									S
Agriculture Land Reform Office	x									S
Dept. of Livestock Development	x									-
Ministry of Science, Technology and Energy										
The National Energy Administration	x	x	x							SM
Ministry of Transport and Communication										
The Harbour Dept.					x					-
Ministry of Defence										
National Security Command Division	x		x							S
Royal Thai Army (Second Army Area)	x		x							S
Office of the Prime Minister										
The Electricity Generating Authority of Thailand*			x				x		x	L

Note: A = Irrigation and agriculture, B = Hydropower, C = Domestic, D = Navigation,

E = Industry, F = Water Quality, G = Fishery, H = Flood Alleviation,

I = Implementation (L:Large, M:Medium, S:Small Project)

* State enterprise agency

Two national committees set out the guidelines for development, the National Water Resources Committee (NWRC) and the National Rural Development Committee (NRDC). The latter has the coordination of small-scale projects as a part of its responsibility, whereas the NWRC is concerned with the overall development programme, in accordance with its following decisions, approved by the Cabinet in January 1990 (NWRC, 1990):

1. The National Water Resources Committee shall be the supreme organ in determining policies and the work plan for national water resources development. Moreover, it shall have the responsibility of submitting its views on such matters relating to water resources development as are submitted by the various ministries for the Cabinet's consideration.

2. It approves the policy of water resources development and the operational procedure together with such responsibilities of the National Water Resources Committee and the Secretariat of the National Water Resources Committee as are submitted by its Secretariat.

3. It assigns the Secretariat of the National Water Resources Committee to prepare proposals for submission to the National Water Resources Committee on five following matters:

3.1. A country-wide plan to seek additional water resources;

3.2. A plan to solve regional water shortages including the search for water resources for development of the eastern region;

3.3. Measures to reduce the number of agencies duplicating work of one another;

3.4. Ways and means whereby the National Water Resources Committee and the Budget Bureau could ensure that additional water resources development activities will not duplicate those of existing agencies; and

3.5. Steps to take for the possible establishment of a national institute of hydrology.

Two of the major ongoing planning and legislation activities of the NWRC are the formulation of a definitive National Water Act, which is now in a draft version, and the formulation of a National Water Plan.

Environmental aspects are within the jurisdiction of the Ministry of Science, Technology and Environment (MSTE). The (draft) Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (MSTE, 1991), repealed previous Environmental Quality acts. It specifies the following membership of the National Environment Board as: the Prime Minister as Chairman; a Deputy Prime Minister; the Ministers of Science, Technology and Environment; Defence; Finance; Agriculture and Cooperatives; Transport and Communications; the Interior; Education; Public Health; Industry; the Secretaries-General of the Board of Investment and of the National Economic and Social Development Board; the Director of the Bureau of the Budget, as members *ex officio*, and members qualified in environmental matters not more than eight persons of which no less than half shall be representatives from the private sector and the Permanent Secretary of the Ministry of Science Technology and Environment as member and secretary.

The 1991 Environment act gives considerable attention to the participation of the public in the enhancement and conservation of environmental quality, and also to the involvement of non-governmental organizations, which "shall be entitled to register with the MSTE as NGOs for environmental protection and conservation of natural resources in accordance with the rules, procedures and conditions prescribed by ministerial regulations". The sole reference to health in this Act is in the case of "an emergency or public danger arising from natural disaster or pollution caused by contamination or spread of pollutants which will, if left without any remedial actions seriously endanger the safety of life, body or health of the people", in which case the Prime Minister is empowered to act.

The Office of Environmental Policy and Planning (OEPP), in MSTE, has formulated general guidelines for preparation of environmental impact statements (EIS) for review by OEPP. In addition, supplementary guidelines are available for specific project categories. Should it be justified by the size and location of a particular project, the OEPP could prepare specific project guidelines. The general and supplementary guidelines, modelled on the practices of the US Corps of Engineers, are described as *"tentative, because the technology and practice of preparing Environmental Impact Statements is still in evolution"*. They are intended mainly for use in preparing complete EIS, but may also be used for Initial Environmental Examinations EIE, to determine whether a full-scale EIS is necessary.

LAO PDR. In Lao PDR, the ministries with involvement in the development of natural resources are: Agriculture and Forestry (MAF); Communications, Transport and Posts; Industry and Handicrafts (which incorporates Electricité du Laos); Labour and Social Welfare; and Health. The MAF is the prime mover in natural resources development, and the National Office for Nature Conservation and Watershed Management is located in the Department of Forestry. Recently, the Committee for Planning and Cooperation was established partly to achieve the coordination of programmes among ministries and departments at national, regional, provincial, district and village levels.

Overall coordination and oversight of environmental affairs has been assigned to the recently created Organization for Environment, Science and Technology (OEST), previously the Ministry of Science and Technology. This operates as a unit in the Prime Minister's Office, in parallel with the State Commission for Planning and Development, and is in charge of integrating sectoral level environmental activities into a consistent national policy framework. The capacity of the OEST requires strengthening, and its mandate to be focused more clearly on environmental issues, if it is to be effective. Among its current activities, the preparation of environmental guidelines is at an advanced stage of drafting.

In general in the Lao PDR, the planning and development of natural resources has so far been on a basis of individual projects, with attempts at coordination at the various administrative levels. Where projects are externally funded, which is often the case, donor preferences appear to dominate their selection, design and implementation. This reflects the great need for capacity-building in the form of national technical and scientific personnel at professional and technician levels.

Viet Nam. With the far greater population of Viet Nam, and the widely-separated major urban centres of Hanoi, the state capital, and Ho Chi Minh City, and the centres of development in the north of the country and in the Mekong Delta in the extreme south, the ministerial structure is represented in the southern provinces by *sub-institutes*. For example, the national Ministry of Water Resources (MWR) the Ministry of Agriculture and Food Industry (MAFI) and the Ministry of Forestry have their southern representation in the Sub-institute of Water Resources Planning and Management; Sub-National Institute of Agricultural Planning and Projection; Sub-institute of Forest Inventory and Planning.

Environmental concerns received increasing recognition through the 1980s in Viet Nam. The Government identified sustainable development with equity as the major objective, and formulated, with UNDP and SIDA assistance, the **National Plan for Environment and Sustainable Development: A Framework for Action (NPESD)**. The aim of attaining appropriate environmental and natural resources management is to be achieved by establishing necessary policies, action plans and institutional structures which ensure that the sustainability of natural resources use is fully integrated into all aspects of the social and economic development processes. In line with the recommendations of the National Plan, a new Ministry of Science, Technology and Environment (MOSTE) was established in September 1992 by upgrading the former State Committee for Sciences. To assist MOSTE in environmental regulation, major cities have developed their own administrative and technical resources for dealing with specific local and regional environmental programmes (UNDP, 1993).

In the visit to Ho Chi Minh City, the mission made contact with one of these agencies, the Environmental Protection Centre (EPC), which is a specialized agency on Environmental Science and Technology, established in 1984. EPC is also a member of the National Association for the Conservation of Nature and the Environment. With 35 permanent staff members, of whom 25 are university graduates or post-graduates, and access to additional expertise from national and international institutions, EPC has various investigation and training programmes and also provides expert-consultants to international and national programmes, such as the Mekong Delta Master Plan, and to projects related to water resources management, wetland conservation, and pollution control among others. The EPC organizes training courses on environmental impact assessment (EIA) techniques and on practical aspects of environmental science.

In Thailand, Lao PDR, and Viet Nam, the main authorities with responsibilities for water resources, environment and conservation hold seats on their national Mekong Committees, and on the Interim Mekong Committee for Coordination of Investigations of the Lower Mekong Basin (IMC), the statutory body at the time of the PEEM mission visit.

Public health

In all the riparian countries of the Lower Mekong Basin, there is an apparently impressive infrastructure for health provision. The organograms for Cambodia and Lao PDR (Figs. 1 and 2) illustrate this, but do not show the chronic shortage of skilled manpower in the health sector, which is most evident in those two countries.

There is a wide range of health expenditures among the countries. Figures from Thailand, Laos and Cambodia show that the Thai Ministry of Public Health had a 1991 total budget of baht 20 600 million (about US\$ 800 million, or \$17 per capita), equal to 5.4% of the total Kingdom budget. Some 11% of the MPH budget was allocated to health promotion and 13% to preventive measures. By 1994, the budget is predicted to rise to baht 39 600 million (about US\$ 30 per capita). In contrast, the Lao PDR budget for the MOH in 1988 totalled about US\$ 6.5 million (of which \$ 2.7 million was from external aid), or roughly \$1.60 per capita. Two thirds of this was for current expenditure and one third for capital expenditure. This figure was expected to be reduced to about \$0.80 per capita in 1989 (UNICEF, 1992). No more recent figures were obtained.

The budget of the central MOH of Cambodia totalled US\$6.6 million in 1991 and \$8.6 million in 1992. Drug imports added \$2.4 and \$3.0 million respectively. The total was distributed equally between central level and provinces, but the latter had additional sources of funding which could not be estimated. The central budget for 1992 represented about US\$1.00 per capita. In Thailand, there is a generally high level of health provision, including provincial and district hospitals, with volunteer health workers at village level, and the incidence of notifiable diseases is regularly recorded. In addition, the provincial malaria and filariasis divisions report directly to the Ministry of Public Health.

The UNICEF report on Laos, while recording a steady increase in the numbers of medical personnel by 1990, to 1090 doctors (about 2.6 per 10 000 population), 3300 medical assistants and 8000 nurses, notes that two thirds of the doctors live in Vientiane prefecture, where each serves only 1400 people. In 1989, at district level, only 20 out of 110 dispensaries were said to offer services and at sub-district level and in rural areas most of the health posts had not been in regular operation for 2 or 3 years, and the others opened only for a few days each month.

In the Cambodian Ministry of Health, the Department of Health has technical responsibility for health services throughout the country, but decentralization has detracted from its effective technical advisory or supervisory rôles, as also has the lack of funds. In practice, the

National Centre for Hygiene and Epidemiology (CNHE), functions as the central public health institute for the entire country, with both preventive and promotional rôles. Its five sections comprise: potable water and sanitation; expanded programme of immunization; epidemiology; health education; dermatology (leprosy) and sexually transmitted diseases.

