**Mekong River Commission**
For Sustainable Development



# Data Acquisition and Generation Action Plan

**For Implementing the Mekong River Basin Indicator Framework in Support of the MRC's Core River Basin Management Functions and Role as a Regional Knowledge Hub**

# Citation

# Authors

*Project management:*

Mr. Hak Socheat, Director of the Environment Management Division, MRCS; and
Dr So Nam, Chief Environment Management Officer, Environment Management Division, MRCS

*Technical experts:*

MRC Secretariat's technical experts:
Mr Heng Suthy, Regional Technical Advisor/Coordinator, Environment Management Division

International technical expert:
Dr Benjamin Docker, International Consultant, Australia

# PREFACE

This *Data Acquisition and Generation Action Plan* (DAGAP) has been developed to provide a clearer direction to the Member Countries and the MRC Secretariat on the data requirements necessary to implement the Mekong River Basin Indicator Framework (MRB-IF). It details the mechanisms that need to be put in place and systematically implemented to acquire and/or generate data to ensure the next *State of the Basin Report* will not have the same data gaps of previous reports.

Recent basin-wide assessment and reporting has been hampered by data limitations across a range of areas. For instance, the Council Study, completed in 2017, relied on expert opinion on the status and trends in a number of key environmental parameters (such as riverine habitats and biodiversity) due to the lack of available data. Much of the socio-economic data used in the Council Study had limitations in terms of its geographic scope and level of representativeness in the particular areas assessed. The 2018 State of the Basin Report identifies significant knowledge gaps particularly in the social and economic dimensions, where three of four key strategic questions in these two dimensions could not be adequately answered.

The data required to implement the MRB-IF mostly already exists, collected through regional or national monitoring activities and surveys. What is missing is a systematic process of collection, assembly, processing, transmission and analysis of that data in order to best inform an evaluation of the status and trends in key water-related dimensions across the basin. The data available to inform the MRC planning process is often collected at different spatial and temporal scales using different approaches in different jurisdictions and with limited information available on the definitions, methodology and assumptions used in its collection. This makes it difficult to compare data and undertake appropriate analytical processes across the whole of the basin. While this is a problem that will always exist to some extent in a transboundary river basin context, greater clarity on how data will be used, assessed and presented will increase confidence and provide greater guidance to data custodians on what is most useful to inform basin planning. Introducing a more systematic approach to data generation and acquisition provides greater certainty for all parties on roles and responsibilities and helps target appropriate investment in further data collection towards common objectives and to agreed standards.

The DAGAP was developed through extensive consultation and input from national agencies including National Mekong Committee Secretariats and line or specialist in each Member Country. Line and implementing agencies across each water-related sector in the basin were involved in multiple working sessions and were supported by strong engagement from national statistics offices. Following discussion of the concept at the EGEM in December 2018, national consultations on the DAGAP Concept Note were held in April-May 2019 along with a first round of working sessions with national line or implementing agencies on current national monitoring activities. These sessions were used to help complete a matrix on data availability and requirements, which provides the basis for identifying further data gaps and data collection needs.

Follow-up meetings with line or implementing agencies were held in each Member Country in September and October 2019. A regional consultation meeting was held on 16-17 October 2019 in Bangkok, Thailand, to consider and provide feedback on the first draft of the DAGAP. Following this meeting, the second draft of the DAGAP was shared with Member Countries for further review and comment. The final draft was prepared and endorsed by the EGEM on 12-13 December 2019 and submitted to the MRC Joint Committee for consideration in early 2020.

# CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AD | Administration Division |
| ADPC | Asian Disaster Preparedness Center |
| AWP | Annual Work Plan |
| CNMCS | Cambodia National Mekong Committee Secretariat |
| CRBMFs | Core River Basin Management Functions |
| DAGAP | Data Acquisition and Generation Action Plan |
| DSF | Decision Support Framework (of the MRC) |
| ED | Environment Management Division |
| EGEM | Expert Group on Environmental Management |
| EHM | Ecological Health Monitoring |
| FAO | Food and Agriculture Organisation of the United Nations |
| FAOSTAT | Food and Agriculture Organisation Statistics |
| FiA | Fisheries Administrator |
| FP | Focal Point |
| GDP | Gross Domestic Product |
| GHG | Greenhouse gas |
| GIS | Geographic Information Systems |
| GSO | General Statistics Office (of Viet Nam) |
| HH | Household |
| HYCOS | Hydrological Cycle Observing System |
| IFREDI | Inland Fisheries Research and Development Institute |
| IQQM | Integrated Quantity and Quality Model |
| IUCN | International Union for the Conservation of Nature |
| ISIS | Integrated Spectographic Innovative Software |
| IWMI | International Water Management Institute |
| JC | Joint Committee (of the Mekong River Commission) |
| ILOSTAT | International Labour Organisation Statistics |
| ISO | International Standards Organisation |
| LNMCS | Lao PDR National Mekong Committee Secretariat |
| LARReC | Living Aquatic Resources Research Center |
| LMB | Lower Mekong River Basin |
| MAF | Ministry of Agriculture and Forestry |
| MAFF | Ministry of Agriculture, Forestry and Fisheries |
| MEF | Ministry of Economy and Finance |
| MCs | Member Countries |

| | |
|---|---|
| MERFI | Mekong Region Futures Institute |
| MoE | Ministry of Environment |
| MOI | Ministry of Interior |
| MONRE | Ministry of Nature Resources and Environment |
| MoU | Memorandum of Understanding |
| MOWRAM | Ministry of Water Resources and Meteorology |
| MPI | Ministry of Planning and Investment |
| MPWT | Ministry of Public Works and Transport |
| MRB-IF | Mekong River Basin Indicator Framework |
| MRC | Mekong River Commission |
| MRCS | Mekong River Commission Secretariat |
| MRC-IS | Mekong River Commission Information System |
| MRC SP | Mekong River Commission Strategic Plan |
| MTR | Mid-Term Review (of the MRC Strategic Plan) |
| NMCSs | National Mekong Committee Secretariats |
| NPV | Net Present Value |
| NS | National Specialist |
| OAA/P | Other Aquatic Animals/Plants |
| OCEO | Office of the Chief Executive Officer |
| OECD | Organisation for Economic Cooperation and Development |
| ONEP | Office of Natural Resources and Environment Policy and Planning |
| PD | Planning Division |
| PDIES | Procedures for Data and Information Exchange and Sharing |
| PMFM | Procedures for the Maintenance of Flow on the Mainstream |
| PNPCA | Procedures for Notification, Prior Consultation and Agreement |
| QA/QC | Quality Assurance/Quality Control |
| RS | Regional Specialist |
| PWQ | Procedures for Water Quality |
| SIMVA | Social Impact Monitoring and Vulnerability Assessment |
| SOBR | State of the Basin Report |
| SWAT | Soil Water Assessment Tool |
| TD | Technical Cooperation Division |
| ToR | Terms of Reference |
| TNMCS | Thailand National Mekong Committee Secretariat |
| UNEP | United Nations Environment Program |
| UNEP-WCMC | United Nations Environment Program – World Conservation Monitoring Centre |
| UNESCO | United Nations Education, Scientific and Cultural Organisation |

| USGS | United States Geological Service |
| VNMCS | Viet Nam National Mekong Committee Secretariat |
| WHO | World Health Organisation |
| WUP-FIN | Water Utilisation Program – Finland |

# EXECUTIVE SUMMARY

The MRC aims to be the pre-eminent source of data and information on the status and trends in water-related conditions across the Mekong River Basin. This ambition is reflected in the MRC's mandated Core River Basin Management Functions (CRBMFs), as identified in the *Basin Development Strategy 2016-2020* and the *MRC Strategic Plan* 2016-2020 and primarily embodied in CRBMF 1: *Data acquisition, exchange and monitoring.* But it is also through recognition that CRBMF 1 supports all the other Core River Basin Management Functions and the role of the MRC as a regional knowledge hub.

The MRC *Procedures for Data and Information Exchange and Sharing* (PDIES) provide overall policy guidance in relation to the management and transmission of data between Member Countries and with the MRCS. Implementing these procedures is supported by the Mekong River Basin Indicator Framework (MRB-IF) which identifies the matters important to Member Countries in helping to understand the state of the basin as it relates to achieving the objectives of the *1995 Mekong Agreement*. The implementation of the MRB-IF as a working document central to the MRC planning cycle requires the collection, processing, transmission, analysis and reporting of data for around 185 monitoring parameters, consisting of 277 individual data requirements.

The *Data Acquisition and Generation Action Plan* (DAGAP) sets out arrangements to ensure the *Mekong River Basin Indicator Framework* (MRB-IF) can be implemented in full through the preparation of the next *State of the Basin Report* in 2023. It covers each and every monitoring parameter and the data requirements to enable assessment of the 15 Strategic Indicators and 53 Assessment Indicators across the five dimensions of the MRB-IF – environment, social, economic, climate change and cooperation. In this regard, the objective of the DAGAP is:

> *To ensure common understanding among Member Countries and the MRCS on the roles and responsibilities, processes and arrangements for ensuring the required data is available to assess the status and trends of conditions across the Lower Mekong Basin in accordance with the Mekong River Basin Indicator Framework.*

The DAGAP seeks to help reinvigorate data management within the MRC through a focus on the actual data content necessary to implement the MRB-IF consistent with PDIES. To do this requires a strategic approach to data acquisition and generation across the whole organisation and the nurturing of a culture of data stewardship through:

1. **High-level responsibility and oversight of data acquisition and generation at both MRCS and within Member Countries**. The MRC Joint Committee has overall responsibility for overseeing implementation of this Action Plan and is supported by the MRCS and the relevant expert groups.
2. **Adequate budgetary support for ongoing and additional data collection, surveys and analysis**. A total financial commitment of **USD 1.32 million to USD 1.85 million** per year is needed over the next Strategic Plan period for data acquisition, generation and processing in accordance with this Action Plan.
3. **Close engagement and enhanced ownership of technical expertise within Member Countries and particularly line or implementing agencies**. Relevant National Specialists need clearly defined Terms of Reference for data collection, processing and transmission as a core part of their job description.
4. **Data stewardship as a core part of everyone's job within the MRCS**. Effective data oversight and stewardship needs to be written into everyone's job description at MRCS for the relevant datasets

they are responsible for and as coordinated by the Information and Data Specialist in the Technical Support Division.

5. **Developing smarter approaches to monitoring through continual improvement and proactive engagement of third parties involved in data collection, acquisition and analysis**. Putting in place arrangements with third party data providers, improving existing methodologies and taking advantage of advances in remote sensing, earth observation technologies and computing capacity to support more cost effective future monitoring.

The existing and new data required to implement the MRB-IF will come from a variety of sources including:

(i) MRC routine monitoring activities (e.g. hydrological and water quality monitoring);

(ii) Periodic studies and surveys undertaken through the MRC work plan by the MRCS and Member Countries (e.g. periodic assessment of wetland extent);

(iii) National monitoring and survey data collected by national agencies in the ordinary course of business (e.g. national census; wellbeing surveys); and

(iv) International organisations such as the World Bank, Asian Development Bank and United Nations agencies.

Memoranda of Understanding and Terms of Reference need to be agreed between relevant national line or implementing agencies, National Mekong Committee Secretariats and the MRCS for the collection and transmission of data in accordance with the schedules of this Action Plan. The DAGAP identifies which data sources need to continue to provide data, what is existing and what is new monitoring activity and what needs to change to ensure greater consistency and alignment of datasets across all countries of the Mekong River Basin. Implementation of the DAGAP, involves a two-step approach:

(i) The first step involves ensuring sufficient data is available to implement the next SOBR by 2023, while using agreed estimation techniques and proxy regional data and tools to fill gaps. At this step there will still be gaps in terms of alignment and synergy of datasets between Member Countries and some lesser priority data requirements may not be fully available at the necessary spatial and temporal scales.

(ii) The second step involves the implementation of this Action Plan to the fullest extent over three years (2020-2022). This would involve the development and implementation of a more comprehensive alignment and synergy of datasets across Member Countries and include the collection and analysis of additional primary datasets through new regional studies and assessments, and modifications to existing national monitoring and surveys.

At both implementation steps there will be sufficient data available to implement the MRB-IF for the next SOBR, notwithstanding that at Step 1 there will not necessarily be complete basin-wide coverage, consistency and alignment across Member Countries at the necessary sub-basin scale. Member Countries will need to agree to gap-filling techniques and the use of regional and international datasets, as well as some targeted additional data generation efforts.

The budget required for Step 1 is only USD 0.30 million per year beyond what is already committed for monitoring and reporting purposes at the MRC. An additional USD 0.55 million per year would be required to implement Step 2 of the DAGAP. These additional costs for steps 1 and 2 (USD 0.85 million in total) are directly relevant to supporting the MRC's role as a regional knowledge hub and its core river basin management functions. If agreed, it would bring the total annual expenditure on data collection, analysis

and reporting in accordance with the MRB-IF to around **USD 1.85 million per year**. The risks for the MRC associated with not undertaking Steps I and II of this Action Plan are identified as follows:

| Risks involved in *not* undertaking Step I | Risks involved in *not* undertaking Step II |
|---|---|
| *All* risks identified in not undertaking Step II, as well as<br><br>- Incomplete 2023 State of the Basin report with substantial lack of data in the social and economic dimensions, and strategic questions on the conditions and trends in the basin left unanswered;<br>- Large gaps and reduced quality and reliability of MRC studies, products and assessments;<br>- Inaccuracies and discrepancies in all MRC findings and recommendations inhibiting the promotion of trust and transparency among MCs and with the MRCS;<br>- Social and economic data for a limited set of indicators generally only available at national scale, reducing the relevance and validity of assessments;<br>- Additional significant costs required for international consultants to compile datasets for the next State of the Basin Report and any future scenario assessments and studies. Costs much higher compared to the proposed budget for DAGAP;<br>- Incomplete capacity to adequately identify the spatial impacts, particularly on poor, resource dependent people, of water resource development from any future scenario assessments;<br>- Reduced confidence of stakeholders in the MRC's capacity to fulfil its regional knowledge hub role and to demonstrate its comparative advantage relative to other regional water cooperation platforms; and<br>- Additional costs for both national agencies and MRCS associated with duplicated data requests, clarifying requirements and collection of data which is unnecessary or not useful to assessments. | - Some data gaps will remain, particularly for parameters identified in Table 18:<br>  ○ OAA/P abundance and diversity<br>  ○ Water bird abundance and diversity<br>  ○ Economic value of riverbank gardens, navigation, sand mining, tourism<br>  ○ Costs of riverbank erosion, flood and drought<br>  ○ Greenhouse gas emissions<br>  ○ Drought protection measures<br>  ○ Expected future value of joint and significant projects<br>- Some misalignment in temporal and spatial scales, particularly for social and economic dimension parameters identified in Table 17, resulting in incomplete capacity to identify the spatial impacts of water resource development from scenario assessments;<br>- Costs associated with any specific studies that may need to be commissioned from time to time to answer questions requiring the above data;<br>- Incomplete understanding on the impacts of ecosystem functions and services in the basin;<br>- Inaccurate assessment of environment, social and economic implications due to changes in ecosystem functions and services;<br>- Equity of benefit sharing for sustainable development according to MA 1995 not accurately and transparently defined; and<br>- Substantial gaps in defining economic valuations in various MRC water and related sectors. |

Given the current gaps in data availability as identified in the *State of Basin Report 2018*, and as reflected in the ongoing data collection mechanisms, the strategic priorities for data acquisition and generation over the next Strategic Plan period are:

1. Ensuring the systematic assembly and transmission of existing social and economic data from Member Countries to the MRCS at provincial scale according to the agreed schedule and with a focus on:
   a. Food and water security and access to electricity at the household level;
   b. Employment and livelihoods in water-related sectors;

c. Economic values, especially production volumes, and prices for agriculture, fisheries, navigation and hydropower sectors; and

d. The collection of gender disaggregated data throughout the social dimension.

