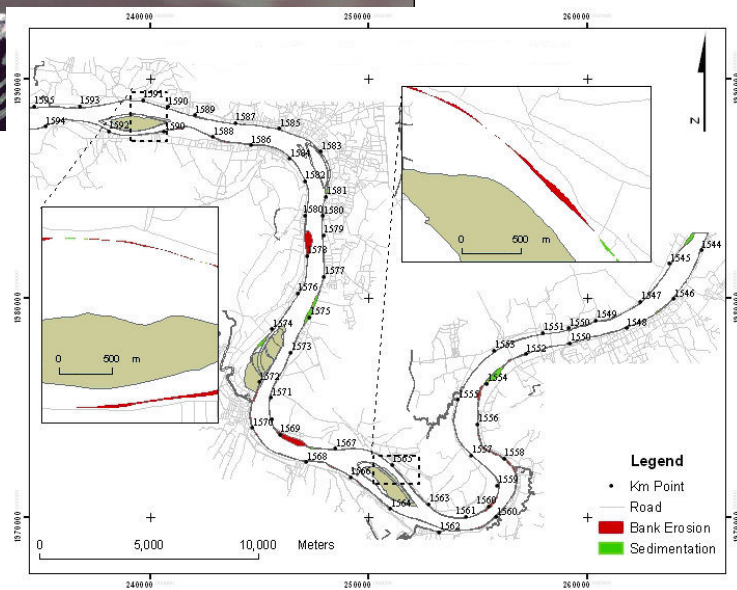
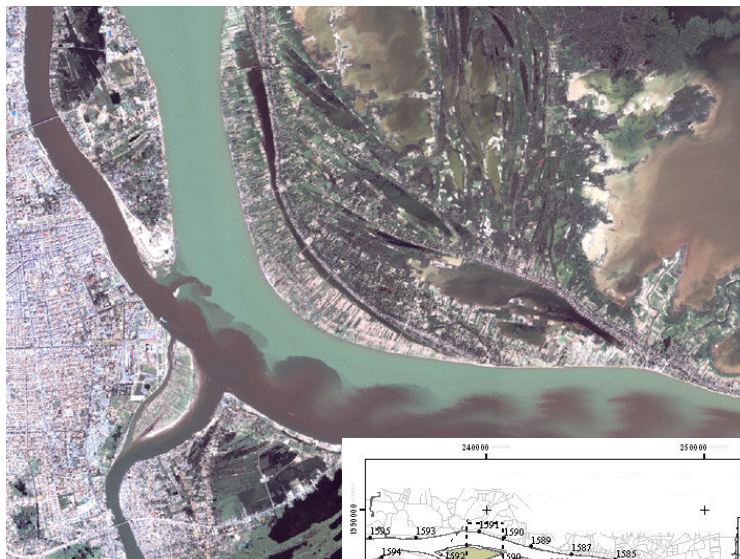




Information and Knowledge Management Programme

Programme Document

June 2007



Contents

Abbreviations and Acronyms	iii
Executive Summary	v
1 Programme Context	1
1.1 Mekong Development Context	1
1.2 Legal and Institutional Framework	1
1.3 History of IKMP Formulation	3
2 Stakeholder Requirements and Problem Analysis	5
2.1 MRC Member Countries	5
2.2 MRC Programmes	8
2.3 MRC Flood Management and Mitigation Programme (FMMP)	15
2.4 MRC Hydro-meteorological Projects	16
2.5 Other Regional Initiatives	18
3 Programme Design	19
3.1 Guiding Principles and Cross-cutting Issues	19
3.2 Overall Goal and Objectives	20
3.3 Programme Structure	21
3.4 Outline of IKMP Components	23
3.5 Technological Foundation	28
4 Component 1, Programme Management	32
4.1 Immediate Objective and Associated Outputs	32
4.2 Output 1.1 – The IKMP team and resources are well managed	32
4.3 Output 1.2 – Communication, cooperation and coordination with IK clients and partners are effective	33
4.4 Output 1.3 – Business Processes ensure client oriented delivery of IK products and services	34
4.5 Output 1.4 – IKM policy, implementation strategy, and guidelines are established	36
5 Component 2, Hydro-meteorological Data	37
5.1 Immediate Objective and Associated Outputs	37
5.2 Output 2.1 – Monitoring programs and networks are operating and maintained	37
5.3 Output 2.2 – Monitoring data is processed, quality managed and compiled into the knowledge base	38
5.4 Output 2.3 – Hydro-meteorological data services and products are provided	39
5.5 Output 2.4 – Monitoring programmes and networks are integrated and improved	39
6 Component 3, GIS and Databases	42
6.1 Immediate Objective and Associated Outputs	42

6.2	Output 3.1 – Core MRC spatial and other databases are integrated, spatially linked, maintained and accessible	42
6.3	Output 3.2 – Data access, management and analysis services are provided to MRC and external clients	45
6.4	Output 3.3 – Relevant geospatial information is acquired and incorporated in GIS	48
6.5	Output 3.4 – Capacity building services to access and manage data and produce maps	50
6.6	Output 3.5 – Visualisation of data and information for improved communication	51
7	Component 4, Modelling	53
7.1	Immediate Objective and Associated Outputs	53
7.2	Output 4.1 – Operational and well maintained modelling platform	53
7.3	Output 4.2 – Visualisation tools to communicate modelling scenarios and assessments	55
7.4	Output 4.3 – A validated Modelling Toolbox that provides tools to assess impacts and alternatives of proposed developments	55
7.5	Output 4.4 – Modelling services and data products focusing on basin-wide issues	56
7.6	Output 4.5 – Modelling services focusing on national and trans-boundary feasibility, planning and scenario studies	58
7.7	Output 4.6 – Optional services and case studies	59
8	Component 5, Communications and Knowledge Management	60
8.1	Immediate Objective and Associated Outputs	60
8.2	Output 5.1 – User friendly and powerful MRC-IS Portal	60
8.3	Output 5.2 – MRC Documentation and Learning Centre operational	62
8.4	Output 5.3 – International and regional networks, and collaborative tools	63
8.5	Output 5.4 – MRC Management Information System (MRC MIS)	64
9	Programme Implementation	66
9.1	Organisation and Staffing	66
9.2	Implementation Schedule and Priorities	69
9.3	Planning, Monitoring and Reporting	70
10	Budget	71
	Annex A: Linkages between IKMP and other Programmes	72
	Annex B: Draft IKM TACT Terms of Reference	74
	Annex C: Original TACT Terms of Reference	78
	Annex D: Draft IKMP Steering Committee Terms of Reference	82

Abbreviations and Acronyms

ACMECS	ADB Ayeyawady - Chao Phraya - Mekong Economic Cooperation Strategy
AHNIP	Appropriate Hydrological Network Improvement Project of the MRC
ASEAN	Association of Southeast Asian Nations
ATTS	Applied Technical Training Standards
BDP	Basin Development Plan, a MRC Programme
CTA	Chief Technical Advisor
DC	Documentation Centre of the MRCS
DLC	Documentation and Learning Centre
DMS	Document Management System
DSF	Decision Support Framework of the MRC
EP	Environment Programme of the MRC
FGDC	U.S. Federal Geographic Data Committee
FMMP	Flood Management and Mitigation Programme of the MRC
FP	Fisheries Programme of the MRC
MRCGIS	Geographical Information System
GMS	Greater Mekong Sub-region
HRD	Human Resource Development
HRM	Human Resource Management
HYCOS	Hydrological Cycle Observing System
IBFM	Integrated Basin Flow Management
ICCS	International Cooperation and Communication Section of the MRCS
IKMP	Information and knowledge management
IKMP	Information and Knowledge Management Programme of the MRC
IS	Information System
IWRM	Integrated Water Resources Management
LA	Line Agency
M-IWRM	World Bank supported Mekong IWMR-project, under formulation
MRC	Mekong River Commission
MRCS	MRC Secretariat
MRC-IS	Mekong River Commission Information System
MRC-WUMS	MRC Water Use Monitoring System
MWRAP	World Bank's Mekong Water Resources Assistance Programme
NMC	National Mekong Committee
PC	Primary Custodian
PDIES	Procedures for Data and Information Exchange and Sharing
RFMMC	MRCS Regional Flood Management and Mitigation Centre
RS	Remote Sensing
SEA	Strategic Environmental Assessment
SIA	Social Impact Assessment
SP	MRC's Strategic plan 2006 – 2010
TACT	Technical Assistance and Coordination Team
TSD	Technical Support Division of MRCS
USD	US Dollar

WUP Water Utilisation Programme

WUP-FIN Finnish funded Lower Mekong Modelling Project under WUP

Executive Summary

Context



Population expansion and accelerating development are bringing about increasing and often competing demands upon the water resources and landscape of the Mekong Basin. To ensure that, as far as possible, this development process is planned, managed and coordinated on the basis of environmentally, socially and economically sound principles, then data, information and knowledge are indispensable. These together with capacity building create the basis for balanced, sustainable and equitable development that can benefit all, most particularly the poor, without jeopardising the natural functioning of the river system. The new MRC *Information and Knowledge Management Programme* (IKMP) has a responsibility to provide such outputs, materials and services that support both developmental and environmental programmes and activities. The IKMP has also to implement appropriate technological training at the national level and ensure the fully effective dissemination of its benefits through proactive external collaboration.

IKMP as information and knowledge services

This broad context of the IKMP is in accordance with the Mission of the MRC defined in the Strategic Plan: *"To promote and coordinate sustainable management and development of water and related resources for the countries' mutual benefit and the people's well-being"*. As a knowledge-based organisation therefore, the MRC must gain and promote regional knowledge and ensure its integration into the planning and development process. The IKMP provides the formal means to achieve such an objective.

Service functions

The IKMP's primary role as an information and knowledge service provider is supported by (i) the development of data, information and knowledge management systems, (ii) proactive exchange, sharing, networking and collaboration, both internal and external and (iii) ensuring that the full knowledge potential of MRC staff and riparians is brought to full advantage.

Countries' ownership

One of the main principles guiding IKMP-formulation has been the promotion of the countries' ownership of the knowledge base and the development of the capability to effectively utilise it. Consequently, adequate resources are to be reserved to conduct national training programmes in GIS, database analysis and modelling, with an emphasis on hands on training, problem solving and the development of independent capability.

MRC programmes and projects

IKMP is a cross-sectoral programme supporting all MRC programmes and projects, to which it will provide data, information and knowledge, products and services. The main data types are hydro-meteorological and other monitored time series, such as water quality and sediment for example. Spatial data such as GIS products and simulated data and outputs are from the suite of mathematical modelling programs.

The IKMP will support the *Basin Development Plan* (BDP) through monitoring activities and modelling services. It will also provide for interdisciplinary needs of the *Integrated Basin Flow Management* (IBFM) process under the *Environment Programme* (EP). The *Fisheries Programme* (FP) will combine its expertise with the IKMP modelling component to support sustainable Tonle Sap management, while

the *Hydropower, Navigation and Agriculture, Irrigation and Forestry Programmes* each will have their own specific data and information requirements from the IKMP. The IKMP will need to work particularly closely with the FMMP, which will generate intensive data demands and outputs during the flood forecasting season.

Partnership with other regional initiatives

The other regional institutions and projects utilising IKMP data and modelling results are: *World Bank* (Delta Master Plan, MRC M-IWRM, MRC WUP); *Global Challenge Food and Water Program* (M-POWER water governance); *IUCN* (Water and Nature Initiative Project, Mekong Wetlands Biodiversity Project, Multi Stakeholder Platform-dialogue process); *ADB* (Tonle Sap Built Structures Project, RETA - The Sesan, Sre Pok and Sekong River Basins Development Study in Cambodia, Lao PDR and Vietnam); and *WWF* (Environmental Criteria for Hydropower Planning, Mekong Wetlands Project).

IKM Policy and Implementation Strategy

Concurrent with the IKMP formulation process, the MRC Secretariat initiated the drafting and development of the IKM Policy and Implementation Strategy. A first draft Policy and Implementation Strategy Document has been prepared for discussion with the MRC member countries. The aim of the IKM Policy is to guide the IKM function, namely '*the establishment and operation of all data, information and knowledge management, sharing and exchange activities within the MRC*'.

Programme structure

The IKMP includes four main functions: data collection; data management; data services; and knowledge management. To ensure efficient implementation, these functions are grouped into five thematic programme components: (1) Programme Management; (2) Hydro-meteorological Data; (3) GIS and Databases; (4) Modelling; and (5) Communications and Knowledge Management.

Component 1, Programme Management

The Programme Management Component sets in place the technical and institutional framework for all data, information and knowledge collection, processing, analysis, integration, storage, access and security. Component 1 must provide leadership, coordination and management for the IKMP, set out all working practises and responsibilities and monitor implementation. Given the cross cutting nature of the IKMP, Programme management will be complex and there will be a clear need for wide collaboration at both the managerial and technical levels

Component 2, Hydro-meteorological data

A well informed understanding of the physical conditions of the major rivers in the basin is fundamental to the effective application of Integrated Water Resource Management (IWRM) principles. Component 2: Hydro-meteorological Data seeks to maintain the ongoing collection of critical time series data and to further the understanding of the physical condition of the mainstream and major tributaries in the Mekong River Basin through new data collection activities. Its greatest challenge is one of technical coordination of the collection of a very wide range of data types, and achieving time critical data collection and acquisition in cooperation with a variety of institutions across the basin.

Component 3, GIS and Databases

Component 3: GIS and Databases constitute the technical backbone of the IKMP, providing the core database services upon which all other components of the IKMP depend and build. It will integrate and coordinate data and information collection and management activities in the other components of the IKMP, in addition to the

other MRC programmes. It will contribute to the setting of standards and guidelines, valid and binding for all data collection and management activities performed in all MRC programmes. Component 3 will ensure the implementation of these guidelines and quality criteria for database management. It will also oversee technical coordination and the services for data and information collection, analysis and product generation.

Component 4, Modelling	<p>Mathematical modelling has proven to be a powerful tool for the understanding of the complex structure and dynamics of natural and regulated river systems. Component 4 will further develop modelling tools that generate data and information for forecasting, decision making, planning and impact assessment. Activities will also focus on building the MRC's and the national capacities for problem analysis, model application and the provision of decision support services. The expertise within Component 4 is already considerable, given the skills training, data collection and information tools that have been developed during the course of the previous MRC-, GEF-, World Bank- and Finnish-financed projects.</p>
Component 5, Communications and Knowledge Management	<p>Component 5, Communications and Knowledge Management, will facilitate data, information and knowledge exchange, sharing and networking and will support collaboration within MRC and amongst external stakeholders. It includes a focus on eliciting "soft" knowledge, the tacit knowledge that exists throughout the wide network of people who work within the MRC or interact with it. Through identification and setting up of virtual systems on the internet, the Communications and Knowledge Management Component will assist the MRC to take advantage of the latest technologies to improve work processes and efficiency, and drive the demand for information flows.</p>
Implementation	<p>The programme will be lead by a riparian Programme Coordinator, supported by an international Chief Technical Advisor. Component Managers will oversee the implementation of component activities with support from international advisors. The national activities will be realised under the coordination of the National Mekong Committees. National teams for GIS/ thematic maps and modelling will be led by NMC coordinators. Coordinators will liaise with the line agencies, national programmes and other stakeholders to secure the provision of data and the communication of information to the planning and decision making processes. They will also act as links between the IKMP, NMCs and the DS teams. The MRCS and national teams will share and exchange experts in order to strengthen the link between the countries and the MRCS. International experts will also participate in this process of transferring problem solving skills and the ownership of information technology.</p>
Programme budget	<p>The total budget for the five year duration of IKMP is USD 25 million (EUR 19.5 million).</p>

1 Programme Context

1.1 Mekong Development Context



Tens of millions of people in the Mekong River Basin rely on the waters of the river system for their food security and livelihoods. Increasing population will place ever greater pressure on the current capacity of the river system to meet these basic human needs. Socio-economic development aims to increase the benefits available from natural resources and, when done with pro-poor considerations it can increase the equity to be derived from the regional development process, particularly if activities are planned and implemented in a coordinated manner. Developing the water resources potential of the Mekong River system in a sustainable way – for domestic and industrial use, for fisheries, for hydropower, for navigation, for irrigation – can play a key role in poverty alleviation and livelihood improvement. Given the high reliance people have on the river's natural eco-system, such development must be undertaken on the basis of a sound knowledge of the system dynamics, most particularly those concerning cause and effect and the potential to damage the environment. The challenge is to ensure that all the partners in development and conservation cooperate fully as far as their strengths and mandates permit, in order to accelerate the achievement of the common vision of an economically prosperous, socially just and environmentally sound Mekong River Basin.

1.2 Legal and Institutional Framework

The 1995 'Mekong Agreement on the Cooperation for Sustainable Development of the Mekong River Basin' outlines the legal mandate of the Mekong River Commission (MRC). The first three articles define the scope of the core mandate of the MRC, outline areas of cooperation related to planning, programmes and projects, and emphasise protection of the environment and the ecological balance.

With respect to data, information and knowledge management, the MRC has a crucial role at the interface between information and knowledge generation on the one hand and policy formulation and implementation on the other. Functions of the IKMP are mentioned in articles 24e, and 30e.

Article 24 (Functions of the Joint Committee) stipulates *'To assign tasks and supervise the activities of the Secretariat as is required to implement this Agreement and the policies, decisions, projects and programmes adopted there under, including the maintenance of databases and information necessary for the Council and Joint Committee to perform their functions, and approval of the annual work programme prepared by the Secretariat.'*

Article 30e (Functions of the Secretariat) reads *'Maintain databases of information as directed.'*

The executive summary of the current Strategic Plan 2006 to 2010 the MRC states *'The role of the MRC in serving the joint interests of its Member States is to pro-*

The 1995 Mekong Agreement

MRC Strategic Plan 2006 to 2010

mote sustainable development in the Mekong River Basin. The primary value-added of MRC as an international river basin organisation is to focus on the joint and basin-wide issues, including scenario developments, identification of important joint and basin-wide projects and programmes, and the analysis of implications (economic, social and environmental) of ongoing and proposed developments in the basin.'

The overall Five-Year Goal of the MRC is to support the MRC member countries for *'More Effective Use of the Mekong's Water and Related Resources to Alleviate Poverty while Protecting the Environment.'* This Strategic Plan (SP) sets forth the following four goals which correspond to the four roles of MRC with regard to water and related resources. They are:

- Goal 1: To promote and support coordinated, sustainable, and pro-poor development;
- Goal 2: To enhance effective regional cooperation;
- Goal 3: To strengthen basin-wide environmental monitoring and impact assessment; and
- Goal 4: To strengthen the Integrated Water Resources Management capacity and knowledge base of the MRC bodies, NMCs, Line Agencies (LAs) and other stakeholders.

These goals underscore the MRC's role as an information- and knowledge-based River Basin Organisation: With regard to each of the four, the SP states the following:

Goal 1: *'The planning process will be information system (IS) based and use the MRC Decision Support Framework which will include a water balance assessment for the basin.'*

Goal 2: *'The Outcome of this goal will be increased use of the MRC by its Member Countries as the key mechanism for joint planning, cooperation, and resolution of trans-boundary water-related issues. A basin-wide dialogue will result in an increased number of activities with the upper riparians.'* As the IKMP as a whole, and DSF in particular, is geared to aiding the joint planning process and for examining trans-boundary issues based on integrated and non-biased information, the role of the IKMP in achieving Goal 2 is pivotal.

Goal 3: *'Within its work towards this goal the MRC will also develop, maintain and make accessible a basin-wide environmental and socio-economic knowledge base as part of the MRC IS-based knowledge system. The Outcome of this goal will be operational basin-wide environmental monitoring and impact assessment systems.'*

Goal 4: *'The knowledge base under this goal encompasses the MRC Decision Support Framework as a central basin planning tool. Capacities will be strengthened through a programme approach under the MRC Integrated Capacity Building Programme. The Outcome of this goal will be that MRC bodies, NMCs and Line Agencies are able to manage water resources applying the IWRM principles using MRC's basin-wide GIS and knowledge management system.'*

1.3 History of IKMP Formulation

Previous contextual activities at MRC

The MRC has a long tradition of data collection and storage. With the establishment of the Technical Support Division (TSD) in 2000, the MRCS started the development of a regional information system, the MRC-IS, with the following objectives:

- Link/relate databases necessary for the MRC's objectives and tasks to each other, with a minimum of redundancy of necessary data, so that they can be used in integrated approaches and analyses.
- Develop forecasting and simulation models to generate useful information and knowledge that would serve to support decision and policy making.
- Develop institutional and technical data and information sharing and exchange mechanisms. Build capacity in the fields of data and information management.

MRC-IS outputs to date

The MRC-IS initiative was not conceptualised as an MRC programme, and separate funding for the MRC-IS was therefore not available. However, with funds from different donors and MRC programmes, some noteworthy outputs were achieved:

- A permanent working group (TACT) with representatives from the four countries has been coordinating the development of the MRC-IS;
- Formalised agreements on data and information sharing have been adopted, namely the '*Procedures for Data and Information Exchange and Sharing, (PDIES)*', adopted by the MRC Council on 1 November 2001 and the '*Mekong River Commission Guidelines on Custodianship and Management of the Mekong River Commission Information System*', adopted by the MRC Joint Committee on 11 July 2002;
- Technical guidelines and documentation on several aspects of the MRC-IS;
- The spatial database (integrated GIS) has been significantly improved;
- Information products on CD-ROM have been developed and distributed;
- More efficient ways of hydrological and meteorological data collection are under construction;
- A Decision Support Framework based on hydrological/hydrodynamic simulation models, is in place to support the basin development process;
- MRCS and National modelling teams have been trained and are operational in a number of projects;
- Modelling activities such as the TSD Modelling Team, WUP-JICA and WUP-FIN are providing information to MRC programmes and projects as well as to the riparian states to support national planning and decision making;
- A system of management and dissemination of electronic documents has been successfully implemented through the internet-based information sharing system MekongInfo;
- The MRC-IS Portal is operational and providing access to interactive maps, a document management system, metadata, and a series of roadmaps and technical guidelines for accessing spatial data, including satellite imagery; and
- Draft IKM Policy and Strategy Framework documents have been prepared.



IKMP programme formulation

The IKMP formulation has been initialised following the request of the MRC Joint Committee at its Eighteenth Meeting in 2003 to take action to ensure the

sustainability of the MRC-Information System (MRC-IS), and prepare a proposal on allocation of funds for the development, implementation and maintenance of the MRC-IS for submission to donors. Hence, this document is based on transforming the MRC-IS initiative into a fully operational MRC programme.

This IKMP proposal has benefited from consultations with all MRC member countries during the period of 4-20 October 2006.

2 Stakeholder Requirements and Problem Analysis

2.1 MRC Member Countries

This chapter is based on the national consultations conducted during October 2006 in Vietnam, Cambodia, Laos and Thailand. Since the IKMP structure and the Programme Document were under formulation at the time, no formal review process was conducted and the consultations were generally informal small group discussions; the material regarding country requirements and problem analysis is therefore preliminary and tentative and to be consolidated after country reviews and Regional Consultations. The results of the October consultations are discussed below thematically. General feedback on the IKMP structure and other issues are presented first followed by the prioritised problems that were identified during small group discussions.