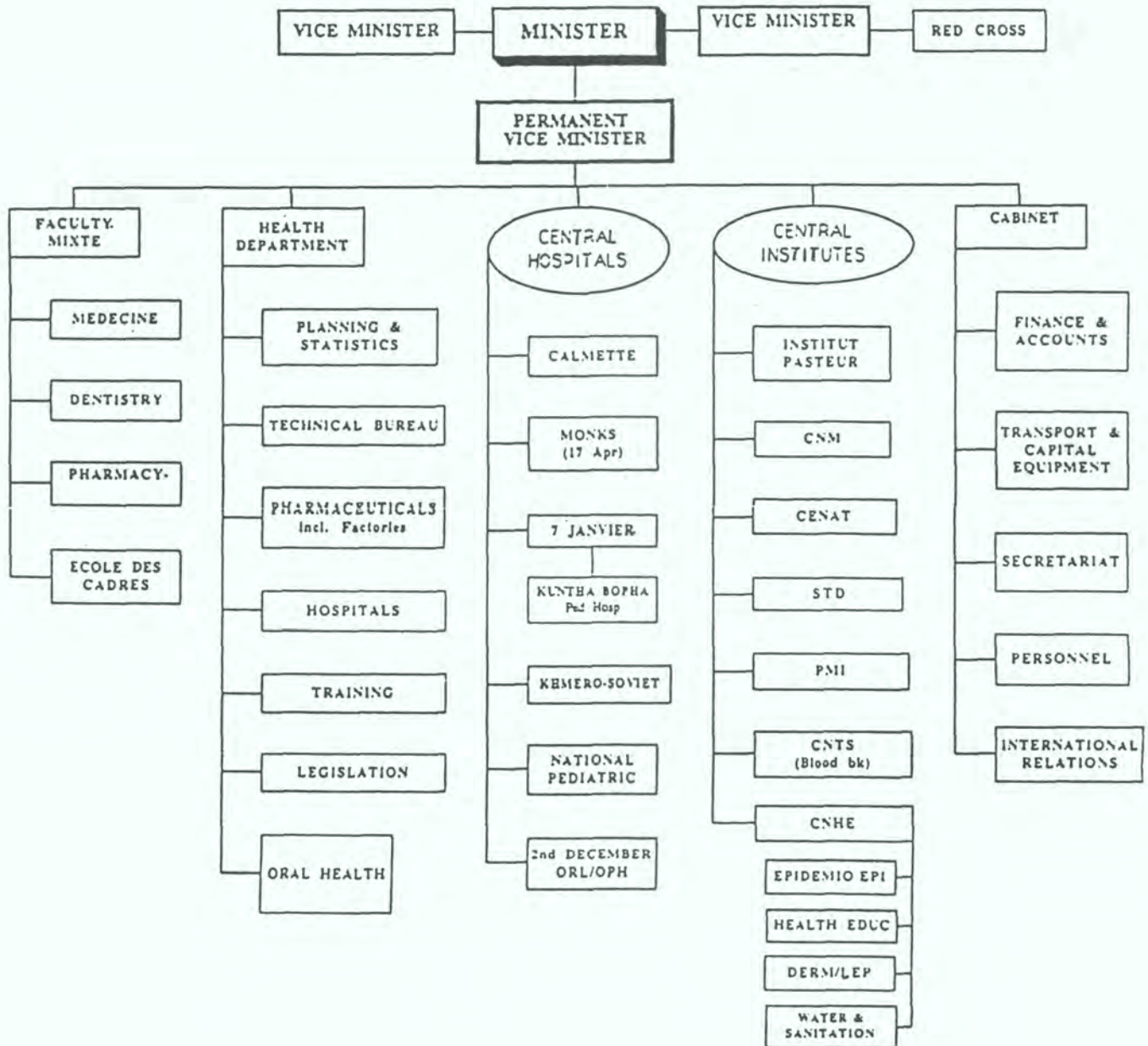


Fig.1 Cambodia, Ministry of Health and Central Institutes
October, 1992

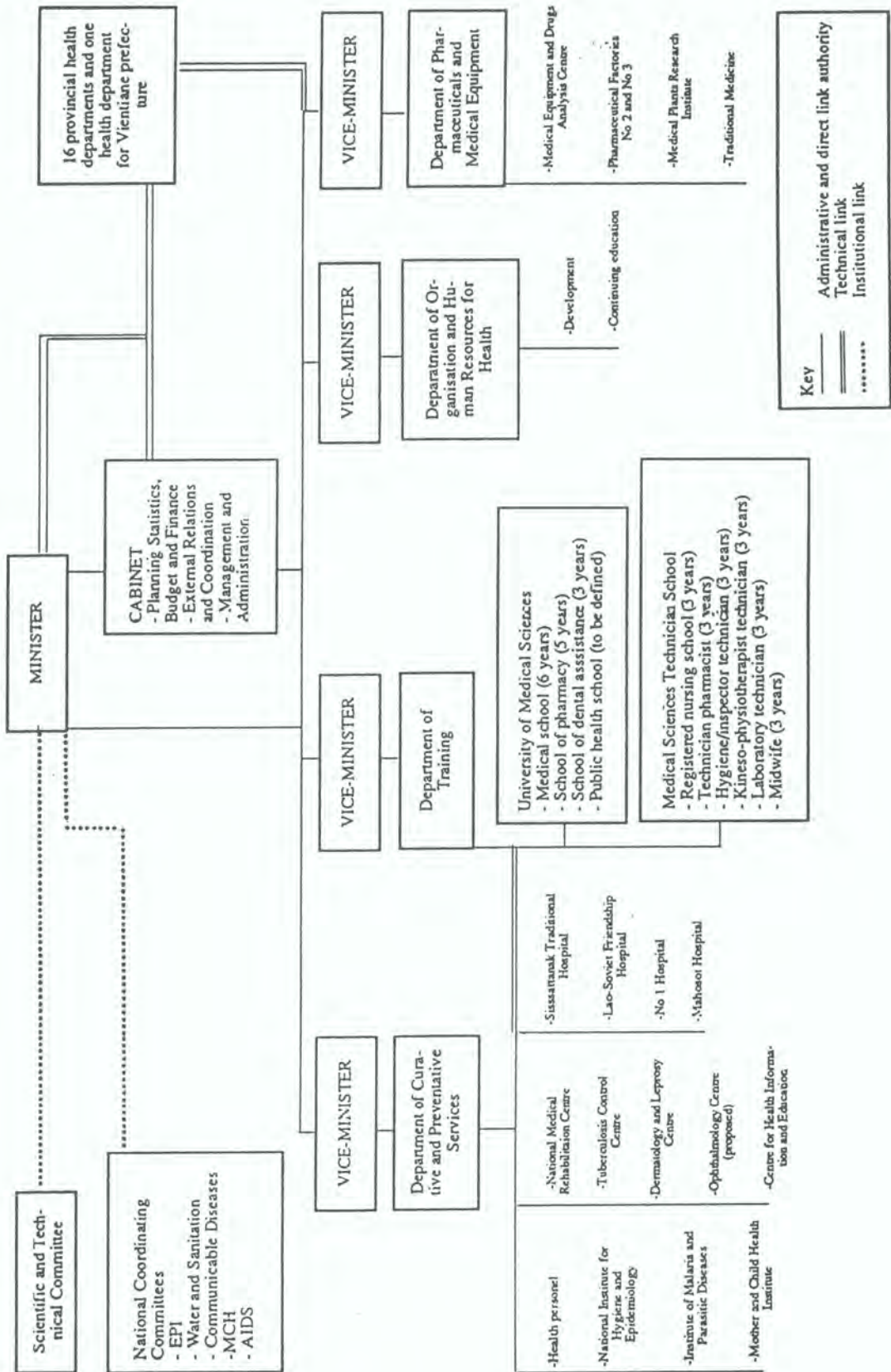


Fig. 2
Lao PDR Ministry of Health organizational structure, 1990

The National Centre for Malaria (CNM) was created in 1980 in response to the considerable increase in cases of malaria, and the emergence of chloroquine-resistant malaria strains. Its objectives are:

- ♦ leadership and technical supervision of malaria control;
- ♦ training and retraining of peripheral workers;
- ♦ applied research in clinical diagnostic and therapeutic, entomological and parasitological specialist areas.

Throughout Cambodia, the health sector is heavily dependent on external assistance. This includes many of the UN system agencies and programmes, such as UNICEF, UNDP, WHO, WFP. The most notable contribution in funds and personnel is through international NGOs, totalling more than 60, which in 1992 provided over US\$ 29 million.

In addition to the formal structures for dealing with public health matters, the countries of the region have a great asset in the participation of the community, especially in rural areas, which are generally poorly served in comparison with urban centres. Two cases will illustrate this.

Following the construction of the Nam Pong reservoir in northeastern Thailand, and the associated irrigation development, the greater production and consumption of fish, traditionally eaten uncooked, resulted in an increase of opisthorchiasis among the resettled villagers. In 1982, a pilot project to control the infection was launched by the Faculty of Tropical Medicine of Mahidol University, supported by GTZ, which mobilized the villagers to modify their traditional eating and sanitary habits through demonstration and education. After three years of implementation, not only was opisthorchiasis under control, but other aspects of primary health care such as clean drinking water, the introduction of toilets, generally improved environmental conditions and supply of essential drugs were initiated and made available to the community (Harinasuta, C. *et al.* 1988).

Referring to the Water Supply and Sanitation Project in Laos, UNICEF reported that the involvement of villages in the construction and maintenance of their water supply system is a condition of the success of any rural water programme. Women now play a key rôle in UNICEF's water and sanitation project, both as managers of domestic activities and in the ways they influence children's hygiene habits and health. This will be done primarily through the Lao Women's Union, a government organization concerned with improving women's status in Lao society, with membership of over 250 000 women across the country (UNICEF, 1993).

Institutional collaboration

The previous sections have illustrated the pressures for socioeconomic development in the countries of the Lower Mekong Basin, and the consequent demands for more rapid exploitation of the basin's natural resources, to which water development is the key. The governments' line ministries are therefore being urged strongly to implement their projects for expanding and intensifying agriculture, for energy generation and for industrialization.

An awareness of the environmental effects of development is also becoming more apparent in the riparian countries, to the extent that all are in the process of formulating environmental guidelines to safeguard their resources from damage and deterioration. These are, in some cases, being incorporated into new legislation, for example the draft Enhancement and Conservation of National Environmental Quality Act B.E. 2535 in Thailand. But in general this concern is only recent (mostly in the past decade), and has yet to become formalized in development processes. The newness of the concept, and of the national agencies responsible for its

incorporation within those processes, has in fact engendered the same resistance among the long-established developmental ministries and agencies in the Basin as was encountered among many of the more advanced industrialized countries when the risks of their unsound and unsustainable developments were earlier becoming too evident.

However, it is gradually becoming accepted that the initial costs and, particularly the delays, involved in planning and designing projects for environmental soundness have their ultimate socioeconomic benefits in greater sustainability and the reduction of measures to remedy environmental damage, always assuming that remedy is possible. It must be expected though, that emergencies and political expediency will sometimes override environmental concerns, for example under threat from the drought now affecting parts of the Basin.

The concept of human health in development, however, is not often evident even in the more advanced national guidelines and legislation. The problem is also compounded by the limitations of many of the public health ministries of the riparian countries, in terms of financial resources, equipment and staff, which often confine their efforts to static health services and to curative measures, rather than to preventive measures incorporated in physical development activities. Sometimes, the problems have already reached massive proportions, as for example in the strip settlements of the Mekong Delta, with totally inadequate water supply and sanitation. Here, an equally massive remedial intervention is the only solution. No longer can the mere "incorporation of a health component" be effective.

But there are many cases where advance planning between the development and health sectors can avoid exacerbating a potential problem. One example is that of reservoir construction, such as the developments of the Electricity Generating Authority of Thailand, EGAT, which has probably the most advanced environmental unit within a non-environmental agency in the Lower Mekong Basin.

EGAT, in collaboration with the Ministry of Public Health and the Mahidol University Faculty of Tropical Medicine has taken into account the physical and human impacts of its developments from the project concept phase, through feasibility, design and construction phases to the post-evaluation of environmental impacts, comparing actual measured impacts of the project with pre-project conditions and with predicted impacts (EGAT, 1989).

This is something of an exception for national projects in the region, but it has helped to build up a valuable source of knowledge and experience that has wider application. It is perhaps worth noting that concepts of health impacts of development tend to focus mainly on reservoirs, their effects on the ecology, on vector-borne diseases and on the displaced populations. There is less awareness of the potential health risks associated with agriculture, especially through water development and management, although this may often place a far larger population at risk through daily socio-economic activities and poorly planned settlements, if in fact they are planned at all.

In general then, institutional collaboration in development and health at national level in the riparian countries is at present rudimentary. In Thailand, the abilities and resources are already available, if called on. Viet Nam has assembled environmental skills, and has adequate health personnel, although the latter complain of shortages of funds and equipment. These are resources that can be mobilized once the awareness of the need to incorporate human health into development becomes a recognized component of national plans.

International level

Within the region of South-East Asia and the Pacific, there is a wealth of organizations and institutions dedicated to specific aspects of natural resources development, some with particular focus on agriculture, others on investment in major projects, and a few concerned with the health and welfare of the groups of people affected, notably the underprivileged. The mandates of these agencies are usually clearly defined in order to target their limited resources on particular objectives so that projects, programmes and results can be presented and assessed in quantifiable terms related to those objectives. This has clear advantages in delineating areas of interest and reducing unnecessary duplication of effort. At the same time, it does little to introduce coordination among diverse but interdependent sectoral areas of concern, especially the issue of human health in development processes.

Over the past decade, there has been some recognition of this dichotomy, and the situation was reviewed by the Ninth PEEM Meeting (PEEM, 1990). Rather than restate the problems of integrating health into the interests and activities of development-oriented agencies, it is more useful to explore the potential for improving such integration among the many organizations operating within the Lower Mekong Basin.

The Interim Mekong Committee

The Mekong Committee was established as an intergovernmental regional organization by Cambodia, Laos, Thailand and Viet Nam in 1957. In the mid 1970s, Cambodian participation in the Mekong Committee came to an end. Its absence led to the formation of the Interim Mekong Committee (IMC) in 1978. The IMC is a structure for cooperation and coordination of the planning and development of the water resources of the Lower Mekong Basin. The reintegration of Cambodia into the activities of the Mekong Secretariat is progressing, and a number of projects are underway in Cambodia.

The Mekong Secretariat's programme areas consist of:

- **Policy and planning** dealing with strategic studies and basinwide planning.
- **Technical support** including data collection and information systems, the hydrology sector, remote sensing, mapping and environment.
- **Resources development** comprising water resources and hydropower, agriculture, irrigation, watershed and forestry, fisheries, riverworks and transport, and human resources development.