The analysis presented in this DAGAP demonstrates that many of the social and economic data requirements already exist within Member Country databases. Assembling and transmitting to the MRCS in a systematic manner every five years according to a Memorandum of Understanding will greatly enhance efficiency and effectiveness in preparing inputs to the MRC planning cycle.

2. Finalising methodologies and establishing a long-term commitment to environmental monitoring for critical parameters where they do not yet exist, particularly for:
   a. Sediment transport and river geomorphology;
   b. Extent of wetland and forest area through periodic land cover assessments; and
   c. Riverine, estuarine and coastal habitats, especially for bank erosion.

Development of the Mekong River Basin has had, and is likely to continue to have, substantial detrimental effects on the transport of sediment downstream and on wetlands throughout the basin. It is imperative that regular monitoring and assessment processes are put in place to enable effective mitigation and conservation plans to be developed and implemented.

3. Establishing a climate change monitoring and reporting system to enable ongoing collection, analysis and reporting of changes in the regional climate and Member Countries' responses to those changes. Indicators need to cover:
   a. Climatic variables;
   b. Potential climate impacts as reflected in environment, social and economic dimensions; and
   c. Adaptation efforts.

Climate Change is already having an effect in the Mekong River Basin through rising temperatures. Monitoring these and other changes as they occur will be of critical importance in being able to respond quickly and appropriately through adaptation efforts. Monitoring adaptation activities will also support learning and knowledge-sharing between Member Countries and improvements in approaches over time.

4. Systematic data collection, management and reporting of key measures of cooperation both between Member Countries and the MRCS and with other parties, supporting enhancement of both an inward and outward focus to cooperation.

Cooperation between Member Countries, the MRCS and with third parties is largely focused at present on the existence of joint projects. While this is an importance aspect of cooperation within the Mekong Basin, the extent of cooperation is much broader and this should be reflected in a more comprehensive set of statistics illustrating the extent to which all parties are working effectively together towards the objectives of the *1995 Mekong Agreement*.

5. Alignment of the MRC-IS with the MRB-IF including in relation to:
   a. Data handling and management protocols; and
   b. Linking of MRCS and MC database systems.

The collection of data required to implement the Mekong River Basin Indicator Framework will be inefficient and ineffective without a data management system in place both at the MRCS and within NMCSs that is aligned to the indicators, monitoring parameters and data requirements of the MRB-

IF. Alignment includes not only the database structure, but also the protocols, workflows and responsibilities of parties to ensure it functions as intended.

To implement these strategic priorities, key actions for each implementation step are outlined on the following page. For each of these actions there is a role for both MRCS and national line or implementing agencies, as described further in the document. The key actions at Step II involve implementing all of the Step I actions in addition to those identified for Step II.

| DAGAP Step I Implementation – Key Actions | DAGAP Step II Implementation – Key Actions |
|---|---|
| **1.1:** Prepare and agree between the MRCS and MCs the Memoranda of Understanding and Terms of Reference for delivery of all data from national line or implementing agencies to the MRCS according to the specified data requirements and data delivery schedule in <u>Appendices A and B</u>. | **2.1:** Design and implement new regional assessment approaches and data collection requirements for the following studies:<br><br>a. Riverine, estuarine and coastal habitats (including sandy habitats, rocky habitats, deep pools, riparian vegetation and river and coastal erosion) for the whole basin;<br>b. Economic value of wetland ecosystem services; and<br>c. Vulnerability to floods, droughts and storms. |
| **1.2:** Discuss and agree with relevant third party data holders, the arrangements for the periodic delivery of, or access to, data to support the implementation of this Action Plan, including as detailed in Table 12 and the data requirement and data delivery schedules in <u>Appendices A and B</u>. | **2.2:** Improve the design of regional assessment approaches for the Assessment Indicators as identified in the improvement strategies for each indicator in <u>Appendix B</u>; including by:<br><br>a. Periodically ground-truthing habitat yield assessments for fisheries in different regions;<br>b. Evaluating the extent of natural land cover types in ecologically significant areas and include consideration of species range distributions;<br>c. Improving the multi-media monitoring assessment as recommended in previous reports; and<br>d. Improving wetland extent and health mapping of the whole basin, based on work completed to-date for MRC wetland health and ecosystem function project. |
| **1.3:** Continue to implement the following routine regional monitoring activities and review the approach to decentralisation, updating the budget accordingly:<br><br>a. Hydro-meteorological monitoring;<br>b. Water quality monitoring;<br>c. Ecological health monitoring;<br>d. Discharge and sediment monitoring; and<br>e. Fisheries monitoring. | |
| **1.4:** Following the piloting of the Joint Environmental Monitoring of Mekong mainstream hydropower projects, consider rolling out as a routine monitoring activity. | **2.3:** Prepare additional or modified national survey questions or data collection processes, disaggregate all relevant data by province, and increase the sampling power of national surveys to elicit additional socio-economic data applicable at a provincial level as indicated in Table 17, and detailed in Table 19 for each Assessment Indicator, with a particular focus on the following national surveys and data collection processes:<br><br>a. Cambodia Socio Economic Survey;<br>b. Lao Expenditure and Consumption Survey;<br>c. Viet Nam Living Standards Survey;<br>d. Labour Force surveys for each country;<br>e. The preparation of National Accounts for each country; and<br>f. LMB water-related economic sector reporting for power generation and tourism. |
| **1.5:** Modify regional monitoring activities and update Terms of Reference in order to:<br><br>a. Add all relevant climate parameters to the hydro meteorological monitoring activity;<br>b. Add additional parameters to water quality monitoring to include oils and grease and phenols, consistent with the Procedures for Water Quality;<br>c. Add data on the future economic benefits of joint projects, projects of basin-wide significance and with potential transboundary significance;<br>d. Clarify definitions for knowledge-sharing activities and partnerships between MRC and other parties for inclusion in regional cooperation databases; and<br>e. Evaluate re-directing SIMVA resources to improved sub-basin scale coverage of national socio-economic monitoring and surveys. | |
| **1.6:** Include the following regional studies, reviews and assessments within the MRC Strategic Plan and Annual Work Plans, based on existing methodological designs. These are largely assessments which have been done before but need to be repeated on a periodic basis. Only two are completely new assessments, as indicated:<br><br>a. Drought risk assessment for water security;<br>b. Multi-media contaminants assessment; | **2.4:** Design new national data collection and transmission mechanisms for the data requirements identified in Table 18, with a particular focus on:<br><br>a. OAA/P abundance and diversity;<br>b. Water bird abundance and diversity;<br>c. Gross economic value of riverbank gardens;<br>d. LMB water-related economic sector reporting for sand mining, navigation, forestry, and tourism; |

| DAGAP Step I Implementation – Key Actions | DAGAP Step II Implementation – Key Actions |
|---|---|
| c. Modelling salinity intrusion in the delta;<br>d. Riverine, estuarine and coastal habitats based on national reporting for specific case study sites;<br>e. Landcover assessment, including wetland and forest types;<br>f. Review of threatened water-dependent species and the protection status of ecologically significant areas;<br>g. Hydro-meteorological network assessment and design;<br>h. Fisheries habitat yield assessment;<br>i. Extent and severity of flooding; and<br>j. Extent and severity of drought. | e. Greenhouse gas emissions by sector and by greenhouse gas, within the basin;<br>f. The area and value of land lost to riverbank erosion; and<br>g. Drought protection measures (reservoir volumes for agriculture and urban uses and demands for water during the dry season). |
| **1.7:** Identify and collect the proxy data, estimation techniques and approved third party datasets that will be used to fill gaps in relation to each Assessment Indicator for the State of the Basin Report 2023 as reflected in Appendix B and identified by Regional Specialists. | |

# 1. DATA ACQUISITION AND GENERATION AT THE MRC

## 1.1 IMPLEMENTING THE MEKONG RIVER BASIN INDICATOR FRAMEWORK

The Mekong River Basin Indicator Framework consists of 15 Strategic Indicators and 53 Assessment Indicators across five dimensions – social, environment, economic, climate change and cooperation. These indicators reflect the issues important to the Member Countries in helping to understand the state of the basin as it relates to achieving the objectives of the *1995 Mekong Agreement*. The implementation of the Indicator Framework as a working document central to the MRC planning cycle requires the collection, processing, transmission, analysis and reporting of data for around 185 monitoring parameters, consisting of 277 individual data requirements.

Many of these individual data requirements are already collected and available to the MRC through existing activities, for example, the routine monitoring of hydro-meteorological, water quality, fisheries, aquatic ecology and sediment transport parameters. Many others are available within Member Country databases and are mostly provided on request to the MRC as and when required. However, there is no systematic and consistent approach agreed for doing so, leading to potential inefficiencies in the process and ultimately data gaps. Other data requirements are not yet available either at a national or regional level and require further discussion and agreement between all parties on exactly what is needed and how these can be generated in the most cost effective and fit-for-purpose way.

The large number of indicators and monitoring parameters that make up the Mekong River Basin Indicator Framework, reflecting the priorities of four Member Countries, means there is a substantial data collection effort required at least every five years to provide the necessary information to inform MRC planning processes. Providing clarity on what is required, by when and by whom, including to enable any data gaps to be filled, will help ensure an efficient and effective planning process commencing with the publication of the State of the Basin report and followed by the development of the Basin Development Strategy and National Indicative Plans. It is important these regional planning instruments are based on the most up-to-date data relevant to the critical issues and challenges Member Countries are facing in the sustainable development, conservation and management of the Mekong Basin.

Recent basin-wide assessment and reporting has been hampered by data limitations across a range of areas. For instance, the Council Study, completed in 2017, relied on expert opinion on the status and trends in a number of key environmental parameters (such as riverine habitats and biodiversity) because there was insufficient data available. Much of the socio-economic data used in the Council Study had limitations in terms of its geographic scope and its level of representativeness in the particular areas assessed. The *2018 State of the Basin Report* identifies significant knowledge gaps particularly in the social and economic dimensions where three of four key strategic questions in these two dimensions could not be adequately answered due to there being 'insufficient data to form a view'. Across the five dimensions of the draft Indicator Framework used for the *2018 State of the Basin Report*, an average of 54% of individual data requirements were available, with the highest number in the environment and climate change dimensions.

The data available to inform MRC planning processes is often collected at different spatial and temporal scales using different approaches in different jurisdictions and with limited information available on the definitions, methodology and assumptions used in its collection. This makes it difficult to compare data and undertake appropriate analytical processes across the whole of the basin. While this is a problem that

will always exist to some extent in a transboundary river basin context, greater clarity on how data will be used, assessed and presented will increase confidence and provide greater guidance to data custodians on what is most useful to inform basin planning. Introducing a more systematic approach to data generation and acquisition provides greater certainty for all parties on roles and responsibilities, and helps target appropriate investment in further data collection towards common objectives and to agreed standards.

## 1.2    OBJECTIVE OF THIS ACTION PLAN

The development of the Mekong River Basin Indicator Framework and its trialling through the development of the *2018 State of the Basin Report* identified a need for greater clarity and explicit articulation of the data generation requirements necessary for its implementation.

The source of the data and the specific arrangements for its collection, processing, transmission and management will vary for each individual monitoring parameter. A common understanding is required on the exact arrangements in each case to ensure that the next State of the Basin Report has all the data available to implement the Indicator Framework in full and that data generation, processing and management is planned within the constraints of available financial resources. The *Data Acquisition and Generation Action Plan* (DAGAP) has the following objective:

> *To ensure common understanding among Member Countries and the MRCS on the roles and responsibilities, processes and arrangements for ensuring the required data is available to assess the status and trends in conditions across the Lower Mekong Basin in accordance with the Mekong River Basin Indicator Framework.*

Achieving this objective will support the goal of obtaining all the data required to implement the MRB-IF in place and accessible in advance of the next State of the Basin Report and to support implementation of the next Basin Development Strategy for the Mekong Basin, including through any future scenario assessment work.

## 1.3    SCOPE OF THIS ACTION PLAN

The scope of the *Data Acquisition and Generation Action Plan* covers each and every monitoring parameter listed in the current working document of the Mekong River Basin Indicator Framework and the data requirements in the accompanying spreadsheet. The existing and new data required will need to come from a variety of sources including:

(i)    MRC decentralised monitoring activities (e.g. hydrological and water quality monitoring);
(ii)   Periodic studies and surveys undertaken through the MRC work plan by the MRCS and Member Countries (e.g. periodic assessment of wetland extent);
(iii)  National monitoring and survey data collected by national agencies in the ordinary course of business (e.g. national census; wellbeing surveys); and
(iv)   International organisations such as the World Bank, Asian Development Bank and United Nations agencies.

Where data sources cannot be identified or Member Countries do not agree to the additional efforts required to acquire or generate the data, further refinement of the monitoring parameters as recommended in the *2018 State of the Basin Report* may be necessary. Any such changes can be reflected in future updates to the Mekong River Basin Indicator Framework.

The scope of data collection should cover as much of the entire Mekong Basin as possible, notwithstanding there will need to be some flexibility in scale given budget constraints and the nature of data collection through existing processes. The frequency of data collection will vary for different parameters but needs to occur and be transmitted at least once every five years for every monitoring parameter in order to ensure up-to-date and accurate data for the five-year MRC planning cycle.

## 1.4 A STRATEGIC APPROACH TO DATA ACQUISITION AND GENERATION

The MRC should be the pre-eminent source of data and information on the status and trends in water-related conditions across the Lower Mekong Basin. This ambition is reflected in the MRC's mandated Core River Basin Management Functions (CRBMFs), identified in the *Basin Development Strategy 2016-2020* and the *MRC Strategic Plan* 2016-2020, and primarily embodied in CRBMF 1: Data acquisition, exchange and monitoring. But it is also through recognition that CRBMF 1 supports all the other Core River Basin Management Functions, without which it will not be possible to achieve the overall vision for the basin, or the goals and mission of the MRC and its Member Countries. Good quality data and its effective management and use are at the heart of all the CRBMFs and essential to undertaking effective:

1) **Analysis, modelling and assessment (CRBMF 2);**

2) **Planning support (CRBMF 3);**

3) **Forecasting, warning, and emergency response (CRBMF 4); and**

4) **Implementing MRC Procedures (CRBMF 5).**

The centrality of data acquisition, exchange and monitoring to the achievement of the MRC's goals and implementation of the Core River Basin Management Functions necessitates a strategic approach to data acquisition and generation across the whole of the organisation. A strategic approach will help reinvigorate and nurture a culture of 'data stewardship', as recommended by the *Mid-Term Review of the MRC Strategic Plan 2016-2020* and in line with the *Procedures for Data and Information Exchange and Sharing (PDIES)*. It will ensure that in a time of diminishing resources, all parts of the organisation, at both regional and national levels, are working together in the most efficient way possible to continue building the foundation for information and knowledge on the sustainable development, management and conservation of the Mekong River Basin.

This Action Plan identifies several strategic elements that will be necessary to reinvigorate and nurture a culture of 'data stewardship' at the MRC and ensure capacity at both regional and national levels to deliver on the CRBMFs of the MRC's mandate. These elements are:

1. **High Level responsibility and oversight at both the MRCS and within MCs**

   The institutional arrangements for implementing this Action Plan involve the MRC Joint Committee (JC) as the body with overall responsibility for overseeing its implementation and ensuring its objective and goals are achieved. The JC is supported by the MRCS and the Expert Groups on Data, Modelling and Forecasting, on Basin Planning, and on Environmental Management to develop and continually improve the strategies, methodologies and approaches to data generation and assessment within each of their assigned areas of responsibility.