Feedback on general IKMP issues from country consultations

Data sharing problems both within countries and between them on the regional scale have been frequently noted. All programmes within MRC are data-dependent and need to share and access data more efficiently. Donors subscribe to this focus on better data management and dissemination. The MRC must be a strong legal and technical organisation and provide tools, technologies and human resources, and exploit its neutral status in harmonising the interests of the member countries to the greater benefit of all. Special attention should be paid to the tools and technology, such as modelling and databases, required to strengthen the capacity of the MRCS.

The countries need assistance towards providing data and information, as they are the primary collectors. Data user groups should be clearly delineated as there are often sensitivities and confidentiality to be taken into account, while stakeholder, planning and decision making data needs should be reviewed and clarified.

National information and knowledge management between and within most national agencies face many of the same problems that exist in the MRCS. There is therefore benefit to be had in developing programme activities and outputs that have potential common relevance and application, which would result in better national datasets, better national capabilities and a greater motivation to share and exchange data nationally, as well as regionally.

The small group discussions emphasised capacity building, training and best practices including standards, quality control and integrated data collection as the ways that MRCS can improve regional water resources related data, information generation and knowledge base management. Other issues arose with regard to financial support, equipment and specific data needs such as water quality, biodiversity, flood forecasting, a drought database, and hydrological stations. The strengths within the current MRCS Information and Knowledge Management activities are listed as: strategies for existing structures (MRCS, LAs); preparation and dissemination of guidelines and procedures; enabling data and information

sharing; and providing resource persons (TACT) and information technology support in general. Improvements are needed especially in financial and technical support, capacity building, improved networking, strengthening guidelines and implementation procedures, website development, document centre development and supporting workshops/ meetings for information exchange.

The areas where the MRCS could improve institutional development and capacity building include financial and human resources support, technical assistance, sustainability, hardware and software provision, improving coordination between the MRCS, NMCs and LAs, database work, policy support and development, monitoring and evaluation and capacity development within national agencies to allow independent use of model, data and analysis tools. Technology transfer is especially important and involves building capacity through people working with new technologies in their workplace within the national context. This factor should be carefully planned and effectively implemented within the IKMP framework of 'deliverables'.

The core challenges to effective capacity building are (i) a lack of financial support, (ii) a lack of determination to address difficult issues, and (iii) a lack of equipment and skilled staff. Limited staff skills result in part from the specifics of the reward and promotion systems within National organisations.

It was agreed that MRC PDIES (Procedures for Data and Information Exchange and Sharing) is being implemented by the countries, but its effectiveness is limited through:

- The lack of support staff, technical and financial support.
- A disconnection between technical staff trying to implement PDIES and management. The latter are often not well aware of the requirements and benefits of PDIES may have a residual reluctance to share what might be 'sensitive' data, regardless of agreements.

A central problem within the countries is that national government regulations do not give the NMCs and other individual agencies enough power to implement data management and sharing, even across different ministries. This makes the development of common standards and procedures difficult.

The benefits that the MRC currently provides with respect to regional hydro-meteorological data collection concentrated on (i) trans-boundary/international data sharing and use and (ii) provision of data for modelling including flood forecasting.

The areas where MRCS could improve its data assembly and dissemination roles are financial and technical support, capacity building, support of human resources, creating awareness and understanding for the need for data exchange and sharing, equipment, putting real time data on the website, reconciling water levels to a common datum, increasing the number of stations of the hydro-meteorological network to improve coverage, data quality, poor standardisation, lack of metadata, reliability and accuracy, and problems in data access and communications.

Feedback from country consultations on hydro-meteorological data collection

Feedback from country consultations on GIS and databases

The benefits of the current MRC activities are: provision of some data for planning and decision support; saving of money and time by easing data collection; storage of historical data; and knowledge generation from existing data.

A data warehouse should be established to integrate the variety of formats in which data is collected in the countries and convert it into a standard format and store it centrally, without which it will be difficult to link and integrate databases working with different software and data formats.

Feedback from country consultations on modelling

The focus of the MRC WUP-A, WUP-JICA and WUP-FIN modelling activities in the past has been the development of methodologies for water resources, environmental and socio-economic planning, impact assessment and management. Another focus has been capacity building to transfer basic knowledge about modelling techniques and their use for practical problem solving and impact assessment. During general project implementation, the modelling approach has become better understood, useful results have been generated and knowledge of the modelling and impact assessment tools has grown. The potential of the tools has become obvious to the riparian countries as well as the MRCS. At the same time, the MRCS is further expanding its information services, through the Flood Management and Mitigation Programme for example, which is also developing specific modelling tools...

The benefits of the current MRCS modelling activities according to the IKMP consultations are: technical consulting services; hardware and software; tools for flood forecasting and analysis; river basin modelling; drought forecasting; provision of clear information; faster response for water resource planning; decision support for water resource development; training and capacity building through learning by doing (case studies); data enabling feasibility studies and improved designs and reduced costs; user networks; clarification of concepts for water resource management; and increasing understanding between riparians through scenario generation.

Feedback from country consultations on communications and knowledge management

The problems identified include: insufficient financial resources for national agency participation; data is unclear, insufficient, old and in different formats; there is a gap between the technical level (modellers) and the decision makers; development of local (on both national and regional levels) specialists has not been achieved and consequently there is a dependency on international consultants; basic knowledge and skills of staff is limited, and because of this it is difficult to build modelling skills; the DSF software is hard to use; technical operations and maintenance difficulties; and existing tools have not been able to support all line agency needs, for instance water quality and fisheries.

The benefits of current MRCS Communications and Knowledge Management activities are: data exchange and sharing; educational information; the MRCS website; stakeholders involvement; public data access; promotion of international cooperation; creation of world wide recognition and an existing mechanism for information management and dissemination.

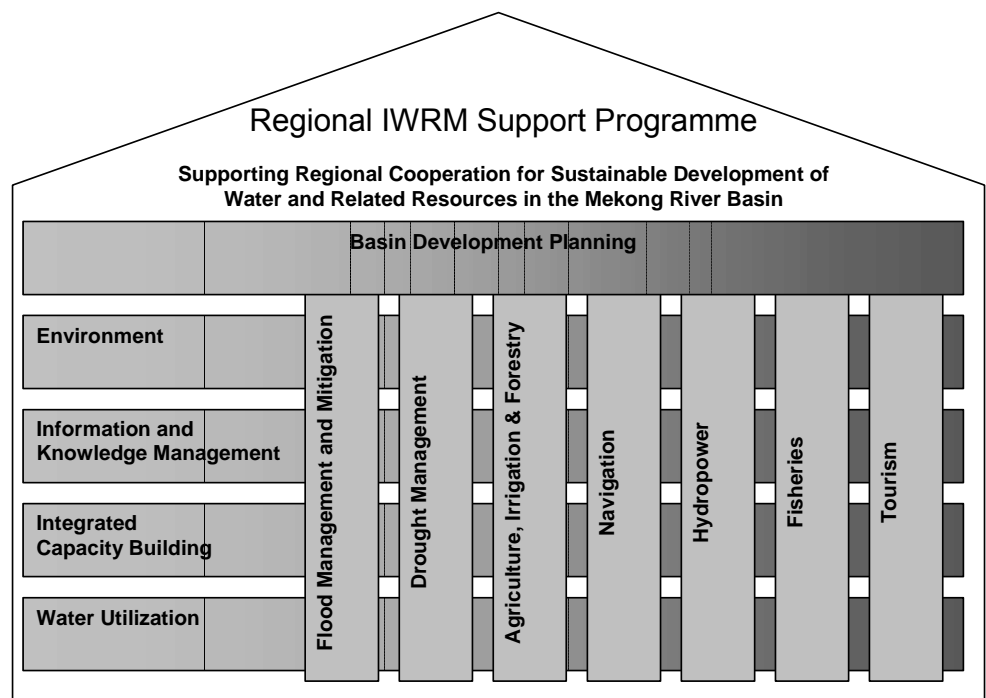
The problem areas are similar within the GIS and Database Component activities including: data accessibility / non user-friendly access software; inappropriate

technological foundation; and the lack of motivation and the skill limitations of users.

2.2 MRC Programmes

IKMP functions and requirements delineated by the Strategic Plan

The MRC Strategic Plan describes the MRC requirements for Information and Knowledge Management in considerable detail. The requirements are summarised below and supplemented with material arising from programme consultations.



The integrated programme structure of the MRC comprises the following: Flood Management and Mitigation; Drought Management; Agriculture, Irrigation and Forestry; Navigation; Hydropower; Fisheries; and Tourism. This cohesive set of programmes will be integrated and cross-cut by five programmes in Basin Development Planning, Environment Management, Information and Knowledge Management, Integrated Capacity Building and Water Utilisation.

Linkages to the MRC Programmes

The IKMP linkages and relations to other MRC programmes as well as the programmes' requirements are collected in the annex A. Below an overview of the nature of the programmes and their requirements is presented.

Basin Development Plan (BDP)

Within this overall structure, the basin planning function through the Basin Development Plan (BDP) will take on a pivotal role in a highly integrated and coordinated manner. This function will use acquired knowledge from the MRC programmes to build an overall perspective of what the development needs and knowledge gaps are and which eventually will set the agenda of the MRC programmes themselves. The BDP will further ensure that project programming is done in harmony with the IWRM Strategic Directions. Another area of importance is the Integrated Basin Flow Management (IBFM) process which is an important and

effective vehicle for implementing IWRM within the MRC. IBFM is a set of multi-disciplinary activities providing information and knowledge to decision makers on the economic benefits and environmental and social impacts of development on the basis of potential changes to flow regime.

BDP will have a modeller. The responsibilities of the BDP modeller include:

- formulation of 10 – 15 scenarios
- collection of data from the countries for the scenarios
- checking of the results of the scenario runs
- monitoring scenario work in the BDP
- monitor other models which will be used in BDP2, such as RAM, SIA, SEA.

BDP modeller will provide modelling services and communication specific for the BDP. The IKMP Component 4, Modelling, will provide BDP the maintained and verified basin-wide and local tools necessary for the work as well as support for all aspects of the scenario work. BDP will also have a GIS and data management specialist. The responsibilities of this position include managing and quality assurance of the BDP project database and developing and managing relevant BDP documents and materials under GIS format. The IKMP Component 3, GIS and Databases, will assistance and services in data storage and management, GIS support and services, and in the production of information products including data visualisation.

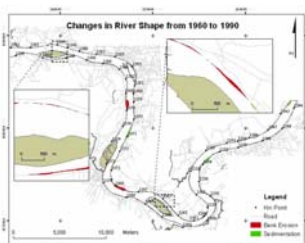
WUP/ M-IWRM

Water Utilisation Programme (WUP) consists of 4 working groups: WG1 Development of Knowledge Base and Decision Support Framework, WG2 Environmental and Trans-boundary Analysis, WG3 Procedures for Water Utilisation, and WG4 Management and Institutional Strengthening. Through its work WUP is closely linked to the IKMP both as a developer of the central modelling tools such as DSF and WUP-FIN models, and a major user of MRCS database and hydro-meteorological monitoring. WUP continuation is under formulation under the name Mekong Integrated Water Resources Management (M-IWRM) by the World Bank. Regional and national IWRM related capacity building, development of regional modelling, support for national modelling activities, improved data collection, facilitation of regional and national cooperation towards IWRM and broader stakeholder participation in IWRM are considered as focal teams of the M-IWRM.

Priorities for future development of water and related resources

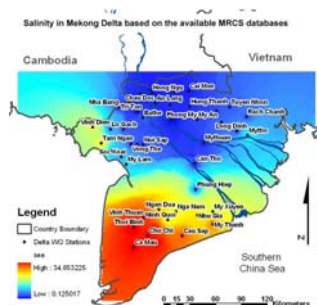
Priorities for future development of water and related resources, reflecting programme activities and data requirements are listed below together with the role of the IKMP within them.

- *Irrigation and agricultural water management.* The MRC can analyse the potential for inter- and intra-basin transfers of water to areas with potentially high agricultural productivity using hydrological data and modelling tools.
- *Hydropower.* The MRC has a potential role in the hydropower sector to coordinate and support developments and to ensure that they meet the necessary social and environmental safeguards. MRC services to member



countries in this sector might include the assessment of proposed projects through the development of its modelling capabilities.

- *Navigation.* Priority actions for the MRC include assisting in the development and implementation of ports, river works and regional waterways. There is room for MRC involvement in morphological management, including bank protection and dredging. Geospatial, socio-economic, morphological and sediment data in connection with modelling provides an information basis for navigation sector activities.
- *Floods and droughts.* Drought management is an emerging issue for the MRC. Potential areas for action include modelling to support policy design for improved water management options to mitigate drought impacts, including improved water storage and intra- and inter-basin transfers. Improved flood management remain indispensable and will in the future be more in demand than ever. The large floods of the Mekong are regional in character, and MRC is in a unique position to contribute effectively to improved flood management at the regional level. The high degree of cooperation and coordination required between IKMP and FMMP is discussed in more detail in section 2.3.
- *Water supply and sanitation.* Water resources and water quality data as well as modelling tools provide necessary information for this sector.
- *Fisheries.* It is very important that the MRC take a role in using its knowledge of the Mekong Fishery to protect and further develop this vital resource. The MRC Database and DSF with its Modelling Toolbox provides background information on the dynamics of flooding, habitat conditions, impact of upstream developments on productivity and understanding reservoir water quality and productivity which are important for the management of capture fisheries and aquaculture. IKMP can play a role in supporting the development of fisheries research, for example in terms of systems-analysis.
- *Environmental management need.* The MRC has a role in monitoring and helping the countries in protecting the environment and to maintain the ecological balance. The comparative advantage of the MRC is in regional environmental monitoring, assessing and studying environmental trends and conditions and modelling environmental impacts from development. Specific environmental issues and the role of IKMP in relation to them are discussed in the sections below.
- *Water quality.* The overall water quality of the lower Mekong River generally is of a good standard; however, at the local level water quality problems can be experienced such as turbidity, salinity and eutrophication. Water resources development will inevitably bring about impacts upon water quality. The DSF already has a facility to look into the causal relations behind water quality conditions and examine potential mitigating measures.
- *Land and water resources.* An IWRM approach to water resource development is founded upon the knowledge that water is but one element of a healthy environment, and preservation of the environment requires a holistic



approach to management. Issues such as salinisation in the Mekong Delta and increasing nutrients from intensive agriculture have potential to impact water quality and land productivity. Again the DSF provide a basis for the management of large and complex systems under conflicting interests and management alternatives.



- *Tonle Sap Lake.* Given the critical importance of the resources of the Tonle Sap Lake for fisheries production, biodiversity and livelihoods, addressing the issues of the Lake system will remain a high priority in future MRC work. Long-term data collection and advanced modelling are already ongoing
- *Biodiversity and Wetlands.* Conservation of biodiversity means both the maintenance of the productivity natural systems and security of access to those resources, including the genetic resources, by current and future generations. The biodiversity and productivity of the Mekong Basin is in large part represented by its wetlands, which include lakes, rivers, rice fields, marsh, swamps, flooded forest and estuaries. Wetland geospatial information combined with knowledge of the flood dynamics would form a basis for planning wetland management activities, for example.

MRC knowledge base

The comparative advantage and value-added of MRC is its knowledge base that combines information from several countries and extensive accumulated knowledge about the hydrology and environment of the Mekong River Basin; the BDP and WUP tools (models, SEA, SIA, etc.); the potential for contributing improved quality management and regional harmonisation of data and information; and the facilities available for collecting and disseminating data and information from/to national agencies and the public.

Regarding economic assessment the MRC will further strengthen and adapt the tools already developed under the BDP phase 1 and the WUP to produce better and more readily applicable information. The analyses of basin-wide development scenarios will help to illustrate the sensitivity of the basin in relation to water resources development. This will be very valuable to assist joint decision-making.

The MRC can have a role in supporting the identification of sustainable investment opportunities. It can use its knowledge-based planning processes to screen investment opportunities with a basin-wide perspective and use its planning tools to assess the trade-offs between various development options and investment opportunities based on the economic, social, environmental, and foreign policy interests of the Member States to facilitate ‘wise’ development initiatives incorporating environmental and social safeguarding and monitoring. In this manner, MRC can support the screening and formulation of suites of projects which hold win-win outcomes based on the interests of the Member States. Finally, the MRC can develop preliminary project descriptions including potential resource and cost implications.

Programme requirements according to consultations

The different programmes have similar data and information service requirements. Because of this they are described in this chapter together, except that is for the

FMMP which due to its data intensive nature is presented separately and in more detail.

The activities of all programmes can be categorised as:

- Data collection, validation and storage;
- Data processing, integration and creation of data products;
- Use of information services such as database queries, GIS analyses and mapping and modelling analyses; and
- Capacity building for information management.

It is to be noted that IKMP should not be totally customer driven. Often the customer can only vaguely state his information needs, especially when the problem at hand doesn't easily yield to analysis and/or is complex. Because of this, IKMP must have its own development projects and initiatives, which might be tested through pilot projects in order to get timely user feedback.

A thorough data, information and knowledge needs assessment will be carried out: what data, information, knowledge gaps have to be filled, for whom, and why. This will begin with programme consultations, in concert with consultations with the member countries. Such needs assessments have already been partially implemented within MRCS and partner institutions by the Watershed Management Project and a cross-divisional group of MRCS staff who undertook first steps towards developing an Information Management Strategy in 2004.

Data collection,
management and data
products creation

Data flows (among member countries and e.g. MRCS – RFMMC) with regard to monitoring/planning activities must be either ensured or re-established. MRCS should commit itself for clarifying maintenance support for hydrological/meteorological data collection, and should facilitate collection of sediment data, socio-economic data and development project data by other programmes. The maintenance support is especially important for the AHNIP and HYCOS stations, which have to be maintained after the projects have been finished. Maintenance policy and strategy should be drafted including (i) maintenance responsibilities and cost sharing and (ii) schedule for handing over the maintenance to the countries. The plans should take into account differences between the countries in respect to the resources. The plans should also be acceptable for donors when external support is required.

All programmes need storage and data management services. An in-house module of the MRC-IS Portal, which provides access to data which MRCS does not publicly distribute, will be a useful tool in this regard. All programmes anticipate archival of certain core datasets at the TSD to be arranged under the IKMP. Specific programme oriented/customised services on this matter will be inventoried and brought to execution under the IKMP. Examples are: the need for HYDSIS or HYMOS databases; transmission of data between MRCS-TSD and RFMMC; storage of water quality data; storage of fisheries data; storage of navigation data; migration of wetland databases; set up of ecological health monitoring databases; and set up of BDP databases.

All programmes need on going support and services with regard to geographic information processing such as: production of maps; linking datasets; and advice on the use of geographic information. Many programmes need assistance and services in the production of information and knowledge products (for e.g. interactive CD-ROMs). These needs will be inventoried and responded to under IKMP.

Coordination, procedures and guidelines

There is a need to increase awareness, dedication and focus on the fact that *'data, information and knowledge processing'*, and hence the MRC-IS, has a clear overall goal, which is not so much on the technology, but rather in terms of improving *'communication, dialogue, making well informed decisions, avoiding conflict'*.

The IKMP will play a major role in facilitating closer collaboration and coordination related to data, information and knowledge production, dissemination, and sharing and exchange within the MRCS. Close collaboration and coordination will be required between TSD and the communication unit of the International Cooperation and Communication Section (ICCS) of the MRCS. Collaboration items include: IKM policy and strategy, maintenance of the website, information and knowledge packaging (fact sheets, case studies, best practice reports etc.).

There is a need to manage the internal information, knowledge and document flow within the MRCS. This includes improvement and further development of the existing Document Management System (DMS) and the Documentation Centre (DC) – these will be integrated and linked to spatial references so that they can be mapped and documents can be searched by location.

Another IKMP role is to organise and facilitate coordination among the different modelling initiatives. A description will be available on the objective and function of each model, what information it generates, the reason it is required, and who will use it.

There is a need to implement business processes with regard to data, information and knowledge processing. This in order to: 1) focus on client-oriented, demand driven generation of products and services; and 2) to ensure that the financial, equipment, human and data resources that guarantee important processes such as monitoring, data analysis and generation of knowledge products are available.

There is a need to review and develop new procedures and guidelines, both administrative and technical, for data, information and knowledge management, sharing and exchange.

Management Information System (MIS)

The need for Management Information System (MIS) development is related to the development of the MRCS business processes. At the moment there doesn't exist a unified and comprehensive software and knowledge infrastructure for project management at the MRCS. Because of this it is difficult for the top management to obtain an overview of the project and programme status at any given moment and take necessary action based on the status. Also on the programme and project level the planning and follow-up of activities has not been systemised. Utilisation of a MIS would create new business culture at the MRCS where project planning and follow-up are executed under one system. The advantages of utilisation of such system include:

- utilisation of project plans in project resources follow-up
- real-time view of the financial status and progress of activities
- improved and more transparent utilisation of resources
- guaranteeing that resources are available for required tasks
- unified management of activities for improved efficiency and communication.

MRCs capacity building

A key issue for the success of the IKMP is building capacity for Information and Knowledge Management (IKM) within the riparian countries. Experience has demonstrated that the best way to build capacity is to work in close cooperation with national agencies and through a combination of focused and consistent training, on-the-job experience, mentoring, technical assistance and material support.

Experience from previous programmes has demonstrated that all too often activities to build capacity have not achieved their goals due to a combination of factors including the lack of consistency in methodology and materials, the failure to fully understand or consider the organisational context, the disconnection between training and work activities, and the lack of follow up. To address these technical training issues, the Applied Technical Training Standards (ATTS), a standard set of training criteria, resources and procedures has been developed that can be utilised for any technical training activities.

The MRC-IS Portal and MekongInfo

The current MRC-IS Portal is operational. However, the current system is limited in functionality and is only available on the MRCS intranet. The IKMP will undertake further development of the MRC-IS Portal, and ensure the maintenance of the Portal. This will include: establishing links between the interactive maps of the Portal and relevant databases; including more themes into the interactive map section; the document management system will have additional content added and brought into operation; MekongInfo (also see below) will be integrated with the document management system; procurement of information products will be enabled; and links between the library and document management system will be enabled. Further functional analysis will be carried out to make the Portal more powerful. The further development and maintenance of the MRC-IS Portal will benefit all MRC programmes.



MekongInfo (www.mekonginfo.org and accessible through the website) is an interactive system for sharing information and knowledge about natural resources and watershed management in the Lower Mekong Basin. In addition to over 3,000 documents in its online library, MekongInfo provides: (a) a contacts database of individuals, projects and organisations; (b) news and announcements of events; (c) relevant Web Links; (d) a Gallery of useful resource materials; (e) a Forum for online discussions; and (f) a free web hosting service. The number of user sessions has been consistently growing from about 10,000 per month in 2002 to over 60,000 per month in 2006.