The mandate and structure of the Mekong Committee, and extracts from the 1993 Work Programme are presented in Annexes 1 and 2 respectively. Programme expenditures for 1992 amounted to US\$10 121 000. Support to the programme, in addition to contributions from the riparian countries, came from 12 bilateral donors, UNDP, the European Community (EC) and the Asian Development Bank (ADB). NGOs also participated in the programme. With these functions of coordination of inputs and of attracting donor support to the Lower Mekong Basin, the Interim Mekong Committee is clearly the key to any integration of environmental and human health components in the Basin's development processes, provided that both the riparian countries and the donors are convinced of the importance of such integration.

The Mekong Project Manual makes two particularly important points of relevance to the content of its various activities:

1. *Over the last years, the Committee has moved gradually from a project-oriented to a programme-oriented approach.*
2. *The Secretariat, on behalf of the Committee, is responsible for ensuring that the Work Programme reflects what the member countries need, as compared to what the donors want and are willing to finance.*

The implications of the first favour the long-term view so essential to any environmental and health-related activities, which require an extended period of implementation and subsequent monitoring, and the second illustrates the need for an awareness of issues such as human health on the part of both the recipient and the donor.

Bilateral agencies

Bilateral agency support is a major source of funds and technical assistance for the IMC, with Sweden, the Netherlands, Denmark, Australia, Germany and Switzerland all contributing heavily to many of the Technical Support, Resources Development and Programme project activities, quite apart from those mainly concerned with construction work and the provision of equipment. It is remarkable that none of the projects, even those under the Sub-programme: Environment, make reference to impacts on human health, although various activities related to water resources, agriculture, forestry and fisheries have the potential to affect the health of the communities involved.

Direct bilateral aid to the riparian countries also tends to follow traditional sectoral patterns, as shown by a selection of news items that appeared during the PEEM mission.

Cambodia. *North Korean Prime Minister Kang Song-San left here yesterday after promising economic and military assistance to Cambodia. "We have signed a bilateral agreement on economic assistance especially in the field of agriculture", Cambodian Foreign Minister Prince Norodom Sirivudh said. "Our Korean friends have much experience in improving agricultural produce, and the North Korean expertise will be particularly valuable in helping Cambodia improve its irrigation system in order to improve rice yields".*

Agence France-Presse, Phnom Penh.
The Nation on Sunday,
Bangkok, 14 November 1993

Lao PDR. *Germany has agreed to provide workers to assist Laos's development of vocational workers and human resources. Laos has so far received aid from Germany of US\$13.8 million for rural telecommunications, agriculture, food security, reforestation and basic health studies.*

Bangkok Post, Indochina supplement
Tuesday, 23 November 1993.

Perhaps the most encouraging article was that of Supapohn Kanwerayotin, also in the Indochina supplement of the Bangkok Post, with dateline Hanoi, 30 November 1993:

Viet Nam. *Thai doctors and nurses are to help develop a primary health care system at a hospital in Dien Bien Phu, a small town in northwest Viet Nam. The project, set to start in the first half of 1994, shows that the Thai Government sees public health as a sector where it can extend valuable assistance to its neighbours.*

Thailand can for now offer learning trips for Vietnamese personnel, with the final goal being "to help Viet Nam so that they can help themselves", said Dr Somsong Rugpaok senior medical

officer with the Office of the Permanent Secretary for Public Health. Viet Nam has a surplus of personnel in medical fields, but most of them need retraining to adjust to modern equipment sourced mostly from the West. "We see another problem in Viet Nam that is similar to Thailand in the past: doctors shun or dislike rural assignments", he said.

Public health-related projects are to be a priority in aid programmes, not only for Viet Nam, but also for Laos, Cambodia and Burma - prime recipients of Thailand in its relatively new rôle as a donor country. Thailand intends to coordinate its public health assistance to Viet Nam with specialized agencies such as the World Health Organization and UNICEF.

The collaboration of Thailand in basinwide activities of the Mekong Committee has already been evident in the earlier phases of the Waterborne Diseases projects, through the Mahidol and Khon Kaen universities, and the continuation and expansion of such cooperation could offer considerable opportunities to promote the incorporation of health components in Basin-wide and riparian country development activities.

Multilateral agencies

All agencies of the UN system are represented in the riparian countries of the Lower Mekong Basin. The UNDP, as a founder of the Mekong Committee, still makes some direct support to the Secretariat and to IMC projects, with recent concentration on Cambodia. The UN Economic and Social Commission for Asia and the Pacific (ESCAP) is located in Bangkok, and the World Health Organization has a somewhat dispersed presence with its regional offices in New Delhi and Manila, and the Western Pacific Regional Environmental Health Centre in Kuala Lumpur. Agricultural interests are represented in the region by the UN Food and Agriculture Organization (FAO), and by CGIAR bodies: the International Rice Research Institute (Los Baños, the Philippines) and the International Irrigation Management Institute (Colombo, Sri Lanka).

In the field of environmental health, in the countries of the Lower Mekong Basin, the work of UNICEF is outstanding, especially through its programmes for water supply and sanitation. Lao PDR and Cambodia have depended very heavily on UNICEF for the planning and implementation of their national programmes, particularly among rural communities, within the agency's major thrust for child and maternal welfare. This work has usually been closely linked to national ministries for public health and to WHO support. Also directly concerned with public health through water supply, sanitation and settlement planning are the Asian Development Bank (ADB) and the UN Centre for Housing and Settlement (HABITAT), mostly in an urban context.

The World Bank is collaborating with the Mekong Secretariat in the Master Plan for the Mekong Delta, and is active within the Basin countries in various capacities, for example in its recent environmental overview in Lao PDR, and its assistance in formulating a malaria control programme, also in Laos. Other international agencies operating in the four countries include the World Food Programme (WFP) and the International Fund for Agricultural Development (IFAD), both of which would be appropriate to assist in rural community participation in projects aimed at safeguarding health where labour-force and food may be inadequate.

Other agencies contributing to the IMC, and with activities at country level, include the Commission of the European Community and the Asian Development Bank. The latter, already referred to earlier, deserves particular mention. As a major investment agency, it is in a position to influence attitudes of client governments towards the planning and design of the projects it supports, and the Bank's approach to environmental and health issues is therefore very relevant to the PEEM area of interest. At an ADB Symposium on Environmental and Natural Resources Planning, in 1986, the following statement appeared in the papers and proceedings:

The political priorities of banks do not normally favour environmental interests, although energetic lobbying in the US and elsewhere has forced them to be responsive to environmental policies in recent years. The financial and economic priorities do provide some leverage for environmental planning, if it is shown that significant financial and economic costs are at stake, but they also prove a disincentive for more detailed project assessment and appraisal. The capacity of banks to impose conditions on loans, and their concern for the policy and institutional framework surrounding development activities, does provide the chance to promote environmental planning if both bank and Government see fit. (Horberry, 1986).

More recently, the ADB adopted **Guidelines for Health Impact Assessment**, in which the Foreword expresses something of an advance, at least in perceptions of environment and health (ADB, 1992):

Physical and mental well-being of people is the ultimate rationale of efforts to foster economic development and to ensure that the process avoids or minimizes negative impacts on the physical environment, and through it, on people...

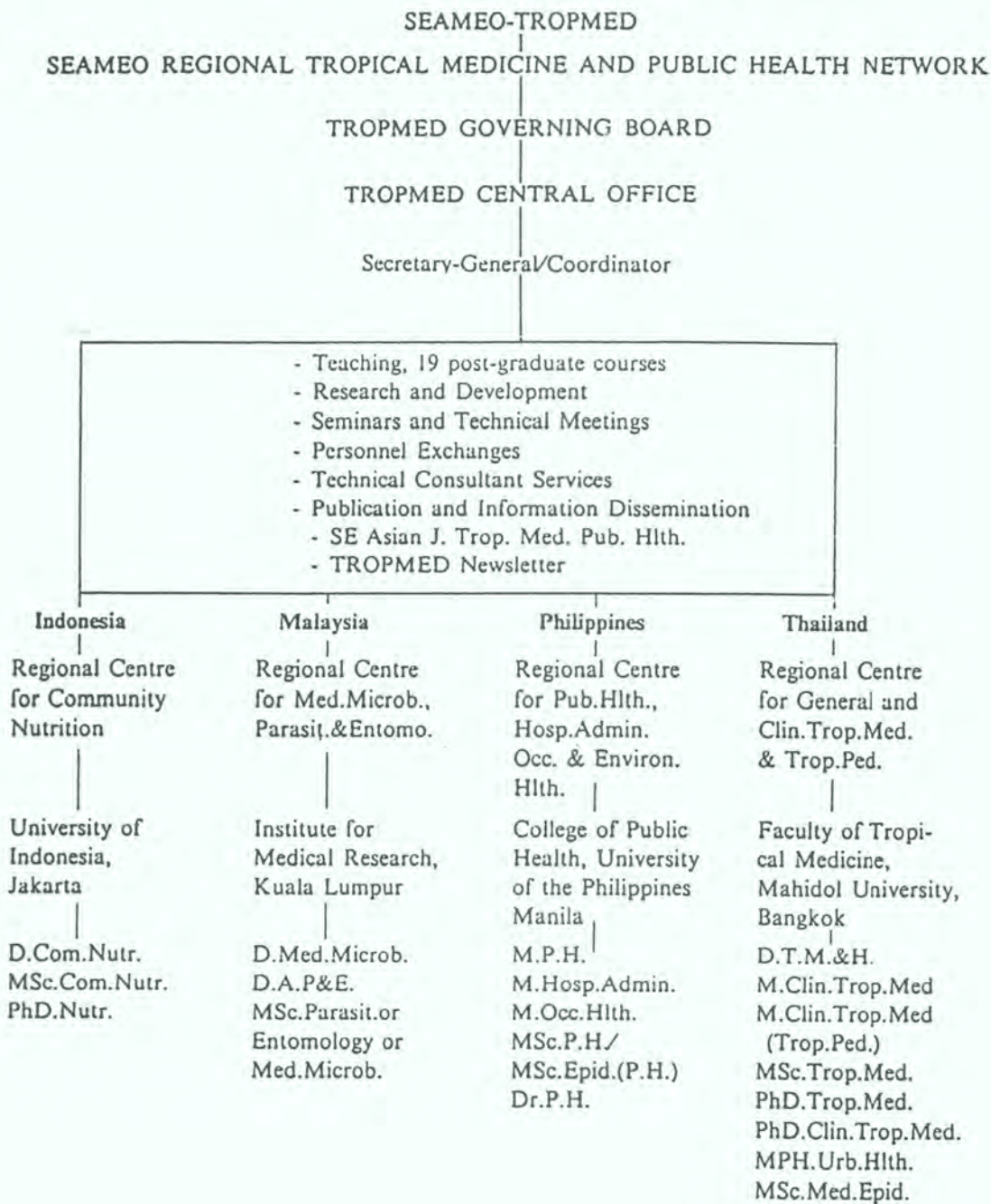
Not infrequently, the link that unites (i) economic activities, (ii) their impact on the physical environment and (iii) health, has been almost separated into two: the impact of economic activities on the environment, and the effect of environmental changes on health. In drafting and implementing the procedures for environmental assessment of their investment activities, multilateral development banks and many overseas development assistance agencies have typically stressed the former link. Specialized agencies such as WHO and domestic regulatory bodies, on the other hand, have been putting more emphasis on the latter. Yet both groups are aware of the full extent of the interactions.

The guidelines presented in this document are an attempt by the Bank to complete, or at least be more explicit about, the "missing link" Balanced environmental assessment of projects should simply encompass many things, including health.

ADB-WHO Steering Committee

One of the international organizations with real potential for encouraging the incorporation of health components within development in the Lower Mekong Basin is the South-East Asian Ministers of Education Organization/Regional Tropical Medicine and Public Health Network. SEAMEO is a chartered international organization for the promotion of regional human resources development. SEAMEO-TROPMED, established in 1967, is one of eight regional units under SEAMEO, "with the rôle of promoting health and preventing or controlling tropical diseases and public health problems, thus improving the living conditions of people in Southeast Asia through relevant programmes and services"

As a Regional Network for Education in Tropical Medicine and Public Health, which currently operates through four TROPMED Centres in Indonesia, Malaysia, the Philippines and Thailand, SEAMEO TROPMED serves to facilitate the strengthening of institutional capabilities in research and human resource development through various training and postgraduate academic programmes, linkages, personnel exchanges, scientific fora, technical consultant services, publications and information dissemination. The structure of the Network, with its four regional centres is shown in Fig. 3. The TROPMED Central Office is in Bangkok. The guiding theme of TROPMED "Healthy economy needs healthy community" is in harmony with the overall aims of PEEM.