   The Expert Group on Data, Modelling and Forecasting has a particularly important role in ensuring the data and information management systems at the MRC are aligned to and support the implementation

of the Mekong River Basin Indicator Framework, and that the procedures and guidelines for data collection and management across the MRC are fit-for-purpose and implemented effectively.

The high-level involvement of Member Countries through the JC and through commitments to Memoranda of Understanding (MoU) for the ongoing provision of data to support implementation of the MRB-IF in line with this Action Plan will also be critical. These commitments are necessary from both National Mekong Committee Secretariats and from national line or implementing agencies as the primary data custodians in accordance with PDIES. Key Performance Indicators may be established and approved by the JC to support monitoring and evaluation in accordance with this Action Plan and any associated MoUs or data sharing arrangements.

## 2. Adequate budgetary support for ongoing and additional data collection, surveys and analysis

The MRC is facing a challenging budget situation over the period of the next Strategic Plan. By 2030, the MRC aims to be entirely funded by Member Country contributions, with a projected budget in that year of USD 9.8 million. This is approximately 35 per cent less than the total budget in 2017, when 23% was contributed by Member Countries.

The *MRC Strategic Plan 2016-2020* identifies 13% of the total MRC budget as necessary for CRBMF 1. This is approximately USD 1.3 million per annum as reflected in 2017 annual expenditure[1]. Reducing this budget by 10% per year over the next Strategic Plan period in line with the revised MRC decentralisation plan will require a commitment from the MRC Council to average annual funding for CRBMF 1 of approximately USD 1.0 million between 2020 and 2024 to go towards:

- Routine MRC data collection and assessment through core river monitoring activities;

- Periodic data collection, surveys and analysis in support of regional assessments, both from national agencies and other regional and international organisations;

- Assembly, processing and transmission of national datasets from Member Countries to the MRCS; and

- Maintaining and implementing the MRC Information System (MRC-IS) and Decision Support Framework (DSF), once upgraded and aligned with the MRB-IF, to support the MRC strategic planning cycle.

This funding would cover only the data acquisition, generation and processing associated with CRBMF 1. Budget support for methodological development, regional assessments (including scenario assessments), and analysis, modelling and forecasting activities will need to continue to occur through CRBMFs 2, 3, 4, and 5.

Including all CRBMFs relevant to this Action Plan, a total financial commitment estimated at approximately USD 1.32 – 1.85 million per annum will be required to implement the MRB-IF in full over the next Strategic Plan period. This represents approximately 13% to 19% of the forecast MRC budget in 2030, reflecting a substantial reduction in the existing budget for data collection, analysis, assessment and reporting. This is the minimum necessary investment in foundational data and information for MRC to be considered an effective regional knowledge hub.

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[1] MRC 2017 Annual Report (http://www.mrcmekong.org/publications/governance/annual-reports/)

3. **Close engagement and enhanced ownership of technical expertise within Member Countries and particularly line or implementing agencies**

Implementing this Action Plan will require a high degree of ownership over regional outcomes at both national and regional levels. The establishment of Expert Groups is a central element in helping achieve this ownership of the MRC's Core Functions as these groups take on greater responsibility for regional activities previously done by the Secretariat. In addition to the Expert Groups, it will also be important that dedicated National Specialists are identified within relevant Member Country line or implementing agencies with responsibility for each dataset required to implement the MRB-IF.

These national specialists should have as part of their job description the collection, management, processing, quality assurance and transmission of data to the MRCS in accordance with agreed MoUs between relevant parties. It is critical this role is both perceived as, and is in practice, a core part of an official's function, not just an additional burden to be undertaken as and when other priorities permit. Without this level of commitment, the timely and complete assembly and transmission of required high quality and reliable datasets is likely to remain problematic.

National Specialists will be supported by and work closely with their regional counterparts at the MRCS to ensure seamless management of datasets at both regional and national levels. Together they will ensure consistency in datasets held in different databases, common understanding of methodologies and assumptions employed in the collection and analysis of data, and quality assurance and control according to agreed standards. Regular communication to ensure awareness of delivery schedules and constraints, progress with collection and analysis, and to jointly address issues as they arise is an important feature of this relationship. Regular communication and engagement between specialists within data custodian agencies in different countries will also be important for enhancing capacity and improving knowledge-sharing throughout the region.

4. **Data stewardship as a core part of everyone's job within the MRCS**

Reinvigorating a culture of 'data stewardship' means that everyone in the organisation, from the CEO on down, has an important role to play in demonstrating leadership in support of the MRC's role as a regional knowledge hub, thereby ensuring effective management of data and information. Appropriate handling, systematic processing, quality assurance, storage and security of all datasets under a person's control, and a commitment to data quality and transparency, including adherence to international standards for data management, are essential components of good data management and governance. Effective data oversight and management needs to be written into everyone's job description for the identified datasets that each person is responsible for in their area of expertise.

The Information and Data Specialist within the Technical Support Division is responsible for overall coordination of data and information system management and for ensuring timely updates and quality control of datasets uploaded to the MRC-IS and downloaded for the use by MRCS Divisions, Member Countries and other stakeholders. In addition, the Information and Data Specialist, with the support of the CEO, has responsibility for ensuring all personnel understand what is expected of them and have the support they need, whether through training, systems, or tools to undertake their data management functions. An internal data coordination committee, consisting of the Information and Data Specialists and the Regional Specialists in each division, should meet regularly to review progress and identify opportunities for improvement.

5. **Developing smarter approaches to monitoring through continual improvement and proactive engagement of third parties involved in data collection, acquisition and analysis**

Being a regional knowledge hub does not necessarily mean having sole responsibility for data collection and generation. There will be some datasets the MRC needs to collect through ongoing monitoring and survey efforts, but there will also be datasets created and maintained by third parties, including other regional and international organisations, that will be beneficial to implementing the MRB-IF. Identifying these datasets and putting in place arrangements with the data owners for the MRCS to access and use the data in evaluating the status and trends in conditions across the Lower Mekong River Basin has the potential to greatly increase efficiencies in the overall data collection effort.

In addition, advances in remote sensing, earth observation technologies and computing capacity to deal with large amounts of data mean that over time, more efficient and effective mechanisms may be identified to take the place of expensive on-the-ground surveys and monitoring activities. A commitment to continual improvement and regular review of opportunities will be an important element to ensure cost effective and sustainable data collection over the long term.

To enact this commitment, each Regional Specialist (dataset focal point), should have responsibility for identifying potential alternative third party datasets and discussing opportunities for data sharing and access with relevant data owners. Developing new techniques and methodologies for analysing regional datasets relevant to the MRB-IF should be done periodically as and when resourcing permits and in conjunction with relevant MRC Expert Groups.

Where there are synergies, standing agreements for the provision of datasets and cooperative monitoring activities will need to be established with third parties, including other regional and international organisations or research institutes. These agreements may need to cover core data requirements for MRC assessments and reporting as well as provide supplementary data and information that can contribute to the multiple lines of evidence necessary for a comprehensive understanding of changing conditions and trends across the basin.

The wider dissemination and mainstreaming of the MRB-IF into national and regional activities within and outside the scope of MRC functions will also support harmonisation of data acquisition and generation by all organisations operating across the Lower Mekong Basin. The alignment of data acquisition and generation through a common framework should enable a more cost effective and complementary monitoring effort by all parties.

The strategic elements outlined above are intended to help mobilise the whole of the MRC towards building the foundation of data necessary to fulfil its mandated core functions and support its role as a regional knowledge hub. They require resourcing and commitment from all parties if a culture of data stewardship is to be reinvigorated as required. The various sections of this Action Plan that follow elaborate more fully on each of these elements.

## 1.5 LESSONS LEARNED FROM EARLIER DATA ACQUISITION AND GENERATION EFFORTS

The MRC has considerable experience in the collection (generation and acquisition), processing and utilisation of data. Several large-scale exercises have been completed over the years involving the generation and transfer of data from Member Countries to the MRCS. These exercises include data

collection and transfer for the development of the Basin Development Plan/Strategy, the Council Study, the State of the Basin Report and various other MRC studies and projects (***Figure 1***).

| Lesson Learnt: | What we need to do? | What are the future Outcomes and Impacts? |
|---|---|---|
| • BDP2<br>• Council Study<br>• State of Basin Report<br>• Update of MRC-IF<br>• Procedures Implementation<br>• Basin Development Strategy<br>• MASAP<br>• Others MRC studies and Projects | • Standardization of process data collections and generations by all divisions<br>• MRC-IF as basis of projects, studies implementation and Technical reporting<br>• Develop and Implement Data Acquisition, Transmission and Generation Action Plan (DAGAP) and embedded into divisions activities and planning | • Closing the MRC data and information gaps<br>• Capacity improvement<br>• Ready for any MRC reports and stusies<br>• Cost effective implementation of MRC activities, studies and projects<br>• More focus on MRC core functions and MRC objectives<br>• Enhanced MRC values as the IWRM Knowledge and Data Hub in the regoin |

**Figure 1.** The pathway from lessons learnt in MRC data collection and analysis exercises to required actions and their expected outcomes

Based on this experience, a number of key lessons can be drawn:

- Preparation and planning are crucial. There needs to be sufficient time, resources and advance notice to all relevant parties so they can accommodate any request into their work planning and budget considerations.
- There must be clarity on what is required by when and by whom. The more specific the request, the easier it is for Member Countries to fulfil the requirement, minimising the need to go back and forth and waste effort.
- All parties need to agree on the importance, and see value in, the use of the data. Requests for data and information impose time and in some cases resourcing costs on Member Countries and this imposition can come at the expense of other important work. It is therefore important that all parties have shared understanding on the value of the data and its use by the MRC. This means that all relevant data custodians, including from national line or implementing agencies, need to be involved in discussions.
- The request and the process should be as simple as possible, drawing on existing processes wherever feasible. Minimising the duplication of processes can achieve considerable cost savings.
- There needs to be flexibility to accommodate different country perspectives and data availability. Each Member Country will have different datasets as well as processes and procedures for data collection, processing and storing and these need to be factored in to the way in which the data is requested, transmitted and analysed by the MRC.

The implications of these lessons learned are discussed further in the DAGAP Concept Note and this Action Plan has been developed taking these lessons and their implications into account.

# 2. EXISTING DATA COLLECTION, MANAGEMENT AND ASSESSMENT ARRANGEMENTS

## 2.1 DATA COLLECTION AND ASSESSMENT

The MRC has a wealth of existing datasets which continue to be expanded. These datasets are one of the most valuable resources held by the organisation in its role as a regional knowledge hub. The MRC Information System (MRC-IS) includes thousands of data items of different types including time series, survey and spatial data, some of which were collected through routine monitoring and some of which were collated from secondary sources for the purposes of a particular assessment activity or study.

As identified above, the data required to implement the Mekong River Basin Indicator Framework will need to come from a variety of sources and all of the types of data generation processes that are likely to be necessary already exist (*Figure 2*). Ongoing MRC monitoring activities are in place and in the process of being decentralised to Member Countries for fisheries monitoring, hydro-meteorological monitoring, discharge measurement and sediment monitoring, ecological health monitoring and routine water quality monitoring.

Each of these monitoring activities involves the collection of monitoring parameters and data requirements relevant to implementing the MRB-IF. In addition, there are a range of *ad-hoc* or periodic studies and assessments that have been carried out by the MRC that rely on the collection of both primary and secondary data. In recent years, this has included data assembly for *Basin Development Plan 2*, the *Basin Development Strategy*, the *Mekong Adaptation Strategy and Action Plan*, the *Council Study*, the *State of the Basin Report 2018*, as well as the periodic SIMVA surveys and various other MRC studies and projects.
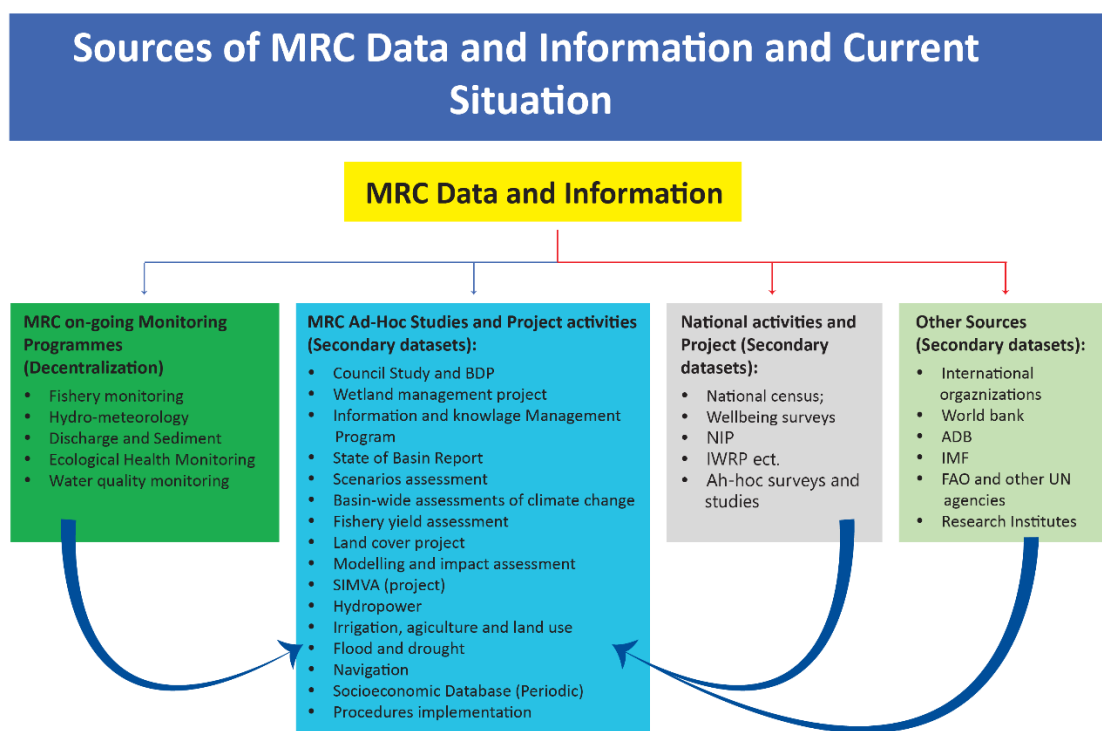


**Figure 2.** Existing sources of data and information held by the Mekong River Commission

8

As a result of this work, the MRCS holds a substantial amount of historical data on key parameters relevant to the sustainable development, conservation and management of water and related resources in the Lower Mekong Basin. To inform this Action Plan, a review of these current data holdings was undertaken to examine their alignment with the data requirements of the MRB-IF. The review found that while some historical data is available in each dimension, there are substantial gaps. Only around 58% of the total data requirements exist within the MRC-IS for the areas of the basin relevant to each Member Country (**Table 1**).

**Table 1:** Current number of datasets available at the MRCS that meet the requirements of each Member Country

| | Cambodia | Lao PDR | Thailand | Viet Nam | Total data requirements in each dimension |
|---|---|---|---|---|---|
| **Social** | 27 | 26 | 31 | 26 | 47 |
| **Environment** | 107 | 107 | 107 | 107 | 119 |
| **Economic** | 31 | 28 | 27 | 32 | 88 |
| **Climate Change** | 40 | 40 | 40 | 40 | 92 |
| **Cooperation** | 11 | 11 | 11 | 11 | 28 |

The biggest gaps exist in the Social, Economic, Climate Change and Cooperation dimensions. However, even where data is available within the MRC-IS, it is often available at different spatial scales, over different timeframes, and using different units of measurement and data categories in different countries. This makes it difficult to compare and evaluate conditions at a basin-scale. In addition, although historical data has been made available in the past, there is not necessarily an ongoing data collection mechanism in place to continue to update these datasets, other than for the environment dimension parameters collected in the five ongoing monitoring activities referred to above.