2.3 MRC Flood Management and Mitigation Programme (FMMP)

FMMP role



The FMMP documents recognise the importance of close cooperation between the IKMP and the FMMP, including assisting IKMP to set benchmark practices and standards for data and information management and ensuring appropriate training and knowledge transfer to MRCS staff and affiliated agencies. It is envisioned that the FMMP will increasingly utilise the IKMP facility to efficiently store and catalogue its own outputs, such as digital flood probability maps, and as a platform for their dissemination to other potential MRC users, such as the BDP. Some of the ToR recommendations include:

- FMMP should assist TSD in preparing a detailed specification for upgrading the current geophysical data management system under the IKMP to one that meets with modern standards of information technology.
- The FMMP should encourage the organisation of an in house (MRCS) forum or Working Group to steer the direction of 'relational' database development so that the needs of the various core programmes are equitably met and an effective and coordinated plan is identified and as part of the IKMP Development Plan.

FMMP's specific needs

The FMMP documents make clear the need for a data and information management system as planned within IKMP. Specific recommendations on the system and the practicalities of addressing FMMP's specific needs in the interim are made including:

- 1 The IKMP historical data and information management system should be centralised and have a top down structure in order to avoid the dislocation caused by geographical dispersion and to enable quality control.
- 2 The IKMP system should be able to cope with very heterogeneous types of data and information.
- 3 The FMMP system should be capable of operational interfacing with the telemetry systems that automatically convey information from the sensors to the primary data site and databases. The operational data may be stored eventually as historical data in the IKMP system, but policies and procedures have to be developed for that.
- 4 There is a need to have a more systematic and formal method for accessing data, preferably through an automatic procedure such as envisioned under the Data Clearinghouse Mechanism.
- 5 There is a need for routine data quality, verification and validation procedures to be in place for hydrometric data, a system for recording when changes are made and a means for data outside of the mainstream to be available more recently.
- 6 The Document Management System offers good potential for FMMP usage but requires 'best practise standards' for document control and metadata.
- 7 A thorough data audit will need to be undertaken and the geophysical database sorted out as soon as possible by the IKMP. Given the current situation and likely lag in time before IKMP is operational, it is recommended to do this work in FMMP first to address their immediate requirements and only hand the function over to IKMP after the issues raised have been resolved satisfactorily in the medium term.

- 8 The data verification technology and statistical expertise developed under the WUP-A project should be utilised to ensure quality control within the IKMP databases and the already cleaned and improved hydrological and meteorological databases processed within that project incorporated within the MRCS.
- 9 The prospects for web based knowledge transfer will expand and new opportunities arise from this, opening up prospects for collaborative work and improved sharing of information among other things.

It is clear that particularly close cooperation should be maintained throughout the implementation between these two programmes.

FMMP modeling needs

FMMP is going to utilize the current DSF model as a support tool for its flood mapping and management activities. DSF has been installed in the Regional Flood Center in Phnom Penh. MRCS Modeling Team will train the Flood Center personnel for the DSF application and support model use. Further flood modeling development requires extensive expertise, resources and sustainability that are most feasible to concentrate on the MRCS Modeling Team. The Modeling Team is also in the best position to utilise considerable synergy between the flood modeling and other types of model development and application. The planned support by the IKMP to the FMMP includes:

- implementation of a 2T-basin pilot flood mapping project (Phase I)
- implementation of a 2T-basin pilot flood forecasting project (Phase II)
- development of an open modelling platform to accommodate various models needed for flood mapping and forecasting
- development of hydrodynamic models for advanced flood mapping and forecasting including control structures, 2D models and combined 1D/2D/3D models needed for extensive lake, floodplain, channel network and control structure system modeling.

The foreseen role of the FMMP concerning modeling is maintenance and operational use of the models as well as utilization of the results. IKMP role is development of the tools and provision of modeling support for the FMMP.

2.4 MRC Hydro-meteorological Projects

Closely linked to the FMMP are the two hydro-meteorological projects: (i) the Appropriate Hydrological Network Improvement Project (AHNIP) and (ii) the Mekong HYCOS.

AHNIP

The AHNIP was established in April 2001. Until March 2006 the project established and/or improved a total of 18 hydrological stations, all of which are equipped with a telemetry system to support MRC capability for real-time flood forecasting and early warning. The AHNIP system was implemented with the aim to support the establishment of the MRC flood forecasting and early warning system, which is presently carried out by the RFMMC.

It is understood that over its short lifespan the AHNIP system has experienced a number of technical shortcomings, which affected the reliability of data transmission and overall performance. Once the system is fully operational, its automatic data

acquisition, storage, processing, and dissemination capability will serve as a priority data acquisition system to the RFMMC. It could also contribute to the development of the critical low flow forecasting including saline intrusion in the Mekong Delta. Its current restriction in terms of number of parameters (water level and rainfall) needs a review with the perspective to include improved water flow and possible water quality. As well, current level-to-flow rating curves are subject to considerable error and need to be improved.

ANHIP was extended to August 2007 with funding from the Australian Government. The new activities of AHNIP are (i) interim replacement of field equipment and support of AHNIP objectives; (ii) development of an MRC Information and Knowledge Management Policy; and (iii) formulation of the Project Document for the technical upgrade of the AHNIP Network and the integration with the Mekong HYCOS Network.

Mekong HYCOS

The Mekong HYCOS is a major new project of the MRC which is aimed at strengthening both the technical and institutional capacity for hydrological and meteorological monitoring in the Mekong Basin. It will be complementary to the existing hydro-meteorological network such as AHNIP, and provide reliable real-time data from the Mekong mainstream and its major tributaries. The Mekong HYCOS project will form a regional component of the global WHYCOS¹ programme. The Mekong HYCOS will serve as a priority data acquisition system for the flood forecasting and early warning system of the RFMMC.

The Mekong HYCOS project will install a total number of 21 water level and rain gauging stations and one tidal measuring station. Meteorological parameters other than water level and rainfall are not proposed at this stage. According to the project document, the identification and prioritisation of the monitoring station locations will be decided through a dialogue amongst the project national collaborators and the MRCS. So far, a long list of proposed locations has been prioritised and proposed for further discussion. Priority criteria include the following: (i) the country's preferences, (ii) representativeness, (iii) regional program needs such as navigational, environmental, and flood forecasting aspects, and finally (iv) budget availability. Mekong HYCOS implementation started in September 2006.

WUP Procedures for Maintenance of Flow

Internally AHNIP and Mekong HYCOS monitoring stations are also linked with the WUP *'Procedures for the Maintenance of Flow on the Main Stream'*, which recommends a number of stations on the main stream for its monitoring purposes.

¹ The World Hydrological Cycle Observing System (WHYCOS) is a WMO programme aiming at improving the basic observation activities, strengthening the international cooperation and promoting free exchange of data in the field of hydrology. It is guided by the WHYCOS International Advisory Group (WIAG). (ref. www.whycos.org)

2.5 Other Regional Initiatives

The MRC must be involved within the development process in order to ensure sustainability; environmental and social monitoring goes hand-in-hand with sustainable development. However, studies and research work, no matter how well done, will have no impact if they are not used in development planning. Sustainable development will require closer interaction of the MRC with development partners, in particular the Member States, development banks, and other regional initiatives. The guiding principle of the MRC Strategic Plan 2006-2010 is that the MRC roles are within the MRC's mandate, complement the comparative advantages of others, avoid duplication of efforts and reflect the expressed interest of the Member States. The focus of the MRC's role will be on basin-wide and trans-boundary programmes and projects.

A major value-added aspect of the MRC is in the coordination and promotion of partnership with development banks, development agencies, UN institutions, the private sector, academic institutions and NGOs. The MRC must forge effective links with these regional initiatives, especially the GMS Initiative, ASEAN, World Bank's Mekong Water Resources Assistance Programme (MWRAP) and ACMECS. For example, ASEAN can provide the political will and sense of ownership necessary for reaching compromises on the trade-offs of development, while GMS and MWRAP can provide the link to the tangible development outputs. With regional initiatives, it will be important that roles are clearly defined so that overlap is avoided in accordance with each organisation's mandate. MRC also has an important role at the bi- and trilateral level in addressing sub-basin trans-boundary issues.

The rules for data sharing and exchange will be clearly defined between the MRCS and partners in development work in order that sensitive data remains available only to those who are permitted access by the data holders.

Examples of regional initiatives and projects utilising IKMP data and modelling results are:

- World Bank Delta Master Plan, WB/MRC Mekong Integrated Water Resources Management Programme (M-IWRM));
- Global Challenge Food and Water Programme;
- IUCN Water and Nature Initiative Project and Multi Stakeholder Platform-dialogue process;
- ADB Tonle Sap Built Structures Project under the Tonle Sap Initiative; ADB RETA: The Sesan, Sre Pok and Sekong River Basins Development Study in Cambodia, Lao PDR and Vietnam; and
- ADB/WWF/MRC Environmental Criteria for Hydropower Planning.

3 Programme Design

3.1 Guiding Principles and Cross-cutting Issues

IKMP functionality

From the stakeholder and problem analysis, it follows that the IKMP will:

- Provide a solid foundation for high quality and efficient data collection and management activities;
- Promote efficient information and knowledge management procedures and practices throughout the MRCS framework (cross-sectoral policy);
- Promote integrated information use in the planning and decision making process;
- Provide information services such as GIS and modelling analyses for the MRCS programmes, countries and other regional organisations; and
- Design the IKMP components in a way that facilitates component management and maintains the current MRCS information related activities.

Capacity building

Based on training needs assessments, IKM training modules will be developed. For example, capacity building in the technical components relies extensively on hands-on training and support to communicate lessons learned and spread the general methodology for capacity building outside of IKMP, more formal training will be also arranged for decision makers and planners in order to disseminate programme results and train them in using the IKMP outputs.

Cooperation and coordination within the MRCS

The IKMP will have a wider significance within the MRC as it can take the lead in facilitating and sustaining more collaborative working practises and encourage the use of the MRC-IS Portal and related internet technologies to improve communications and bring about more efficient standard working practices.

The role of the NMCs and line agencies

The NMC's have a coordinative and partnering role with the MRCS and are not implementing agencies. The implementation link is a direct one between the MRCS and line agencies, or any other national institutions or consultants, as the case may be. The IKMP is therefore more closely linked to the NMCs as communications and coordination are among its primary roles. The NMCs will support IKMP through acting as an outlet for the information and data products at the national level – this positive service role will assist them in their regular cooperation with the line agencies.

Line agencies are the primary custodians of the fundamental datasets. As active partners in implementation, the national line agencies will especially benefit from the institutional strengthening aspects - managerially, technically and administratively. The development and use of the various guidelines and standards will have the potential to be an important contribution to improving regional information, data policies and practices.

IKM Policy and Implementation Strategy

In May 2006 and with the assistance from AusAID, the MRCs started the process of drafting and consolidating an IKM Policy and Implementation Strategy. This process is complementary to the IKM programme formulation. The IKM Policy and Implementation Strategy will be further elaborated and shared with MRC member countries during the IKMP inception and implementation process.

In order to guide *“the establishment and operation of all data, information and knowledge management, sharing and exchange activities within the MRC”* the IKM Policy will set forth policy principles which include:

- The need to formulate, and regularly review, a set of criteria to determine whether activities will be included under the IKMP or not.
- Some general policy principles referring to MRC’s independence; the relation with Integrated Water Resource Management (IWRM); the respect to national sovereignty, etc.; and the aim for sustainability of the IKM processes.
- References to base the planning and management of the IKMP on sound business practices;
- The MRC data disclosure policy.

At the moment of writing, the draft IKM Implementation Strategy is more a framework version than the draft Policy. It addresses implementation issues and provides:

- All necessary background references and information to go ahead with the formulation of an implementation strategy;
- Significant elements, of the “how to achieve”, and
- Recommendations to guide the way in which implementation activities will be planned in finer detail and ultimately performed.

3.2 Overall Goal and Objectives

Regionally, increased population and development pressures necessitate improved understanding of the river basin, the identification of optimal management options and the implementation of environmentally, socially and economically sound practices. Information together with capacity building creates the basis for such balanced development that benefits the poorest part of the population without jeopardising the natural functioning of the river system. IKMP provides direct guidance to development and investments taking into account environmental and livelihoods impacts, thus contributing to balanced development and poverty reduction in alignment with the Millennium Development Goals.

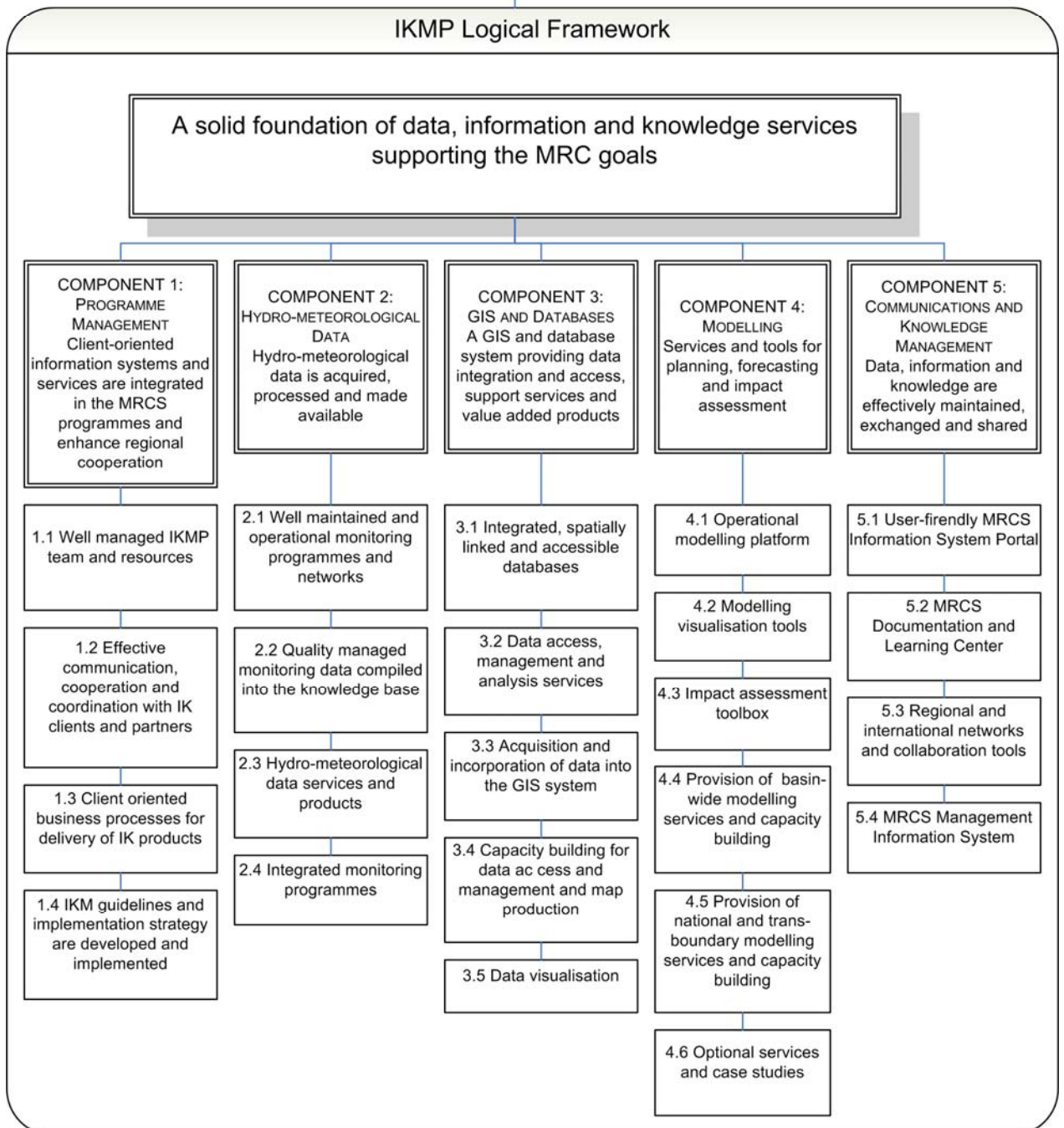
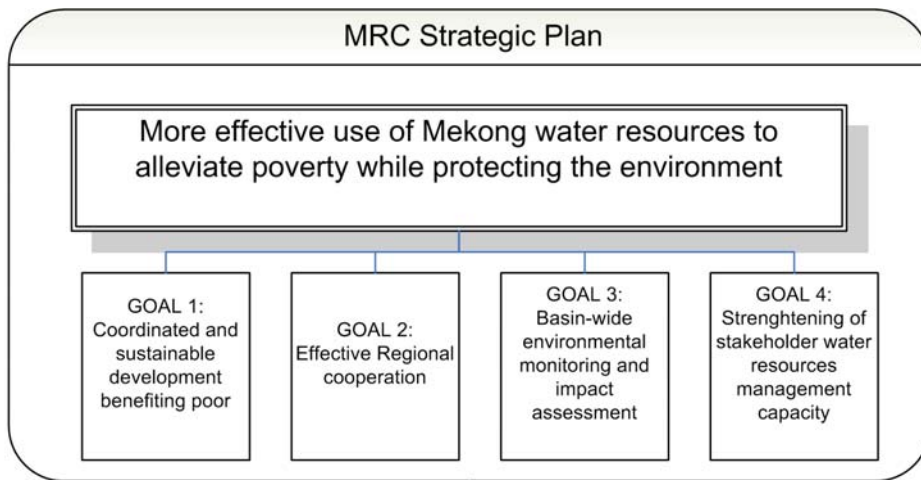
The IKMP overall Development Objective shall therefore be: *‘To build a solid foundation of data, information and knowledge products, systems and services that supports the goal of the Mekong River Commission.’*

3.3 Programme Structure

IKMP functions	The IKMP provides information and knowledge services, its four main functions are: <ol style="list-style-type: none"> 1 Data collection; 2 Data management; 3 Data services; and 4 Knowledge management.
Programme components	These functions are achieved through 5 programme components:

	<i>Component</i>	<i>Functions</i>
1	Programme Management	Manages all IKMP components; maintains external contacts; IKM policy and guidelines; sets and monitors business processes.
2	Hydro-meteorological Data	Acquires and validates hydro-meteorological data.
3	GIS and Databases	Data management; provides geo-spatial analysis and mapping services.
4	Modelling	Provides modelling tools, services and programme support; provides decision support services and scenario analysis.
5	Communications and Knowledge Management	Exchange, sharing, networking and collaboration; Documentation and Learning Centre; support to capacity building.

The structure of the IKMP including the component objectives and associated outputs is shown on the following page:



3.4 Outline of IKMP Components

Component 1,
Programme Management

The Programme Management Component of the IKMP provides overall leadership, coordination and management for IKM and for the programme. This includes setting in place the framework for systematisation of data, information and knowledge management by designing and implementing appropriate business processes throughout the MRCS and working closely with the national agencies to support their capacity building and cooperation with the programme.

Component 1 outputs

The following functions will be fulfilled through the outputs of Component 1:

- *Output 1.1 – The IKMP team and resources are well managed.* A management structure is in place providing clear direction and leadership for the programme and ensuring resources are available and performance is monitored so that results are achieved and reporting needs addressed;
- *Output 1.2 - Communication, cooperation and coordination with IK clients and partners are effective.* The legal and institutional basis for cooperation on IKM is in place and current and communications are established with all involved agencies and staff so that effective coordination is maintained.
- *Output 1.3 - Business Processes ensure client oriented delivery of IK products and services.* Carrying out needs assessments and functional analyses in order to effectively redesign the processes governing IKM work so they can deliver what's needed to clients.
- *Output 1.4 – IKM policy, implementation strategy and guidelines are developed and implemented.* Developing an accepted overall IKM policy and implementation strategy and implementing it consistently.

Component 2, Hydro-
meteorological Data

A well informed understanding of the physical conditions of the major rivers in a basin is fundamental to the effective application of Integrated Water Resource Management principles within that basin. Regional consultations and the focus of the current MRC Strategic Plan reflect this viewpoint.

Component 2 seeks to add to the level of understanding that currently exists on the physical condition of the mainstream and major tributaries in the Mekong River Basin, and is therefore of high priority.

Currently, each of the MRC programmes collects considerable amounts of data and information, and generates knowledge within their particular area of expertise. The IKMP will support these programmes by providing services and expertise in the processing, storage and management of these data, and the linking of it to knowledge from other programmes to form the MRC knowledge base. IKMP Component 2 will be responsible for collecting hydro-meteorological data, which is critical for many MRCS functions. Component 2 will also accommodate other types of monitoring activities in synergy with the hydro-meteorological data collection, such as sediment and river-morphological monitoring activities. Component 2 of the IKMP will ensure that collection of these types of data and information is properly coordinated, planned and performed.



Component 2 will handle three types of data:

- *Historical data*, which are required for the analysis of past flood and drought events in order to uncover the structure and pattern of the hydrological regime in the Lower Mekong, to analyse the incidence and severity of extreme events, their risk of occurrence and their linkages with synoptic and climatic conditions. Historical data are also required for understanding long term trends, calibrating and testing models and evaluating socio – economic impacts on the basis of past events.
- *Present data*, which are needed for monitoring purposes, for real time assessment and prediction, and as the inputs to the forecasting models. They are required continuously and in real (or near real) time from the telemetry network. Delays in the delivery of these data will disable the forecasting process which is a key output of the FMMP
- *Future data* are the outputs from the forecasting models. These need to be stored for forecast users, post event analysis and as the basis for upgrading the models.

The systems that deliver these data to the MRC, and prepare it for integration into the knowledge base should be designed with the facility to detect and report failures and potential errors using a combination of software filters and expert surveillance that will check the integrity of the data vectors. During the phased implementation of this Component, a comprehensive process should be undertaken to ensure that all critical data streams and existing historical archives are inventoried and work plans put in place to fully integrate them into the routine functions of the Component. Procedures should be devised for incorporating late-arriving observations correctly and further quality controls developed and applied in order to ensure that the historical data collections and individual records are as complete and accurate as possible. Additionally, agreement must be reached with the member countries on standard datums and collection methods so that the systemic inconsistencies between data from the different countries can be eliminated.

Sound data analytical / statistical support is advocated, particularly with regard to data validation, treatment (gap filling, correction/ flagging of error and so on), quality assurance and numerical analysis. The information technology required to meet most of the needs of Component 2, while challenging, can be developed from existing capabilities through relatively standard software engineering and equipment. The greatest challenge therefore, is in technical coordination and capacity building across the range of types of data that will need to be routinely made available to the MRC and the similarly extensive scope of agencies with which the MRC will need to work to achieve that availability.

Central to the success of the data management system will therefore be an ability to handle a wide variety and large volumes of data dependably, deliver it efficiently and reliably through a quality management process to the user community and also provide it operationally to software, for example in the case of forecasting.