**Fig.3 South-East Asian Ministers of Education Organization
Regional Tropical Medicine and Public Health Network**

HEALTH AND DEVELOPMENT IN THE MEKONG WORK PROGRAMME

Programmes and projects

The Mekong Work Programme is approved by Cambodia and the National Mekong Committees of Laos, Thailand and Viet Nam. In this way, it reflects the requirements of the riparian countries, and in accordance with these requirements the Committee has developed a comprehensive **environmental programme** which constitutes an important part of the Work Programme. The Committee is also pursuing the recommendations of the UNCED, in order to ensure **sustainable development** of the basin's resources (Mekong Secretariat, 1992).

It is therefore appropriate to refer to the UNCED Report, Agenda 21, Chapter 18, Protection of the quality and supply of freshwater resources: Application of integrated approaches to the development, management and use of water resources. The following excerpts are of particular relevance:

INTRODUCTION

18.2 Water is needed in all aspects of life. The general objective is to make certain that adequate supplies of water of good quality are maintained for the entire population of this planet, while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water-related diseases. Innovative technologies, including the improvement of indigenous technologies, are needed to fully utilize limited water resources and to safeguard those resources against pollution.

WATER FOR SUSTAINABLE FOOD PRODUCTION AND RURAL DEVELOPMENT

18.65 Sustainability of food production increasingly depends on sound and efficient water use and conservation practices consisting primarily of irrigation development and management, including water management with respect to rainfed areas, livestock water supply, inland fisheries and agro-forestry. Achieving food security is a high priority in many countries and agriculture must not only provide food for rising populations, but also save water for other uses. The challenge is to develop and apply water-saving technology and management methods and, through capacity building, enable communities to introduce institutions and incentives for the rural population to adopt new approaches for both rainfed and irrigated agriculture. The rural population must also have better access to a potable water supply and to sanitation services. It is an immense task, but not an impossible one, provided appropriate policies and programmes are adopted at all levels - local, national and international.

18.68 The key strategic principles for holistic and integrated environmentally sound management of water resources in the rural context may be set forth as follows:

(a) Water should be regarded as a finite resource having an economic value with significant social and economic implications reflecting the importance of meeting basic needs;

(b) Local communities must participate in all phases of water management, ensuring the full involvement of women, in view of their crucial rôle in the practical day-to-day supply, management and use of water;

(c) Water resource management must be developed within a comprehensive set of policies for (i) human health; (ii) food production, preservation and distribution; (iii) disaster mitigation plans; (iv) environmental protection and conservation of the natural resource base;

(d) It is necessary to recognize and actively support the rôle of rural populations, with particular emphasis on women.

The investigations of the PEEM mission, admittedly brief and superficial, suggest that while many of the UNCED principles are taken into account in the Mekong Programmes, there has been little progress towards the incorporation of human health components in a number of ongoing and proposed developments in the riparian countries of the Lower Mekong Basin.

The problems, their scale and the cost of their solutions, especially those affecting water supply and sanitation to rural settlements, are already recognized by the health sector, and reported in many recent development studies in the four countries. Concern for water-related diseases is demonstrated in the proposal for a specific project in the 1993 Work Programme. There is, however, little evidence of the integration of human health components into development processes, or indeed into projects for the investigation and planning of natural resources development which could, with only minor adjustment and expense, assess the need for and types of any desirable accompanying health protection measures.

Experience in health-related projects

This refers essentially to the water-borne diseases projects, Phase 1 - Basinwide Reconnaissance Survey of Water-borne diseases, and Phase 2 - Basinwide Study of Water-borne diseases, and to the proposal in the 1993 Work Programme for the Basinwide Water-borne Diseases Management Project. Phase 1 provided the background data on the relevant diseases in Thailand, Laos and Viet Nam, and led to the formulation of the Phase 2 project with the long-term objective *"to build health planning into water resources development schemes, in order to ensure that the health of riparians is not impaired by water resources development activities"*. Immediate objectives included the establishment of a standardized monitoring system for water-borne diseases in the Lower Mekong Basin; identification of the disease problem, its magnitude and locations; investigation of disease vectors, intermediate hosts and animal reservoirs; assessment of faecal contamination of domestic water; the spread of knowledge gained in disease control measures in the riparian countries; training of health technicians; and the spread, among the public, of basic knowledge of transmission of water-borne diseases (Mekong Commission, 1987).

Early in the Phase 2 project, a workshop was organized in Bangkok *"to refresh the knowledge of government officials responsible for monitoring the impact of water resources development on the health of the population. It is also envisaged that a common monitoring system, including the diseases and methodology, can be established in the region"* (Mahidol University, 1989). The workshop was held in October 1989, followed by further training programmes, but apart from a start on the survey of water-borne diseases and their vectors in Viet Nam, the project went no further and was terminated, with the withdrawal of remaining funds by the donor.

A comprehensive review of the project was carried out for the Mekong Secretariat, (International Environmental Management Inc. 1991) which presented conclusions on the shortcomings of the project and recommendations for its modification and for its continuation. Two comments in the review are of particular significance:

"One of the more important reasons for slow progress can be attributed to the lack of pre-implementation planning and design. The programme has been implemented in an unknown environment. No institutional analysis was completed to better understand the existing health programmes related to water-borne diseases, particularly in Laos and Viet Nam".

"The long-term objective should be revised to be more specific and related to the outcome of the proposed programme. The following suggestion is provided:

To strengthen health institutions to ensure that each country in the Mekong Basin has the capability to consider the possible water-related diseases effects of water resources development activities and to prepare appropriate preventative or treatment strategies”.

The recommendations of the review have essentially been incorporated in the current proposal for the Water-borne Diseases Management Project (Mekong Secretariat, 1991), and the national health sector agencies visited by the PEEM mission all expressed support for implementation of the project. The mission considers that future potential implementation problems may best be avoided by the establishment of a preliminary Task Force, at an appropriate high level, to prepare an Agreement on operational and financial issues, for signature by all participating riparian countries prior to the start of the project. Also, it would be of wider benefit if non-health agencies involved in water development in the basin were to be kept informed of the project and its progress, and eventually of the outcome in terms of future plans and arrangements for health safeguards applicable to development programmes.

Opportunities

By virtue of the network of National Mekong Committees, the Mekong Secretariat is in a position to promote the incorporation of health in natural resources development in the programmes and projects of the Work Programme and, by extension and example, within national development activities in the riparian countries.

Many of the ongoing and proposed projects in the 1993 Work Programme offer scope for the consideration of a health component. This is not to say that an elaborate and costly element should be built in, but rather that an awareness of health issues should be indicated in the project document, to alert the government line agencies to any risk, and to inform national health authorities of development studies and proposals at an early stage. The approach could be identical to that adopted by the Mekong Committee at its 68th session in 1975, when it resolved to “*seek assistance for the establishment of an ad hoc panel of environmental consultants to review its programme of development, and to suggest ways and means in which environmental concerns could be incorporated in its work*”.

It is now suggested that an *ad hoc* panel of consultants on environmental health and tropical diseases could complement the rôle of the environmental panel, and screen project and programme proposals, and recommend how to incorporate health concerns. At a preliminary level, this may well be accomplished by a desk-study screening where local epidemiological, disease and vector factors are generally known. At later pre-feasibility and feasibility levels, if potential health problems have been indicated, they can receive an appropriate degree of attention.

Many of the projects in the 1993 Work Programme would justify this form of initial screening, including some for land and water use and management, irrigation, hydropower, forestry, fisheries and human resources development. At present, none makes any reference to possible health issues. A preliminary screening may, in many cases, eliminate the need for detailed study, referring such issues for attention only under the routine programmes of the national health authority.

There are many competent, experienced agencies and personnel in the countries of the Basin (including national health authorities), and in the South-East Asia region, that could be mobilized to assist in such a screening process, and to participate in a panel convened by the Mekong Secretariat as part of its programme preparation and, if necessary, in a subsequent consultant capacity.

CONCLUSIONS

It is of primary importance to recognize that the concept of **integrated river basin development and management** is somewhat idealistic in circumstances where the riparian states have widely differing populations and infrastructure, and different levels of socioeconomic development and diverse capabilities in terms of skilled personnel and finance, especially when much of the region has been severely affected by war and drastic political changes. Also, whereas Lao PDR and Cambodia are almost entirely contained within the Lower Mekong Basin, both Thailand and Viet Nam have a major part of their territory outside the basin, thus creating unequal levels of dependency on the Mekong. In spite of these differences, the Interim Mekong Committee has achieved a remarkable **compatibility** among the Lower Mekong riparians, and also maintains contact with the two upstream riparians China and Myanmar. The former, in particular, could have a marked influence on downstream water users, notably Viet Nam, depending on any future changes in the development and management of the upper catchment.

All the riparians of the Lower Mekong Basin are conscious of environmental factors in relation to their programmes for natural resources development, although planning is, in many cases more in the nature of a series of discrete sectoral projects, with limited cohesion within programmes. Environmental issues therefore tend to be considered on an *ad hoc* basis, sometimes avoided if the development agency believes this is expedient and unlikely to attract serious legal penalty. The creation of new and more powerful environmental units at high levels in national governments, and effective and enforceable legislation, will eventually improve the degree of control. The present status of arrangements and capabilities for environmental control varies, with Thailand being the most advanced, Viet Nam making considerable progress, and Lao PDR moving to develop guidelines and legislation in circumstances of strong pressures for economic development and shortages of trained personnel and finance.

Health components in development have tended in the past to be introduced retroactively, through the need for remedial action on the part of national health authorities. Only recently have they begun to receive attention through the medium of environmental considerations, a point noted earlier in the comment of the ADB-WHO Steering Committee on Guidelines for Health Impact Assessment. It has been largely due to the influence of external agencies that attention is now being paid to human health in development, in many countries, particularly in the rural and agricultural environment that typifies so much of the Basin and its populations. Most of the environmental guidelines currently being drafted in the riparian countries of the Mekong make little or no reference to the protection of human health.

While national health authorities recognize the problem, and some have been actively incorporating appropriate measures in specific projects, (most commonly in the context of reservoir construction and the resettlement of displaced communities), they are constrained by limitations of staff and funds in the extent to which they can intervene. At the same time, the four countries (notably Thailand, and also Viet Nam), and the South-East Asia region in general can mobilize staff and appropriate training facilities to assist in generating a basinwide capability to investigate health risks in LMB developments and to design measures for their monitoring, reduction and control.

A major impediment to progress in the incorporation of human health components into basin development and management is undoubtedly the lack of awareness of potential disease problems and their control, among many of the authorities and agencies with responsibility for resource development. Against this background, acceptance and compliance with the rather

tentative guidelines and legislation now being drafted will be a slow process. But most of those authorities visited by the PEEM mission responded positively, when the health issues were presented as an essential component of the benefits from development and of sustainability, since damage to community health has its impacts on lost productivity, on the decline or even the abandonment of schemes, and on increased costs of medical care.

Within the Lower Mekong Basin the Interim Mekong Committee is in a unique position to develop this awareness of the human health component among the non-health agencies. Its proposed Basinwide Waterborne Diseases Management Project is evidence of a general concern, at least among the health authorities of the riparian countries, and the project will serve to identify locations and types of health risk to enable attention and resources to be directed to schemes where the people may be most susceptible to disease. The IMC could give greater prominence to human health within its programmes, at little additional cost. In fact, it is probable that the subject would attract external support from the donor community as a parallel activity to the above project.

Finally, the problem of safe domestic water supply and improved sanitation is an only too obvious health risk in many parts of the Basin, and inseparably linked to a number of the endemic diseases. One of the objectives of the ongoing and planned national water resources development programmes in the Basin must be the adoption and incorporation of suitable measures for the provision and improvement of these services, otherwise an already serious health situation will deteriorate still further.