There are also a range of existing national processes involving the collection of data relevant to the MRB-IF, especially in the social and economic dimensions (*Table 2*). These processes include national censuses, household wellbeing and livelihood surveys, and specific sectoral surveys and assessments, for example on the state of the agriculture sector. Each Member Country has different data collection processes in place which correspond to national needs. Member Countries implement different surveys with different objectives, questions, target groups and timeframes. The MRB-IF, including the choice of Assessment Indicators and Monitoring Parameters, has been developed cognisant of these differences and seeks to focus on areas where there is a degree of commonality.

In addition to data sources already in place at the MRCS and across Member Countries, a number of international organisations also collect, analyse and disseminate data relevant to the MRB Indicator Framework (*Table 3*). This includes international organisations such as the World Bank and the United Nations Food and Agriculture Organisation. Often, the data used by these agencies originates from country monitoring or surveys, but it may in certain circumstances also involve additional modelling or estimation work to fill gaps and extrapolate where appropriate to help guide policy decisions. One limitation of this source of data is that in most cases the data published by international organisations is only available at a national level and therefore not always entirely relevant to assessing the status and trends in social and economic conditions within the Mekong Basin.

**Table 2:** Existing Member Country data collection processes relevant to implementing the MRB-IF

| Dimension | Cambodia | Lao PDR | Thailand | Viet Nam |
|---|---|---|---|---|
| Social | - National Census<br>- Inter-censal population survey<br>- Cambodia Socio-Economic Survey<br>- Cambodia Demographic and Health Survey<br>- Cambodia National Malaria Control Programme<br>- Cambodia National Dengue Control Programme<br>- MAF Annual Reports | - National Census<br>- Statistics Yearbook compilation<br>- Lao Expenditure and Consumption Survey<br>- National Development Plans<br>- Agriculture Census | - National Census<br>- Registration statistics<br>- Household Socio-Economic Survey<br>- National Labour Force Survey<br>- Informal Employed Survey<br>- Health statistics reporting<br>- Royal Irrigation Department statistics<br>- National Accounts | - National Census<br>- Statistics Yearbook compilation<br>- GSO web statistics compilation<br>- Living Standards Survey<br>- Rural, Agriculture Census<br>- Labour Force Survey<br>- Economic Census |
| Environment | - Hydro-meteorological monitoring for MRC<br>- Water quality monitoring for MRC<br>- Ecological Health monitoring for MRC<br>- Fisheries monitoring for MRC<br>- Discharge and sediment monitoring for MRC | - Hydro-meteorological monitoring for MRC<br>- Water quality monitoring for MRC<br>- Ecological Health monitoring for MRC<br>- Fisheries monitoring for MRC<br>- Discharge and sediment monitoring for MRC<br>- Erosion database updates | - Hydro-meteorological monitoring for MRC<br>- Water quality monitoring for MRC<br>- Ecological Health monitoring for MRC<br>- Fisheries monitoring for MRC<br>- Discharge and sediment monitoring for MRC | - Hydro-meteorological monitoring for MRC<br>- Water quality monitoring for MRC<br>- Ecological Health monitoring for MRC<br>- Fisheries monitoring for MRC<br>- Discharge and sediment monitoring for MRC |
| Economic | - Agriculture census<br>- Ministry of Agriculture Annual Report generation<br>- Monthly Price Bulletin<br>- Annual tourism statistics<br>- National Accounts<br>- Annual Power Sector Report generation<br>- Annual Report of MPWT<br>- Company sand mining reports to ministry<br>- MEF statistics on costs of floods and droughts | - Statistics Yearbook compilation<br>- Energy generators and grid operators reports<br>- Provincial reporting processes<br>- National Accounts<br>- Crop Statistics Reports<br>- Village surveys on flood and drought costs | - Agriculture statistics reporting<br>- National Accounts<br>- Provincial Power Authority and EGAT data<br>- Fisheries Department data | - Statistics Yearbook compilation<br>- GSO web statistics compilation<br>- Agriculture Statistics reporting<br>- National Accounts<br>- Inland Waterways Administration Survey<br>- Forestry Administration Survey<br>- Agriculture and Rural Development Survey |
| Climate Change | - Cambodia Socio-Economic Survey<br>- MOWRAM Annual Report<br>- Hydro-meteorological monitoring<br>- MoE and line ministry data on policies, strategies and adaptation measures<br>- SIMVA | - National social welfare database updates<br>- National waterway database updates<br>- National irrigation database updates<br>- Hydro-meteorological monitoring<br>- SIMVA<br>- Waterways, MAF and MONRE databases | - Registration statistics<br>- Hydro-meteorological monitoring<br>- Department of Disaster Prevention and Mitigation statistics<br>- Royal Irrigation Department statistics | - Hydro-meteorological monitoring<br>- Department of Climate Change Survey<br>- Agriculture and Rural Development Survey<br>- SIMVA |
| Cooperation | - National Indicative Plans<br>- National Accounts | - National Indicative Plans<br>- National Accounts | - National Indicative Plans<br>- National Accounts | - National Indicative Plans<br>- National Accounts |

**Table 3:** Existing international organisation or other third-party data collection processes relevant to implementing the MRB-IF

| Dimension | International organisation or other third-party data collection or assessment processes |
|---|---|
| Social | - FAOSTAT – food and agricultural production, consumption and economic statistics<br>- WHO – incidence of malaria<br>- ILOSTAT – employment and labour force statistics<br>- LandScan Global Population Distribution<br>- UNESCO education statistics – net primary enrolment rate by gender |
| Environment | - IUCN Red List of threatened species<br>- Asian Water-bird Census<br>- UNEP-WCMC World Database of Protected Areas<br>- SERVIR-Mekong Geospatial datasets – landcover |
| Economic | - World Bank Data Bank – world development, education, gender, health, nutrition and population, and poverty and equity statistics<br>- Mekong Region Futures Institute Ecosystem Value Estimation Tool |
| Climate Change | - Climate Watch global emissions tracking<br>- Joint Typhoon Warning Centre storm tracking<br>- IWMI Flood Risk Mapping: Southeast Asia<br>- SERVIR-Mekong Geospatial datasets – flood, drought extent and severity |
| Cooperation | - |

## 2.2  MRC SYSTEMS AND TOOLS FOR MANAGING DATA

The Member Countries adopted the *Procedures for Data and Information Exchange and Sharing* (PDIES) in 2001. The PDIES seek to:

a) Operationalise data and information exchange among the four MRC Member Countries;
b) Make available, upon request, basic data and information for public access as determined by the NMCs concerned; and
c) Promote understanding and cooperation among the Member Countries in a constructive and mutually beneficial manner to ensure the sustainable development of the Mekong River Basin.

The Procedures do this by providing the basis for cooperation among all parties on data and information exchange and sharing including in relation to data delivery to the MRCS for major groups and types of data, delivery schedules, data standards and modalities for exchange and sharing. The Procedures also provide the authority for the MRCS's establishment and custodianship of the MRC Information System (MRC-IS). The Procedures are supported by guidelines for the *Management of the Mekong River Commission Hydro-meteorological Network,* and *Custodianship and Management of the MRC-IS,* as well as the *Operational Procedures for Data Delivery*.

The 12 major groups or types of data and information that were approved for sharing in the PDIES are directly aligned to the five dimensions of the MRB-IF (*Table 4*). The PDIES therefore provides the policy framework through which the exchange and sharing of data and its management within the MRC-IS is accommodated. However, not all Strategic Indicators and Assessment Indicators require data to be shared through PDIES. For instance, Self-finance of the MRC relies on MRC budget information; the Equity of Benefits derived from the Mekong River System relies on data provided through other Strategic Indicators; and much of the Benefits Derived from Cooperation strategic indicator relies on data on regional activities already available at the MRCS.

This *Data Acquisition and Generation Action Plan* identifies which specific data is necessary and how it needs to be collected or generated so that it can be provided according to agreed arrangements (including a clearly defined schedule) under PDIES. The Action Plan does not replace the MRC data portal, MRC-IS or

PDIES; implementing the DAGAP will help give effect to these existing systems and processes by defining the content required and enabling the data gaps to be filled so that the SOBR and other assessments can be implemented consistent with the MRB-IF. The DAGAP must be integrated into existing MRC data and information systems.

In many cases, existing processes do not need to change as a result of the DAGAP. For existing MRC monitoring, where agreements are already in place and the data is already provided, that should continue. However, there are many cases where there are no existing systematic and consistent processes in place (e.g. for the socio-economic and climate change indicators) and these are identified in this Action Plan in order that they be addressed.

The MRC has a number of tools available for managing, assessing and presenting data. The Decision Support Framework (DSF), in particular, was developed through a process of consultation involving four Member Countries and relevant line agencies. The system comprises three main elements: (i) a suite of basin simulation models (SWAT, IQQM and ISIS); (ii) a knowledge base; and (iii) a set of impact assessment tools. Other modelling and data analysis tools have been used to supplement the DSF in specific studies; for example, the eWater Source Model and WUP-FIN tools. The MRC has also commenced work on a comprehensive upgrade of data management and information systems which may in the future lead to a fully integrated Decisions Support System that makes greater use of satellite and other remote sensing data and real-time monitoring across a range of disciplines.

**Table 4:** Alignment of 12 major groups or types of data and information under PDIES with the MRB-IF dimensions, Strategic and Assessment Indicators

| PDIES Major Group or Type of Data and Information | MRB-IF Dimension | MRB-IF Strategic Indicators | MRB-IF Assessment Indicators |
|---|---|---|---|
| Water Resources | Environment Climate Change | 4. Water flow conditions in the mainstream 5. Water quality and sediment conditions in the mainstream | 8. Compliance of dry season flows with the PMFM 9. Compliance of flood season peak flows with the PMFM 10. Compliance of Tonle Sap Reverse Flow with the PMFM 11. Change in the timing of onset of wet season flows 12. Ecological health and water quality compliance with the PWQ 13. Changes in sediment transport 14. Extent of salinity intrusion in the delta |
| Natural Resources | Environment Economic | 6. Status of environmental assets 8. Economic performance of MRC sectors | 17. Condition and status of fisheries and other aquatic resources 20. Economic value of hydropower 22. Economic value of sand mining 23. Economic value of wetlands 24. Economic value of capture fisheries 25. Economic value of aquaculture 26. Economic value of forestry |
| Agriculture | Social Economic Climate Change | 1. Living conditions and wellbeing 5. Water quality and sediment conditions in the mainstream 8. Economic performance of MRC sectors 11. Climate change trends and extremes 12. Adaptation to climate change | 2. Water Security 14. Extent of salinity intrusion in the delta 19. Economic value of agriculture 30. Economic cost of drought 41. Extent and severity of drought 44. Drought protection measures |
| Navigation and Transport | Economic | 8. Economic performance of MRC sectors | 21. Economic value of navigation |
| Flood Management and Mitigation | Environment Economic Climate Change | 8. Economic performance of MRC sectors 12. Adaptation to climate change | 29. Economic cost of flood 40. Extent and severity of flooding 43. Flood protection measures 45. Vulnerability to floods, droughts and storms |
| Infrastructure | Climate Change Cooperation | 12. Adaptation to climate change 14. Benefits derived from cooperation | 43. Flood protection measures 44. Drought protection measures 49. Joint efforts on projects of basin-wide significance and with potential transboundary significance |
| Urbanization/Industrialisation | Social Economic | 1. Living conditions and wellbeing 2. Livelihoods and employment in LMB water-related sectors 12. Adaptation to climate change | 2. Water Security 4. Access to electricity 44. Drought protection measures |
| Environment/Ecology | Environment Climate Change | 5. Water quality and sediment conditions in the mainstream 6. Status of environmental assets 7. Overall environmental conditions 11. Climate change trends and extremes | 12. Ecological health, and water quality compliance with the PWQ 15. Extent of wetland area 16. Condition of riverine, estuarine and coastal habitats 17. Condition and status of fisheries and other aquatic resources 18. Condition and status of ecologically significant areas |

| | | | 37. Changes in tropical storm frequency and intensity, and storm surge risk<br>38. Changes in temperature<br>39. Change in precipitation |
|---|---|---|---|
| Administrative Boundaries | Social<br>Economic | All social and economic indicators | All social and economic indicators |
| Socio-economy | Social<br>Economic<br>Climate Change | 1. Living conditions and wellbeing<br>2. Livelihoods and employment in LMB water-related sectors<br>3. Overall social conditions<br>8. Economic performance of MRC sectors<br>9. Contribution to basin economy<br>10. Greenhouse gas emissions<br>12. Adaptation to climate change | 1. Food security<br>2. Water security<br>3. Water-related health security<br>4. Access to electricity<br>5. Employment in LMB water-related sectors<br>6. Economic security<br>7. Gender equality in employment and economic engagement<br>28. Economic cost of riverbank and coastal erosion<br>31. Contribution of LMB water-related sectors to basin, national and regional GDP<br>32. Contribution to food grain supply<br>33. Contribution to protein supply<br>34. Contribution to power supply<br>35. Greenhouse gas emissions from LMB water-related sectors<br>36. Relative contribution to global emissions<br>42. Institutional response to the effects of climate change<br>45. Vulnerability to floods, droughts and storms |
| Tourism | Economic | 8. Economic performance of MRC sectors | 27. Economic value of tourism and recreation |

# 3. KEY GAPS AND STRATEGIC PRIORITIES

## 3.1 DATA GAPS

The development of the SOBR 2018 and a review of available data within MRCS consistent with the MRB-IF identified substantial data gaps (***Table 5***). The most significant of these gaps are in the social and economic dimensions of the Framework, reflecting the MRC's core river monitoring activities, which are largely focused on environmental matters. The SIMVA surveys and Council Study have resulted in some data collected which aligns with social and economic dimension requirements, but the geographic scale of these is limited to the mainstream corridor, making it of limited use for basin-wide assessment. Where social and economic data has previously been transmitted from Member Countries to the MRCS it is at different spatial and temporal scales and includes different parameters for the same assessment indicators. Most data have previously been supplied at a national scale rather than a basin or sub-basin scale, which is more problematic for data on Thailand and Viet Nam than for Cambodia and Lao PDR given that the large part of Thailand and Viet Nam exists outside the basin.

The environment data is the most complete, particularly where it aligns with existing monitoring activities (e.g. hydrology, water quality, fisheries, and sediment transport). However, there are still gaps in the environment dimension in terms of ongoing data collection and assessment processes, especially for the periodic assessments, many of which are now out-of-date. Climate data has been collected in the past and there is a comprehensive set of historical data that was collected under the MRC's Climate Change and Adaptation Initiative, but this is mostly focused on meteorological parameters rather than adaptation, and the ongoing approach to climate change monitoring and reporting is still being established.

The basic data required for the cooperation dimension is largely available but has substantial gaps in terms of full implementation of the Framework, particularly in terms of the value of future benefits from joint and transboundary projects and projects of basin-wide significance. The quantity of projects in each category and the initial investment amount is generally recorded, but not the ongoing flow of benefits that each project is expected to provide.