Component 2 outputs

With its outputs, Component 2 will fulfil four major functions:

- *Output 2.1 – Monitoring programs and networks are operating and maintained.*
- *Output 2.2 – Monitoring data is processed, quality managed and compiled into the knowledge base.*
- *Output 2.3 – Hydro-meteorological data services and products are provided.*
- *Output 2.4 – Monitoring programmes and networks are integrated and improved.*

Component 2 implementation

Component 2 will be mostly implemented through two ongoing MRC projects: (i) Appropriate Hydrological Network Improvement Project (AHNIP) and (ii) Mekong HYCOS.

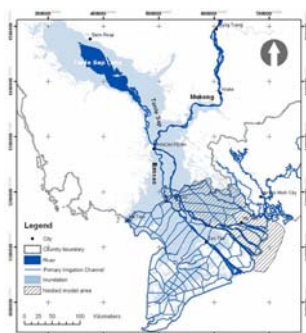
Component 3, GIS and Databases



MRCS's activities in the fields of GIS and Remote Sensing (RS) have been long established. A brief overview of the MRCS's history of using GIS and RS seems therefore appropriate. The first mention of an experimental use of GIS for deriving a land suitability map by combining various thematic layers is found in the 1988 Annual Report. From then on, GIS and RS very quickly gained recognition as highly useful tools. Only one year later, the 1989 Annual Report states that 'maps are important tools in planning the development of the lower Mekong basin. The importance attached to the production of these tools was acknowledged by the Committee when it adopted the draft programme for the Establishment of the Mekong GIS using RS techniques. The programme represents a logical continuation of the Committee's effort to map the natural resources of the Lower Mekong Basin.' With this decision, GIS and RS became permanent tasks of the Committee's Remote Sensing and Mapping Unit. During the last reorganisation in the year 2000, the present Technical Support Division (TSD) was established, maintaining GIS and RS as major fields of activity.

Component 3: GIS and Databases constitute the technical backbone of the IKMP, providing core database services upon which all other components of the IKMP depend and build. It will closely interface with and coordinate data and information collection and management activities in the other components of the IKMP as well as the other MRC programmes. It will set standards and guidelines valid and binding for all data collection and management activities performed in other components of the IKMP and in other MRCS programmes, and provide related technical coordination and service functions for data and information collection and production.

Component 3 outputs



With its outputs, Component 3 will fulfil 5 major functions:

- *Output 3.1 Core MRC spatial and other databases are integrated, spatially linked, maintained and accessible.* Providing management of and infrastructure for core MRCS spatial and other databases.
- *Output 3.2 Data access, management and analysis services are provided to MRC and external clients.* Providing access to MRCS databases and related technical services.
- *Output 3.3 Relevant geospatial information is acquired and incorporated in the GIS.* Acquiring and / or generating spatial (GIS or RS) data that are not

part of the data collection efforts of other components of the IKMP or of other MRC programmes.

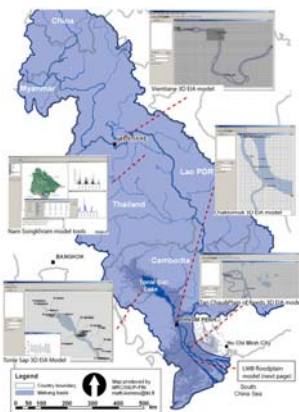
- *Output 3.4 Capacity building services to access and manage data and produce maps.* Providing capacity building services related to activities under this component including GIS, RS, database management, and visualisation.
- *Output 3.5 Visualisation of data and information for improved communication.* Providing value added production services through map design.

Through its Output 3.5 the Component will support the establishment of technical capacities in IKM Units attached to the National Mekong Committees. These NMC IKM Units will serve as outlets for MRCS information and knowledge products and services, facilitating their provision to line agencies and other actors in the water resources sector. The IKM Units will be provided with full access to the core MRCS spatial and other databases, with sufficient technical capacity to exploit those databases especially through map design, and with related capacity building.

Component 4, Modelling



The MRCS modelling activities stretch back to the 1960s. The most notable modelling projects were examination of Tonle Sap Lake regulation by Sogreah in 1966 and USAID sponsored development of a flood forecasting system. The flood forecasting system is still in use as well as the topographic data gathered by Sogreah. In the 1990s, MRCS started to develop its own modelling capacity. The Finnish Government supported this activity by sponsoring modelling advisors to the MRCS from 1998 onwards. In 2001 WUP-A (Water Utilisation Programme, Component A) started to develop basin-wide modelling tools for estimating development scenario impacts (DSF, Decision Support Framework). The project was funded by the World Bank and co-financed by the Finnish and French governments (WUP-FIN and WUP-FRENCH). DSF development was realised between 2001 and 2003. After that the work has been mostly geared for producing estimated impacts of development scenarios for the MRCS, most notably for BDP, the Basin Development Plan, and IBFM, Integrated Basin Flow Management. In 2006 the Modelling team has continued supporting the WUP assessments and initiating scenario work according to country specifications.



Mathematical modelling has proven to be a powerful tool for the understanding of the complex structure and dynamics of natural and regulated systems. The Modelling Component provides information for forecasting, decision making, planning and impact assessment. It focuses on building MRCS' and national capacity for problem analysis, model use and the provision of decision support services. It is founded upon the expertise, relationships, training, data collection and information tools that have been created in the course of the previous MRCS-, World Bank- and Finnish-financed projects. In addition, the Component cooperates closely with other regional and global partners, including the IUCN and ADB.

The modelling component consists of two main functions, (i) Decision Support Framework (DSF) development and (ii) modelling services and capacity building.

Component 4 outputs

The DSF development (i) includes:

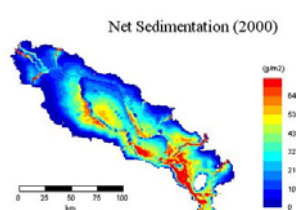
- *Output 4.1 Operational and well maintained modelling platform;*

- *Output 4.2 Visualisation tools to communicate modelling scenarios and assessments; and*
- *Output 4.3 A validated Modelling Toolbox that provides tools to assess impacts and alternatives of proposed developments.*

Service and capacity building functions (ii) include:

- *Output 4.4 Modelling services and data products focusing on basin-wide issues; and*
- *Output 4.5 Modelling services focusing on national and trans-boundary feasibility, planning and scenario studies; realised by national teams.*
- *Output 4.6 - Optional services and case studies (optional).*

Thematic areas of modelling services



The IKMP's Modelling Component will work in close cooperation with and support most of the MRCS thematic areas and programmes:

- Basin-wide hydrological/ hydrodynamic scenarios: Hydropower and irrigation development; climate change;
- Sediments at basin-wide scale: Productivity of the system; navigation;
- Ecosystem productivity, especially Tonle Sap fisheries;
- Sustainable agricultural and forestry development;
- Basin-wide mitigation and trade-off mechanisms;
- Basin-wide flood modelling support; and
- Trans-boundary and cumulative issues.

The successful execution of the works requires integration of existing data, collection of relevant primary data, multidisciplinary impact assessment, use of state-of-the-art assessment tools, broad partnership and networking, and communication of generated information to the stakeholders.

Component 5,
Communications and
Knowledge Management

The Communications and Knowledge Management Component facilitates data, information and knowledge exchange, sharing and networking and supports collaboration within MRC and among other stakeholders. It includes a focus on eliciting 'soft' knowledge, the tacit knowledge that exists throughout the wide network of people who work within the MRC or interact with it. Through identification and setting up of virtual systems on the internet, the Communications and Knowledge Management Component will assist the MRC to take advantage of the latest technologies to improve work processes and efficiency, and drive the demand for information flows while building the infrastructure to supply it.

Component 5 outputs

The outputs of the Communications and Knowledge Management Component are:

- *Output 5.1 User friendly and powerful MRC-IS Portal.* An intranet- and internet-based system allowing users to easily access maps, documents and other information consisting of a web-based mapping system, the MekongInfo information system, and an integrated Document Management System linked to indexed digital documents from the MRC library and other sources.
- *Output 5.2 MRC Documentation and Learning Centre operational.* An upgraded resource at the MRCS that provides training and educational materials, produces 'showcase' publications highlighting issues of importance

in the Mekong River Basin, develops a methodology and training for national centres and provides the service of indexing and digitisation of documents.

- *Output 5.3 International and regional networks, and collaborative tools.* Bringing the full benefit of the internet and computer systems to bear on the MRC's working processes to gain greater collaboration, networking, efficiency and gaining the contact and understanding from the wider circle of people with knowledge of the Mekong River Basin.
- *Output 5.4 MRC Management Information System (MRC MIS).* Providing a management information system (MIS) that supports project cycle management and administrative processes.

3.5 Technological Foundation

IT infrastructure

An important task for the IKMP is to evaluate and facilitate decisions on strategic options about certain technological subject matters that relate to data, information and knowledge management. A significant aspect in this regard is the IT infrastructure sustaining the activities of the IKMP and therefore those of all other MRC programmes. Some important issues which must be considered in depth are:

- Installation of a corporate database;
- Installation and integration of dedicated software (GIS, modelling, visualisation, monitoring, etc.);
- Transmission and networking; and
- Open source or mainstream commercial software.
- In order to facilitate decisions on such matters, it is important to determine the importance and priority of criteria that determine the feasibility of the technological options. The following criteria, amongst others, must be evaluated and clearly documented (in Requirement Documents and Specifications Documents):
- What is the required performance?
- What is the required reliability?
- What is the required security?
- What is the required compatibility?
- What is the required flexibility and adaptability to accommodate future needs?
- Should centralised or distributed solutions be preferable?
- What standards should be implemented and what are the consequences?
- What are the financial constraints?
- Is local maintenance available?
- What is the investment effort in terms of training staff?

Although careful analysis and consideration are needed to authoritatively evaluate alternative technology, some initial guidelines are provided below. They are provided to help discussion and subsequent analyses and formulations.

Central database

The MRCS database will include two components. The first one consists of relational database for storing metadata, field measurements etc. The second component is a

specialised geo-database for GIS-data. The specifications and requirements for both components include:

- Able to be accessed over the Internet with a web-browser for queries;
- Queries supported for wide variety of clients;
- Able to accommodate wide variety of data (metadata, tables/time series, model outputs, variable field measurements, text, etc.);
- It should be able to make queries over wide varying data; for instance it should be possible to query all documents, GIS-data, and water quality data for a selected location;
- The Document Management System should be based on the centralised database;
- Provides capacity for large data sets;
- Able to handle a number of simultaneous input data streams such as the hydro-meteorological on-line measurements;
- Provides different user access rights and security levels;
- Compatible with the MRCS GIS-database (geospatial database);
- Separate GIS-database is recommended at the moment for simplicity; it will be possible to upgrade for integrated one later one if necessary;
- Database should be centralised;
- Riparian copies maintained and automatically updated from the central database over the Internet (not necessarily complete copies);
- There is no need for extremely high level security or support for huge data volumes or high-frequency transactions;
- Software with need for specialised hard-to-find maintenance personnel should be avoided; and
- Appropriate moderately priced software with moderate maintenance costs to be preferred.

Software to be considered includes for instance Oracle, SQL Server and MySQL (Enterprise), the latter open-source.

Geo-database

The specifications specific for the geo-database software are:

- Able to serve geospatial data over Internet;
- Connects to the basic relational database for querying specific data (for instance pointing a location on a map shows water levels from that point);
- It should be able to duplicate the geospatial databases for the riparian countries and update them automatically over the Internet; and
- Techniques for speeding access over low-capacity Internet connections recommended.

Currently MRC uses Oracle/ArcSDE geo-database. ArcSDE can also run on open-source solutions such as MapServer. ArcSDE offers currently support for SQL Server. For the integrated 3D visualisation there exists a large number of both commercial and open-source solutions.

Monitoring network

The monitoring network can be divided into on- and off-line parts. Considerations for the on-line network include:

- Way of transmission (satellite or radio transmission; many different radio transmission solutions available);
- Ruggedness and reliability of instrumentation;
- Ease and cost of maintenance;
- Expandability of the stations to include new sensors such as rainfall, turbidity and oxygen;
- Compatibility with the existing instrumentation and mode of transmission; and
- Capability for station status and fault monitoring (Vaisala and other vendors' hard- and software solutions).

The off-line or near-on-line measurements are an important activity of the MRCS. There are unexplored potential to use low-tech local-level resources for monitoring. These include provincial line agency teams for discharge and water level measurements and local villagers for monitoring water levels or other parameters. The readings can be transmitted via cheap cellular phones daily.

Software currently exists that has been developed for the WUP-A for data correction, quality control and data gap filling. It could be integrated in the routine hydro-meteorological data management process.

Modelling framework

The modelling framework (or Decision Support Framework) consists of a Modelling Platform, Visualisation Tools and Modelling Toolbox. Modelling Platform includes general user interfaces, connectivity to databases and model input/output processing. The Modelling Toolbox includes various 'model engines', the actual numerical simulation models. Modelling Platform considerations and specifications include:

- User-friendly GUI (Graphical User Interface);
- Ease of use, for instance routine operations automated;
- Automatic connectivity to the central database for model input;
- Able to accommodate wide variety of models and future needs;
- Versatile data processing and visualisation capabilities; and
- Easy to modify and expand.

Examples of modelling platforms include MRCS DSF, Delft Fews (flood modelling, nearly open-source), Washington State University VSB (Virtual Scalable Basin) and EIA Ltd. VIV (licence free).

The Modelling Toolbox will be based on existing DSF, WUP-JICA and WUP-FIN tools. They include:

- IQQM water resources management model;
- SWAT hydrological/ watershed model;
- ISIS 1D hydrodynamic, sediment and salinity model;
- MIKE11 1D hydrodynamic model;
- WUP-FIN 1D, 2D and 3D hydrodynamic, sediment, water quality, sediment and salinity models;
- WUP-FIN distributed and lumped hydrological/watershed models (VMOD and HBV); and
- WUP-FIN socio-economic and policy models.

These tools provide basis for solving a wide variety of problems for scenario and planning work, flood mapping and environmental and socio-economic impact assessment. Other commercial and open-source models will also be reviewed for their applicability. Inclusion of new tools into the official DSF will be conducted through approval process by the countries.

Communications and
knowledge management
related software

The Portal will be a means to access parts of the main database and the Document Management System (DMS) from outside through the Internet. The Portal also includes the MRCS corporate web page, plus an associated array of communication and collaboration functions. The Portal will be based on the IT infrastructure and central database built under component 3.

Similarly, the DMS will be built and maintained under Component 5, in logical association with the Documentation and Learning Centre, and will use the general IT and database infrastructure established under Component 3 (Activities 3.1.2 and 3.1.6).

The communications function of the Component 5 is facilitated by the promotion of the use of listserves, internet telephony, instant messaging, web conferencing, bulletin/ discussion boards, webinars and wikis.

4 Component 1, Programme Management

4.1 Immediate Objective and Associated Outputs

Immediate objective	<i>Immediate Objective 1</i> – Demand-driven and client-oriented information and knowledge systems, services and products are integrated throughout the MRC's programmes and enhance regional cooperation.
Outputs	<p><i>Output 1.1</i> – The IKMP team and resources are well managed.</p> <p><i>Output 1.2</i> – Communication, cooperation and coordination with IK clients and partners are effective.</p> <p><i>Output 1.3</i> – Business Processes ensure client oriented delivery of IK products and services.</p> <p><i>Output 1.4</i> – IKM policy, implementation strategy and guidelines are developed and implemented.</p>

4.2 Output 1.1 – The IKMP team and resources are well managed

Activity 1.1.1 - Establish IKMP management structure within TSD and to coordinate MRCS IKMP activities

Purpose	To set in place the management structure for day to day operational leadership and coordination of the IKMP with an orientation to a demand driven client oriented approach.
Approach	<p>IKMP management will need to establish and maintain on a day to day basis a clear direction for the programme by:</p> <ul style="list-style-type: none"> • Articulating clearly objectives, outputs and team roles as part of managing and motivating staff; • Ensuring the IKM team have access to appropriate, state of the art resources so they are available to effectively meet clients' needs; and • Performance monitoring to measure progress towards the achievement of policy objectives and planned results, reporting to schedule. <p>IKMP management will prepare an Overall 5-Year and Annual Implementation Plans including indicators.</p>
Result	A well organised and functioning IKMP that effectively meets client needs in a measurable manner.

Activity 1.1.2 - Perform annual progress monitoring

Purpose	To assess performance of the IKMP and adjust the programme based on the results.
Approach	An annual progress monitoring will be performed following the monitoring plan and using the indicators established. All findings will be published in the IKMP Annual Report and feed into the preparation of the next IKMP Annual Work Plan.
Results	An IKMP Annual Report assessing the performance of the programme.

Activity 1.1.3 – General management of the IKMP

Purpose	Regular annual programme management.
Approach	Production of annual work plan. Recruitment of personnel. Financial planning management. Etc.
Results	A well-functioning programme.

4.3 Output 1.2 – Communication, cooperation and coordination with IK clients and partners are effective*Activity 1.2.1 - Establish an IKM TACT*

Purpose	Provide regional coordination and management to IKMP.
Approach	It is suggested to transform the existing Technical Assistance and Coordination Team (TACT), which coordinates at the regional level the development and implementation of the MRC-IS and the Water Use Monitoring System, into the IKM TACT by expanding its ToR. The IKM TACT will act as the IKM management committee (similar to the WUP Management Team), and will provide coordination on all matters relevant to the IKMP implementation which need regional consensus and conversion into national actions.
Results	IKM TACT operational and facilitating regional coordination on IKMP implementation.

Activity 1.2.2 - Communication with riparian countries

Purpose	To provide the organisational basis for implementing IKMP activities within the riparian country institutions of MRC
Approach	The IKM National Units will facilitate exchange and sharing of data, information and knowledge; promotion of guidelines and standards; discussion of security and access issues; and follow-up of agreements with the Primary Custodians (PC) at Line Agencies. They will also identify additional potential sources of data, information and knowledge and act as the outlet within the riparian country for data, information and knowledge products and services developed within the IKMP.
Results	IKM National Units established at NMCs led by the IKM National Coordinator and in regular contact with Primary Custodians and others to communicate and promote the goals and coordinate the activities of the IKMP.

Activity 1.2.3 - Organise and participate in IKM national and regional workshops

Purpose	To communicate and promote as necessary IKMP within the riparian country institutions of MRC and other stakeholders.
Approach	In the event that a specific need for communicating/promoting IKMP is identified, the programme coordinator may direct a national or regional workshop be held with NMCs, Line Agencies and regional and international organisations as appropriate.

Similarly, IKMP may participate in workshops, conferences and other forums that are in alignment with IKMP communications needs, IKMP may be represented at that event.

Relevant issues may include promoting, communicating and raising awareness of best practices for IKM, procedures and processes, the value of data and information exchange and sharing, the importance of quality management to promote objectives and use of the MRC-IS and potential classification systems for regional data harmonisation.

Results National and regional workshops to raise awareness and promote IKM best practices, regional data harmonisation, MRC-IS and quality management.

Activity 1.2.4 - Facilitate, maintain, update and prepare agreements and MOUs

Purpose To ensure that the legal and institutional basis for cooperation on IKM issues is in place and current.

Approach IKMP will work with ICCS to see that agreements MRC has entered with other parties are maintained and updated. Where necessary, IKMP will work with ICCS to establish new agreements and Memoranda of Understanding (MOU) with other parties.

Note that this activity will not impinge on the responsibilities of the IKM TACT. Additional issues such as data security and access rights and permissions for sensitive datasets will continue to be discussed and revised based on the regular meetings through IKM TACT and, where necessary, raised to higher levels for review and approval.

Results Agreements and MOUs established, maintained, and updated, facilitating cooperation on data collection, exchange and sharing.

4.4 Output 1.3 – Business Processes ensure client oriented delivery of IK products and services

Activity 1.3.1 - Conduct assessments of client needs

Purpose To understand user requirements so that products and services are demand-driven and client-oriented.

Approach Understanding and delivering client needs cost effectively is a primary factor for ensuring business success. Formal and informal communications with IKMP clients will be undertaken on a regular basis focusing on user needs and satisfaction. Needs assessment will include examining issues of which data to collect (type, source, scale), what information is required to be generated from data, how it needs to be packaged for delivery, what support is necessary to access and utilise it, which opportunities exist for harmonisation of data among primary custodians.

A particular issue of significance is a review of the use of the MRCS library and determining the need for converting this library to a Documentation and Learning Centre.

Results A sound basis for the design and delivery of IK products and services to address the needs of clients.

Activity 1.3.2 - Design data, information and knowledge products and packaging

Function To improve the utility and user acceptance of the products of the IKMP

Approach This activity will design products for distribution for knowledge and information to improve the user acceptability and dissemination of the IKMP outputs.

Potential products will be generated through a design process that will include the following aspects: examining international best practices in IKM, generating alternatives and assessing these in a consultative framework, selecting and testing preferred alternatives and finalising these as standards, guidelines, formats and means of packaging and distribution.

Results Improved data, information and knowledge products, increased circulation and user satisfaction.

Activity 1.3.3 - IKM process analysis and redesign

Purpose To analyse the current IK practices within MRC, prioritise areas for improvement and identify how to best improve them to ensure demand driven, client oriented services and products are able to be delivered effectively

Approach The IKM process analysis will examine all aspects of IKM practices to determine their impact on effective delivery to clients of products and services. This will particularly require examination of the outcomes of Activities 1.3.1 and 1.3.2 as re-alignment may be necessary to meet client needs and to deliver redesigned products effectively.

Practices to be examined will include management, planning, information flows, legal issues and agreements, quality management, data integration, staff/agency roles and responsibilities, procedures, and indicators, monitoring and evaluation (M&E). The analysis will identify opportunities and requirements to improve the system. This will include a SWOT analysis to prioritise areas for improvement.

Results A clear understanding of current IKM processes and a roadmap of issues to be addressed to resolve existing problems.

Activity 1.3.4 - Establish a cost recovery system

Purpose To gain revenues to sustain IKMP services

Approach	A cost recovery system will be designed based on an analysis of the actual costs incurred for different products and services to be provided, and a pricing structure for internal client, and external non-commercial and commercial clients.
Results	A cost recovery system is in place with a transparent policy and respective procedures.

4.5 Output 1.4 – IKM policy, implementation strategy, and guidelines are established

Activity 1.4.1 - Develop and ratify MRC IKM policy and strategy

Purpose	To complete the process of setting the overall IKM policy and strategy for the MRC.
Approach	<p>The IKM Policy and Implementation Strategy being developed in parallel with the IKMP formulation will result in a broad regional consensus on key issues to guide the establishment and operations of an Information and Knowledge Management function. This will include the important principles and major directions for IKMP and definition of where there is consensus and where additional work is required to achieve agreement among all riparian countries.</p> <p>During implementation of the IKMP, consultations will be carried out to fully develop the Policy and Strategy Framework into a document that is agreed upon by all four riparian countries and can be ratified by them.</p>
Results	An accepted and ratified IKM Policy and Implementation Strategy within the MRC.

Activity 1.4.2 - Prepare IKM Operational Manual

Purpose	To provide an overall guide to implementing the IKMP.
Approach	A draft IKM Operational Manual will be prepared outlining the manner in which IK operations will be implemented including outlining staff roles and responsibilities, indicators, the M&E system, institutional arrangements, management processes, needs assessment, linkages, information flows, reporting formats and requirements.
Results	An IKMP Operational Manual will govern management of the programme.