RECOMMENDATIONS AND PROPOSAL

The Terms of Reference for the PEEM mission established its framework for investigation as the river basin. Therefore, while the sovereign status of the riparian countries has been fully recognized in this report, it is felt that recommendations should be directed, or related to the Interim Mekong Committee as the body mandated to "promote the development of water resources of the Lower Mekong Basin". In that capacity, it is the appropriate authority to stimulate and coordinate the riparian members in the incorporation of a human health component into basin planning, development and management, in much the same way as this has been done with the environmental issues with which health is so closely associated. Within this context, five specific recommendations are presented:

1. In addition to the review of environmental issues in **proposed projects**, carried out for the Lower Mekong Basin programme of development, or as a component of that review process, it is recommended that the previously mentioned Mekong Committee *ad hoc* consultant panel be expanded to take into account potential impacts on human health, the assessment of health risks, and opportunities for introducing health safeguards in development.
2. The same process could be applied to **ongoing projects**, many of which relate to agriculture, fisheries, forestry, and impoundment of water for purposes such as energy generation, irrigation, etc. and may have the potential to introduce or increase disease transmission in the community. These projects could be subjected to a preliminary assessment, followed if necessary by a reconnaissance-level field investigation, in order to provide a summary report to the responsible development and health agencies on the likely presence, or absence, of any disease risk to be taken into account at an early stage in construction or implementation.
3. The Basin-wide Waterborne Diseases Management Project is awaited with considerable interest and enthusiasm by the health authorities in the four countries. Funding for the project should be actively pursued, and it is hoped that the PEEM network can be mobilized to attract interest and support from potential donors. The project would eventually have a close connection with the above recommendations 1 and 2, as it would contribute greatly to the identification of disease risks and their locations, and thus to the design of health protection measures in development projects.
4. The Mekong Work Programme contains a number of projects which relate to organizational, legal and environmental studies, and to programme studies and services for human resources development and regional training. Many of these could be of direct relevance to important environmental health issues, and it is recommended that consideration be given to the complementarity of such issues in these projects.
5. The incorporation of a health component in natural resources development is constrained by a lack of awareness of the problem on the part of non-health professionals, and limited capacity and resources of many health units to identify risks and to design and apply protection measures. In an attempt to address these problems, a project proposal, in the form of a series of related activities, has been formulated to assist in preparing the ground for the Basin-wide Waterborne Diseases Management Project, and for subsequent support to the project. The general aim of the proposal is for capacity building for the incorporation of health safeguards in integrated basin development. It is proposed that the 12th meeting of PEEM give consideration to this proposal as an activity for which PEEM may seek external support, to combine with and to complement the programme of the Interim Mekong Committee. The detailed proposal is incorporated in this report for presentation to the 12th Panel Meeting.

PROJECT PROPOSAL

Capacity-building for the Incorporation of Health safeguards in Lower Mekong Basin Development

Background

At present, within the Mekong Basin, few agencies and institutions have taken into consideration the impact of natural resources development programmes on the health of the population. Even less attention has been given to the integration of health safeguards into such programmes.

Generally, the riparian countries and the international agencies associated with development formulate their projects within the narrow framework of their technical and sectoral experience. Any integration is found only among the economic sectors and sub-sectors such as agriculture (with forestry, and fisheries), transport, industry and population settlement. The health sector, if involved at all, tends to be associated the routine health service activities, and usually in a retroactive curative rôle. It is seldom that specific safeguards are identified and included, and where this does occur it is most often initiated by donor or investment agencies in pursuit of a broader interest in environmental concerns.

The reasons for this neglect of human health in development planning are entirely understandable. The need for increased production and growth is the primary, pressing factor that drives the accelerating economic development programmes. Limited time, funds and, most notably, trained personnel force the line ministries to concentrate efforts on their sectoral goals, with the often-expressed belief that economic advances will automatically bring health and welfare benefits to the communities. Extensive experience in the region, and elsewhere in the world, has disproved this theory. But while there is a growing awareness that environmental factors must be regarded as an essential component of the sustainability of development, the health of the people involved in making development work is seldom seen as a basic factor of both production and sustainability.

In spite of the present apparent constraints on incorporating health safeguards in development programmes, the interest and concern for the problem was evident among many of the individuals and agencies visited by the PEEM Mekong mission. The proposed Basin-wide Water-borne Diseases Management Project is strong proof of this, and the mission team believes that the Panel should use its network of institutions and facilities to stimulate and encourage support for such objectives. The following proposal indicates the types of support that would assist in achieving this aim.

Summary proposal

With the aim of facilitating the incorporation of human health issues into the programmes and projects for planning, development and management of the Lower Mekong Basin resources, the PEEM mission suggests consideration of the following measures:

- I. Increase the awareness of policy makers, donors, investment agencies and implementing agencies, in each riparian country, of the potential impact on health resulting from the development of natural resources, with special regard to land and water use and human settlement.

- II. Introduce and disseminate the PEEM *Guidelines for Forecasting the Vector-borne Disease Implications of Water Resources Development Projects*.
- III. Promote the implementation of the Basin-wide health monitoring system, with special emphasis on water-related diseases and water quality.
- IV. Apply specific disease protection and control measures when and where appropriate.
- V. Where the need is revealed by the monitoring system, introduce periodic evaluation of the health and disease status of the affected population.
- VI. As an immediate step to improve access to information on health in relation to natural resources development, improve and ensure the distribution of relevant material from PEEM and its participating UN Organizations to the national, regional, bilateral and multilateral agencies concerned in the Lower Mekong Basin.

Project components

I. Increase awareness of potential health impacts of land and water resources development.

This measure should be introduced at national level, initially through the organization of a “**Mobile Introductory Seminar**” which will circulate among the riparian countries. The national seminar should be of short duration, preferably over a lunch period at a reputable hotel, to create a suitable impression among the participants, and will also not demand too much of their time. Those invited should be the **chief executives** or deputies of national, bilateral and international agencies

and institutions involved in the planning and implementation of the economic development of the country. Emphasis is on targeting the “non-health” agencies and institutions.

The objective of the seminar is to provide information on the health impacts of land and water resources development, with illustrations, if possible from the particular country. The key to success in this seminar lies in **careful advance planning** for each venue, and in **convincing policy-makers** to attend.

Participants to be invited should represent agencies and institutions such as the following:

National bodies. National Mekong Commissions; Economic Development Boards (or equivalent); committees or offices with mandates for science, technology and the environment; Ministries or departments of agriculture, water resources, irrigation, forestry and energy; electricity authorities; ministries of health and education; national research institutes and universities with health science departments.

Bilateral donor agencies, with interests in supporting projects in the country, as for example those already contributing to projects in the Mekong Work Programme.

Regional agencies such as the Mekong Committee, SEAMEO, AIT, IRRI, IIMI, etc.

International agencies and organizations, including UNDP, UNICEF, UNEP, ESCAP, WHO, FAO, the EC, World Bank, Asian Development Bank, etc.

The "Mobile Introductory Seminar" (2 to 2½ hours)

1. **Opening address** by a prominent national statesman (10 mins)
2. **Introduction of the problem** by a multi-visual presentation (about 10-12 mins)
3. **Lunch** (30-40 mins)
4. **Talk on "Health impacts of land and water resources development"** (30 to 40 mins)
 - 4.1 - **Impact of development on the environment**
 - Environmental changes resulting from development
 - Effects on disease vectors and human habitat
 - Water quality, especially downstream and in canals
 - 4.2 - **Water-related diseases**
 - Brief introduction to diseases
 - The relationship between resource development and disease transmission, (if appropriate with an example observed in the particular country)
 - 4.3 - **Mitigation and control of disease risks**
 - Water Acts and Environmental Acts, requiring inter-disciplinary consideration and management
 - Integration of health sector at the planning stage
 - Health risk assessment
 - Disease control programmes
5. **Opportunity for questions and discussion.**

(The presentation should be accompanied by a pictorial and data display, posters and slides, and documents related to the talk should be distributed to participants).

II. Introduction of the PEEM Guidelines.

This component is intended to educate **project planners** in assessing health risks in their own areas of economic development. Having identified a potential risk, the appropriate health agency should be consulted for the design of suitable measures for the safeguard of human health and the mitigation of adverse impacts from the project, so that these may be integrated into the development plan at the outset.

It is proposed that a workshop be organized at national level or basin-wide, with the objective of familiarizing participants with the PEEM guidelines. A field demonstration of the guidelines should be arranged in the area of one of the planned water resources developments.

Ideally, **the participants** would be a group comprising development planners, water resources engineers, agriculturists, environmentalists and public health workers from the riparian countries.

The course content would comprise:

The course content would comprise:

1. Introduction to health impacts of land and water resources development.
2. Water-related diseases, their morbidity and transmission.
3. Introduction to the PEEM *Guidelines on Forecasting the Vector-borne Disease Implications of Water Resources Development Projects*.
4. A practical field application of the assessment.

Different approaches could be used for organizing this workshop. It could be a follow-up to the Mobile Introductory Seminar, taking advantage of the same team in the country, or it could use the model of the PEEM/DBL training course on "Health Opportunities in Water Resources Development". This may lend itself more readily to basin-wide application. Advance planning would be essential, especially in the latter case, and appropriate modifications would be required to adjust the course content to the endemic diseases of the Southeast Asia region.

III. Introduction of the basin-wide health monitoring system, with emphasis on water-related diseases and water quality.

With the initiative of the Mekong Secretariat, the Basin-wide Waterborne Diseases Management Project has been formulated (see Annex 2). This followed the projects Basinwide Reconnaissance Survey of Waterborne Diseases (Phase 1) and the Basinwide Study of Waterborne Diseases (Phase 2) which was prematurely terminated. The Phase 2 project initiated technical training of technicians from the riparian countries, but did not implement action on the basin-wide monitoring of water-borne (or water-related) diseases.

With the background training to date, the region could soon be ready to implement a health-monitoring system foreseen as a component of the proposed Waterborne Diseases Management Project. It is therefore suggested that a critical review of the proposed system and its methodology be carried out, with agreement and adoption by the riparian countries, and that a short refresher course be implemented in readiness for that project, and to improve and standardize ongoing routine activities in disease monitoring.

IV. The application of specific disease protection and control measures, when and where appropriate.

With many common, or at least similar conditions of geography, climate, human culture and behaviour, the people of the Lower Mekong Basin are faced with the same types of disease problems. Some of these problems have already been studied, and control of certain water-related diseases has been implemented with a high degree of success in the Mekong Basin. For example, the self-reliance model for the control of liver fluke infection and the malaria control programme in Thailand have considerably reduced the transmission of these diseases. Such measures should be reviewed, modified as necessary to suit specific local conditions, and implemented in other riparian countries. Resource persons and institutions to participate in these activities and programmes are available within the four countries, and elsewhere in the region, and could be invited to assist in training personnel of the riparian countries of the Mekong Basin.

V. Periodic evaluation of the health and disease status of affected populations.

Following the implementation of the monitoring system in the Basin-wide Water-borne Diseases Management Project in selected pilot areas in the riparian countries, an evaluation of health and disease status should be undertaken periodically. An interval of three years may be sufficient to indicate relevant changes.

The evaluation should be carried out by organizing a seminar to allow the monitoring teams of each country to present their results and to discuss the suitability of, and proposals for improvement of, the monitoring system. It is through such exchanges that new technologies or tools can be mobilized to increase effectiveness and efficiency, for example by the use of modern immuno-diagnostic tests using genetic engineering, or by the development of a regional computerized data base on vectors and environmental features.

VI. PEEM Information packages.

The PEEM Mekong mission has established that there is considerable interest among the riparian countries in the concern for human health in conjunction with programmes for land and water resources development. This is evident also in the proposed Water-borne Diseases Management Project. To stimulate this interest, and in support of the preceding project proposal, especially component No.I, it is strongly recommended that packages of PEEM literature and other relevant WHO, FAO, UNEP or UNCHS documents be sent to the various organizations and agencies visited during the mission. It is through concentration on target areas such as the Lower Mekong Basin, in this phase of dynamic development, that the message of PEEM can be most effective in its application to the enormous programmes now being formulated and implemented, which may affect the lives of many of the Basin's fifty million people.

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ANNEX 1

MANDATE OF THE MEKONG COMMITTEE

The Interim Mekong Committee for Coordination of Investigations of the Lower Mekong Basin (IMC), established in 1978, consists of three members, namely the Lao People's Democratic Republic, the Kingdom of Thailand and the Socialist Republic of Viet Nam.

The IMC's main function, as laid down in its Rules of Procedure, is to:

'promote the development of water resources of the lower Mekong basin'

Prior to the existence of the IMC, the Committee for Coordination and Investigations of the Lower Mekong Basin (Mekong Committee) was established in 1957 by the Governments of Cambodia, Laos, the Republic of Viet Nam and Thailand. In its 1957 Statute, the function of the Mekong Committee is to:

'promote, coordinate, supervise and control the planning and investigation of water resources development projects in the lower Mekong basin'.