**Table 5:** Key data gaps within existing MRCS data holdings in relation to the MRB-IF

| Dimension | Assessment Indicator | Monitoring Parameters Missing Key Data Requirements |
|---|---|---|
| Social | Food Security | Adequacy of dietary energy supply<br>Prevalence of undernourishment<br>Prevalence of infant malnutrition |
| | Water Security | Adequacy of domestic water supply<br>Sufficiency of water for farming |
| | Water-related Health Security | Access to safe water supplies<br>Prevalence of malnutrition<br>Access to sanitation<br>Incidence of water-borne disease |
| | Access to electricity | Urban household electrification rate<br>Rural household electrification rate |
| | Employment in LMB water-related sectors | Proportion of working age population employed in water-related sectors |
| | Economic Security | Sufficiency of household income<br>Sufficiency of household assets |
| | Gender equality in employment and economic engagement | Female-male ratio of people employed in LMB water-related sectors<br>Gender equality in ownership of land |

| | | |
|---|---|---|
| **Environment** | Extent of wetland area | Flooded forest area<br>Inundated grassland area<br>Marsh or swamp area<br>Inundated rice field area<br>Mangrove area<br>Waterbody area<br>Aquaculture area |
| | Condition of riverine, estuarine and coastal habitats | Area of sandy habitat<br>Area of rocky habitat<br>Average depth of deep pools<br>Mangrove area<br>Area of vegetated riparian habitat<br>Area of riverbank erosion<br>Area of coastal erosion |
| | Condition and status of fisheries and other aquatic resources | Abundance of other water-dependent biodiversity (especially Other Aquatic Animals (OAAs) and water birds) |
| | Condition and status of ecologically significant areas | Extent of natural land cover in ecologically significant areas<br>Forested land area (by type of forest) |
| **Economic** | Economic value of agriculture | Riverbank gardens<br>Agricultural prices |
| | Economic value of navigation | Volume of cargo transported<br>Passenger transport numbers<br>Navigation prices |
| | Economic value of sand mining | Sand mining production<br>Sand mining prices |
| | Economic value of wetlands | Flooded forest ecosystem services production<br>Inundated grassland ecosystem services production<br>Marsh or swamp ecosystem services production<br>Mangrove ecosystem services production<br>Waterbodies ecosystem services production<br>Wetland services prices |
| | Economic value of forestry | Forestry production<br>Forestry prices |
| | Economic value of tourism and recreation | Tourism and recreation revenue |
| | Economic cost of riverbank and coastal erosion | Riverbank erosion losses<br>Coastal erosion losses |
| | Economic cost of flooding | Annual cost of flood damages |
| | Economic cost of drought | Annual cost of drought damages |
| **Climate Change** | Flood protection measures | Area of urban land protected by embankments/levees<br>Area of rural land protected by embankment/levees |
| | Drought protection measures | Proportion of irrigable land that is irrigated<br>Volume of available water storage |
| | Vulnerability to floods droughts and storms | Exposure, sensitivity and adaptive capacity to floods<br>Exposure, sensitivity and adaptive capacity to droughts<br>Exposure, sensitivity and adaptive capacity to storms |
| **Cooperation** | Overall social benefits derived in each country's part of the basin | Amalgamation of other data gaps in the social dimension |
| | Overall environmental benefits derived in each country's part of the basin | Amalgamation of other data gaps in the environment dimension |
| | Aggregated economic benefits derived from water-related sectors in each country's part of the basin | Amalgamation of other data gaps in the economic dimension |
| | Joint efforts on projects of basin-wide significance and with potential transboundary impacts | Value of projects of basin-wide significance<br>Value of transboundary projects notified |
| | Partnerships between the MRC and other parties | Value of joint projects with other parties |
| | Proportion of benefits derived from cooperation to total net value | Value of joint projects, transboundary projects and projects of basin-wide significance |

*Table 5* above identifies the current data gaps in relation to historical datasets held by the MRCS. Implementation of the MRB-IF, however, requires not only historical data but an ongoing supply of future data as datasets need to be regularly updated. To do this requires both routine monitoring and periodic assessments conducted at either a regional or national level, or a combination of both.

**(i)      Routine MRC monitoring activities required to implement the MRB-IF**

Routine monitoring activities required at a regional level to implement the MRB-IF are identified in *Table 6*. Six of these activities already have agreed ongoing monitoring arrangements in place. They are four of the routine river monitoring activities, for hydro-meteorology, water quality, ecological health and fisheries, as well as the SIMVA survey and monitoring by the MRC of budget contributions from the Member Countries.

One activity has existing monitoring and assessment methods that have been used in the past and could be used again. However, there are no ongoing activity implementation agreements in place. Four other activities will need to develop agreed methods, including improved definitions, in order that data is collected in a consistent and replicable manner over time.

**Table 6:** Routine MRC monitoring activities required to implement the MRB-IF

| Regional Monitoring | Existing MRC Methods | Agreed Ongoing Activity | Required Assessment Frequency |
|---|---|---|---|
| 1.    Periodic transmission of socio-economic data to the MRCS | | | 5-yearly |
| 2.    Hydro-meteorological monitoring | | | Annual |
| 3.    Water quality monitoring[2] | | | Annual |
| 4.    Ecological health monitoring | | | Biennial |
| 5.    Discharge and sediment monitoring | | | Annual |
| 6.    Fisheries monitoring | | | Annual |
| 7.    SIMVA | | | 5-yearly |
| 8.    Quantity and value of joint and transboundary projects and projects of basin-wide significance[3] | | | 5-yearly |
| 9.    Extent of knowledge-sharing activities | | | 5-yearly |
| 10.  Partnerships between the MRC and other parties | | | 5-yearly |
| 11.  MRC budget contributions | | | Annual |

**(ii)     Periodic MRC studies, assessments or reviews required to implement the MRB-IF**

In addition to the routine MRC monitoring activities, from time to time the MRC has undertaken periodic studies, assessments or reviews in order to respond to different needs at different times. These periodic regional assessments are those where it is more efficient to implement a consistent regional methodology across the whole basin rather than combine separate approaches in each Member Country. They have often required specific data collection exercises and therefore have existing methodologies that can be applied as they have been in the past in order to meet the requirements for implementing the MRB-IF (*Table 7*). However, there are no current agreements in place between the MRCS and Member Countries for any data collection associated with undertaking periodic studies, assessments or reviews at regular intervals. The MRB-IF and MRC planning cycle requires that data collection for these periodic studies, assessments and reviews occur at least once every five years.

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[2] Additional monitoring parameters to be added for oil and grease, and phenols
[3] Number and investment in projects are regularly reported to the MRC, but not economic value

Only a small number of the required periodic studies or reviews have existing MRC methods available. The ones that do are: (i) drought risk assessment, which has previously been carried out under the former drought programme; (ii) forested area by type of forest; (iii) extent of wetland area by type of wetland, through previous MRC land cover assessments; (iv) fisheries yield assessment by habitat type, which was developed under the former fisheries programme; (v) the number of threatened species; and (vi) the protection status of ecologically significant areas (specifically protected areas), which have previously been collected for a range of purposes including basin-wide climate change assessments and State of the Basin Reports.

**Table 7:** Periodic MRC studies or reviews required to implement the MRB-IF

| Regional Study | Existing MRC Methods | Agreed Ongoing Activity | Required Frequency |
|---|---|---|---|
| 1. Drought risk assessment for water security | (green) | (red) | 5-yearly |
| 2. Multi-media contaminants – heavy metals and pesticides | (green) | (red) | 5-yearly |
| 3. Salinity intrusion in the delta[4] | (green) | (red) | Annual |
| 4. Land cover assessment (including wetlands and forest types) | (green) | (red) | 5-yearly |
| 5. Riverine, estuarine and coastal habitats (including sandy habitats, rocky habitats, deep pools, riverine and coastal erosion) | (red) | (red) | 5-yearly |
| 6. Threatened water-dependent species and ecologically significant areas | (green) | (red) | 5-yearly |
| 7. Hydro-meteorological network analysis and design | (red) | (red) | 10-yearly |
| 8. Economic value of ecosystem services | (red) | (red) | 5-yearly |
| 9. Fisheries yield assessment by habitat type | (green) | (red) | 5-yearly |
| 10. Extent and severity of flooding | (red) | (red) | 5-yearly |
| 11. Extent and severity of drought | (red) | (red) | 5-yearly |
| 12. Vulnerability to floods, droughts and storms | (red) | (red) | 5-yearly |

**(iii)    Routine national monitoring and surveys required to implement the MRB-IF**

Member Country governments undertake monitoring and surveys across a wide range of fields in order to meet national needs. These include national censuses and periodic surveys of social and economic conditions as well as the routine collection of general statistics in various sectors. Routine and periodic assessments are also undertaken from time to time to inform national planning and policies.

*Table 8* to *Table 11* identify the existing national routine monitoring and surveys undertaken in each country as relevant to the particular data requirements of the MRB-IF and whether or not these align with the spatial and temporal requirements in each case. For a number of data requirements there are no existing national surveys or monitoring programs in place to collect the required data and so these data requirements will need to be met by other data collection processes in future. This might involve new data collection processes or modifications to existing ones.

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[4] Continuing data collection on salinity is agreed through the water quality monitoring activity, but not the regular modelling assessment processes to determine the area of the delta affected

**Table 8:** Routine national monitoring activities in Cambodia required to implement the MRB-IF, with the current spatial and temporal scale of collected data assessed against MRB-IF scale requirements

| National Monitoring Activity | Relevant MRB-IF Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 1. National Census and Inter-censal population survey | • Population<br>• Population by age group<br>• Population – urban and rural<br>• Population density<br>• No. of people employed in each LMB water-related sector<br>• Employment rate across the LMB<br>• Household size<br>• No. of households – urban and rural<br>• No. of jobs in each LMB water-related sector occupied by females<br>• No. of jobs in each LMB water-related sector<br>• No. of rural households owning land<br>• No. of rural households within each spatial unit<br>• Population in flood-affected areas<br>• Population in drought-affected areas<br>• Population in storm-affected areas<br>• Male life expectancy at birth<br>• Female life expectancy at birth<br>• Migration rate from rural to urban | Village or Province | 5-yearly |
| 2. Cambodia Socio-Economic Survey (CSES) | • Household income/expenditure<br>• Household size<br>• Households with access to water supplies from an improved source<br>• Total number of households within each spatial unit<br>• Households with access to water supplies that meet drinking water standards<br>• Households with access to sanitation facilities<br>• Urban households with access to electricity<br>• Rural households with access to electricity<br>• Total number of urban households within each spatial unit<br>• Total number of rural households within each spatial unit<br>• Working age population<br>• No. of rural households owning land<br>• No. of jobs in each LMB water-related sector<br>• No. of girls and boys attending primary education<br>• No. of boys and girls in the community<br>• No. of agricultural households headed by males<br>• No. of agricultural households headed by females<br>• No. of agricultural households headed by males that own land<br>• No. of agricultural households headed by females that own land<br>• Population below the national poverty line in flood-affected areas<br>• Population below the national poverty line in drought-affected areas<br>• Population below the national poverty line in storm-affected areas<br>• Percentage of population earning less than USD1.25/day and USD2.00/day | Urban/ rural and regional | Biennial |
| 3. Cambodia Demographic and Health Survey | • Proportion of children <5 yrs old exhibiting stunting<br>• Proportion of children <5 yrs old exhibiting wasting | Province | 5-yearly |
| 4. Cambodia National Malaria Control Programme | • No. of reported cases of malaria | District or Province | Annual |

19

| National Monitoring Activity | Relevant MRB-IF Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 5. Cambodia National Dengue Control Programme | • No. of reported cases of dengue | District or Province | Annual |
| 6. Mekong Basin Disease Surveillance | • No. of reported outbreaks of Cholera | District or Province | Annual |
| 7. Bathymetric survey for the Waterway Infrastructure Database | • Area of rocky habitats<br>• Location of deep pools | River Sections | 3-yearly |
| 8. Cambodia FIA and WWF Dolphin Population Monitoring | • No. of Dolphins | Site | Annual |
| 9. Agriculture Census and Annual Report | • Quantity of rice produced for food<br>• Cropped area for each crop (irrigated, rain-fed, recession)<br>• Annual yield for each crop (irrigated, rain-fed, recession)<br>• Annual production of each main fish species and OAA from Aquaculture<br>• Total area of forestry<br>• Average unit timber log production<br>• Average timber log unit price<br>• Average value of non-timber forest products | Province | Annual |
| 10. Annual Power Sector Report | • Total production of hydropower for domestic consumption<br>• Total production of hydropower exported<br>• Total amount of hydropower generated<br>• Average unit price of hydropower in domestic consumption<br>• Average unit price of power in import countries<br>• Basin electric power demand (produced + imported)<br>• National electric power demand (produced + imported) | National | Annual |
| 11. Company production reports and invoices to the Ministry of Mines and Energy | • Annual total quantity of aggregates, sands and sediments abstracted for commercial use<br>• Average selling price of aggregates, sands and sediments | Province | Annual |
| 12. National Accounts | • National GDP<br>• GDP growth rate<br>• GDP per capita<br>• Discount rate | National | Annual |
| 13. Monthly price bulletin for various foods | • Average farm gate price for each irrigated crop<br>• Average farm gate price for recession rice<br>• Average farm gate price for each rain-fed crop<br>• Average price of fish species and OAAs at landing site<br>• Average price of fish species and OAAs at farm gate | Province | Monthly |
| 14. National Indicative Plans | • Number of projects of basin-wide significance<br>• Cost of initial project investment | Basin | 5-yearly |
| 15. SIMVA and Annual Reports | • Irrigation area within each spatial unit<br>• Total cropped area of riverbank gardens<br>• Annual yield for riverbank gardens<br>• Average farm gate prices for riverbank garden crops | Region | Annual |
| 16. SIMVA | • Household asset value | River Sections | 5-yearly |
| 17. National Annual Report of MAFF and TSA | • Biomass of OAA/P harvested<br>• Time spent harvesting OAA/P<br>• Harvest of crabs<br>• Harvest of shrimp | Site | Annual |

| National Monitoring Activity | Relevant MRB-IF Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| | • Harvest of water snakes<br>• Harvest of other OAA/P | | |
| 18. National Annual Report of MoE/WCS and TSA | • No. of water birds<br>• No. of water bird species | Site | Annual |
| 19. National Annual Report of Ministry of Public Works and Transport | • Annual total quantity of ITW cargo transported along the mainstream<br>• Annual total number of passenger trips made along the mainstream<br>• Navigation prices | National | Annual |
| 20. Tourist Data and Waterways from MPWT and MOT | • No. of international and domestic tourists visiting the basin<br>• Average length of trip<br>• Average spend per trip/day | Province | Annual |
| 21. TBC | • Cost of lost production for each crop type due to flooding<br>• Government reported costs of flood damage<br>• Government reported costs of drought damage<br>• Production loss from agriculture due to drought<br>• Total damages and losses due to drought | National | Annual |
| 22. Annual Report MOWRAM | • Daily maximum temperature<br>• Daily minimum temperature<br>• Daily rainfall | Station | Daily |
| 23. MoE and line ministries data | • Greenhouse gas emissions from LMB water-related sectors<br>• Policies and strategies for climate change response<br>• Budgets for climate change response<br>• No. of awareness raising activities on climate change<br>• Receipt of international climate finance<br>• Existence of national and local disaster risk management plans for floods, droughts and storms | National | Biennial |
| 24. National Report of MOWRAM and line ministries | • Area of urban land protected by embankments/levees<br>• Area of rural land protected by embankments/levees<br>• Total volume of water reservoirs for agricultural use<br>• Total volume of water for urban use<br>• Domestic water-use demands over the dry season<br>• Agricultural water-use demands over the dry season<br>• Land classification as urban land<br>• Land classification as agricultural land<br>• Digital elevation modelling with flood mapping | Sites | Annual |
| 25. NCDM Annual Data Collection Damage and Annual report of MOWRAM | • Time households affected by flooding<br>• Time households affected by drought<br>• Time households affected by storms<br>• Total flood-affected area<br>• Total storm-affected area<br>• Total drought-affected area<br>• Asset damage due to flooding<br>• Cost of lost production due to drought<br>• Asset damage and lost production due to storms | Sites | Annual |
| 26. CNMC Data | • Expected future cash flow from projects of basin-wide significance, transboundary impacts and from joint projects and time periods over which they are expected to generate returns | Basin | Annual |
| 27. National Accounts | • Gini coefficient<br>• GDP by LMB water-related sector<br>• Basin GDP<br>• Basin GDP per capita | National and 5 biggest provinces | Annual |