5 Component 2, Hydro-meteorological Data

5.1 Immediate Objective and Associated Outputs

Immediate objective	<i>Immediate Objective</i> - Required hydro-meteorological data is acquired, processed and made available.
Outputs	<p><i>Output 2.1</i> – Monitoring programmes and networks are operating and maintained.</p> <p><i>Output 2.2</i> – Monitoring data is processed, quality managed and compiled into the knowledge base.</p> <p><i>Output 2.3</i> – Hydro-meteorological data services and products are provided.</p> <p><i>Output 2.4</i> – Monitoring programmes and networks are integrated and improved.</p>

5.2 Output 2.1 – Monitoring programs and networks are operating and maintained

Activity 2.1.1 - Review current day-to-day data collection and delivery operations.

Purpose	To understand the current status of day-to-day data collection and delivery operations and develop strategies to address any non-compliance with existing data needs and agreements.
Approach	Consultations with MRCS Programmes, NMCs and line agencies will compare the current status of day to day data collection and delivery operations with known data needs and existing agreements, particularly PDIES. These consultations will also review existing systems, technology, equipment and other resources to define strengths in current operations, or limiting factors preventing the full delivery of data needs or compliance with existing agreements. Strategies will then be developed and prioritised for building the strengths and overcoming the limiting factors. The Component 2 team will lead this work but it will be performed in close cooperation with the IKMP Component 1 team.
Results	Full and sustainable implementation of existing data collection and delivery requirements and agreements.
	<i>Activity 2.1.2 - Coordinate and support operation and maintenance of monitoring network</i>
Purpose	To ensure accurate, reliable and timely delivery to the IKMP, of the data required to effectively meet client needs.
Approach	In line with management, human resources and financial plans, and business processes developed in IKMP Component 1, and technical standards, procedures and agreements developed by the Component 2 team, the efficient and effective day-to-day operation and maintenance of the hydro-meteorological, sediment and river morphology networks will be coordinated and supported by the Component 2 team.

Results Well operated and maintained hydro-meteorological, sediment and river morphology networks deliver to the IKMP, the data required to effectively meet client needs in a measurable and efficient manner.

Activity 2.1.3 - Provide technical assistance as required to implementing line agencies and/or service providers

Purpose To assist implementing line agencies and/or contractors fulfil the requirements of their data collection/delivery MoUs in cases where they may be facing temporary or systemic difficulties in doing so.

Approach The IKMP will maintain a level of technical expertise through IKMP staff integrated into the staff matrix of the MRC. The IKMP will also maintain access to high level technical expertise. Monitoring of operation and maintenance of the networks will identify cases in which implementing line agencies and/or contractors are facing difficulties in fulfilling the requirements of their MoUs. In such cases a partnership focus and consultations will determine what appropriate technical assistance can be provided to overcome the difficulties.

Results Line agencies and/or service providers are able to effectively fulfil the work requirements of their data collection/delivery MoUs.

5.3 Output 2.2 – Monitoring data is processed, quality managed and compiled into the knowledge base

Activity 2.2.1 - Review current practices and develop improved data processing and validation procedures, develop standard data processing and data quality management procedures

Purpose To identify strengths that can be built upon, and weaknesses to be addressed in these practices, and develop a strategy for improvement.

Results A strategy is developed to improve the data management and quality management practices.

Activity 2.2.2 - Conduct a data review/cleaning/correction process on existing historical monitoring data

Purpose To as far as possible, remove any discrepancies, bad quality data or data gaps from the historical database.

Approach Significant work has already been achieved in this activity through previous WUP projects. This activity would review the work already completed to assess what discrepancies, bad quality data or data gaps remain, and take steps to resolve those that do.

Results Historical data, of the best quality possible, is compiled into the database and available for use by data users without requiring further manipulation.

5.4 Output 2.3 – Hydro-meteorological data services and products are provided

Activity 2.3.1 - Deliver properly processed and quality managed historical data to the users

Purpose To deliver required data to the customers and assist them in use and interpretation of the data.

Results Good quality monitoring data is available to support the operation of other MRC programmes and inform decision makers.

Activity 2.3.2 – Delivery of properly processed and quality managed operational data directly to real-time data users

Purpose To ensure that data users who need it, receive data in real-time.

Approach The primary user of the real time data is FMMP. IKMP will not participate in this activity. There are however occasions, such as pilot development of operational systems, when real time data needs to be delivered to the MRCS.

Results Data users who require real-time data are reliably supplied with that data via the most direct practical route.

Activity 2.3.3 - Provide data analyses and special services

Purpose To provide users specialised hydrological and statistical data analyses.

Approach Conducted by experienced hydrologist who has sufficient hydrological process understanding and statistical and programming skills. The work consists support for modelling results evaluation, model calibration and validation support, development trends analyses, impact assessments based on hydrological analyses etc.

5.5 Output 2.4 – Monitoring programmes and networks are integrated and improved

Activity 2.4.1 - Develop and regularly review a data needs assessment

Purpose To understand at all times, the existing and emerging data collection and delivery needs of the clients.

Approach Constant communication will be maintained by the IKMP with other MRC programmes, NMCs, line agencies and other data users to assess and define their current and emerging data needs. The results will be collated into a plan to utilise the most effectively technology and methods to meet those needs. The plan will be

reviewed and updated on a regular basis. The Component 2 team will lead this work but it will be performed in close cooperation with the IKMP Component 1 team. Examples of emerging data needs are water level measurements in flood-plains, discharge measurements, groundwater level measurements, monitoring of morphological river changes and integrated discharge/sediment measurements.

Results Demand driven and client orientated data collection and delivery services are effectively provided to clearly identified clients.

Activity 2.4.2 – Review, coordinate and integrate the existing monitoring programmes and networks

Purpose (i) To understand current monitoring system gaps/overlaps, reveal potential synergies and make upgrade plan. (ii) To identify cases in which systems, networks or capacities might need to be upgraded to meet data needs identified in the data needs assessment (Activity 2.4.2)

Approach The data in concern includes hydro-meteorological data (precipitation, water levels, discharges etc.), sediments, morphology, water quality (for regular monitoring and specific studies) etc. The capacities of existing monitoring programs and networks for appropriateness, overlaps, gaps, problems and hidden synergies will be reviewed. Utilisation of synergies and elimination of overlaps will result in harmonisation and optimisation of monitoring programmes and networks with cost savings.

This activity targets specifically the integration of ANHIP and HYCOS networks for improved efficiency and cost-effectiveness. The data needs analysis (Activity 2.4.1) provides basis for the integration. Long-term maintenance and its funding is a key question which has a strong influence on the network integration. The functioning of the network system has to be sustainable and past experiences of loosing network equipment, infrastructure and functionality because of lack of funding and interest should be avoided.

Results Systems, networks and capacities will be appropriate to service client data needs.

Activity 2.4.3 - Improve data delivery to the MRCS and to the countries

Purpose To implement system and network improvements that are required to service a new data need.

Approach Problem analysis will focus efforts on most important upgrades needed. As things stand at present, data output from virtually the entire regional rainfall and discharge observation network is unavailable for forecasting purposes and the real time assessments. Only observations on the Mekong mainstream are received in real or near real time, and even here the stations are prone to interruptions. The HYMOS data are not up to date and lag one or even two years behind the present. Negotiations with the National Line Agencies will be initiated as soon as possible in

order to see how the delivery of hydro-meteorological data can be speeded up and the bottlenecks cleared.

Results System and network improvement projects are implemented in ways that efficiently and effectively meets the needs of the MRC, and establish ongoing benefits.

Activity 2.4.4 – Establish sediment monitoring programme

Purpose Improvement of sediment balance and process knowledge in the Mekong Basin. This is needed for instance for wide scope of development scenario, productivity, water quality and navigational studies.

Approach Plan a comprehensive sediment monitoring programme that works in synergy with the hydrographic and water quality measurements, implement the plan and activities in close cooperation with the MRCS/ EP.

Results Improvement knowledge base on Mekong sediments.

6 Component 3, GIS and Databases

6.1 Immediate Objective and Associated Outputs

Immediate objective	<i>Immediate Objective 3</i> - A geographical information system comprehensively integrates MRC data and information holdings and provides access, support services, and value added products.
Outputs	<p><i>Output 3.1</i> – Core MRC spatial and other databases are integrated, spatially linked, maintained and accessible.</p> <p><i>Output 3.2</i> - Data access, management and analysis services are provided to MRC and external clients.</p> <p><i>Output 3.3</i> - Relevant geospatial information is acquired and incorporated in the GIS. (This output includes two optional activities.)</p> <p><i>Output 3.4</i> – Capacity building services to access and manage data and produce maps.</p> <p><i>Output 3.5</i> - Visualisation of data and information for improved communication.</p>

6.2 Output 3.1 – Core MRC spatial and other databases are integrated, spatially linked, maintained and accessible

Activity 3.1.1 – Establish a GIS and Database Team

Purpose	To provide the organisational basis for implementing the activities of Component 3, by establishing a team of professionals and operators with clear management lines, responsibilities and job descriptions.
Approach	<p>TSD already has a well established GIS and database section, which provides numerous products and services. Given its new and broadened responsibilities under IKMP, the section needs to be enlarged, and responsibilities need to be delineated more clearly.</p> <p>Following overall management directions and plans prepared under Output 1.1, the current management structure, responsibilities, job descriptions, and incentive structures will be reviewed. Following this review, and taking into account the requirements of Component 3. Itself, other components of the IKMP, and other MRC programmes, they will be adapted and extended. Interfaces and communication modes with other components of the IKMP and other MRC programmes will be defined. Additional staff will be selected and hired. Annual targets for individual staff members will be agreed, and their performance will be reviewed accordingly. Management structure, staff responsibilities, job descriptions, incentive structures will be reviewed annually and further developed as required.</p>
Results	Management and team of professionals and operators capable to implement Component 3 in place.

Activity 3.1.2 – Review existing databases and develop and implement improved procedures

Purpose	To provide effective and efficient data storage, transmission, retrieval and archival for the MRC database, including its components at the RFMMC and the NMCs.
Approach	<p>Component 3 will be the backbone of IKMP, maintaining a distributed yet unified database and providing related services. MRC data holdings are currently scattered and fragmented. Storage, transmission, retrieval and archival are handled in multiple and diverse manners. Access to data and information is not optimally effective and efficient. Attempts to streamline data storage, transmission, retrieval and archival have been taken in the past (e.g. when designing the GIS underlying the MRC IS Portal), but the data holdings are still far from being unified. There is a risk of substantial data loss due to deficiencies of archival procedures.</p> <p>This activity will evaluate and facilitate decisions on strategic options about technological issues related to data, information and knowledge management. The existing IT infrastructure (hardware and software) sustaining the activities of MRC, RFMMC, and NMCs will be reviewed. Criteria that determine the suitability (required performance, reliability, compatibility) and feasibility (costs, maintenance availability) of technological options will be established. Minimum standards for IT infrastructure, compatibility, and connectivity will be developed. An appropriate IT infrastructure will be designed, considering options such as decentralised server networks versus central server clusters, or open source versus mainstream commercial software solutions. Procedures will be developed for optimised data storage, transmission and archival. The IT infrastructure will be implemented and maintained through the technical services of Activity 3.1.6., the procedures for optimised data storage, transmission and archival through this activity.</p>
Results	Data storage, transmission, and archival fully functional, data retrieval from database technically optimised in MRC, RFMMC, NMCs.

Activity 3.1.3 – Develop and establish standards and guidelines data and information management

Purpose	To develop and establish standards and guidelines for data / information collection, formats, quality control, data correction, and meta documentation.
Approach	<p>There is substantial incompatibility of data / information maintained in different sections / programmes of the MRC. Data / information collection, even for specific types of data (such as GIS layers) is handled in multiple and diverse manners. Multiple formats for data and meta data are used. Quality control and meta documentation are not consistently applied throughout the organisation. Data / information management is largely a matter of individual preferences, with no common standards applied throughout the organisation. Attempts to streamline data / information collection, formats, quality control, data correction, meta documentation have been taken in the past (e.g. reviews of GIS and RS data and meta data in 2001 and 2002), but follow up has been lacking consistency.</p>

Under the overall guidance of Component 1, and in close cooperation with Components 2. and 4., existing standards and guidelines for data / information collection, formats, quality control, data correction, and meta documentation at MRC, the RFMMC, and the NMCs will be reviewed. Those standards and guidelines that represent current best practices within the organisation will be further developed, with input from subject matter specialists, and considering established industry norms and standards, such as FGDC (U.S. Federal Geographic Data Committee) standards or ISO 19115 - "Geographic Information – Metadata". Those standards will be established as binding throughout the organisation, i.e. for all other components of the IKMP and other MRC programmes / activities.

Results Standards and guidelines for data / information collection, formats, quality control, data correction, and meta documentation available and consistently applied in MRC, RFMMC, NMCs.

Activity 3.1.4 – Implement quality control and data correction procedures

Purpose To implement quality control and data correction procedures for all existing GIS and closely related data holdings of MRC, including those at the RFMMC and the NMCs.

Approach Activity 3.1.3 will set, amongst others, standards for quality control and data correction. Implementing these standards retrospectively for existing and proactively for newly incoming data and information will however require a major allocation of staff resources, and thus justifies an activity specifically addressing this issue.

Following the standards established under Activity 3.1.3, all existing and newly incoming GIS and closely related data (e.g. socio-economic data holdings) at MRC, the RFMMC, and the NMCs will be quality controlled, corrected, and re-formatted as appropriate, and meta data will be updated accordingly.

Results Quality controlled, corrected, properly formatted, and appropriately documented GIS and related data holdings, ready for integration into the MRC database and use by MRC and partner agencies.

Activity 3.1.5 – Develop and implement data integration, content management, and meta data management procedures

Purpose To develop and implement the thematic database architecture, and related data integration, content management, and meta data management procedures for the MRC database, including its components at the RFMMC and the NMCs.

Approach The preceding activities will establish standards and guidelines applicable at the level of individual data sets, the implementation of which will largely be the responsibility of other components of the IKMP, and other MRC programmes. However, in addition there needs to be an overall thematic architecture of the database, and related procedures for its management as the central data repository, the implementation of which will be the responsibility of Component 3.

Existing data holdings at MRC, RFMMC, and NMCs will be reviewed. Based on this review, an overall thematic architecture of the database and related procedures for its management will be developed. Amongst others, these procedures will specify (a) levels of access to data / information reflecting MRC disclosure policies, (b) responsibilities for integrating (uploading) data and meta data to the database, (c) procedures for spatially indexing and linking the various individual parts of the database, (d) versioning and removal / archival of data sets. The thematic architecture and the related procedures will be implemented by Component 3. as an ongoing activity, and will be reviewed annually.

Results Appropriate MRC database architecture in place, database content and meta data managed and accessible.

Activity 3.1.6 – Upgrade and maintain IT infrastructure

Purpose To establish an optimally effective and efficient IT infrastructure with minimised downtimes and local maintenance available.

Approach Component 3., as the backbone of the IKMP tasked to maintain a unified database and provide related services, will requires a fast, reliable, and compatible IT infrastructure in all parts of the MRC, including the RFMMC and the NMCs, which supports the access to the database.

This activity will implement and maintain the IT infrastructure designed under Activity 3.1.2.

Results Appropriate IT infrastructure in place, connected, and maintained in MRC, RFMMC, and NMCs.

6.3 Output 3.2 – Data access, management and analysis services are provided to MRC and external clients

Activity 3.2.1 – Assess existing and optimise future data flows

Purpose To gain better understanding of existing and to optimise future data flows between MRC and primary custodians.

Approach The MRC stores and manages several thematic datasets (environment, socio-economic, hydrology, etc.) which were mainly collected by the NMCs and the line agencies in the member countries. In view of the data and information needs of the MRC programmes, the MRC datasets need to be updated, or even (re)defined. To date, data flows which are aimed to update the already existing datasets are not efficient, or are even unpredictable in time. Moreover, some datasets and their respective data flow mechanisms do not yet exist. Component 3 shall organise a series of data review interviews targeted at all MRC programmes components and entities (within the MRC, within the NMCs and with the primary custodians) in order to describe accurately which data sets/flows are necessary for what purpose. Consequently a series of recommendations and actions will be formulated to

improve and optimise these data sets/flows. This activity will be executed in close cooperation with the needs assessments formulated under component 1.

Results Optimised datasets and data flows maintained by the MRC and a clear understanding about their necessity and purposes.

Activity 3.2.2 – Support and supervise application of standards and guidelines in all MRC programmes

Purpose To ensure the application of standards and guidelines for data / information collection, formats, quality control, data correction, meta documentation, in all MRC programmes, by providing training and supervision.

Approach Standards and guidelines for data collection, formats, quality control, data correction, and meta data documentation will be developed under activity 3.1.3 and will be implemented for GIS and related data holdings under activity 3.1.4. However, in order to guarantee consistent implementation of all data and information standards and guidelines within MRC entities other than those of the IKMP, efforts and cooperation from all MRC programmes are required. Individual subject matter specialists in all MRC programmes, including Components 2 and 4 of the IKMP, will be appointed and trained, and will be responsible for ensuring the data quality. In line with activity 3.1.3, the IKMP will supervise the overall application of standards and guidelines within the MRC, and will provide implementation support during the start-up phase of the IKMP. After that, IKMP will only assist on this matter the programmes with very low capacity or new programmes. All newly incoming data sets will undergo a final data quality audit under component 3 during check in and before integration into the database.

Results Quality controlled and properly documented multi-sectoral data ready for integration into the MRC database.

Activity 3.2.3 – Provide technical support for data and information collection and management

Purpose To provide technical support for data / information collection of GIS and closely related data types.

Approach To date, data collection and management with regard to GIS and related datasets is not streamlined throughout the MRC and strongly disrupt fluent MRC programme operations. This is due to the fact that data collection and management within the several programmes has not been executed in a coordinated and synchronised manner, or is even due to the fact that data collection and management has not yet started due to a lack of capacity within the respective programmes. During the IKMP formulation process, all the MRC programmes have emphasised the importance and urgent need of having a pooled/centralised strong capacity within the MRC's several programmes has not been executed in a coordinated and synchronised manner, or is even due to the fact that data collection and management has not yet started due to a lack of capacity within the respective programmes. During

the IKMP formulation process, all MRC programmes have emphasised the importance and urgent need of having a pooled/centralised strong capacity within the MRC that can assist individual programmes with their data collection and management activities. Through component 3, the IKMP will ensure synchronisation of data collection and management throughout other MRC programmes, and will thus reduce duplication of efforts made for data collection and redundancy of data holdings. This will be achieved by providing advisory and technical support services to the other programmes, avoid isolated data collection and management, and consider the entire data collection/management flows.

Results Synchronised and coordinated data collection and management on GIS and related datasets in all MRC programmes.

Activity 3.2.4 – Design and provide suitable interfaces to integrate data and information collected

Purpose To provide suitable interfaces for other components of IKMP and other MRC programmes to integrate data / information collected into core GIS and databases.

Approach According to activity 3.2.1 the necessary data flows will be established and/or optimised. While activity 3.2.1 will concentrate on determining and documenting the needs of, and activity 3.2.3 on organising data flows, this activity will provide complementing services at the technical level. Since data collection and transfer will often be a recurrent activity, the IKMP will design and install suitable interfaces, ranging from simple technical protocols for data upload to complex computer routines, in order to guarantee consistent and automatic actualisation of the database when new data arrive. These interfaces shall avoid repeated and time consuming manual interventions, and potential errors/inconsistencies due to manual data manipulation. In case of the organisation of new data surveys, development of such interfaces must be automatically considered and executed along the survey process.

Results Efficient upload mechanisms for recurrent data arrivals.

Activity 3.2.5 –Execute requests for data processing, analysis, and delivery services

Purpose To support other components of IKMP and MRC programmes with data processing, analysis, and delivery services as needed.

Approach Data processing, analysis, packaging and delivery on request by other programmes has been one of the core activities of the Technical Support Division in recent years. Examples include the production of many analogue and digital maps and atlases (e.g. CD's on socio-economic aspects of the basin, on people and the environment, etc). This activity is likely to continue and even to expand as data sets held by the MRC are improved in quality, are meaningful integrated, and are collected for well targeted client oriented purposes by the IKMP. Hence, this activity will provide processing, analysis, packaging and delivery services as a routine activity (following needs assessments) or responding to ad hoc requests.

Results Client oriented services on data processing, analysis, packaging and delivery are available on a routine and ad hoc basis at the Technical Support Division of the MRC.

6.4 Output 3.3 – Relevant geospatial information is acquired and incorporated in GIS

Activity 3.3.1 – Design and implement data and information needs assessments

Purpose To design and implement data and information needs assessments.

Approach Geospatial data are the core and are fundamental for the sound operation of the MRC. Under the overall coordination of IKMP component 1, this activity will design and execute concrete data and information needs assessment on geospatial data and this throughout the MRC, the NMCs and the line agencies. The MRC has already developed a significant set of geospatial datasets during the course of its existence. However, some datasets require a complete update. Given the recent evolution in data availability procedures (e.g. some satellite imagery is available at low price or even for free), data acquisition techniques (e.g. collection of high resolution altitude data) and improvements on data resolution with regard to data (1 m or less for ground resolution), the IKMP will, through this activity, investigate and describe the needs for thematic geospatial data in all MRC programmes, NMCs, and relevant partner line agencies. This will largely be implemented through providing subject matter specialist input to needs the assessments conducted in Activity 1.3.1.



Results Detailed description of campaigns and planning on data and information needs assessment, and of their results.

Activity 3.3.2 – Design and prioritise data acquisition and generation activities

Purpose To organise and plan a data acquisition schemes that are feasible in costs and that are timely in supporting the execution of the MRC programmes.

Approach Consequently to the needs identified in activity 3.3.1, concrete plans for data acquisition will be formulated. These plans will include setting of clear priorities of those data themes that most urgently need to be updated or even require collection of an entirely new dataset.

Results Detailed planning for data acquisition.

Activity 3.3.3 – Coordinate and supervise acquisition and generation of new data

Purpose To guarantee synchronisation of data collection activities and ensure application of the same standards (see activity 3.1.3) throughout all acquisition processes.

Approach New data acquisition activities will be coordinated and supervised in a centralised way through this activity. This centralised approach in coordination and supervision shall allow to apply the same standards (e.g. use of same coordinate system, de-

velop metadata, etc) throughout the different data collection activities and will make sure that synchronisation is optimal.

Results Newly collected data sets are delivered to the MRC conform to agreed standards and guidelines and do not conflict in time or content with each other.

Activity 3.3.4 – Acquire and process new data

Purpose To acquire new data which are not yet part of the existing MRC databases.

Approach Following data and information needs assessment, this activity will investigate whether already existing datasets, in other organisations than the MRC and on the Internet, such as historical datasets, recent satellite images or global / regional topographic and environmental data sets etc. can be procured and can be included in the MRC database. A prime partner for cooperation under this activity is the ADB GMS Environment Operations Centre in Bangkok. Recovery of such datasets will often need data processing. The latter must be studied by this activity in terms of cost effectiveness and technical feasibility, and will be executed by this activity in case there are minor data processing requirements.