The above two institutions are hereinafter referred to as the Committee. Over time, the Committee has come to perceive its task as the comprehensive development of the water and related resources of the lower Mekong basin for hydroelectric power, irrigation, flood control, drainage, navigation improvement, watershed management, water supply and related development. The Committee likewise pays attention to the environmental, social and economic aspects of the lower Mekong basin.

The Committee performs its functions through its **technical and administrative arm**, the Mekong Secretariat, which is headed by the Committee's Executive Agent. The Secretariat's primary function is to coordinate the basinwide water resources development efforts and utilization of the waters of the Mekong river. This involves the collection and analysis of a large amount of data on the physical, economic, social, and institutional factors that determine the existing utilization of Mekong waters and opportunities for development in the basin. It also comprises monitoring the development and planning efforts made in the basin by the member countries and other development agencies.

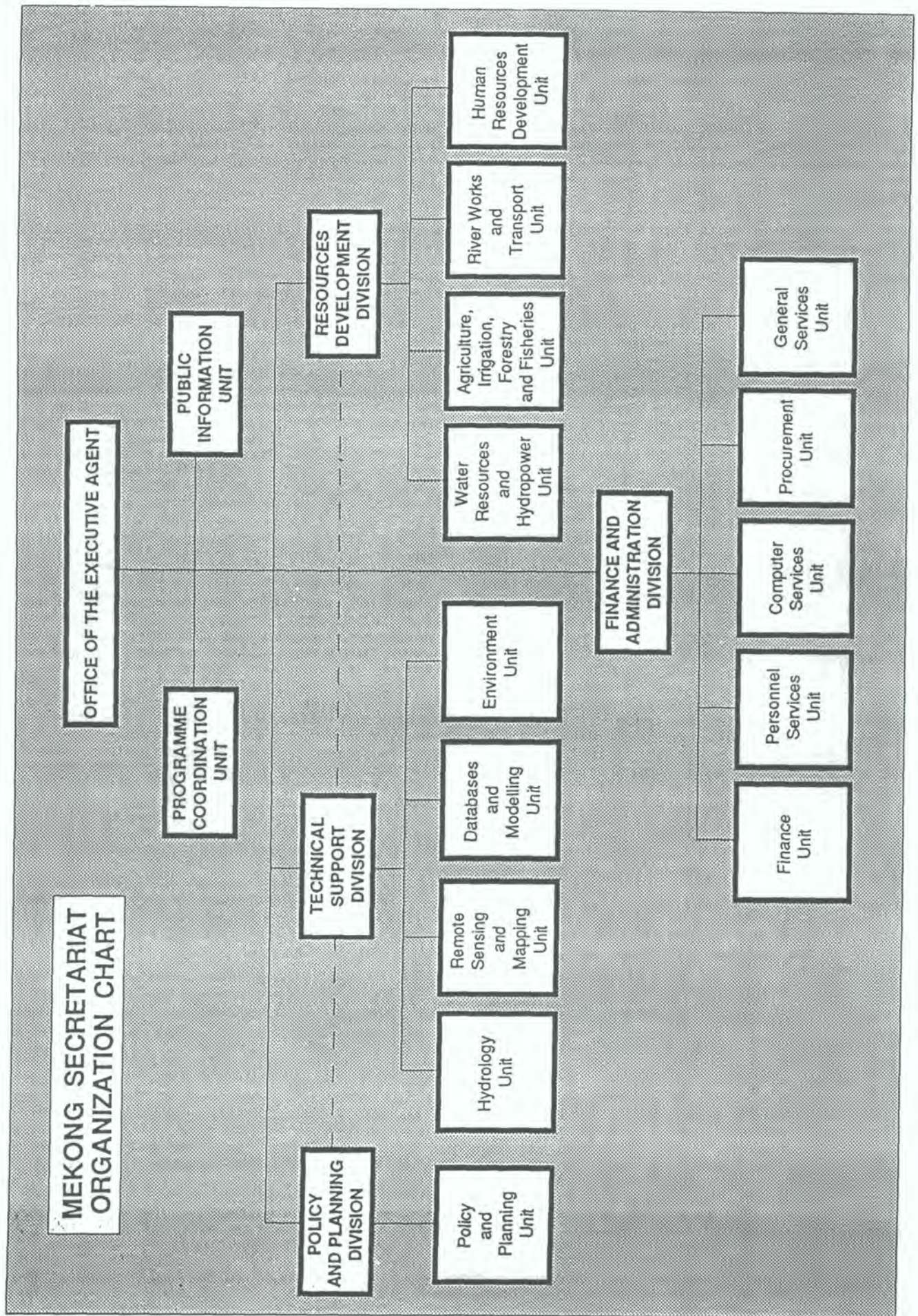
On the basis of data compiled and analysed and the perceived development trends in the basin, the Mekong Secretariat serves as an institutional mechanism for identifying the possibilities for basinwide development and enabling the member countries to jointly plan water resources development and utilization of waters and, at an opportune time, to enter into arrangements defining each member country's reasonable and equitable share in the beneficial uses of the water of the Mekong mainstream. (See Chapter 2 for the linkage between the Indicative Basin Plan and the national five-year development plans of the member countries).

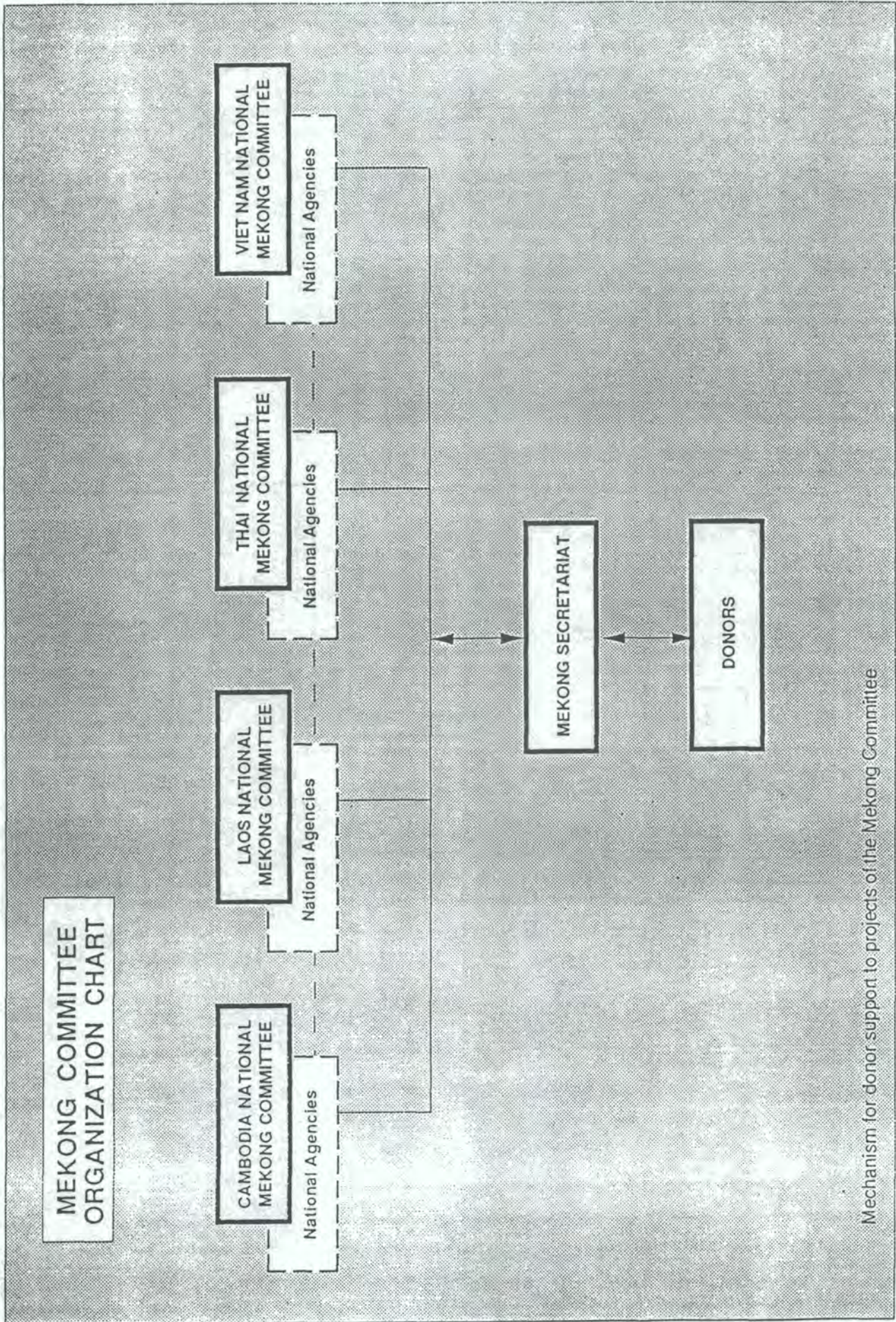
The Secretariat participates in water resources development activities which comprise a wide range of activities from pre-investment, reconnaissance, pre-feasibility and feasibility studies to implementation. In view of the under-developed state of the member countries' economies and in light of the close contact the Mekong Secretariat maintains with the donor community, the Secretariat sometimes assists with fund-raising also for country-oriented projects proposed by the member countries themselves.

These functions imply a gamut of services which the Mekong Secretariat renders provided that they are for the **basic purpose of developing the water and related resources** of the lower Mekong basin in the member countries. These include:

- **Coordination of basinwide development planning**
- **Complementary activities** such as data collection and modelling
- **Pre-investment Studies** for identification and evaluation of investment opportunities.
- **Final Engineering and Design Studies**
- **Field Project Implementation, Evaluation and follow-up**
- **Training of riparian personnel**
- **Management Services** for bilaterally-funded or national projects. (Technical and managerial supervision of project operations, legal advice, procurement, preparation of progress and technical reports, etc.)

The work of the Committee is based on a continuous and close cooperation between the Committee, the Mekong Secretariat, the National Mekong Committees, UN and other international agencies and the donor community.





Mechanism for donor support to projects of the Mekong Committee



MEKONG SECRETARIAT

INTRODUCTION

The 1993 Mekong Work Programme has been approved by Cambodia, and the National Mekong Committees of Laos, Thailand and Viet Nam.

- **Basinwide Priority**

The recent positive political developments in the region have made it possible for the Secretariat to highlight and focus attention on **regional projects for the planning and development of water and related resources**. This is where the Secretariat has unique competence and experience to serve the riparian countries and provide supplementary support to bilateral programmes.

The Work Programme for 1993 emphasizes basinwide programmes and projects. Such development needs to be coordinated not only between the riparian countries directly involved, but also with development activities upstream. The Secretariat has therefore initiated contacts with the upstream riparian states, the People's Republic of China and the Union of Myanmar, initially in order to improve the exchange of technical data and information.

- **Special Considerations**

Over the last years the Committee has gradually moved towards a **programme oriented approach** for its planning. Certain achievements in this regard have been made but it is expected that this transition will take a few more years to complete in cooperation between the member countries and the donors. The Committee's development activities are strongly influenced by environmental and socioeconomic considerations. To meet the requirements of the riparian countries a comprehensive **environmental programme** has been developed and today constitutes a major part of the Work Programme. Advanced computer-based assessment methods, increased use of remote sensing, strengthening of environmental planning as well as improved support for individual projects are some key elements in this effort. With regard to environmental programming the Committee is also pursuing the recommendations of the UNCED conference in June 1992 with consideration of the ecosystem of the basin in order to ensure **sustainable development** of its resources.

The Work Programme itself, as well as the projects within it, acknowledges the need to balance planning activities, physical development and investment in human resources. One of the priorities in the Work Programme for 1993 is **human resources development** activities aiming at establishing a broad and sustainable platform for future development initiatives. This is in addition to a large number of specialized training components within individual projects. Special attention is paid to women in development aspects of the Committee's projects. Increased attention in project formulation has also been given to **social and cultural impacts** of projects.

Although increased emphasis should be placed on **basinwide activities**, it may be expedient due to special circumstances, to continue with a limited number of selected projects that are primarily of national character, for example to address the extraordinary needs of Cambodia.

- **A Rolling Action Plan**

The annual Mekong Work Programme, represents the codification of the coordinated regional planning and development activities. A fundamental part of the Committee's work is the continual engagement of the riparian countries in a dialogue on regional development issues related to the Mekong water resources which they all share. The 35 years history of the Committee is in itself probably the best proof of the necessity of such cooperation.