**Table 9:** Routine national monitoring and surveys in Lao PDR required to implement the MRB-IF

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 1. Statistics Yearbook compilation | • Population<br>• Total number of households within each spatial unit<br>• Total number of urban households within each spatial unit<br>• Total number of rural households within each spatial unit<br>• Working age population<br>• Number of girls and boys attending primary education<br>• Total annual production of fish species<br>• Annual basin protein production<br>• Population density<br>• Power generation by source and consumption | Province | Annual |
| | • Annual production of each main fish species and OAA from Aquaculture | Province | Monthly |
| | • Urban households with access to electricity<br>• Rural households with access to electricity<br>• Number of primary age girls and boys in the community<br>• Male life expectancy at birth<br>• Female life expectancy at birth | Province | Annual |
| | • Gross annual economic value of each sector<br>• Number of international tourists visiting the basin<br>• Average length of trip<br>• Average spend per trip day<br>• Aggregate gross value of production of each LMB water-related sector | National | Annual |
| 2. Labour Force Survey | • No. of people primarily employed in each LMB water-related sector<br>• Number of jobs in each LMB water-related sector<br>• Number of jobs in each LMB water-related sector occupied by females<br>• Employment rate across the basin | Province | Annual |
| 3. Lao Expenditure and Consumption Survey | • Quantity of rice produced for food<br>• Household income/expenditure<br>• Household size<br>• Households with access to water supplies from an improved source<br>• Households with access to water supplies that meet drinking water standards<br>• Households with access to sanitation facilities<br>• Household asset value<br>• No. of households owning land<br>• Number of agricultural households headed by males<br>• Number of agricultural households headed by females<br>• Number of agricultural households headed by males that own land<br>• Number of agricultural households headed by females that own land<br>• Average value of non-timber forest products<br>• Percentage of population earning less than USD1.25/day<br>• Percentage of population earning less than USD2.00/day<br>• Urban and rural populations by country | Province | 5-yearly |
| 4. Lao Social Indicator Survey / Multiple Indicators Cluster Survey | • Proportion of children <5 yrs old exhibiting stunting<br>• Proportion of children <5 yrs old exhibiting wasting<br>• No. of cases of malaria<br>• No. of case of dengue fever<br>• No. of outbreaks of cholera | Province | 5-yearly |
| 5. Crop Statistics Report | • Irrigation area within each spatial unit<br>• Total cropped area for each crop (irrigated, rain-fed)<br>• Annual yield for each crop (irrigated, rain-fed) | Province | Annual |

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 6. Agriculture Census | • Number of agricultural households headed by males that own land<br>• Number of agricultural households headed by females that own land | Province | 5-yearly |
| 7. Market Surveys | • Average farm gate price for each crop (irrigated, rain-fed, recession, garden)<br>• Average price of capture fish species at landing site<br>• Average price of aquaculture fish species at farm gate | Province | Monthly |
| 8. Project on emergency response to oil spills with China | • Oil and grease | National | Annual |
| 9. Bank protection updates for the erosion database | • Net area of land lost to riverbank erosion | Mainstream and tributaries | Annual |
| 10. Cambodia FiA and WWF Dolphin Population monitoring | • Number of dolphins | Site | Annual |
| 11. Reporting by generators and grid operators | • Power generation by source and consumption<br>• Basin electric power demand (total produced + imported)<br>• Annual basin hydroelectric generation<br>• National electric power demand (total produced + imported) | National | Annual |
| 12. National power reporting | • Average unit price of power in domestic consumption<br>• Average unit price of power in import countries | Province | Annual |
| 13. Provincial transport data collection | • Annual total quantity of ITW cargo transported along the mainstream<br>• Annual total number of passenger trips made along the mainstream<br>• Average price of transporting cargo<br>• Average price of each passenger trip | Province | Annual |
| 14. Provincial forestry data collection | • Total area of forestry<br>• Average unit timber log production [quota only] | National | Annual |
| 15. Village surveys | • Annual cost of lost production for each crop type due to flooding<br>• Government reported costs of flood damage to public and private infrastructure | Region | 6-monthly |
| | • Government reported costs of drought damage | Region | Annual |
| 16. National Disaster Risk database updates | • Population in flood-affected areas<br>• Population in drought-affected areas<br>• Population in storm-affected areas<br>• Time households affected by flooding<br>• Time households affected by drought<br>• Time households affected by storms<br>• Total flood-affected area<br>• Total storm-affected area<br>• Total drought-affected area<br>• Asset damage due to floods<br>• Cost of lost production due to droughts<br>• Asset damage and lost production due to storms<br>• Population below the national poverty line in flood-affected areas<br>• Population below the national poverty line in drought-affected areas<br>• Population below the national poverty line in storm-affected areas | District | Annual |
| 17. Waterway database updates | • Location, height and length of embankments/levees | Mainstream | Annual |
| 18. National Accounts | • National GDP<br>• National GDP growth rate<br>• National GDP per capita | National | Annual |

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| | • National GDP by LMB water-related sector<br>• Discount rate | | |
| 19. SIMVA | • Total cropped area of riverbank gardens<br>• Annual yield for riverbank gardens | Mainstream | 5-yearly |
| 20. MPWT Database | • Annual total quantity of aggregates, sands and sediments abstracted for commercial use<br>• Average selling price of aggregates, sands and sediments | Province | Annual |
| 21. MONRE, LSB | • Daily maximum temperature<br>• Daily minimum temperature<br>• Daily rainfall | Province | Annual |
| 22. National Climate Change Book | • Greenhouse gas emissions from LMB water-related sectors<br>• Policies and strategies for climate change response<br>• Budgets for climate change response<br>• No. of awareness-raising activities on climate change<br>• Receipt of international climate finance | National | 4-yearly |
| 23. MPWT database | • Area of urban land protected by embankments/levees | National | Annual |
| 24. MPWT, MONRE and MAF databases | • Area of rural land protected by embankments/levees<br>• Domestic water-use demands over the dry season<br>• Agricultural water-use demands over the dry season<br>• Land classification as urban land<br>• Land classification as agricultural land<br>• Digital elevation modelling with flood mapping | Province | Annual |

**Table 10:** Routine national monitoring and surveys in Thailand required to implement the MRB-IF

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 1. Registration statistics | • Population<br>• Population density | Province | Annual |
| 2. Web statistics compilation | • Quantity of rice produced for food | Province | Annual |
| | • Gini coefficient<br>• Male life expectancy at birth (tbc)<br>• Female life expectancy at birth (tbc) | National | Annual |
| 3. Household socio-economic survey | • Household income/expenditure<br>• Household size<br>• Households with access to water supplies from an improved source<br>• Total number of households within each spatial unit<br>• Households with access to water supplies that meet drinking water standards<br>• Households with access to sanitation facilities<br>• Total number of urban households within each spatial unit<br>• Total number of rural households within each spatial unit<br>• Household asset value<br>• Number of rural households owning land<br>• Number of agricultural households headed by males<br>• Number of agricultural households headed by females<br>• Number of agricultural households headed by males that own land<br>• Number of agricultural households headed by females that own land | Province | Annual |
| 4. Multiple Indicators Cluster Survey | • Proportion of children <5 yrs old exhibiting stunting<br>• Proportion of children <5 yrs old exhibiting wasting<br>• Rural households with access to electricity supply<br>• Urban households with access to electricity supply | Province | 5-yearly |
| 5. Labour Force Survey | • Working age population<br>• Number of people primarily employed in each LMB water-related sector<br>• Employment rate across the basin | Province | Quarterly |
| 6. Informal Employed Survey | • Number of jobs in each LMB water-related sector<br>• Number of jobs in each LMB water-related sector occupied by females | Province | Quarterly |
| 7. National Census and estimates | • Number of girls and boys attending primary education<br>• Number of primary age girls and boys in the community | Region | 3-yearly |
| 8. Agriculture Statistics reporting | • Total cropped area for each crop (irrigated, rain-fed, recession, riverbank garden)<br>• Annual yield for each crop (irrigated, rain-fed, recession, riverbank garden) | Province | Annual |
| | • Average farm gate price for each crop (irrigated, rain-fed, recession, riverbank garden) | Province | Monthly |
| 9. National Accounts | • National GDP | Province | Annual |
| | • Aggregate gross value of production in the basin<br>• Basin GDP per capita<br>• National GDP per capita<br>• GDP growth rate of each country | Province | Annual |
| | • Aggregate gross value of production of each LMB water-related sector | Province | Annual |
| 10. Poverty head count by region and province | • Population below the national poverty line in flood-affected areas<br>• Population below the national poverty line in drought-affected areas<br>• Population below the national poverty line in storm-affected areas<br>• Percentage of population earning less than USD1.25/day<br>• Percentage of population earning less than USD2.00/day | Province | Annual |

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 11. RID Statistics | • Irrigation area within each spatial unit | - | - |
| 12. Department of Fisheries Data | • Annual production of each main fish species and OAA from Aquaculture | Province | Annual |
| 13. Land Development Department Data | • Area of natural land cover within ecologically significant areas | 1:25,000 | Annual |
| 14. EGAT Statistics | • Average unit price of power in domestic consumption<br>• Average unit price of power in import countries | Province | Annual |
| | • Annual basin hydroelectric generation<br>• National electric power demand (total produced + imported) | Region | Annual |
| | • Power generation by source and consumption<br>• Basin electric power demand (total produced + imported)<br>• Average unit price of power in domestic consumption<br>• Average unit price of power in import countries | National | Annual |
| 15. Marine Department and Customs Data | • Annual total quantity of ITW cargo transported along the mainstream<br>• Annual total number of passenger trips made along the mainstream<br>• Average price of transporting cargo<br>• Average price of each passenger trip | TBC | TBC |
| 16. Department of Fisheries Data | • Annual production of each main fish species and OAA from Aquaculture<br>• Average price of capture fish species and OAAs at landing site<br>• Average price of aquaculture fish species and OAAs at farm gate | TBC | TBC |
| 17. TBC | • Basin food grain demand (total produced + imported)<br>• Basin food grain production<br>• Bain protein demand (total produced + imported)<br>• Basin protein production<br>• Basin electric power demand (total produced + imported)<br>• Basin hydroelectric generation<br>• National electric power demand) total produced + imported) | TBC | TBC |
| 18. TMD Annual Report | • Daily maximum temperature<br>• Daily minimum temperature<br>• Daily rainfall | Province | Daily |
| 19. Annual Climate Change Report | • Greenhouse gas emissions from LMB water-related sectors<br>• Policies and strategies for climate change response<br>• Budgets for climate change response<br>• No. of awareness-raising activities on climate change<br>• Receipt of international climate finance<br>• Existence of national and local disaster risk management plans for floods, droughts and storms | National | Annual |
| 20. National Data Collection, Generation and Reporting | • Total volume of water reservoirs for agricultural use<br>• Total volume of water for urban use<br>• Domestic water-use demands over the dry season<br>• Agricultural water-use demands over the dry season<br>• Land classification as urban land<br>• Land classification as agricultural land<br>• Digital elevation modelling with flood mapping | Province and Basin and 1:25,000 | Annual and Biannual |
| 25. National Disaster Report | • Time households affected by flooding<br>• Time households affected by drought<br>• Time households affected by storms<br>• Total flood-affected area<br>• Total storm-affected area<br>• Total drought-affected area<br>• Asset damage due to floods<br>• Cost of lost production due to drought | Province | Seasonal |

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| | • Asset damage and lost production due to storms | | |
| 26. National Statistics | • Migration rate from rural to urban | - | - |

**Table 11: Routine national monitoring and surveys in Viet Nam required to implement the MRB-IF**

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 1. Statistics Yearbook compilation | • Population<br>• Population density<br>• Quantity of rice produced for food<br>• Proportion of dietary energy coming from rice<br>• Number of reported cases of malaria<br>• Number of reported cases of dengue fever<br>• Number of reported outbreaks of cholera<br>• Total area cropped for each crop type (irrigation, rain-fed, recession)<br>• Annual yield for each crop (irrigation, rain-fed, recession)<br>• Total annual production of aquaculture fish and OAAs<br>• Average unit timber log production<br>• Total cropped area for each crop (riverbank garden)<br>• Annual yield for each crop (riverbank garden)<br>• Population in flood-affected areas<br>• Population in drought-affected areas | Province | Annual |
| | • Proportion of population undernourished<br>• Proportion of population suffering malnutrition<br>• Irrigation area within each spatial unit | Region | Biennial |
| | • National poverty rate by region<br>• Percentage of population earning less than USD1.25/day<br>• Percentage of population earning less than USD2.00/day | Region | Annual |
| | • Male life expectancy at birth<br>• Female life expectancy at birth | Region | 5-yearly |
| | • Biomass of OAA/P harvested<br>• Time spent harvesting OAA/P<br>• Harvest of crabs<br>• Harvest of shrimp<br>• Harvest of water snakes<br>• Harvest of other OAA/P<br>• Annual total quantity of aggregates, sands and sediments abstracted for commercial use<br>• Average selling price of aggregates, sands and sediments | Region | Biennial |
| | • Total production of hydropower for domestic consumption<br>• Total production of hydropower exported<br>• Average unit price of power in domestic consumption<br>• Average unit price of power in import countries<br>• Power generation by source and consumption<br>• Basin electric power demand (total produced + imported)<br>• Annual basin hydroelectric generation<br>• National electric power demand (total produced + imported)<br>• Average unit price of power in domestic consumption<br>• Average unit price of power in import countries | Region | Annual |
| 2. Inland Waterways Administration Survey | • Annual total quantity of ITW cargo transported along the mainstream<br>• Annual total number of passenger trips made along the mainstream<br>• Average price of transporting cargo<br>• Average price of each passenger trip | Region | Annual |
| 3. Administration of Forestry/Survey | • Average timber log unit price<br>• Average value of non-timber forest products | Region | Annual |
| 4. National Administration of Tourism/Survey | • Number of domestic tourists visiting the basin<br>• Number of international tourists visiting the basin | Region | Annual |