MRCS has collaborated with the Canadian Space Agency on a long term basis. A 5 year extension to the current agreement will be signed soon and will cover processing and delivery of remote sensing data to the MRCS. The FMMP and its needs for flood mapping, model verification and improvement and flood forecasting will be a primary client for the RS data. Also other Programmes such as EP, BDP and IKMP Modelling component will use the RS data extensively.

Results Newly collected data sets, necessary for the operation of the MRC programmes, are recuperated from existing datasets in other agencies/organisations, and are integrated in the MRC database.

Activity 3.3.5 – Generate new data

Purpose Respond to existing data and information gaps described by the needs assessments.

Approach While activity 3.3.4 attempts to fill data gaps through recuperation from already existing data sets in other organisations, this activity will focus on the acquisition of new data sets that have to be generated. This could include high resolution elevation models of the flood plain and associated gravimetric surveys, or new programmed satellite image acquisitions. Modelling activities in the different MRC programmes might require other highly specific data sets, such as land cover data. As this activity will require specialist skills and major data capture and processing efforts, for which there is no sufficient capacity within the IKMP itself, it will mostly be implemented through outsourcing contracts.

Results Newly collected data sets, necessary for the operation of the MRC programmes, are generated and integrated in the MRC database.

6.5 Output 3.4 – Capacity building services to access and manage data and produce maps

Activity 3.4.1 – Conduct GIS and database capacity needs assessments

Purpose	To generate a concrete and actual description of the capacity needs with regard to issues on GIS, remote sensing, database management and visualisation of data integration, to identify existing gaps/shortcomings in capacity, and to formulate measures to solve capacity gaps.
Approach	In close cooperation with outputs 1.3 (functional analysis and needs assessments) and 5.4 (IKM Human Resources improved) specific subject areas closely related to the activities of this component, such as GIS, remote sensing, database management, visualisation, will be delineated, described and assessed whether the respective existing capacity is sufficient. Deficiency in capacity and mitigation actions will be described.
Results	Detailed description of capacity needs and action plan for resolving capacity gaps.

Activity 3.4.2 – Design and develop content and modes of delivery for capacity building activities

Purpose	To compile training materials and determine best practices to train.
Approach	Based on needs assessments, training curricula will be set up and new/additional content will be designed and developed. The most efficient ways of building capacity will be determined according to the capacity needs described under activity 3.4.1, and in accordance with the standards, methodologies and processes established under activity 5.4.2. Appropriate modes of delivering content will be determined including classroom training, on-the-job training, coaching, mentoring, etc.
Results	Training packages and guidelines on how to use them.

Activity 3.4.3 – Manage participation in capacity building activities

Purpose	To ensure that staff from MRC, NMCs and line agencies participate in the training modules developed under activity 3.4.2
Approach	Describing the necessary capacity and developing means of training and modes of delivery is not sufficient to guarantee successful capacity building. In close cooperation with the activities under Output 5.4, this activity will identify, contact and enrol appropriate candidates, and enquire for feedback from the trainees on the capacity building packages they followed. It will maintain a database on the participation in capacity building activities in order to ensure consistency in capacity building. This is especially important for modular training sequences, which require participants to follow a course over an extended period of time.
Results	Capacity gaps are actually resolved.

Activity 3.4.4 – Implement capacity building activities following IKM Appropriate Technical Training Standards

Purpose	To ensure the implementation of capacity building activities in accordance with standards, methodologies and processes established under activity 5.4.2.
Approach	This activity will deliver the capacity building packages developed under Activity 3.4.2 to the target audiences. Standards, guidelines and procedures on training developed by the MRC in general and by the IKMP in particular will be applied by this activity in order to secure the quality and consistency of capacity building delivery. Follow up to and impact evaluation of capacity building measures, as well as feedback loops ensuring continuous development and re-usability of the training materials and modules will be part of this activity.
Results	Appropriate and high quality capacity building is provided to target audiences.

6.6 Output 3.5 – Visualisation of data and information for improved communication

Activity 3.5.1 – Evaluation of commercial and open source visualisation and map production software

Purpose	To identify the most suitable software options for visualisation and map production software.
Approach	Visualisation and professional map production are important and new fields of activity in the MRC under the IKMP. So far little experiences exist with suitable software solutions. The actual needs and requirements of the IKMP will be identified. This activity will conduct tests with commercial and open source software in close coordination with Component 4.
Results	Best value/suitable software with regard to visualisation and map production is chosen in line with the MRC technical and capacity circumstances and requirements.

Activity 3.5.2 – Establish map design and rendering services at MRC

Purpose	To organise operational procedures which support map design and map rendering in a consistent manner.
Approach	Professional map design and rendering is a new field of activity for MRC. This activity will install the chosen software solutions (see activity 3.5.1) and set up the necessary hardware, including plotters for rendering small volumes of hardcopies in-house. It will develop suites of map products by interpreting existing needs assessments and transposing them to design concepts and production lines (processes). If necessary, additional needs analysis will be conducted.
Results	Routine map design and rendering services available at the Technical Support Division of the MRC.

Activity 3.5.3 – Establish 3D design and rendering services at MRC

Purpose	To organise operational procedures which support 3D design and map rendering in a consistent manner.
Approach	Professional 3D design and rendering is a new field of activity for MRC. This activity will install the chosen software solutions (see activity 3.5.1) and set up the necessary hardware. It will develop suites of 3D products by interpreting the existing needs assessments and transposing them to design concepts and production.
Results	Routine 3D design and rendering services available at the TSD of the MRC.

Activity 3.5.4 – Establish map design and rendering services in IKM units of NMCs

Purpose	To transfer capacity that is built under activity 3.5.2 to the NMCs.
Approach	Professional map design and rendering capacity built at the MRC will be transferred to the NMCs. Hardware and software will be installed with support by the MRC core team and advice will be provided on the standardisation of products, based on design concepts and production lines developed by the MRC core team. The NMC staff will be trained and coached comprehensively by MRC core team staff. Small volumes of hardcopies will be produced in-house under this activity. This is the core technical activity to support the establishment of IKM Units in the NMCs under Activity 1.2.1, based on which other services of the IKM Units may be developed.
Results	Routine map design and rendering services available at the NMCs.

Activity 3.5.5 – Establish 3D design and rendering services in IKM units of NMCs

Purpose	To transfer capacity that is built under activity 3.5.3 to the NMCs.
Approach	Professional 3D design and rendering capacity built at the MRC will be transferred to the NMCs. Hardware and software will be installed with support by the MRC core team and advice will be provided on the standardisation of products, based on design concepts and production lines developed by the MRC core team. The NMC staff will be trained and coached comprehensively by MRC core team staff. Small volumes of hardcopies will be produced in-house under this activity.
Results	Routine 3D design and rendering services available at the NMCs.

Activity 3.5.6 – Establish hardcopy printing services for 3D and map products

Purpose	To establish hardcopy printing services for 3D and map products using commercial service providers.
Approach	With the in house means (such as plotters) available at the MRC, the IKMP will be able to produce only relatively small numbers of hardcopies. For production of larger volumes, work needs to be outsourced to commercial service providers. Outsourcing is a relatively new concept for MRC, there is e.g. very little experience in TSD to manage outsourcing processes. Therefore procedures and capacities need to

be developed that ensure smooth interfacing of design activities in house and their reproduction, including feedback loops for quality control.

Results To establish processes which ensure high volume and quality printing services.

7 Component 4, Modelling

7.1 Immediate Objective and Associated Outputs

Immediate objective *Immediate Objective 4* - Providing the MRC, riparian countries and other clients with decision support tools, services and capacity for planning, forecasting and impact assessment.

Outputs *Output 4.1* - Operational and well maintained modelling platform.
Output 4.2 - Visualisation tools to communicate modelling scenarios and assessments (for the most part optional).
Output 4.3 - A validated Modelling Toolbox that provides tools to assess impacts and alternatives of proposed developments (optional).
Output 4.4 - Modelling services and data products focusing on basin-wide issues
Output 4.5 – Modelling services focusing on national and trans-boundary feasibility, planning and scenario studies.
Output 4.6 - Optional services and case studies (optional).

Optional outputs as indicated above are outside the core programme budget.

7.2 Output 4.1 – Operational and well maintained modelling platform

Activity 4.1.1 - Review of the existing DSF platform based on user experiences

Purpose Assessment of the current DSF limitations from the user point of view; assessment of potential for accommodating future needs and model expansions

Approach Current DSF limitations are (i) complex to learn and use; (ii) under-utilised; (iii) duplicate development of database technologies and policies such as access rights; (iv) expansion for new models and tasks difficult or impossible; (v) analysis and visualisation tools not sufficient; (vi) models mostly for water quantities. On the other hand there are a number of useful tools and features that are used routinely. Also original data gaps have been filled and data errors corrected in the DSF modelling database. A detailed analysis of the DSF will be conducted, especially the DSF design and technology. This will feed to the DSF architecture and development plan.

Activity 4.1.2 – Design of DSF architecture and development plan taking into account software evaluation and past experiences

Purpose Production of a plan and guiding principles for DSF development.

Approach Both commercial and open-source modelling platform software will be evaluated. The DSF review will be taken into account. The architecture of the plan will be devised based on the current activities the platform has to accommodate, connectivity requirements (to the MRC database, Portal etc.) and user requirements. Timing of DSF training will be scheduled for a development phase where the structure and functionalities of the critical parts of the DSF are expected to be consolidated.

Activity 4.1.3 – Design of data products

Purpose Provide accessible and useful data products for planning and decision making processes

Approach MRC programmes, LAs and other stakeholders will be consulted for their data requirements. Sample products will be produced and developed further based on the user feedback. This activity works under the needs assessments of Components 1 and 3. These components give the guidelines and main directions and component 4 refines these based on the model capabilities, available post-processing tools and user experiences.

Activity 4.1.4 – Modelling platform development

Purpose Implementation of the modelling platform

Approach The platform components are:

- Database access interface.
- Model input/output data processing and analysis software.
- General/unified model user interface.

The development work will be scheduled and prioritised based on available resources and overall IKMP development. Database access interface is of the highest priority if modelling will start to rely on the IKMP central database instead of duplicating data. Component 3, Activity 3.2.4, provides interfaces for bringing data into the central database and for retrieving data from it. Component 4 adapts to these interfaces and uses them to automate use of the central database in all required DSF functionalities and routines

Activity 4.1.5 - Platform maintenance and support

Purpose Keep the modelling platform functional under software and hardware changes. Accommodate functions and user requests. Provide user support including manuals, advices and problem solving.

Approach MRC modellers will be trained for management, development and support of the platform. As the skills of the platform managers develop more and more complex and demanding tasks can be expected from them. It is mostly the responsibility of Output 4.3 to install new or further developed existing models into the platform, but the managers should have independent capacity.

A long term plan for handing over the software and its maintenance must be developed. This must take into account DSF development schedule, required time to acquire operation skills, and need for maintaining acquired knowledge through mentoring in case of staff changes.

7.3 Output 4.2 – Visualisation tools to communicate modelling scenarios and assessments

Activity 4.2.1 - Evaluation of commercial and open source visualisation software (Optional)

Purpose	Find most appropriate and cost-effective 3D visualisation solutions
Approach	Test and evaluate 3D visualisation software. The activity will be conducted jointly with Component 3, activity 3.5.1. Component 3 provides main guidelines and solutions. Component 3 will adapt these to the modelling specific requirements, especially 3D model user interfaces and production of 3D animations.

Activity 4.2.2 – Development of interactive 3D model user interface (inputs, outputs) developed (Optional)

Purpose	Interactive visualisation of model input/output data e.g. for decision maker demonstrations
Approach	Integrate 3D visualisation software to the modelling platform or when not feasible directly to the models.

Activity 4.2.3 - Model output processing for 3D GIS visualisation

Purpose	Enable use of the 3D GIS visualisation software for viewing model results
Approach	Conduct the activity in cooperation with Component 3. Process modelling outputs into suitable format for GIS visualisation.

Activity 4.2.4 – Development of 3D animations (Optional)

Purpose	Enable 3D visualisation of dynamic processes such as flooding, water quality development and erosion.
Approach	Use post-processing 3D animation software. Process model outputs into suitable format.

7.4 Output 4.3 – A validated Modelling Toolbox that provides tools to assess impacts and alternatives of proposed developments

Activity 4.3.1 - Evaluation of existing DSF models and other commercial / open source models (Optional)

Purpose	Find most appropriate and cost-effective models to be included in the Modelling Toolbox
Approach	<p>Test and evaluate different models. Selection of the model types is dependent on the intended applications. It is expected that at least the model types listed in the next activity will be included.</p> <p><i>Activity 4.3.2 – DSF Modelling Toolbox development (Optional)</i></p>
Purpose	Develop the DSF capabilities for required forecasting, scenario, planning and impact assessment work
Approach	<p>The selected models will be thoroughly validated and integrated in the modelling platform. It may be necessary to develop basic models to accommodate required functionality. The development work will include at least:</p> <ul style="list-style-type: none"> • Basin-wide hydrological / hydrodynamic model testing and upgrade. • Sediment / morphological / bank erosion model integration, testing and validation. • Water quality / nutrient / productivity model integration, testing and validation. • Watershed models development (distributed models). • Resource allocation, policy and decision support models. <p>The EP/BDP IBFM-process (Integrated Basin Flow Management) focuses on the use of modelling and impact assessment tools and could function as a natural platform for integration and formal acceptance of the tools and approaches by the countries.</p> <p><i>Activity 4.3.3 - Model maintenance and support (Optional)</i></p>
Purpose	Keep the models functional under software and hardware changes. Provide user support including manuals, advices and problem solving.
Approach	MRC modellers will be trained for model management and support. A long term plan for sustaining modelling skills and knowledge is of top priority. The extensive training required for acquiring independent modelling capacity requires plan to sustain modelling capability in case of organisation changes. The plan must take into account required time to acquire modelling skills, and need for maintaining acquired knowledge through mentoring in case of staff changes.
<p>7.5 Output 4.4 – Modelling services and data products focusing on basin-wide issues</p>	
<p><i>Activity 4.4.1 – Planning of the basin-wide modelling activities in coordination with the MRCS Programmes</i></p>	
Purpose	Establish a work plan for basin-wide modelling activities including integration with the MRCS Programmes.

Approach	<p>A number of central themes requiring modelling and decision support have been identified through interaction with the MRC programmes and other stakeholders. These include:</p> <ul style="list-style-type: none"> • Basin-wide hydrological/ hydrodynamic scenarios. • Sediments in the basin-wide scale. • Ecosystem productivity, especially Tonle Sap fisheries. • Sustainable agricultural and forestry development. • Support to basin wide socio-economic assessment, including trade-off mechanisms and possibilities of mitigating negative social impacts. • Other scenarios and services as requested. <p>The appropriateness of the themes and priorities will be verified with the MRC Programmes and the member countries.</p> <p>The tasks and responsibilities of the programmes and countries will be defined in the plan. The overall principle is that IKMP can implement the modelling activities, especially the more technical aspects of them, without extensive support from outside sources. The activities should be in good synergy with the MRCS and countries activities and communicated effectively to provide useful information. Close cooperation is required for the successful implementation of the activities.</p> <p><i>Activity 4.4.2 - Basin-wide scenario work</i></p>
Purpose	Provide requested information and support for sustainable development. Support modellers' independent capacity for problem solving.
Approach	<p>The key for any successful modelling and impact assessment is development of analytical capabilities to understand processes in nature, functioning of the modelling tools and especially the data produced from monitoring and modelling tools. In addition, it is not enough to have the analytical capabilities, but the modeller must be able to describe the results in a useful way for the users. In practice, these skills can be only acquired through project work, through using modelling tools for real-world problem solving. The project work will be supported by highly qualified international expert that participates in full-time basis in the project work.</p> <p>BDP will provide main socio-economic expertise related to the modelling. BDP will also have a dedicated modeller for liaising with the IKMP. In addition, there is need for limited model development related and Decision Support oriented socio-economic input within the Component 4 including:</p> <ul style="list-style-type: none"> • Cost-benefit analysis; • Livelihoods and vulnerability analysis; • Development impact analysis; • Guidance for modelling; and • Communication with the decision makers and other model result users. <p>Also ecological as well as other expertise is required for the case studies depending on their character.</p>

Activity 4.4.3 - Capacity building

Purpose	<p>(i) Establish capable MRC Modelling Team (Decision Support Team) and National Modelling/ Decision Support Teams working according to the IKMP guidelines and standards. (ii) Information dissemination and capacity building for the decision makers including improved capability to formulate scenarios and to use modelling results in problem solving and decision making process.</p>
Approach	<p>The sustainability of the modelling efforts depends crucially on maintenance of the modelling and impact assessment skills. The three layers of experts in MRC, riparian modelling teams and academic institutions will provide a pool of expertise that develops a corporate memory and is not too dependent on the availability of specific individuals. The role of the academic institutions has been recognised by both the MRC and NMCs. They are the most reliable repositories of models and modelling skills. Individuals working in for instance Line Agencies move easily to better paid positions in the public or business sector. Often also trained and capable individuals move overseas. In the academia the knowledge is more easily institutionalised. Universities also provide persons with required skills to the expert pool.</p> <p>The national teams function to a large extent identically compared to the MRC team. The difference is in the focus of the national teams on national and trans-boundary issues. The national activities will be realised under the coordination of the National Mekong Committees. National teams will be led by NMC coordinators. The coordinators connect to the Line Agencies, national programmes and other stakeholders securing provision of necessary data inputs and communication information to the planning and decision making process. The MRC and national teams share and exchange experts to strengthen the link between the countries and the MRC. International experts participate in the teams and the project work transferring problem solving skills and ownership of information technology methodology and tools.</p> <p>The teams will be trained to accommodate IKMP standards and procedures in its everyday work. Because the Component success is highly dependent on expert skills, both MRCS and national modellers will be selected through competitive processes.</p> <p>The decision maker capacity building aims at (i) increased use of the modelling results in planning and decision making and (ii) increasing decision maker involvement in the modelling process in order to produce useful and customer driven information and data products. The decision maker capacity building consists of conducting workshops and study visits; translating most important reports containing central information into local languages; and use of consultative approach for reaching the decision makers. The consultative process can be utilised for the Activity 4.1.3, Design of data products.</p>

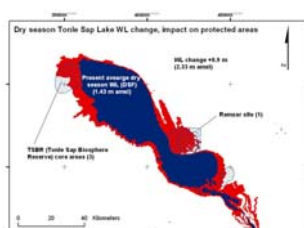
7.6 Output 4.5 – Modelling services focusing on national and trans-boundary feasibility, planning and scenario studies

Activity 4.5.1 – Planning of the national and trans-boundary studies

Purpose Establish a work plan for national and trans-boundary modelling activities including integration with the MRCS Programmes.

Approach The initial suggested applications include:

- River bank erosion control in the 4 riparian countries.
- Sand mining impacts and management in 4 riparian countries.
- Upstream navigational channel improvement.
- Lao hydropower development.
- Nam Songkhram flood, fisheries and irrigation management.
- Kok-river basin flood mapping and control.
- Transboundary flood management studies, especially Cambodian – Vietnamese border
- Tonle Sap infrastructure, irrigation and hydropower development and upstream impacts.
- Water quality at the border of Cambodia and Vietnam.
- Plain of Reeds management.
- Saline intrusion in Delta.
- Other scenarios applications as requested.



The appropriateness of the themes and priorities will be verified with the NMC-led country consultative process. This has already been partly realised in connection with the WUP-FIN project activities where applications and scenarios have been selected by the countries.

The tasks and responsibilities of the programmes and countries will be defined in the plan. The overall principle is that IKMP can implement the modelling activities, especially the more technical aspects of them, without extensive support from outside sources. The activities should be in good synergy with the MRCS and countries activities and communicated effectively to provide useful information. Close cooperation is required for the successful implementation of the activities.

Activity 4.5.2 – Local and trans-boundary scenario work

Purpose Supporting countries' independent capacity for problem solving and provision of required information for planning and decision making

Approach In the similar way as the MRC basin-wide work, the national teams will be supported by local and international socio-economic and other expertise.

7.7 Output 4.6 – Optional services and case studies

Activity 4.6.1 - Provision of optional services and case study work (optional)

Purpose Extensive development and service functions that are mostly tied to specific programmes/projects, outside of the core programme.

Approach The specific activities are listed below. Detailed design of the projects will happen together with the clients. In general the activities are extensive and are outside the core budget.

- Socio-economic integration to modelling.
- Ecological integration to modelling.
- Basin-wide model improvement.
- Advanced flood model development.
- Basin-wide flood modelling support to FMMP.
- Advanced drought model development.
- Drought forecasting and management support.
- Sesan, Sre Pok and Sekong River Basins Development Study in Cambodia, Lao PDR and Vietnam.
- Complex regulated systems (delta) model development.
- Delta Master Plan support.
- Trans-boundary flood management, Cambodia and Vietnam.
- Computational techniques, especially parallelisation, required for complex and/or large area modelling.

The socio-economic and ecological integration and considerations obviously require close coordination and cooperation with other Programmes, most notably BDP and EP. The socio-economic and ecological expertise specific for the Component 4 is needed for giving guidance to the modelling activities concerning key problem areas, specifying required model outputs, and recommending ways to integrate them with socio-economic data.

8 Component 5, Communications and Knowledge Management

8.1 Immediate Objective and Associated Outputs

Immediate objective	Immediate Objective 5 - Data, information and knowledge are easily exchanged and shared with a wide network of decision makers and other stakeholders.
Outputs	<p><i>Output 5.1</i> – User friendly and powerful MRC-IS Portal</p> <p><i>Output 5.2</i> - MRC Documentation and Learning Centre operational</p> <p><i>Output 5.3</i> - International and regional networks, and collaborative tools</p> <p><i>Output 5.4</i> – MRC Management Information System (MRC MIS)</p>

8.2 Output 5.1 – User friendly and powerful MRC-IS Portal

Activity 5.1.1 – Develop the next generation MRC-IS Portal

Purpose	To provide a user friendly and easily accessible platform for a wide range of people to access the MRC-IS data, information and knowledge
Approach	To further develop the MRC-IS Portal to meet the current and future demand, this component will analyse the effectiveness of existing MRC-IS Portal and undertake a user satisfaction survey and needs assessment. It will develop the next generation MRC-IS Portal incorporating improvements with respect to hardware, software, internet infrastructure and additional functionality including full integration of MekongInfo, the Document Management System, the Data Clearinghouse Mecha-

nism and the virtual networking tools of Output 5.3. To gain acceptance among senior staff and policy makers, care will be taken to ensure that sensitive data is adequately protected from unauthorised access and there are clear policies for users.

Results A fully functioning MRC-IS Portal is accessible on the internet and MRC intranet.