The Mekong Committee Work Programme summarizes ongoing and planned projects and serves as a rolling action plan. The annual review of the Work Programme, ensures that it reflects the development priorities of the riparian countries and is in conformity with their national development plans. It responds to the regional political realities on the one hand, and the interests and funding priorities of the donor community on the other. As shown in Annex 1, the Work Programme for 1993 includes projects at various stages of implementation. Some of them started several years ago and are now reaching completion, while others are just getting started and are planned to continue through 1995 or beyond.

Included in the Work Programme 1993 are seventeen new basinwide projects and thirteen new national projects whilst seven basinwide and ten national projects in Work Programme 1992 have been completed or for other reasons deleted from the Programme. The Work Programme 1993 has at the time of submission a portfolio of in all 116 projects of which already at the outset approximately 40% are funded. Despite the fact that the discussions on the modality for future cooperation among the Mekong countries have not yet been concluded, the donors' support to the Work Programme has remained solid. New donor commitments during 1992 amounted to approximately US\$17 million which is well above previous year averages of US\$8-10 million of new contributions a year. To a certain extent this increase relates to the immediate rehabilitation needs of Cambodia, but substantial new contributions have also been made to projects of basinwide nature. During 1991 and 1992 three countries, Austria, Canada and Denmark, have joined or rejoined the donor community.

Number of ongoing and proposed Work Programme projects

Year	Basinwide		National		Total
	(No.)	(%)	(No.)	(%)	
1985	37	33	75	67	112
1992	50	48	54	52	104
1993	60	52	56	48	116

**Funding requirements for ongoing
and proposed Work Programme projects (million \$)**

Year	Basinwide		National		Total
	US\$	(%)	US\$	(%)	
1985	30	9	287	91	317
1992	69	45	85	55	154
1993	88	45	108	55	196

SUMMARY

THE MEKONG WORK PROGRAMME

The process of developing natural resources is itself a complex and multi-sectoral undertaking. It is made even more complex by the international character of the lower Mekong basin and the significant disparities among the riparian countries which must plan collaboratively for its development. The international, social and environmental aspects of development of the Mekong river make it one of the great challenges for resources development in the world.

One of the planning documents for this development is the Work Programme which presents an annually updated overview of the Committee's ongoing and planned activities and sets forth the priority projects approved by the National Mekong Committees for 1993 and beyond. The Work Programme promotes timely and coordinated implementation of projects based upon an overall strategy for the integrated development of the basin's resources on a sustainable basis.

The Work Programme is divided into three main Programme areas and twelve Sub-Programme areas, as follows:

1. **Policy and planning**
 - 1.1 Strategic studies
2. **Technical support**
 - 2.1 Hydrology
 - 2.2 Databases and modelling
 - 2.3 Remote sensing and mapping
 - 2.4 Environment
3. **Resources development**
 - 3.1 Water resources and hydropower
 - 3.2 Agriculture
 - 3.3 Irrigation
 - 3.4 Watershed and forestry
 - 3.5 Fisheries
 - 3.6 River works and transport
 - 3.7 Human resources development

- **Policy and Planning**

Policy and Planning activities include macro level and sectorial studies which are used for decision-making and policy formulation. These are strategic studies directed to a variety of planning and natural resources issues. The transboundary nature of these issues, and the significant impact that development of water and related resources of the basin will have on all riparian countries add a dimension of complexity to the planning process.

- **Technical Support**

Technical Support activities include ongoing database development, surveys, monitoring and analysis of information, remote sensing/GIS and mapping activities: all are essential to the integrity of the planning process and to effective project implementation. Technical support activities, including computer simulation modelling and environmental studies, permit the formulation of alternative development scenarios, as well as realistic goals and objectives, and provide the means to evaluate the effectiveness of ongoing and completed activities.

- **Resources Development**

Resources Development activities focus on reconnaissance and feasibility studies, project organization, human and institutional resource strengthening measures, detailed design, tendering procedures, and construction supervision and management. A collaborative planning process translates into integrated development and finally, to coordinated, effective and sustainable project operations. The Programme addresses each of these essential components of resources development to ensure that the benefits of projects reach beneficiaries and are sustained over the long-term.

- **Programme Projects**

The heading Programme Projects which appears after the three Programmes (page 149), is not a Programme as such, but covers certain cross-programme projects and some special donor-contributed funds which are to be utilized as priority needs arise.

How to read the Work Programme

In this document project descriptions begin with the title and (in brackets) location and/or nature of the project (whether basinwide or Cambodia, Laos, Thailand, or Viet Nam). Each project bears a code number (e.g., 3.2.24/92) which refers to the Programme Area (here, it is 3); the Sub-Programme (in this case, 2); and the serial number (here, 24), followed by the year (92) in which the project was included in the Work Programme.

The number of the reference document (e.g., MKG/R.92041) which provides detailed information on the project is also given. The project summary descriptions in this Work Programme include the Objectives, Justification, the Outputs and Activities to date and those proposed, Time frame and Inputs (in cash and kind). Total Costs, National Contributions and External Funds Required, as well as Funds Secured and their sources are given in a table below the description of Inputs. Full information on the project is given in the MKG/R. document.

2.4. SUB-PROGRAMME: ENVIRONMENT

Priorities:

- Integrating environmental aspects into resource development projects at all steps of the project cycle;
- Training of riparians at various levels in environmental planning (data collection); environmental screening and impact assessment;
- Monitoring of environmental parameters, basinwide as well as site specific, which are prone to change due to water resources development projects.

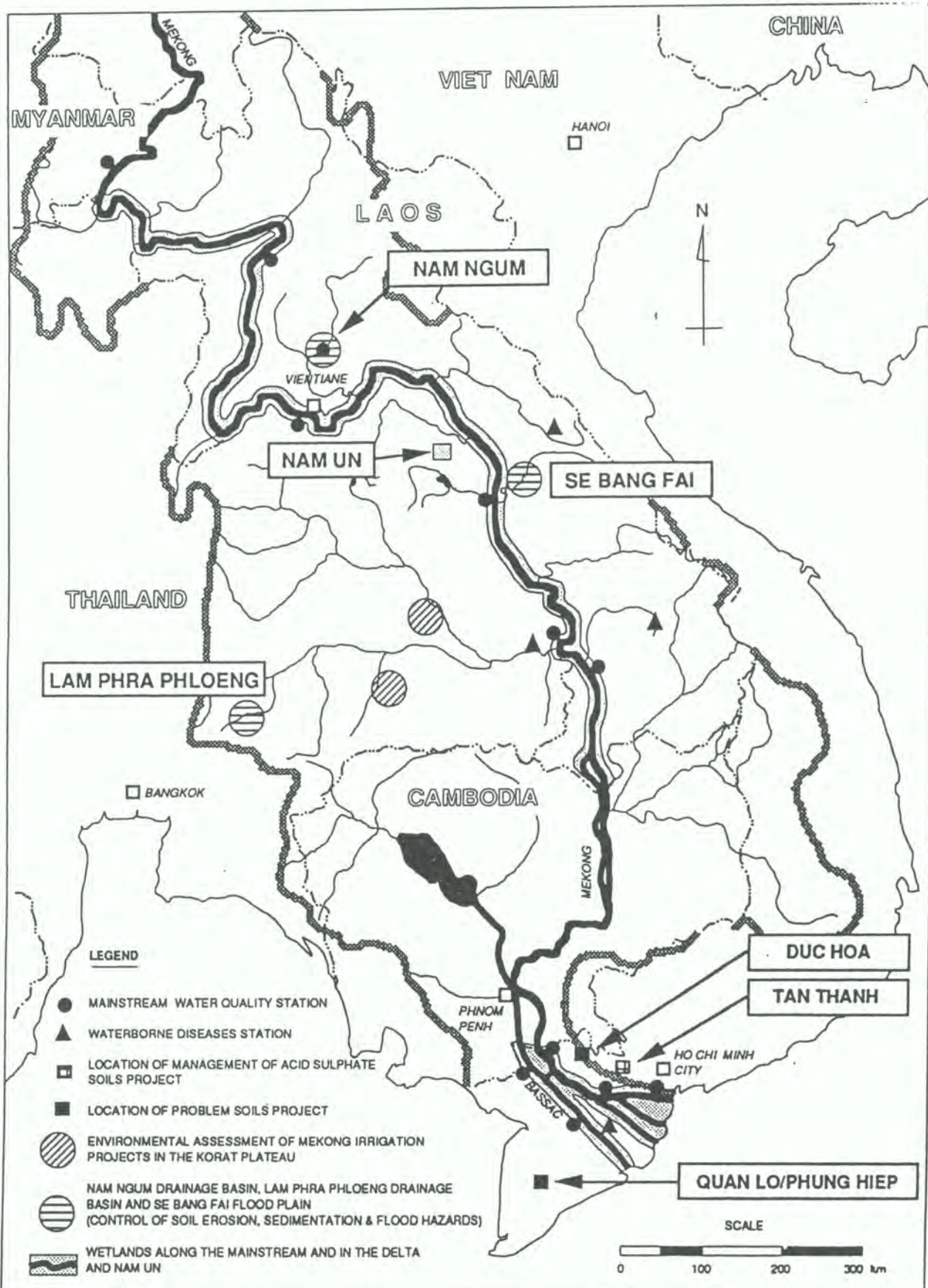
Description: Recognizing the importance of the environmental element in sustainable resource development, the Mekong Committee, at its 68th session in January-February 1975, resolved to 'seek assistance for the establishment of an *ad hoc* panel of environmental consultants to review its programme of development and to suggest ways and means in which environmental concerns could be incorporated in its work.'

The environmental planning element of the programme comprises the elaboration of strategies for environmentally-sound, integrated resource development, based on analyses and interpretation of the data collected; planning measures to enhance benefits or offset adverse effects; and development of environmental management programmes on the basis of impact assessments of specific projects.

The environmental programme of the Committee has then been directed towards taking steps to predict, as far as possible, the undesirable effects that can arise as a result of its development programmes; to define, plan and implement mitigation measures accordingly; and demonstrate by pilot projects the use of natural resources so that optimal benefits are reached and long-term negative impacts are minimized.

The Committee's environmental management objectives are to be achieved through data collection, defining procedures for environmental screening of various projects, establishing monitoring systems and the institution of pilot projects in selected fields such as erosion control, soil conservation, and integrated soil/water management in problem areas, for eventual application basinwide.

ENVIRONMENT PROJECTS



**WATER QUALITY MONITORING NETWORK
IN THE LOWER MEKONG BASIN, PHASE II
(BASINWIDE)**

W.P. code: 2.4.15/88
(former 1.3.17/88)
MKG/R.88011

Objectives:

1. To develop a comprehensive water quality conservation policy and establish systems for early recognition of water quality problems arising from current and future development activities; and
2. To develop predictive tools and ameliorative strategies for special, highly complex, water-related environmental problems of natural and anthropogenic origin.

Justification: The water quality monitoring network project was launched in January 1985 with financial support provided by the Swedish International Development Authority (SIDA). The results have so far shown that the Mekong river water is of good quality, but some of the tributaries have water quality problems related to land use, i.e., erosion in highland regions, salinization in the central and eastern part of the basin, eutrophication in agricultural and urban areas, and acidification in the delta. However, the data available still do not permit a full understanding of the relations nor do they permit the prediction of the effects of future development activities. Surface water quality monitoring also needs data obtained from studies of groundwater and rainwater, as well as pesticides in indicator organisms, which together with information on land use, topography, agricultural practises, soil types and geology will create a base for an integrated data evaluation.

The Water Quality Monitoring Network was extended into a Phase II in September 1988. UNEP has designated this network as a component of the global Environmental Monitoring System (GEMS) from December 1992 to September 1993.

Outputs and Activities: (a) Consolidation in monitoring surface water chemistry, sediment discharge and biology; (b) installation of pesticide and heavy metals laboratories in the member countries; (c) monitoring of pesticides and heavy metals, groundwater and rainwater chemistry; (d) improvement of the established database for water quality at the Secretariat and in the member countries; (e) training of riparian specialists (Laos, Thailand and Viet Nam) in integrated data evaluation and in the use of mathematical models; and (f) formulation of strategies for water resource use without adverse effects. Initial steps to incorporate Cambodia in the network are being taken.

Time frame: 60 months, from October 1988 to September 1993.*

Inputs: Full-time services of a project coordinator and support staff; 39 man-months of consultancy services in monitoring; funds for laboratory equipment, field operations, travel, training, reporting, and sub-contracting for data processing, data evaluation and modelling.