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| | • Average length of trip (domestic and international) | | |
| 5. Agriculture and Rural Development/Survey | • Average value of land lost to bank erosion<br>• Average value of land lost to coastal erosion<br>• Annual area lost to coastal erosion<br>• Annual cost of lost production due to flooding<br>• Government reported costs of flood damage to public and private infrastructure<br>• Government reported costs of drought damage | Region | Annual |
| 6. National Accounts/ Survey | • Aggregate gross value of production in the basin<br>• Basin GDP per capita<br>• Basin food grain demand (total produced + imported)<br>• Bain protein demand (total produced + imported)<br>• Basin electric power demand (total produced + imported)<br>• Basin hydroelectric generation<br>• National electric power demand (total produced + imported) | Region | Annual |
| 7. Living Standards Survey | • Household income/expenditure<br>• Household size<br>• Households with access to water supplies from an improved source<br>• Households with access to water supplies that meet drinking water standards<br>• Number of people primarily employed in each LMB water-related sector | Province | Biennial |
| | • Households with access to sanitation facilities<br>• Urban households with access to electricity<br>• Rural households with access to electricity<br>• Gross annual economic value of each sector<br>• Household asset value<br>• Number of rural households owning land<br>• Number of girls and boys attending primary education<br>• Number of primary age girls and boys in the community<br>• Number of agricultural households headed by males<br>• Number of agricultural households headed by females<br>• Number of agricultural households headed by males that own land<br>• Number of agricultural households headed by females that own land | Province | Biennial |
| | • Urban and rural basin population by country | Region | Biennial |
| 8. GSO web statistics compilation | • Proportion of children <5 yrs old exhibiting stunting<br>• Proportion of children <5 yrs old exhibiting wasting | Rural/ urban | Biennial |
| | • Average farm gate price for each crop (irrigation, rain-fed, recession, riverbank garden)<br>• Average price of capture fish species and OAAs at landing site<br>• Average price of aquaculture fish species and OAAs at farm gate<br>• Total area of forestry<br>• Average spend per trip-day by domestic tourists<br>• Average spend per trip-day by international tourists<br>• Basin food grain production<br>• Gini coefficient | Region | Annual |
| 9. National Census | • Total number of households within each spatial unit<br>• Total number of urban households within each spatial unit<br>• Total number of rural households within each spatial unit<br>• Working age population<br>• Number of girls and boys attending primary education<br>• Number of primary age girls and boys in the community | Province | 10-yearly |

| National Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| | • Number of agricultural households headed by males<br>• Number of agricultural households headed by females<br>• Number of agricultural households headed by males that own land<br>• Number of agricultural households headed by females that own land<br>• Population by age group by country | | |
| 10. Labour Force Survey | • Working age population<br>• Number of people primarily employed in LMB water-related sectors<br>• Employment rate across the basin<br>• Number of jobs in each LMB water-related sector<br>• Number of jobs in each LMB water-related sector occupied by females | Region | Annual |
| 11. National Accounts | • National GDP<br>• Aggregate gross value of production of each LMB water-related sector<br>• National GDP by LMB water-related sector<br>• GDP growth rate<br>• National GDP per capita | National | Annual |
| 12. Internal migration survey | • Migration rate rural to urban | Region | 10-yearly |
| 13. National hydro-meteorological monitoring | • Mean sea-level at the delta coast | Delta | Hourly |
| 14. National hydro-meteorological monitoring | • Daily maximum temperature<br>• Daily minimum temperature<br>• Daily rainfall | Province | Daily |
| 15. Department of Climate Change Survey | • Greenhouse gas emissions from LMB water-related sectors<br>• Policies and strategies for climate change response<br>• Budgets for climate change response<br>• No. of awareness-raising activities on climate change<br>• Receipt of international climate finance<br>• Existence of national and local disaster risk management plans for floods, droughts and storms | Region | Annual |
| 16. Agriculture and Rural Development Survey | • Area of urban land protected by embankments/levees<br>• Area of rural land protected by embankments/levees<br>• Total volume of water reservoirs for agricultural use<br>• Total volume of water for urban use<br>• Domestic water-use demands over the dry season<br>• Agricultural water-use demands over the dry season<br>• Land classification as urban land<br>• Land classification as agricultural land<br>• Digital elevation modelling with flood mapping | Region | Annual |
| 17. National Steering Centre for Natural Disaster Prevention and Control | • Time households affected by flooding<br>• Time households affected by drought<br>• Time households affected by storms<br>• Total flood-affected area<br>• Total storm-affected area<br>• Total drought-affected area<br>• Asset damage due to floods<br>• Cost of lost production due to droughts<br>• Asset damage and lost production due to storms | Province | Annual |
| 18. Survey | • Expected future cash flow from projects of basin-wide significance, transboundary impacts and from joint projects and time periods over which they are expected to generate returns | Region | Annual |

**(iv)    International organisation data potentially required to implement the MRB-IF**

*Table 12* below provides the list of data and tools from international and regional organizations that can be used to help meeting the requirements of the MRB-IF.

**Table 12:** Data and tools from international and regional organisations that can be used to help meet requirements of the MRB-IF

| International or Regional Monitoring or Survey | Relevant Data Requirements | Spatial Scale | Temporal Scale |
|---|---|---|---|
| 1. FAOSTAT food and agriculture statistics | • Quantity of rice produced for food<br>• Proportion of dietary energy coming from rice<br>• Proportion of population undernourished<br>• Proportion of population suffering malnutrition<br>• Adequacy of dietary energy<br>• Average dietary protein<br>• Value of food imports as a percentage of total value of exported goods | National | Annual |
| 2. WHO Global Health Observatory | • Number of reported cases of malaria<br>• Life expectancy by gender | National | Annual |
| 3. ILOSTAT employment and labour force statistics | • Working age population<br>• Number of people primarily employed in each LMB water-related sector<br>• Employment rate across the basin<br>• Gross annual economic value of each sector (labour productivity)<br>• Number of jobs in each LMB water-related sector<br>• Number of jobs in each LMB water-related sector occupied by females | National | Annual |
| 4. UNESCO education statistics | • Number of girls and boys attending primary education<br>• Number of primary age boys and girls in the community | National | Annual |
| 5. World Bank databank | • Population living on less than $1.90 per day | National | Ad-hoc |
| 6. IUCN Red List | • Number of threatened aquatic species extinct<br>• Number of threatened aquatic species critically endangered<br>• Number of threatened aquatic species endangered<br>• Number of threatened aquatic species vulnerable | Area | Ongoing |
| 7. Asian Water Bird Census | • Number of water birds<br>• Number of water bird species | National | Annual |
| 8. UNEP-WCMC World Database of Protected Areas | • Area of each environmentally significant area by IUCN protection category | Area | Ongoing |
| 9. MERFI Ecosystem Value Estimation Tool | • Annual economic value of wetlands | Varies | Once-off |
| 10. Climate Watch emissions tracking | • Emissions from energy generation<br>• Emissions from agriculture<br>• Emissions from land use, land use change and forestry<br>• Annual basin emissions of $CO_2$<br>• Annual global emissions of $CO_2$<br>• Annual basin emissions of $CH_4$<br>• Annual global emissions of $CH_4$<br>• Annual basin emissions of $N_2O$<br>• Annual global emissions of $N_2O$ | National | Annual |
| 11. Joint Typhoon Warning Centre | • Annual number of tropical storms<br>• Intensity (wind speed) of each tropical storm<br>• Annual number of severe tropical storms<br>• Intensity (wind speed) of each severe tropical storm<br>• Annual number of typhoons<br>• Intensity (wind speed) of each typhoon | Storm | Ongoing |
| 12. IWMI Flood Risk Mapping: Southeast Asia | • Annual flood inundation extent | 500 m | Annual |

## 3.2    STRATEGIC PRIORITIES

Given the current gaps in data availability as identified in the *State of the Basin Report 2018*, and as reflected above in the ongoing data collection mechanisms, a number of clear priorities in delivering on this *Data Acquisition and Generation Action Plan* emerge. While all elements of the plan should be put in place in order to deliver on the objective, there are a number of critical areas that require urgent attention. These strategic priorities are:

1.  Ensuring the systematic assembly and transmission of existing social and economic data from Member Countries to the MRCS at provincial scale according to the agreed schedule and with a focus on:

    a.  Food and water security and access to electricity at the household level;

    b.  Employment and livelihoods in water-related sectors;

    c.  Economic values, especially production volumes and prices for agriculture, fisheries, navigation and hydropower sectors; and

    d.  The collection of gender disaggregated data throughout the social dimension.

    The analysis above demonstrates that many of the social and economic data requirements already exist within Member Country databases. Assembling and transmitting to the MRCS in a systematic manner every five years according to a Memorandum of Understanding will greatly enhance efficiency and effectiveness in preparing inputs to the MRC planning cycle.

2.  Finalising methodologies and establishing a long-term commitment to environmental monitoring for critical parameters where they do not yet exist, particularly for:

    a.  Sediment transport;

    b.  Extent of wetland and forest area through periodic land cover assessments; and

    c.  Riverine, estuarine and coastal habitats, especially for bank erosion.

    Development of the Lower Mekong Basin has had, and is likely to continue to have, substantial detrimental effects on the transport of sediment downstream and on wetlands throughout the basin. It is imperative that regular monitoring and assessment processes are put in place to enable effective mitigation and for conservation plans to be developed and implemented.

3.  Establishing the climate change monitoring and reporting system to enable ongoing collection, analysis and reporting of changes in the regional climate and Member Countries' responses to those changes. Indicators need to cover:

    a.  Climatic variables;

    b.  Potential climate impacts as reflected in the environment, social and economic dimensions; and

    c.  Adaptation efforts.

Climate Change is already having an effect in the Mekong Basin through rising temperatures. Monitoring these and other changes as they occur will be of critical importance to responding quickly and appropriately through adaptation efforts. Monitoring adaptation activities will also support learning and knowledge-sharing between Member Countries and improvements in approaches over time.

4. Systematic collection, management and reporting of key measures of cooperation both between Member Countries and the MRCS and with other parties, supporting enhancement of both an inward and outward focus to cooperation.

   Cooperation between Member Countries, the MRCS and with third parties is largely focused at present on the existence of joint projects. While this is an importance aspect of cooperation within the Mekong Basin, the extent of cooperation is much broader and this should be reflected in a more comprehensive set of statistics illustrating the extent to which all parties are working effectively together towards the objectives of the *1995 Mekong Agreement*.

5. Alignment of the MRC-IS with the Indicator Framework including in relation to:

   a. Data handling and management protocols; and

   b. Linking of MRCS and MC database systems.

   The collection of data required to implement the Mekong River Basin Indicator Framework will be inefficient and ineffective without a data management system in place both at MRCS and within NMCs that is aligned to the indicators, monitoring parameters and data requirements of the MRB-IF. Alignment includes not only the database structure, but also the protocols, workflows and responsibilities of individuals to ensure it functions as intended.

A focus on these five key priorities does not diminish the need to implement all the requirements of the DAGAP. However, delivering on these strategic priorities first will ensure a much more comprehensive picture of the health of the Mekong Basin for the next State of the Basin report in 2023.

# 4. FRAMEWORK FOR DATA ACQUISITION AND GENERATION

The framework for implementing the *Data Acquisition and Generation Action Plan* consists of four parts:

**Part I: Principles**

The purpose of the principles is to provide overarching guidance to all parties on the approach to implementing the Action Plan so that a focus is maintained on the objective that is cognisant of the broader context in which sustainable monitoring and reporting within the MRC can occur. These principles will be used to help resolve differences of view in the implementation of the framework and enable shared ownership of agreed courses of action.

**Part II: Resource allocation**

The implementation of the DAGAP needs to be sustainable with respect to the financial circumstances of the MRC, ensuring budgetary resources are directed to the highest priority needs and considering what is feasible to implement over the next Basin Development Strategy period (2021-2030). To support Member Country deliberations on this, a two-step approach is outlined to ensure sufficient data is available to implement the MRB-IF for the next SOBR.

**Part III: Guidelines for addressing data gaps and key issues**

The guidelines for addressing key issues focus on resolving issues of compatibility and consistency between datasets in order to facilitate whole-of-basin assessments in accordance with the MRB-IF. These assessments are undertaken to inform the MRC planning cycle and, as required from time-to-time, to evaluate alternative scenarios at relevant spatial and temporal scales. Although datasets from different countries do not necessarily need to be exactly the same, an agreed approach to combining different datasets for a single basin-scale analysis is required.

**Part IV: Roles and responsibilities**

Roles and responsibilities are outlined to inform the establishment of appropriate governance arrangements and ensure that each party understands who needs to do what in order for the DAGAP and the MRB-IF to be implemented in an effective and timely way and as an aid to planning. This includes a description of workflows between MRCS, National Mekong Committee Secretariats and line agencies for the major types of data collection processes.

## 4.1 PART I: PRINCIPLES FOR DATA ACQUISITION AND GENERATION

**1. Enhancing collaboration and cooperation**

The implementation of this Action Plan will be undertaken in the Mekong spirit of cooperation, collaboration and mutual respect among all parties. There will be a focus on working together to resolve problems as they arise and identifying practical solutions by sharing approaches and lessons learned between countries, including from line agency to line agency. Acceptance and common understanding of regional datasets provides a powerful basis for improved decision-making.

**2. Cost effectiveness and timeliness in data acquisition and generation**

The implementation of the MRB-IF and this Action Plan occurs within the context of an anticipated decline in the overall MRC budget to 2030. Therefore, better use will be made of existing data collection and acquisition processes throughout the region so that new or additional monitoring is only undertaken where absolutely critical to informing regional deliberations on the sustainable development, conservation, and management of the Mekong Basin. The timely acquisition and transmission of data is central to its effective use.

**3. Minimising duplication and multiple-handling**

As far as possible, data will be collected or generated and then transmitted only once so that following initial transmission and storage within the MRC-IS, only updates and corrections to datasets need to be sent. Multiple requests for the same datasets should not occur. The most direct route possible for transmission from primary data custodian to MRCS Regional Specialist and vice versa will be taken, and to the extent possible this will be automated through linked databases, subject to resourcing and appropriate quality assurance and quality control measures.

**4. Enabling common but differentiated approaches between countries**

Data collection and processing is undertaken at a national level to meet national needs. As there will always be different needs in different countries, data acquisition and generation for regional purposes will require a degree of flexibility, applying consolidation and further post-processing to national datasets to enable comparability across the region in a consistent and systematic way.

**5. Openness and transparency**

Data collection and generation is undertaken largely with the use of public resources. With that in mind, data acquired or generated to implement the MRB-IF and this Action Plan will, once processed, quality assured and approved, be made available to the public in as timely and easily accessible a manner as possible. This is imperative for ensuring that the analysis is auditable and replicable and to maintain community confidence in the work of the MRCS and Member Countries.

**6. Continuous improvement to close data and knowledge gaps**

Good data and information is essential to good decision-making. Where opportunities arise to improve the quality, accuracy or applicability of relevant national and regional datasets, measures will be put in place to do so. Member Countries and the MRCS will regularly look for ways to improve the applicability of national and regional datasets to the sustainable development, conservation and management of the Mekong Basin and to fill data and knowledge gaps, where feasible.

## 4.2    PART II: RESOURCE ALLOCATION

Implementation of the *Data Acquisition and Generation Action Plan*, involves a two-step approach:

(i)    The first step involves ensuring sufficient data is available to implement the next SOBR by 2023, while using agreed estimation techniques and proxy regional data and tools to fill gaps. At this step there will still be gaps in terms of alignment and synergy of datasets between Member Countries and some lesser priority data requirements may not be fully available at the necessary spatial and temporal scales.

(ii)    The second step involves an implementation of this Action Plan to the fullest extent over three years (2020-2022). This would involve the development and implementation of a more comprehensive alignment and synergy of datasets across Member Countries, and include the collection and analysis of additional primary datasets through new regional studies and assessments and modifications to existing national monitoring and surveys, before the next SOBR in 2023.

At both steps there will be sufficient data available to implement the MRB-IF in full for the next SOBR, notwithstanding that at step one there will not necessarily be complete basin-wide coverage, consistency and alignment across Member Countries at the necessary sub-basin scale. Member Countries will need to agree to gap-filling techniques and the use of regional and international datasets, as well as some targeted additional data generation efforts.

A two-step approach should enable adequate budget and resource planning and provide sufficient time for appropriate technical development, consultation and implementation of new approaches among all parties. The steps can be considered sequentially or in parallel as there is scope for some flexibility through the MRC Annual Work Plan to alter the timing of various components within each step, as long as this aligns with national line agency plans and capacity. Immediate implementation of Step 2 involves a larger up-front investment in developing and implementing a more comprehensive alignment and synergy of datasets across all Member Countries for the highest priority needs.