Activity 5.1.2 – Operate, maintain and improve the MRC-IS Portal

Purpose To ensure the uninterrupted operation of the MRC-IS Portal and to increase its functionality and usage

Approach An IKMP Web Team will be established within the TSD to provide support for operation and maintenance of the system. They will review existing procedures and guidelines for content management, operation and maintenance of the MRC-IS Portal and implement them and recommend improvements. They will provide regular backups, review security and test system speed. They will provide online support for users and forward requests through the Data Clearinghouse Mechanism. They will undertake an annual review and implement improvements based on this and the latest technological developments.

Results The MRC-IS Portal is running reliably, efficiently and effectively and the user base and frequency of usage is continually expanding

Activity 5.1.3 – Improve riparian agency internet infrastructure and knowledge

Purpose To enable riparian agencies to access the MRC-IS Portal and start using virtual technologies for improved communications and work processes

Approach In order to take full advantage of the communications power available from the internet and the MRC-IS, it is paramount that riparian agencies are properly equipped and connected. The improved communications available offers tremendous savings in costs and time and opportunities to reduce travel and meeting costs. Connecting the agencies to the internet provides additional incentives to change from current inefficient practices.

A number of methods will be employed to train the MRC and riparian staff in the use of the MRC-IS Portal. Workshops will be held to introduce the system and demonstrate to users its functionality and how they can gain benefits from its use. Online tutorials and manuals will be developed and available for users to download so that they can learn at their own pace. Update notifications when new features or information of interest are on the system will be sent to registered users to inform them of what is new in the system and to encourage them to use it. The IKMP Web Team will be available to answer queries from internet forms and by telephone when users run into problems.

Results The MRC, NMCs and Line Agencies are connected through fast and reliable internet infrastructure and staff are regularly using the MRC-IS.

8.3 Output 5.2 – MRC Documentation and Learning Centre operational

Activity 5.2.1 – Design Documentation and Learning Centre

Purpose	To design the upgrade of the Documentation Centre into an institution for education, information extraction and outreach
Approach	As part of Component 1, interest in upgrading the Documentation Centre will be assessed. Will it prove positive, then a study will be commissioned to examine the possibilities for upgrading the centre into a Documentation and Learning Centre (DLC) and including the design of various functions and investments. The DLC could provide non-formal education to the public through interactive exhibits, educational materials and ‘showcase’ publications including attractive maps illustrating aspects of development and conservation issues. The staff will have an ongoing job in digitising the documents within the library including indexing them for incorporation into the MRC-IS Portal and highlighting important publications that will be of major interest to a number of users.
Results	A costed plan for an upgraded Documentation and Learning Centre.

Activity 5.2.2 – Install and operate Documentation and Learning Centre

Purpose	To implement the plan to upgrade the DLC and fulfil its functions
Approach	Based on the design produced from Activity 5.2.2, the DLC will be upgraded through selection and installation of hardware and software systems for digitisation and electronic archiving and design and construction of exhibits. The DLC staffing numbers and capabilities will be increased and training will be provided to enable them to fulfil their new roles and responsibilities. The staff will then undertake their regular activities of collecting and converting documents into electronic form, indexing them to extract keywords and location information that will enable them to be spatially referenced and highlighting documents of particular interest to be showcased. The indexed documents will be uploaded to the MRC-IS Portal and linked within the system. The staff will prepare for and host events to highlight issues of interest for the public and interact with visitors. Maps, CD-ROMs, reports and other packaged information and knowledge products will be showcased and available for sale to the public. At the end of each year of operation, the DLC will be evaluated to determine its effectiveness for public outreach, the impact of the digitisation of the documents and to identify areas for improvement.
Results	The DLC will be functioning regularly and contributing to the digital Document Management System within the MRC-IS Portal.

Activity 5.2.3 Knowledge transfer to National Agencies

Purpose	To transfer the technology and lessons learned from the DLC to national agencies interested in establishing similar centres in their countries
Approach	Some countries have expressed interest in the idea of establishing a similar national Documentation and Learning Centre for similar purposes. In the case where this

has been decided and there are resources available for the establishment of a national DLC, provision has been made for an internship arrangement whereby two selected staff from one country who will work in the national DLC will work in the MRC DLC for a one year period and be trained in the functions of the centre. The hardware, software and exhibit designs will be able to be evaluated for possible implementation in the national centre. The DLC staff will prepare guidelines, standards and methodologies for Documentation and Learning Centre activities suitable for transfer to National Centres.

Results A methodology, guidelines and staff are prepared for technology transfer to a national DLC

8.4 Output 5.3 – International and regional networks, and collaborative tools

Activity 5.3.1 – Support regular meetings with riparian agencies and staff through IKM TACT

Purpose Initiate and facilitate the coordination forum for the implementation of IKMP

Approach The IKM TACT is a critical body for the development of the IKMP and the regular tri-annual meetings shall be continued throughout the IKMP to enable execution of their role. Given the intensity of activity in starting up the IKMP and the numerous important issues to be resolved, it is proposed to meet quarterly for the first two years.

Results IKM TACT meetings continue to provide guidance on all technical aspects of IKMP.

Activity 5.3.2 – Expand network to other organisations and regional initiatives

Purpose To widen the network of cooperating agencies to gain useful data, information and knowledge

Approach This activity will include identification of potentially useful organisations and regional initiatives and development and maintenance of relationships with them. In addition, IKMP will research information available from academic institutions, UN organisations, development banks, NGOs and other agencies that could contribute resource persons, studies, data and information.

Results A wide network of international and regional agencies cooperates with the IKMP to exchange and share data, information and knowledge.

Activities 5.3.3 – Assess, establish and promote use of virtual collaboration tools

Purpose To demonstrate and embed appropriate technology for improving communications and making work processes more efficient

Approach This activity will put in place the internet 'soft' infrastructure and seed the ideas among users to increase virtual collaboration. First, current levels of use of internet

communications will be assessed and potentially useful collaboration tools re-searched. Project teams of likely 'early adopters' will be set up to demonstrate how to utilise the tools in the regular work of MRC programmes. These will then spread through 'viral marketing', where the staff who have used the tools promote them to other staff and project teams. As more acceptance is gained, efforts will be made to promote the wider use of the tools through awareness raising, events, training, user support, monitoring and evaluation and design of incentives for users.

In this way, work collaboration and tacit knowledge management tools that are appropriate and shown to work, possibly including listserves, internet telephony, instant messaging, web conferencing, bulletin/discussion boards, webinars and wikis will become incorporated within MRC infrastructure and regular working practices. These will be embedded wherever possible within the MRC-IS Portal and the MRC corporate website.

Results A range of appropriate virtual collaboration tools are being used throughout the MRC Network and core group of dedicated users established in MRC programmes and projects.

8.5 Output 5.4 – MRC Management Information System (MRC MIS)

Activity 5.4.1 – Review of MRCS project practices and tools

Purpose To understand better the MRCS requirements and existing structures

Approach A MIS-expert will review the MRCS project cycle management practices and existing software tools. This will enable proper software selection and implementation planning.

Results (i) Selection of most appropriate MIS software platform, and (ii) implementation and capacity building plans.

Activity 5.4.2 – Development and implementation of the MIS

Purpose Technical realisation of the system.

Approach A MIS-expert will tailor the application of the selected software and install it to the MRCS server. MRCS project data will be migrated to the system and the system will be tested by the MIS-expert and users before operational use.

Results Functional MIS.

Activity 5.4.3 – Training and implementation of MIS practices

Purpose MIS is fully integrated in MRCS project cycle management and operations.

Approach The MIS training has to be differentiated according to the user level. The project staff needs to feed information to the system on the project progress and resources expenditure, middle management needs to follow project cycle and the top management needs a view of all projects, their status and their relationships. The

most appropriate training consists of presentation of system structure and functionalities followed by hands-on training. There has to be a follow-up for the training when users are learning the system and need support by instructions and problem solving.

Results

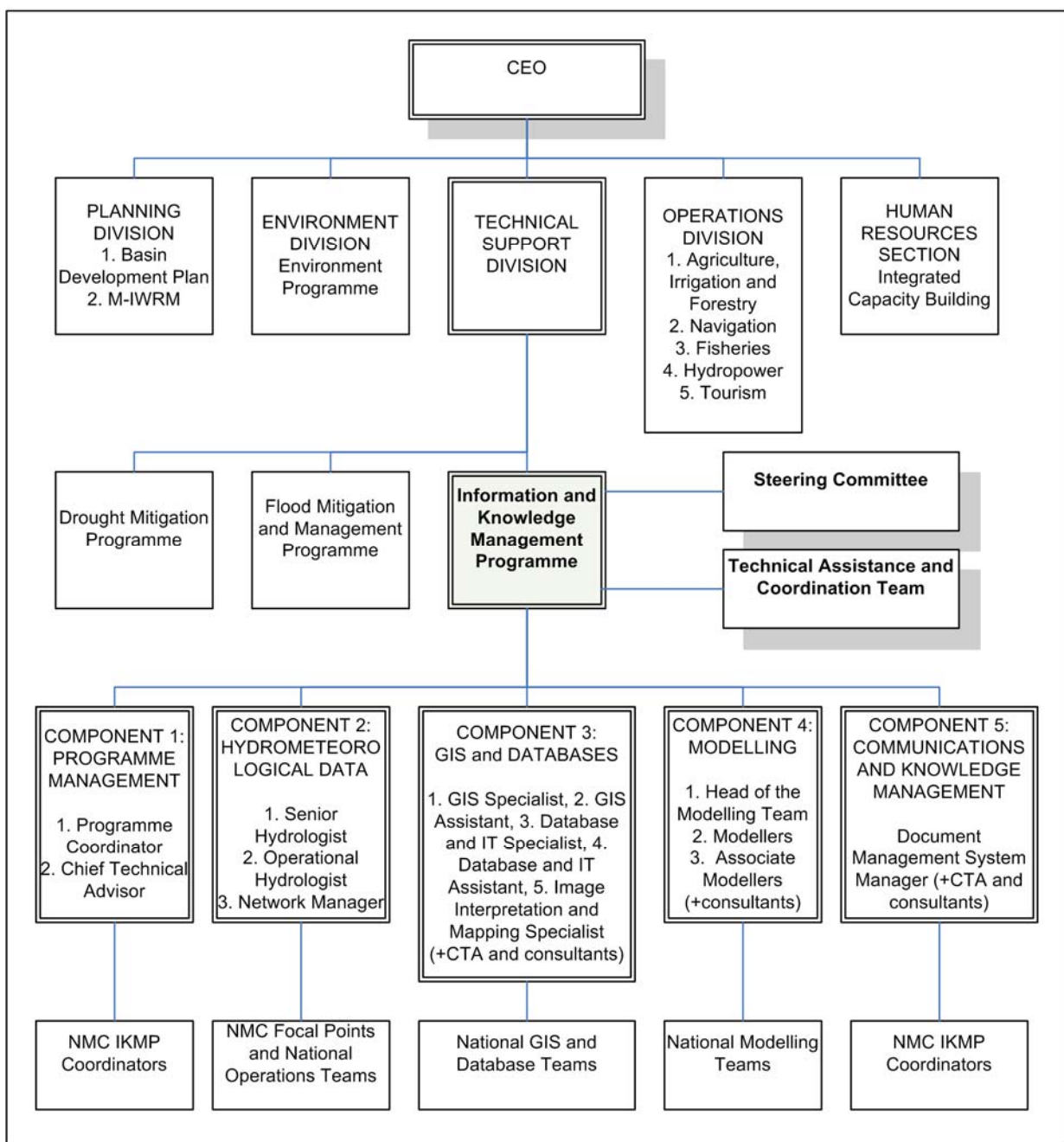
(i) Staff on all levels can use the system. (ii) System use is ingrained in the project work. (iii) System can be effectively utilised for project management and monitoring.

9 Programme Implementation

9.1 Organisation and Staffing

At the MRCS level, the IKMP will be implemented in the Technical Support Division (TSD). The IKMP will refer to the Director of the TSD. The Director of the TSD refers to the Office of the Chief Executive Officer of MRCS, who again refers to the MRC Joint Committee and the MRC Council.

IKMP Organisational Structure



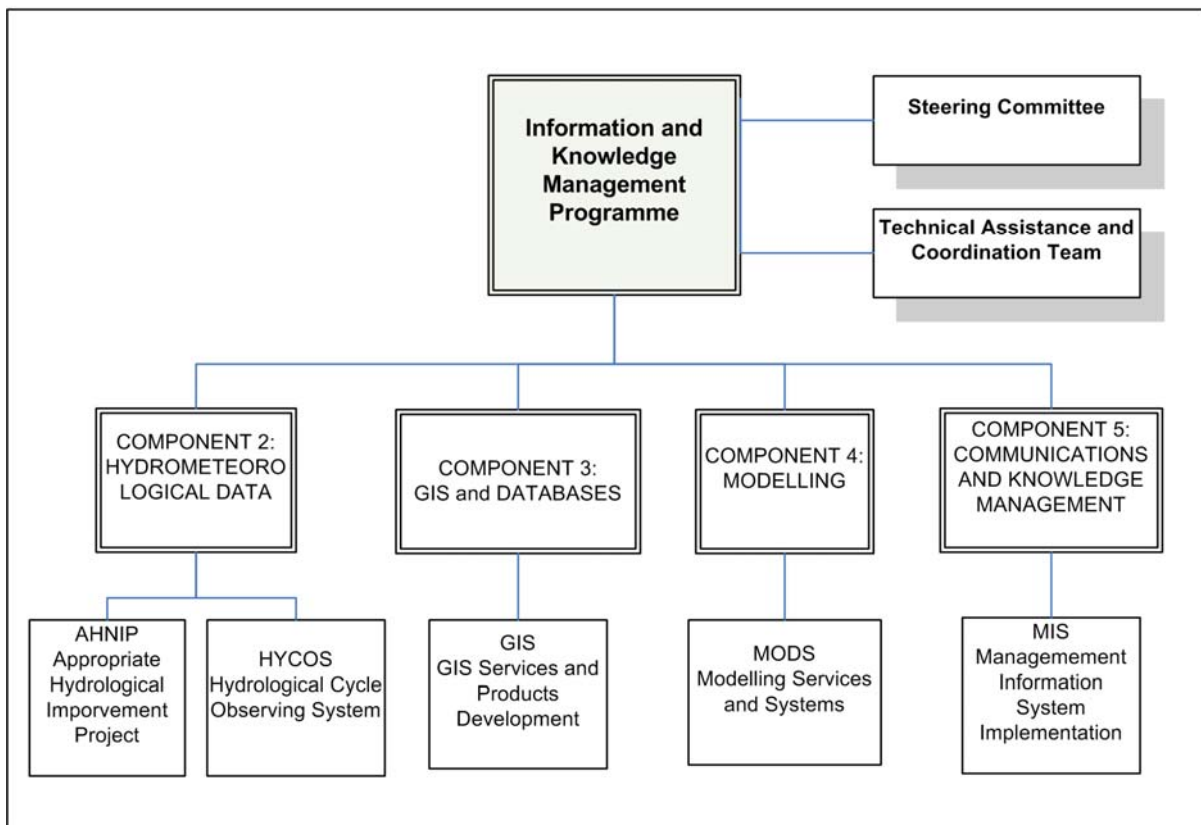
Programme structure and staffing

The IKMP management structure includes a riparian Programme Coordinator (PC), supported by an international Chief Technical Advisor (CTA). The PC and the CTA will also oversee IKMP Component 1. All other components will be overseen by designated Component Managers (riparian nationals, senior technical level), who will be supported by international and national Technical Advisors, a team of national technical staff (mix of junior and senior level), and will call on short term subject matter specialists. The Component Managers can be selected from the senior technical staff. For instance in Component 2 Senior Hydrologist will act as a Component Manager for Component 2.

IKMP projects

In addition to the permanent structure, IKMP accommodates a number of projects. The inclusion of projects is flexible depending on the needs and availability of funding. Currently two projects are running under Component 2: AHNIP and HYCOS (see Chapter 2.4). GIS Services and Products Development project is under preparation and funding is sought for it. Finland, as part of its support for IKMP, is funding Modelling Services and Systems (MODS) project. It conforms to the Programme Document Component 4 modelling framework and is expected to start fall 2007. MRCS Management and Information System Implementation will be realised also with Finland IKMP funding in near future.

IKMP Project Structure



KMP focal points	All MRC programmes and projects will designate 'IKMP Focal Points', who will facilitate exchange and sharing of data, information and knowledge, and follow up on IKMP issues within their areas of responsibility. The IKMP information exchange is facilitated by quarter-annual meetings where the IKMP staff and focal points participate.
IKMP at the regional level	Since 2003 TACT, the Technical Assistance and Coordination Team coordinates the development and implementation of the MRC-IS and the MRC Water Use Monitoring System (see annex C for the original TACT TOR). This regional forum is the successor to the Information System Design and Implementation Team (ISDIT) which was initiated by the MRC in 2000. It is suggested that the TACT is transformed and upgraded into the IKM TACT (see annex B for draft updated IKM TACT TOR). There are 4 advantages in this transformation: 1) recuperation of existing experience; 2) avoid duplication of effort which might be the result from installing a new regional coordination body for the IKMP; 3) avoid complex communication channels between regional coordination bodies; and, 4) the use of already existing networks. With regard to the transformation of TACT into IKM TACT, a revision of the ToR of TACT, and the approval of the MRC Joint Committee is required. TACT can recommend the changes in ToR to the MRC JC.
IKM TACT	The IKM TACT will act as the regional management committee (similar to the WUP Management Team) and will provide coordination on all matters relevant to the implementation of the IKMP which need regional consensus and requires conversion to national action. The IKM TACT will be composed NMC and MRCS members. The MRCS members include the Director of TSD, the IKMP Programme Coordinator, and the Chief Technical Advisor of the IKMP. NMC members include the IKMP National Coordinators.
Steering Committee	The functions of the Steering Committee are to monitor IKMP activities, guide IKMP development, give advice in problem situations, link IKMP to the political level and facilitate information exchange between the IKMP, NMCs and donors. Steering Committee will function under the MRCS CEO. Committee members include CEO, donor representatives, country representatives including Director Generals and the IKMP National Coordinators, IKMP Programme Coordinator, CTA and MRCS Programme Coordinator. The Committee will meet twice each year. The Steering Committee Terms of Reference is presented in Appendix D.
IKMP at the national level	It is suggested that the implementation of the IKMP at the national level the IKMP implementation structure could be handled flexibly, to accommodate the respective national institutional arrangements. For each member country an IKMP National Coordinator will be appointed who will be a member of the IKM TACT and who will be responsible for the national implementation of the IKMP. The latter will be established through the IKMP National Unit (headed by the IKMP National Coordinator).
The IKMP National Unit	The IKMP National Unit consists of national experts grouped according to subject matter (e.g. GIS/DB, modelling, etc.). The unit is headed by the IKMP National Coordinator and consists of staff of the NMCs and Line Agencies (primary custodians). Their task is the conversion of the regional agreements, made by the

IKM TACT, into national actions which are of a technical and administrative/organisational nature.

External linkages

The relationship between the IKMP and the NMCs and line agencies is necessarily very close as all activities will involve working with the national counterparts so that capacity is built throughout the programme and they are able to gain advantage from the investment in IKM.

9.2 Implementation Schedule and Priorities

The IKMP as described is intended to run over a five year period. However, as the programme particularly addresses longer-term goals such as capacity development, sustainability and institution building it will likely continue for a longer period.

A number of activities and projects are already ongoing, will continue and will be integrated into the new IKMP; these include the AHNIP, TSD and WUP-FIN Modelling Teams, the GIS section in the TSD, and the MRC-IS Portal. Other contextual projects will come on stream as funding becomes available, some of which have already had funds allocated but are not yet operational (e.g. HYCOS).

For its vital role as 'data turntable' within the MRC, Component 3: GIS and Databases, can be considered as the 'backbone' of IKMP. Together with Component 1: Programme Management, these two components are considered necessary for the IKMP implementation to start. The remaining components 2, 4, and 5 all include ongoing work which will continue while funding is sought for implementation of activities outlined under the IKMP. The programme has been structured to allow for work to proceed accordingly and to enable donor funds to address remaining activities within these components as they become available.

Within the different components, the following are considered to be the priorities:

- *Component 1.* It is considered critical to put in place the management of the IKMP responsible for overall coordination of the programme and to start the business processes that will allow the systematic approach to data, information and knowledge that is necessary for all programme activities.
- *Component 2.* The continued data collection and improvement of the hydro-meteorological network is the highest priority in order that the continuous long-term time-series database is maintained.
- *Component 3.* The core databases, data access and related technical services of outputs 3.1 and 3.2 need to be implemented in parallel and with high priority from the start of the IKMP, while the capacity building and map design and visualisation depend on this and can commence within a year afterwards. Data acquisition/generation can proceed as a lower priority at a later date, preferably outsourced.
- *Component 4.* The critical MRC and national service and capacity building functions of the modelling component will be continued seamlessly from the beginning of the year 2007. The DSF development will be realised in parallel taking into account specific Program needs, especially the FMMP schedule.

- *Component 5.* The activation of the IKM TACT meetings, continued development of the MRC-IS Portal and setting of the capacity building standards and ATTS are the highest priorities.

9.3 Planning, Monitoring and Reporting

Operational management of the IKMP will be a complex exercise given that it is a cross-cutting programme that will interact with and provide a wide range of products and services to all existing and future MRC programmes and MRC partner agencies, and will play a primary role in the consolidation and expansion of the wider network of stakeholders and cooperating organisations and agencies concerned with the Mekong River Basin. This will require attention to both the big picture and the small details and a flexible programme approach that can adjust to the rapidly changing technology and the opportunities these present.

Tentatively IKMP will produce the following planning documents:

- Inception Report; and
- Annual Work Plans.

A recurring issue in knowledge management is the difficulty of understanding the value of investments in data, information and knowledge. Often the returns on investments are far in the future such as when a long time series of water level and discharge information provides the required data that allows better estimation of flood risks. Other times it is hard to quantify the value of things such as the knowledge of staff, only that it is well understood that when that knowledge is gone, it is hard to replace. The IKMP will establish a baseline of the situation with respect to data, information and knowledge management based on the business process analysis and will identify indicators that can be used to assess these issues. A methodology for regular monitoring will be prepared, tested, and adopted. Findings of the recurrent monitoring will be documented into the IKMP Annual Progress Report and fed back into the annual planning process.

10 Budget

The indicative budget in USD illustrates the total value of the IKMP's 5 year period and the estimated distribution of effort between the five components. The budget is presented in the following categories: (1) IKMP core programme, including activities for which funding has already been committed; (2) of which already funded; and (3) Options. This clarifies the priorities for the IKMP and other possible investments in options that are considered important and useful but a lower priority.

Options

The options include additional consulting services and advisors, more training, a technical upgrade of the AHNIP project, improved discharge measurement, acquisition of a more accurate DEM for the floodplain, satellite imagery, and the development of additional models and more scenario analysis and case studies.