Costs:	US\$
Total project cost:	2,411,000
National input (in-kind):	300,000
External funds required:	1,861,000
External funds required for the period 1/7/92-30/6/93:	250,000
Funds secured from:	
Sweden	2,111,000
UNEP	177,000

* In June 1992 Sweden extended the project another year to June 1993. UNEP support continues until September 1993.

**INTEGRATION OF ENVIRONMENTAL COMPONENTS
IN PROJECTS (BASINWIDE)**

 W.P. code: 2.4.18/91
 (former 1.3.23/91)
 MKG/R.90011

Objectives:

1. To strengthen the capability of environmental impact assessment (EIA) of projects/project components;
2. To gather basic/project specific environmental data;
3. To support training on EIA; and
4. To facilitate the purchase of instruments/equipment needed for studies/monitoring activities.

Justification: Besides the direct benefits, activities in the field of water resource development also generate environmental side-effects, some of which are beneficial and others which are adverse. Some effects are easy to predict at the planning phase of a project; others will not be visible until the field work starts. The need for environmental considerations in project activities has increased the requirements for more detailed and accurate data on environmental parameters likely to be affected by the proposed development activities. Trained manpower is required to make the analysis of the trends and potential changes due to the development schemes. Monitoring activities of specific parameters during a certain time may be needed on issues not identified in the original planning.

Outputs and Activities: The expected outputs are: (a) improved data on environmental parameters (mainly site specific); (b) formulation of mitigation measures in projects; and (c) better trained technicians in EIA. The activities include: (i) integration of environmental components in ongoing projects; (ii) data collection and data base development; and (iii) training workshops for planners and technicians.

Time frame: 40 months, from March 1990 to June 1993.

Inputs: Funds to be used by the Mekong Secretariat: (1) to facilitate quick actions to upcoming needs in project formulations and planning; (2) to improve the environmental data collection at various levels; and (3) to cooperate with established institutions in EIA-training for riparians. The choice to decide on the specific activities is flexible and rests with the Secretariat (up to a level of US\$ 100,000 per a single study/activity) as agreed upon with the donor.

Costs:	US\$
Total project cost:	905,000
National input (in-kind):	30,000
External funds required:	875,000
Funds secured from:	Sweden
	875,000

**BASINWIDE WATERBORNE DISEASES
MANAGEMENT PROJECT**
**W.P. code: 2.4.19/92
(former 1.3.06/85)
MKG/R.91036**
Objectives:

1. To provide a sound institutional base for the prevention and management of waterborne diseases by providing technical assistance necessary to assure adequate health care skills, effective monitoring and management systems and sufficient management expertise to direct and sustain an effective, basinwide waterborne diseases management programme;
2. To establish a comprehensive basinwide waterborne diseases information base to support the development, monitoring and evaluation of preventative/control strategies for waterborne diseases which may result from water resource development activities; and
3. To establish waterborne diseases assessment and management guidelines for water resources development projects in the lower Mekong basin by investigating the inter-relationships between waterborne diseases and water resources development activities.

Justification: Water resources development activities may result in serious adverse health consequences by creating conditions that are conducive to such diseases as malaria, dengue fever, *schistosomiasis*, and *opisthorchiasis*. These activities also contribute to the introduction and spread of new pathogenic agents by attracting a large number of people to a variety of epidemiological situations, such as migrant labour during construction work. To assist in increasing socioeconomic growth and quality of life in the four riparian countries, it is important that the capability to assess and manage waterborne diseases is improved. This project is designed to better understand waterborne diseases problems; provide management and training support; and at the same time assess longer term institutional needs.

Outputs and Activities: Expected outputs will include: (a) development of management support systems; (b) implementation of a standardized monitoring system; (c) waterborne diseases surveys; (d) disease prevention/control strategies; (e) public health education; (f) assessment of water resources development effects on waterborne diseases; (g) technical and management training; and (h) the development of a long-term institutional strengthening programme.

Time frame: 36 months.

Inputs: Services of public health specialists and consultants in the fields of waterborne diseases, environmental impact assessment, health education, institutional strengthening, training, and management support systems. Laboratory and field equipment, and medicines. Services of public health teams to conduct surveys and to implement a monitoring programme.

Costs:	US\$
Total project cost:	1,240,000
National input (in-kind):	265,000
External funds required:	975,000
Funds being sought:	975,000

**INTEGRATED DEVELOPMENT OF THE LOWER
MEKONG BASIN (BASINWIDE)**
**W.P. code: 3.1.22/90
(former 1.1.07/90)
MKG/R. 89056**
Objectives:

1. To develop effective programmes contributing to the optimal and sustainable development of the basin's water resources;
2. To reinforce the Secretariat's capability for effective operational planning, and co-ordinate the resources assessment and development programmes;
3. To strengthen an effective and operational Mekong Secretariat; and
4. To implement a well-designed training programme for member states' institutions.

Justification: The revised Indicative Basin Plan (1987) pointed out that the growth in demand for food and electricity will determine the scope and pace of basin development. Action programmes to improve and extend irrigation, flood and drainage control in most parts of the basin are urgently needed. Improved cooperation among member countries in jointly developing the hydropower potential is required. To facilitate the formulation of sustainable development alternatives, appropriate environmental screening must be developed.

Related to 3.8.09/93 Support for programme activities of the Mekong Committee (basinwide), the Water resources development plan for north-eastern Thailand; Master plan for the integrated development of the Mekong delta (Viet Nam); and Water resources development plan for Laos.

Outputs and Activities: Expected major outputs are: (a) ranked promising development alternatives; (b) identification of environmental measures and appropriate management techniques; and (c) action programmes for the sustainable use of forest resources and agricultural development strategy. The main activities comprise: (i) macro-economic studies and demand projections; (ii) review and identification of potential water resources development projects; (iii) screening of environmental consequences; (iv) training; and (v) preparation of alternative development scenarios and action programmes.

Time frame: 37 months, from January 1990 to January 1993.

Inputs: Cash and in-kind contributions made by the riparian Governments are estimated at US\$1,490,000. UNDP funds (RAS/89/042) cover the costs of consultancy services, sub-contracts, equipment, in-service training and workshops.

Costs:	US\$
Total project cost:	3,652,000
National input (in-kind):	1,490,000
External funds required:	2,162,000
Funds secured from:	UNDP
	*2,162,000

* Includes US\$212,000 for the Hydro-Meteorological Network and US\$200,000 for the Irrigation Study of the Low Pa Mong Multipurpose Project (basinwide).

ANNEX 3

PEEM MEKONG MISSION

Itinerary and Programme

1993

- 9-19 October Mather in FAO Rome for background material on LMB countries' agriculture and water resources.
- 3-13 November Mission team (Mather, Santasiri, Keobang) in Bangkok, Thailand.
- 14-18 November Visit by team to Vientiane, Lao PDR.
- 19-23 November Team in Bangkok.
- 24-27 November Visit by team to Ho Chi Minh City, Viet Nam.
- 28 November - 1 December Team in Bangkok, and participating in the Mekong Water Quality and Assessment Expert Meeting, 29-30 November.
- 2 December- 3 January Mather in Oxford, preparing report draft.

1994

- 4-11 January Draft report to Bangkok for review and comment by team members.
- 12-20 January Team comments incorporated in Final version of report.
- 18-21 January Mather in WHO, Geneva, for submission of report and discussion in PEEM Secretariat.

ANNEX 4

PEEM MEKONG MISSION

Organizations visited and representatives met

Thailand - Bangkok

Faculty of Tropical Medicine, Mahidol University.

SEAMEO TROPMED Regional Centre for Tropical Medicine.

Ministry of Public Health.

Policy and Planning Unit.

Department of Communicable Disease Control.

Department of Health, Rural Water Supply Division.

Ministry of Science, Technology and Environment.

Office of Environmental Policy and Planning.

Royal Irrigation Department.

Project Planning Division (representative).

Electricity Generating Authority of Thailand.

Environmental Department.

Mekong Secretariat.

WHO Representative to Thailand.

UN Economic and Social Commission for Asia and the Pacific (ESCAP).

UNDP Regional Office.

The World Bank, Regional Mission.

FAO Regional Office for Asia and the Pacific.

Lao PDR - Vientiane

Lao National Mekong Committee.

Committee for Planning and Cooperation

Ministry of Health.

Institute of Malaria and Parasitic Diseases.

National Institute of Hygiene and Epidemiology.

Organization for Science, Technology and the Environment.

Department of the Environment.

Ministry of Agriculture and Forestry.

Department of Irrigation.

Dept. of Agriculture and Extension.

Dept. of Forestry.

Dept. of Livestock and Veterinary Services.

Ministry of Communications, Transport, Posts and Construction.

Dept. of International Relations.

Dept. of Housing and Town Planning.

UN System Country Offices of UNDP, UNICEF, WHO, FAO.

Viet Nam - Ho Chi Minh City.

Sub-Institute of Water Resources Planning and Management.

Southern Institute of Water Resources Research.

Sub-Institute of Agricultural Planning and Projection.

Sub-Institute of Forest Inventory and Planning.

National Institute for Health.

Community Health Department.

Institute for Tropical Technology and Environmental Protection of Viet Nam.

Environment Protection Centre.

ANNEX 5

PEEM TECHNICAL DISCUSSION 1994

Incorporating human health component into integrated river basin development and management

Terms of Reference for River Basin Missions

Two fact-finding missions to international river basins are proposed in preparation for the technical discussion on the agenda of the 12th PEEM meeting (Aswan, 20-26 March, 1994): one to the Lower Mekong Basin, the other to the Zambesi Basin. This document contains the terms of reference for the mission to the Lower Mekong Basin.

PURPOSE AND ACTIVITIES

The Lower Mekong Basin mission will provide a case study to facilitate the Panel's discussion and formulation of outputs on the following issues identified as the objectives for the technical discussion 1994.

1. To review current water sector policies, including water allocation among sectors, and their impact on human health.
2. To devise mechanisms for national and local capacity- building to facilitate the incorporation of health safeguards in river basin development.
3. To evaluate tools for the assessment, surveillance and monitoring of health risk factors in the planning, development and management of river basins.
4. To define appropriate environmental management measures, for implementation at river basin level, which consider water availability, water quality, disease vector habitats and disease transmission potential.
5. To develop strategies to promote people's participation in all phases of project development and management, as a basis for sustainability.

The scope of the following listed field activities encompasses a comprehensive investigation of the existing and potential health status of populations within the framework of a major river basin management system. It is fully recognized that constraints of time and data availability are unlikely to permit so comprehensive a study. The mission, as soon as possible after arrival in their regions, is therefore asked to make an initial estimate of those aspects considered to require major attention and emphasis in its studies and reports, while covering the other aspects at whatever depth is feasible.

The mission will carry out an assessment of human health status within the basin, with particular reference to the identification of areas of actual or potential health risks and of vulnerable groups of the population in relation to the development or management of basin resources and to any associated impacts on the environment, the economic or social conditions, including employment, settlements and supporting services.

The above studies will be complemented by simultaneous investigations into the current and projected status of river basin development and management, including policies and mechanisms for

sectoral and intersectoral cooperation in development, and the integration of practices and facilities for the management of basin resources of land, water etc. These two components of the mission will combine to define the areas of present and future concern and needs for community health activities, and will indicate opportunities for health protection and improvement within the context of river basin plans and programmes.

The existence of, and the requirements for institutional arrangements relating resource development to health, and for capacity-building to ensure the functioning of these, will form an element of the investigation, as also will the assessment of the adequacy and needs for promoting the informed participation of the affected populations. This will call for a review of current health surveillance practices and a review of measures and procedures for monitoring river basin resources and the effects of their development and management. The mission should consider and report on means for integrating health indicators within these monitoring and surveillance procedures. Measures designed primarily for the protection of the environment against damage and degradation resulting from basin resource development should be studied for their potential benefit, or otherwise, in protecting or improving community health.

The mission will make a broad review of economic, fiscal and social policies governing, guiding or influencing the development and management of the river basin at various levels (e.g. international, national, sectoral, urban, rural). Plans and proposals for the protection and promotion of the health of the community will be reviewed in relation to potential environmental, social and economic impacts arising from decisions or changes in such overall policies.

The Mekong mission will submit its report to the PEEM Secretariat within one month of completing field activities. The report will be aimed primarily at the provision of factual material in relation to objectives 1 to 5 listed above, but it should also contribute to the formulation of policies, strategies or technical measures which may enhance existing or projected plans for the development and management of resources in the river basin.