<i>Programme component / output</i>	<i>(1) Indicative budget IKMP core programme in USD</i>	<i>(2) of which already funded in USD</i>	<i>(3) Options in USD</i>
1 Programme Management	1,790,000.-	-	-
2 Hydro-meteorological Data	5,690,000.-	4,207,726.- ²	1,358,000.-
3 GIS and Databases	4,300,000.-	-	2,580,000.-
4 Modelling	6,340,000.-	-	4,280,000.-
5 Communications and Knowledge Management	3,640,000.-	-	-
Subtotal 1	21,760,000.-		
Contingencies (5% of Subtotal 1)	1,088,000.-		
Subtotal 2	22'848'000.-		
MRCs management and admin fee (11% of Subtotal 2)	2'513,280.-		
Total	25,361,280.-		

Annual distribution

The annual distribution of direct donor support is estimated to be:

Year 1	USD 3,300,000.-
Year 2	USD 4,200,000.-
Year 3	USD 5,400,000.-
Year 4	USD 6,000,000.- and
Year 5	USD 6,500,000.- (rounded).

² This includes
(i) for AHNIP the USD equivalent of remaining Australian funds of AUD 207,143.- from the AHNIP phase 1, as well as additional Australian funds to MRC for the AHNIP extension of AUD 211,532.- Australia also pledged additional funds to the Australian managing contractor of AHNIP, these are not included (exchange rate 1,00 AUD = 0.735 USD); and
(ii) for Mekong HYCOS funding support from AFD and the French GEF over the USD equivalent of EUR 3.0 millions (exchange rate 1,00 EUR = 1.300 USD)

Annex A: Linkages between IKMP and other Programmes

<i>IKMP Component</i>	<i>Other MRCS Programmes</i>	<i>Requirements for the IKMP</i>
	<i>Related activities</i>	
1 Programme Management		
(i) Integration of information systems, services and products throughout MRCS Programmes	All Programmes: data, information and knowledge processing	All: Coordination and collaboration within the MRCS
(ii) Enhancement of regional cooperation	AIFP: IKM Strategy and Concept development	All: Management of the internal information, knowledge and document flow All: Operationalisation of data, information and knowledge management, sharing and exchange
2 Hydro-meteorological Data		
Acquisition, processing and provision of required hydromet data	All: flow regime analysis related activities EP: sediment, water quality, toxic substances etc. monitoring FMMP: specific flood mapping related hydromet data collection FMMP: improvement of quality, reliability and delivery speed of on-line data; in close collaboration with the IKMP WUP/ M-IWRM: data correction, filling of gaps, data processing tools development (to be integrated in the IKMP)	All: Data flows must be ensured All: Appropriate data must be collected All: Provision of hydrological data products and support for data analysis EP: Coordination with water quality monitoring including sediment sampling WUP/ M-IWRM: Data products for rules and IWRM development
3 GIS and Databases		
(i) Integration of data and information	EP: geo-referenced ecological, wetland etc. data collection	All: Data storage and management
(ii) Provision of data access and support and value added information products	BDP: socio-economic data collection including development projects, hydropower, Planning Atlas FP: fisheries data collection Drought Management: precipitation and soil moisture assessment NAP: River Information Services FMMP: acquiring improved topographic, land use, infrastructure and socio-economic data for flood management; in close collaboration with the IKMP	All: GIS support and services All: Assistance and services in the production of information products including data visualisation EP: store heterogeneous data and information (time series, maps, reports, metadata) in central database DMP: assessment in remote sensing data storage and processing FMMP: copy and update of relevant MRCS central database data to the Flood Center

<i>IKMP Component</i>	<i>Other MRCS Programmes</i> <i>Related activities</i>	<i>Requirements for the IKMP</i>
4 Modelling		
Provision of tools, services and capacity for planning, forecasting and impact assessment	EP: IBFM (Integrated Basin Flow Management)	All: coordination among different modelling initiatives
	BDP: feasibility and impact analysis of development projects	All: provision of hydrological, water quality, sediment etc. data products and support for data analysis
	FP: fisheries management, especially Tonle Sap	EP: impact assessment of Basin Developments on flows, salinity, geomorphology, water quality, ecology and socio-economics
	NAP: feasibility, planning and impact analysis of navigational improvements	EP: flood dynamics impacts on wetlands
	Hydropower: feasibility and coordination of hydropower projects	BDP: support for feasibility and impact analysis of development projects
	Drought Management: irrigation management	FP: flow regime and development impacts on fish habitats and fisheries
	WUP/ M-IWRM: Development of Decision Support Framework	NAP: sustainability of dredging; channel impacts on flow, erosion and water levels; forecasting of water levels in development scenarios
	WUP/ M-IWRM: Rules for Water Utilisation and IWMR development	AIFP: impacts of inter- and intra-basin water transfer for irrigation
	BDP: further development of knowledge base and assessment tools (DSF, SIA, SEA and RAM); in close cooperation with the IKMP	Hydropower: generation of data for feasibility studies, hydropower impacts on water resources
	FMMP: provision of flood mapping and forecasting services	Drought management: assessment and forecasting for soil moisture and irrigation water availability
		WUP/ M-IWRM: Scenario analyses, IWMR support
		FMMP: installation and support of the DSF in the Flood Center (IQQM, SWAT, ISIS)
		FMMP: development of advanced flood modelling (improved accuracy, better description of structures, improved floodplain description, 2D flood dynamics)
		FMMP: operational flood forecasting development
5 Communications and Knowledge Management		
Exchange and sharing of data, information and knowledge	All: (i) information dissemination, (ii) data exchange and sharing	All: data sharing through the Portal
	AIFP: Mekong Info and Document Management System development	All: Document Management System
	NAP: operational River Information Services	All: facilitation for tacit knowledge maintenance
	FP: The Strengthening of Inland Fisheries Information Systems	EP: derived maps presented through the Portal
	BDP: assistance for knowledge base development for facilitating discussions about trade-offs	

Annex B: Draft IKM TACT Terms of Reference

Information and Knowledge Management

Technical Assistance and Coordination Team (IKM TACT), to be approved by the Joint Committee at its Twenty-Sixth Meeting in 2007

1 Background

In order to strive for the vision, namely, “an economically prosperous, socially just and environmentally sound Mekong River Basin”, the Mekong River Commission (MRC) aims to serve the Mekong riparian countries on the sustainable development of the Mekong River Basin water and related resources. One of the important means to achieve this Vision is to provide meaningful information and knowledge to relevant partners.

In July 2000, the MRC Secretariat started with the preparation for the development of the MRC Information System (MRC-IS). The System is intended to provide data and information services to the MRC, its member countries, and projects and programs. Hence, through the development of the MRC-IS, the MRC Secretariat plays a key role as a regional information hub, which will link partners through information networks, and which will provide them information and knowledge services and products. The Procedures for Data and information Exchange and Sharing (PDIES) and the Procedures for Water Use Monitoring (PWUM), approved by the MRC Council in 2001, 2003 respectively, provide a comprehensive and adaptive framework for data and information exchange, and water use monitoring, to support the implementation of the 1995 Mekong Agreement. Due to the close relationship between the requirements of the PDIES and PWUM and the support provided by the MRC-IS, a regional coordination forum for technical issues to serve both procedures, was established known as the “Information System Design and implementation Team (ISDIT)” in 2002 and then the “Technical Assistance and Coordination Team (TACT)” in 2003.

Following the request of the MRC Joint Committee in 2003 to take action to ensure on the sustainability of the MRC-IS, the Information and Knowledge Management Programme (IKMP) has been formulated in 2006. The IKMP was established with the ongoing activities and experiences in the development of the MRC-IS. However, the programme more strongly embeds the original objectives of the MRC-IS in the framework of Integrated Water Resource Management (IWRM), which results in transparent links between the IKMP and the MRC Strategic Plan 2006-2010, and between the IKMP and all other MRC programmes. The programme also expands and accentuates the original objectives of the MRC-IS towards catalysing dialogue based on sound knowledge.

The implementation of the IKMP requires regional coordination on several technical issues which are in line with those handled by the TACT. This IKM TACT Terms of Reference (ToR) is therefore an expansion and modification of the original MRC TACT ToR.

2 Objectives

The IKM TACT is a permanent body of the MRC serving as a forum for the MRC Secretariat and the National Mekong Committees (NMCs) to coordinate and agree at the regional level on all matters relevant to the IKM Function which is defined as *"the establishment and operation of all data, information and knowledge management, sharing and exchange activities within the MRC."* The IKM TACT also initiates the conversion of regional agreements into national actions with regard to the IKM Function.

The scope of work:

- 1 The implementation of the procedures under the 1995 Mekong Agreement related to information and data exchange and sharing, and water use monitoring, namely: 1) Procedures for Data and Information Exchange and Sharing; and, 2) Procedures for Water Use Monitoring;
- 2 The implementation of new procedures, guidelines and standards established under the IKMP.

3 Functions and Responsibilities of the IKM TACT

The establishment, maintenance and improvement of the operation of the IKM Function will be institutionalized through the IKM Guidelines, and the implementation of the IKMP. As mentioned earlier, the IKMP more strongly embeds the original objectives of the MRC-IS more firmly in the framework of the IWRM, which results in transparent links between the IKMP and the MRC Strategic Plan, and between the IKMP and all other MRC programmes. The programme also expands and accentuates the original objectives of the MRC-IS towards catalysing dialogue based on sound knowledge.

The IKM TACT shall:

- 3.1 Serve as the forum for coordination between the MRCS and the NMCs for all matters relevant to the establishment, maintenance and improvement of the operation of the IKM Function as implemented by the IKMP, and the development and implementation of the MRC-Water Use Monitoring System (WUMS).
- 3.2 Serve as the forum for the preparation, consultation and agreement on the IKM guidelines, to be submitted to and approved by the MRC Joint Committee
- 3.3 Serve as a mechanism to assist the MRC in the implementation of the PDIES, PWUM, and the IKM Function through the IKM guidelines and the IKM Programme including:
 - 3.3.1 designing, developing/establishing, implementing and improving the MRC-IS, the DSF, and the MRC-WUMS;
 - 3.3.2 prioritizing, formulating and recommending data, information and knowledge needs and updates;
 - 3.3.3 prioritizing, drafting and recommending standards on, among other matters, format, classifications and data, information and knowledge quality;

- 3.3.4 prioritizing, drafting and recommending relevant technical guidelines;
- 3.3.5 planning and drafting delivery schedules;
- 3.3.6 preparing for approval by the Joint Committee (JC) modalities and verification guidelines for data, information and knowledge exchange and sharing, and for water use monitoring;
- 3.3.7 drafting data license agreements including obligations and responsibilities of users;
- 3.3.8 implementing monitoring activities; and
- 3.3.9 undertaking other tasks as instructed by the JC.

MRC-WUMS

The Mekong River Commission Water Use Monitoring System (MRC-WUMS) consists of three components:

- 1 The physical equipment and related structures (i.e., relevant water measuring devices such as: stream flow/level and reservoir gauges, water quality monitoring stations, meteorological and hydro-meteorological facilities, data transmission means by telephone, telemetry and satellite, and data gathered through remote sensing technologies). The physical equipment and related structures are normally located in and managed/owned by respective country;
- 2 Various procedures (i.e. relevant monitoring methodologies, operation and maintenance requirements and processes, calibration standards and verification protocols, and data collection and communication procedures); and
- 3 Related personnel/institutions/organisations (i.e., those directly involved in the operation and maintenance of the physical equipment and related structures through the various procedures).

4 Composition and Meetings

The IKM TACT shall be composed of four members from each NMC and three members from the MRC Secretariat representing the Technical Support Division (TSD): the Director of TSD will serve as Convener while the IKMP coordinator, assisted by the Chief Technical Adviser, will serve as Secretary. The NMC's members should be led by an officer at decision-making level. One of the members of the NMC should be the IKMP National Coordinator

Each NMC shall designate its representatives to the IKM TACT for a minimum period of two years and inform the MRC Secretariat. The members should have the following qualification:

- 1 A broad knowledge on data management, information technology, knowledge management and, preferably, on general concepts regarding databases and Geographic Information Systems;
- 2 A good knowledge on data and information availability and related monitoring systems within the MRC programs, NMCs, and line agencies; and
- 3 A basic understanding of the application of computer modelling relevant to the MRC programmes.

Each NMC shall inform the MRC Secretariat on the change of its representatives in the IKM TACT.

The IKM TACT meetings shall convene regularly as decided by its members or as directed by the JC. The IKM TACT may invite participation of other ad hoc members from time-to-time in accordance with the requirements of specific subjects under discussion.

Financial support will be provided for IKM TACT meetings from the IKMP, or other MRC programmes.

5 Decisions and Reporting

The IKM TACT will make decisions by consensus. Any pending issue shall be submitted to the JC for instruction and decision.

The IKM TACT shall prepare minutes after each meeting, review its activities, conclusions and recommendations and distribute them to all members.

The IKM TACT shall prepare an annual report to the JC regarding its activities and reviews of the appropriateness and applicability of the approved procedures and relevant IKM documents with recommendations for amendments if necessary.

6 Modification of the Terms of Reference for IKM TACT

The present ToR supersedes the ToR for TACT endorsed by the JC on 30 September 2003.

IKM TACT and NMCs may recommend modifications to this ToR to the JC.

Any modification of this ToR shall be approved by the JC.

Annex C: Original TACT Terms of Reference

**Technical Assistance and Coordination Team (MRC TACT)
Approved by the Joint Committee at the 18th Meeting,
30 September 2003**

1 Background

In order to strive for the vision, namely, “an economically prosperous, socially just and environmentally sound Mekong River Basin”, the Mekong River Commission (MRC) aims to serve the Mekong riparian countries on the sustainable development of the Mekong River Basin water and related resources. One of the important means to achieve this Vision is to provide meaningful information to relevant partners.

In July 2000, the MRC Secretariat started with the preparation for the development of the MRC Information System (MRC-IS). The System is intended to provide data and information services to the MRC, its member countries, and projects and programs. Hence, through the development of the MRC-IS, the MRC Secretariat plays a key role as a regional information hub, which will link partners through information networks, and which will provide them information services and products.

The Procedures for Data and information Exchange and Sharing (PDIES) and the Procedures for Water Use Monitoring (PWUM), approved by the Council in 2001 and 2003 respectively, provide a comprehensive and adaptive framework for data and information exchange, and water use monitoring, to support the implementation of the 1995 Mekong Agreement. Due to the close relationship between the requirements of the PDIES and PWUM and the support provided by the MRC-IS, it is a “technical body” of the MRC linked to serve both procedures, known as “Technical Assistance and Coordination Team”.

2 Objectives

2.1 MRC Technical Assistance and Coordination Team (TACT)

The TACT is a permanent body of the MRC serving as a forum for the MRC Secretariat and the National Mekong Committees (NMCs) to coordinate and agree all matters relevant to the implementation of the procedures under the 1995 Mekong Agreement related to information and data exchange and sharing, and water use monitoring, namely:

- 1 Procedures for Data and Information Exchange and Sharing
- 2 Procedures for Water Use Monitoring

The specific responsibilities of the TACT are to establish, maintain and improve the MRC-IS (ref. 2.2) and the MRC Water Use Monitoring System (ref. 2.3).

2.2 Mekong River Commission Information System

The Mekong River Commission Information System (MRC-IS), including the modelling and knowledge base components comprising the Decision Support Framework (DSF), is intended to provide data and information services to the MRC, its member countries and projects and programs. Hence through the development of the MRC-IS, the MRC Secretariat aims to play a key role as the regional information hub, which will link partners through the information networks, and which will provide them information services and products.

The objectives of the MRC-IS are:

- 1 To provide integrated databases of all relevant data and information required for the implementation of the Mekong Agreement;
- 2 To develop and support models to enable analysis and generate information and knowledge;
- 3 To develop and support institutional and technical mechanisms for data and information exchange and sharing; and
- 4 To enhance capacity in the fields of data and information management.

2.3 Mekong River Commission Water Use Monitoring System

The Mekong River Commission Water Use Monitoring System (MRC-WUMS) consists of three components:

- 1 The physical equipment and related structures (i.e., relevant water measuring devices such as: stream flow/level and reservoir gauges, water quality monitoring stations, meteorological and hydro-meteorological facilities, data transmission means by telephone, telemetry and satellite, and data gathered through remote sensing technologies). The physical equipment and related structures are normally located in and managed/owned by respective country;
- 2 Various procedures (i.e. relevant monitoring methodologies, operation and maintenance requirements and processes, calibration standards and verification protocols, and data collection and communication procedures); and
- 3 Related personnel/institutions/organizations (i.e., those directly involved in the operation and maintenance of the physical equipment and related structures through the various procedures).

3 Functions and Responsibilities of the TACT

The TACT shall:

- 3.4 Serve as the forum for coordination between the MRCS and the NMCs for all matters relevant to the development and implementation of the MRC-IS and the MRC-WUMS.

- 3.5 Serve as a mechanism to assist the MRC in the implementation of the PDIES and PWUM including:
- 3.5.1 designing, developing/establishing, implementing and improving the MRC-IS, including the DSF, and the MRC-WUMS;
 - 3.5.2 prioritizing, formulating and recommending data and information needs and updates;
 - 3.5.3 prioritizing, drafting and recommending standards on, among other matters, format, classifications and data quality;
 - 3.5.4 prioritizing, drafting and recommending technical guidelines;
 - 3.5.5 planning and drafting delivery schedules;
 - 3.5.6 preparing for approval by the Joint Committee (JC) modalities and verification guidelines for data and information exchange and sharing, and for water use monitoring;
 - 3.5.7 drafting data license agreements including obligations and responsibilities of users;
 - 3.5.8 implementing monitoring activities; and
 - 3.5.9 undertaking other tasks as instructed by the JC.

4 Composition and Meetings

The TACT shall be composed of three members from each NMC and three members from the MRC Secretariat representing the Technical Support Division (TSD) and relevant programs. The Senior MRC Secretariat's representative will serve as Convener. The Senior Database Administrator of the TSD shall serve as the Secretary of the TACT.

Each NMC shall designate its representatives to the TACT for a minimum period of two years and inform the MRC Secretariat. The members should have the following qualification:

- 1 A broad knowledge on data management and information technology (IT), and, preferably, on general concepts regarding databases and Geographic Information Systems (GIS);
- 2 A good knowledge on data and information availability and related monitoring systems within the MRC programs, NMCs, and line agencies; and
- 3 A basic understanding of the application of computer modelling relevant to the MRC programs.

Each NMC shall inform the MRC Secretariat on the change of its representatives in the TACT.

The TACT meetings shall be convened regularly as decided by its members or on direction by the JC. The TACT may invite participation of other ad hoc members from time-to-time in accordance with the requirements of specific subjects under discussion.

Financial support will be provided for TACT meetings from the GEF-financed Water Utilization Program Start-up Project, through to the end of the WUP funding in 2006.

5 Decisions and Reporting

The TACT will make decisions by consensus. Any pending issue shall be submitted to the JC for instruction and decision.

The TACT shall prepare minutes after each meeting, reviewing its activities, conclusions and recommendations and distribute them to all members.

The TACT shall prepare an annual report to the JC regarding its activities and reviews of the appropriateness and applicability of the procedures with recommendations for amendments if necessary.

6 Modification of the Terms of Reference for TACT

The present Terms of Reference (ToR) supersedes the ToR for ISDIT endorsed by the JC on 11th July 2002.

TACT and NMCs may recommend modifications to this ToR to the JC.

Any modifications of these ToR shall be approved by the JC.

Annex D:

Draft IKMP Steering Committee Terms of Reference

Information and Knowledge Management Programme Steering Committee (IKMP SC), to be approved by the Joint Committee at its Twenty-Sixth Meeting in 2007

1 Background

Following the request of the MRC Joint Committee in 2003 to take action to ensure on the sustainability of the MRC-Information System (MRC-IS), the Information and Knowledge Management Programme (IKMP) has been formulated in 2006. The IKMP was established with the on-going activities and experiences in the development of the MRC-IS. However, the programme more strongly embeds the original objectives of the MRC-IS in the framework of Integrated Water Resource Management, which results in transparent links between the IKMP and the MRC Strategic Plan 2006-2010, and between the IKMP and all other MRC programmes. The programme also expands and accentuates the original objectives of the MRC-IS towards catalysing dialogue based on sound knowledge.

The implementation of the IKMP requires regional coordination on several management issues which are in line with the new Strategic Plan 2006-2010. This Terms of Reference (ToR) is therefore a new development to guide IKMP implementation.

2 Objectives

2.1 IKMP Steering Committee (IKMP SC)

The objectives of the IKMP SC are to ensure effective programme management and appropriate coordination with NMCs, donors, and concerned partners in implementation, monitoring and delivery in terms of contractual obligations between MRC and the Donors.

The aims of IKMP are:

- 1 Demand-driven and client-oriented information and knowledge systems, services and products are integrated throughout the MRC's programmes and enhance regional cooperation;
- 2 Required hydro-meteorological data is acquired, processed and made available;
- 3 A Geographic Information System comprehensively integrates MRCS data and information holdings, and provides access, support and services, and value-added products;

- 4 Providing the MRC riparian countries and other clients with decision support tools, services and capacity for planning, forecasting and impact assessment; and,
- 5 Data, information and knowledge are easily exchanged and shared with a wide network of decision makers and other stakeholders.

3 Functions and Responsibilities of the IKMP SC are:

- 3.1 To review the submitted reports concerning IKMP work plan, progress, technical performance and budgets; and to monitor the performance of the overall Programme.
- 3.2 To approve the Programme implementation plan (PIP) and annual work plans;
- 3.3 To consider any proposed modifications to the PIP in terms of programme structure, organisation, scope, content, timing, budgets for which the consent of the donors would be required;
- 3.4 To provide strategic guidance and coherence to the IKMP implementation to increase its effectiveness.
- 3.5 To be a forum dealing with strategic and policy issues of high level, and to recommend to JC for consideration and advice if so required.

4 Composition and Meetings

The IKMP SC shall be composed of two members from each NMC and three members from the MRCS including the Director of TSD, the IKMP coordinator, assisted by the Chief Technical Adviser, will serve as Secretary, and Donor representatives from the Donor agencies. The level of the NMC representation on the SC will be at the Deputy Director General / Deputy Secretary General level, other member of the NMC is the IKMP National Coordinator. The chairmanship of the IKMP SC meeting will be rotated in alphabetic name order of the MRC Member Countries. As one of the IKMP SC members from the host country will serve as chairperson for the meeting, the host NMC may assign one additional member to fill the vacant seat in its delegation at that time.

The IKMP SC meetings shall be convened at least 3 times per year. The IKMP SC may invite participation of other ad hoc members from time-to-time in accordance with the requirements of specific subjects under discussion.

Financial support will be provided for IKM SC meetings from the IKMP, or other MRC programmes.

5 Decisions and Reporting

The IKMP SC will make decisions by consensus. Any pending issue shall be submitted to the JC for instruction and decision.

The IKMP SC shall prepare minutes after each meeting, review its activities, conclusions and recommendations and distribute them to all members.

6 Modification of the Terms of Reference for IKMP SC

IKMP SC and NMCs may recommend modifications to this ToR to the JC.

Any modifications of this ToR shall be approved by the JC.