**Step I:** Meeting the requirements of the MRB-IF based on existing datasets and using agreed estimation techniques, third party datasets and prudent assumptions to fill gaps.

Implementation to Step 1 involves systematising the assembly and analysis of existing datasets held by the MRCS, Member Countries and third parties and applying estimation methodologies to fill gaps and enable comparisons across different parts of the basin. Agreements on data collection and transmission between national line or implementing agencies, NMCs, other regional and international organisations and the MRCS will be put in place for all data requirements with a focus on the assembly and processing of existing secondary datasets.

In order to manage costs, Step 1 implementation involves only minimal additional primary data collection beyond that which already occurs at national and regional levels. The key objective of this level is to ensure agreements, systems and infrastructure are in place to implement the data collection processes necessary to achieve a complete State of the Basin Report in 2023.

**Step II:** Designing, developing and implementing regionally consistent monitoring and assessment approaches where there are opportunities to improve.

Implementation to *Step 2* involves designing and developing new data assessment processes in order to improve whole-of-basin consistency and coverage. New approaches may be necessary to ensure data is available at a sub-basin scale and to allow aggregation of datasets from different countries. This phase will involve the commissioning of several new elements of work focused on design and development, including potential new survey questions that could be added to national census and survey forms, and periodic regional studies where it is more efficient to undertake a single whole-of-basin assessment approach.

This work may include additional sampling efforts to ensure representative datasets at provincial level, new or expanded monitoring activities, and new or modified regional studies and assessments. The development and implementation process is likely to include testing and trialling of new methodologies in each Member Country and integrating the new work into national and regional budgets and work plans. It will require a high degree of engagement from all relevant line agencies.

## 4.3 PART III: GUIDELINES FOR ADDRESSING DATA GAPS AND KEY ISSUES

It is inevitable given that data is collected in four different countries using different monitoring and survey approaches corresponding to different national needs, that there will be challenges combining input into consistent, comparable regional datasets. The challenges arise in two main areas:

1. **Differences in spatial and temporal scales:** This arises where data is collected over different time periods and frequencies and at different administrative levels. For instance, data may be collected at provincial level in one country, but only at national level in another. Even where data is collected across administrative units at a level lower than national, the level of sampling effort may mean it can only be considered representative of a national or regional population. National level data is more problematic for Thailand and Viet Nam than for Cambodia and Lao PDR, given that the larger portion of Thailand and Viet Nam exists outside the LMB.

2. **Differences in definitions and types of parameters collected:** This arises because of different national priorities and differences in technology, methodologies, community awareness and historical practice. For example, different countries may have different definitions of what is considered an 'improved water source' or rather than asking survey respondents to estimate the value of their total possessions, may ask specific questions about individual items (e.g. vehicles, livestock, consumer goods). Land-cover data may be categorised differently or use different thresholds for delineating between classes. Countries may collect data on similar but not exactly the same things.

In addressing these challenges, to minimise inconsistencies and enable regional datasets to be established, general approaches consistent with those applied in the *MRC Council Study* are proposed below. Specific data gaps that are identified in the implementation of this Action Plan will need to be addressed for each individual monitoring parameter. The *Council Study* methodological reports for social and economic assessments provide some guidance on ways in which to do this. Appendix B of this Action Plan provides some strategies for each individual monitoring parameter of the MRB-IF to enable any data gaps to be filled through a process of continual improvement.

### 4.3.1 Addressing differences in spatial scale

The default spatial scale for future MRC assessments of social and economic data will be the **provincial** level. Provincial-scale data enables an understanding of sub-basin geographic differences in key parameters that allow consideration of the locations and areas most impacted by development. It provides an appropriate balance between the role of an overarching regional organisation to facilitate coordination and cooperative action and the need for national authorities to lead and implement assessments within their territory. Investigating and evaluating finer scale variations in conditions and impacts (i.e. at district, commune or village level) should remain the responsibility of competent national authorities rather than the MRC.

If data from Member Countries is only available at a spatial scale larger than provincial, then the relevant values of the larger scale will be assumed to apply to all provinces that are encompassed by that area (i.e. the region or national area) (*Figure 3*). Exceptions to this approach may be made where there is otherwise a logical approach to estimating basin-scale data from national data. For example, national greenhouse emissions from agriculture can be applied at the basin-scale in proportion to the share of national agricultural production from the basin. If data is available at a smaller spatial scale than provincial, then it will be aggregated to provincial level using population-weighted averages. Survey data that overlaps

provincial units but does not cover the entire spatial area can be assumed to be uniformly distributed within the administrative boundary taking into consideration the sample size and spatial distribution of the sampling points in the overlapping area. This generic approach can be applied to upscale or downscale data as necessary to ensure consistent and comparable assessments across the basin and is consistent with the approach taken for social data in the *MRC Council Study*.

Where data can be disaggregated into values for urban and rural populations, MRC assessments should focus primarily on **rural population** data. This is preferable for the water and water-related assessments undertaken by the MRC as these communities are more directly involved in and impacted by water and water-related sectors (e.g. agriculture and fisheries) of the Mekong River system.
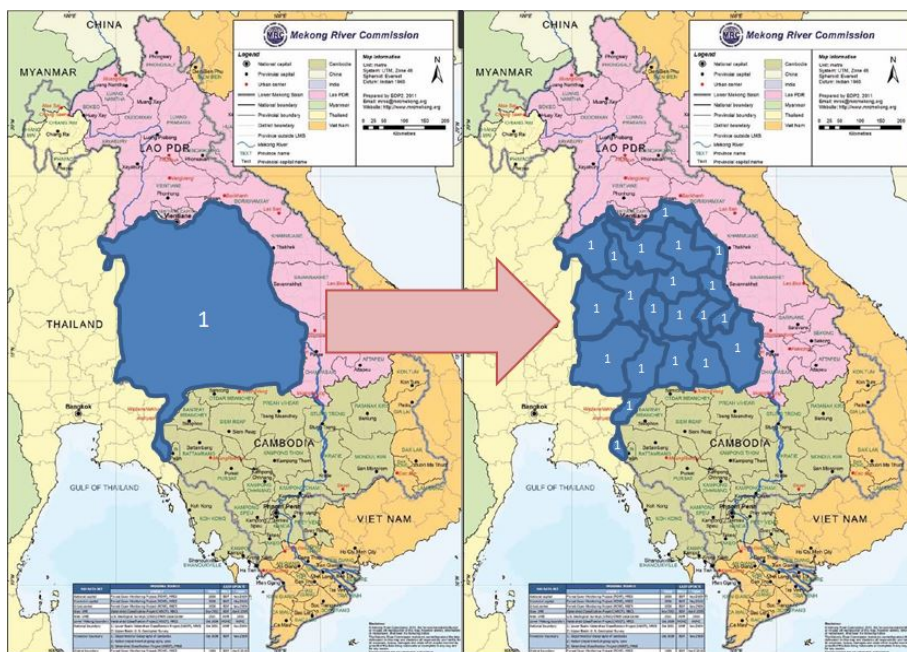


**Figure 3:** Illustration of proposed approach to downscaling data to the provincial level in cases where there is not otherwise a logical approach to apportion national or basin-scale data at the provincial level

## 4.3.2   Addressing differences in temporal scale

The default temporal scale of data to be used in future MRC assessments is **annual**. To enable comparison of data for common years, where data is not collected at this frequency, the preferred approach will be to use national estimates. For example, population data is not necessarily collected each year, but all countries have techniques for estimating population and population growth each year. Where this is the case, these national estimates will be used. In circumstances where national estimates are not available, interpolation and extrapolation will be undertaken to align country estimates to common years (*Figure 4*).

Where data is available at a shorter temporal frequency than annual, it will be aggregated to a total annual value. If data is only available at a greater temporal frequency than annual, data for intervening years will be estimated by direct linear interpolation. Where data is not available to a common end year in each spatial unit, it will be estimated by linear extrapolation using a five-year trend line. This is consistent with the approach taken for the *Council Study,* which used annual rates of growth to extrapolate and interpolate data as necessary. Any time that an estimate is used instead of an actual measured value it must be clearly identified as such.
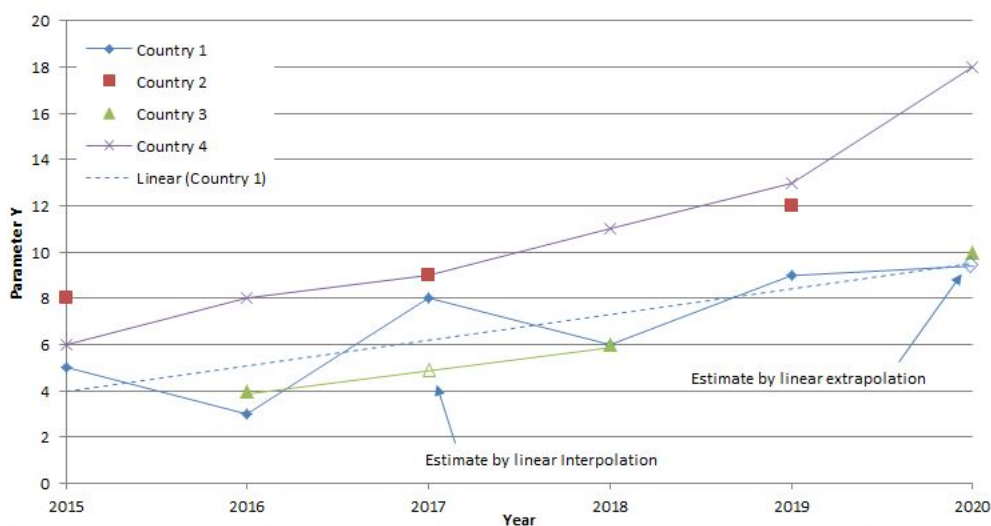
**Figure 4:** Example of proposed approach to aligning temporal data when differences between spatial units and national estimates are not available. Country 3 only collects data every two years. Therefore, for missing years such as in 2017, a value is estimated by linear interpolation. Country 1 only has data up to 2019. To estimate a value for 2020 consistent with Country 4, extrapolation is undertaken using a five-year trend line

## 4.3.3   Addressing differences in definitions and types of parameters collected

The draft methodology for evaluating the indicators of the MRB-IF involves a separate assessment of each indicator within each individual spatial unit (e.g. province). Therefore, although desirable it is not absolutely necessary to use exactly the same definitions and types of data within each unit across the whole of the basin. A different approach can be applied in each case because what is relevant for the MRB-IF is an assessment of each spatial unit against a common set of criteria with the assessment result being a binary yes or no, met or not met descriptor. The definitions and types of parameters collected by each country through existing monitoring and surveys will remain as defined by national governments, unless there is specific agreement to the development and implementation of a regional study or assessment using a common set of data with a consistent methodology.

## 4.3.4   Data Quality Management

Ensuring good quality data is fundamental to good decision-making. Data quality can generally be defined as 'fitness for purpose' and commonly includes attributes such as accuracy, reliability, timeliness, accessibility, interpretability, coherence, comparability, credibility, integrity, and cost efficiency. It is important that national agencies within Member Countries and the MRCS have systems and processes in place to facilitate the production and management of good quality data.

The *United Nations National Quality Assurance Framework* provides a good basis for the establishment of national frameworks to ensure data quality across the range of data types and uses relevant at a national level. The OCED's *Quality Framework and Guidelines for OECD Statistical Activities*, similarly provides an example of an approach to data quality within an international organisation which is relevant to the MRC.

In relation to the acquisition and generation of the data required to implement the MRB-IF, data management occurs within the context of existing national and regional processes. This Action Plan seeks to ensure that within that context, the quality of data collection, transmission and management is maintained and where necessary improved over time.

## 1. Data assurance and control

The overall approach to quality in the acquisition and generation of data for implementing the MRB-IF is intended to minimise the probability of errors and enable fit-for-purpose use of all types of data across the five dimensions of the Indicator Framework at both national and regional levels. The following guidelines will help achieve this.

i. There will be multiple check points for the quality assurance and control of data as relevant to both national and regional needs. Building in redundancy to quality assurance and control helps to identify errors and maintain standards.

ii. There will be clearly defined roles and responsibilities for checking, processing, transmitting and uploading data to relevant databases at both national and regional levels. National and Regional Specialists for each data requirement will be assigned and have responsibility for the quality assurance process.

iii. Consistency between data held in multiple locations needs to be maintained through regular communication between data custodians on changes or updates to datasets as soon as practicable after such changes or updates occur.

iv. Where third party data is used as a primary data source in the evaluation of an Assessment Indicator, only such data from reputable organisations as agreed by Member Countries and the MRCS will be used.

## 2. Data standards

The appropriate standards for the exchange or sharing of data relevant to the MRB-IF is the *Statistical Data and Metadata Exchange* standard, currently version 2.1 (SDMX 2.1)[5] or its equivalent ISO standard: ISO-17369:2013. The SDMX provides the standards to facilitate the exchange of statistical data and metadata using modern information technology. It is sponsored by various international organisations including the United Nations, World Bank, and OECD and includes technical specifications for the formats for the exchange of aggregated statistical data and the metadata needed to understand how the data is structured. The major focus is on data presented as time series, although cross-sectional XML formats are also supported.

Much of the data required to implement the MRB-IF is place-based and attributable to either a point or particular spatial unit. The appropriate standard for geographic data within the MRC is ISO 19115. This is the internationally adopted schema for describing geographic information and services. It provides information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of digital geographic data.

The first edition of ISO 19115 was published in 2003. It has since been split into three parts: ISO 19115-1:2014, which contains the fundamentals of the standard; ISO 19115-2:2009, which contains extensions for imagery and gridded data; and ISO/TS 19115-3:2016, which provides an XML schema implementation for the fundamental concepts compatible with ISO/TS 19138:2007 (Geographic Metadata XML, or GMD).

The methodologies for the collection and analysis of each data requirement must be specified in relevant activity technical guidelines. These guidelines are developed with the involvement of international and national experts and through extensive consultation with relevant agencies in Member Countries, often

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[5] https://sdmx.org/?page_id=5008

going through several rounds of trial and revision before being adopted. This process is important both in ensuring methodological soundness, and in increasing awareness and understanding of approaches. Any new or modified activity required to implement the MRB-IF must go through this process with the relevant Expert Group playing a leadership role.

### 3. Data Processes

Most data required for use in the implementation of the MRB-IF will be collected by national line or implementing agencies. This is the case whether the monitoring activity is decentralised or centralised. The only real exceptions are when the MRCS needs to acquire data from an international organisation or development partner, or to commission a third party to collect or assemble a particular dataset for a regional study or assessment.

National agencies that collect data to be used in implementing the MRB-IF will continue to operate according to national standards and guidelines for those datasets. Pre-processing, formatting, quality checks, dataset assembly and quality assurance for the production of national datasets should already be in place.

Following quality assurance by the relevant national experts, the dataset is uploaded to a national database for storage and retrieval. This dataset, or the required sub-component, can then be transmitted from the national line agency specialist (NS) to the relevant focal point (FP) in the NMCS and the Regional Specialist (RS) in the MRCS (according to the agreed schedule in this Action Plan). The MRCS Regional Specialist will generally be the regional subject-matter expert and in this case should review the data for quality relevant at the regional level and undertake the necessary post-processing in order to combine the dataset with those from the other Member Countries to create the regional dataset for each monitoring parameter. The national dataset at the regional level and the combined regional dataset, once ready, will be uploaded to the MRC Master Catalogue by the MRCS data manager, having undertaken a final quality check. *Figure 5* illustrates this process for data collected at the national level.
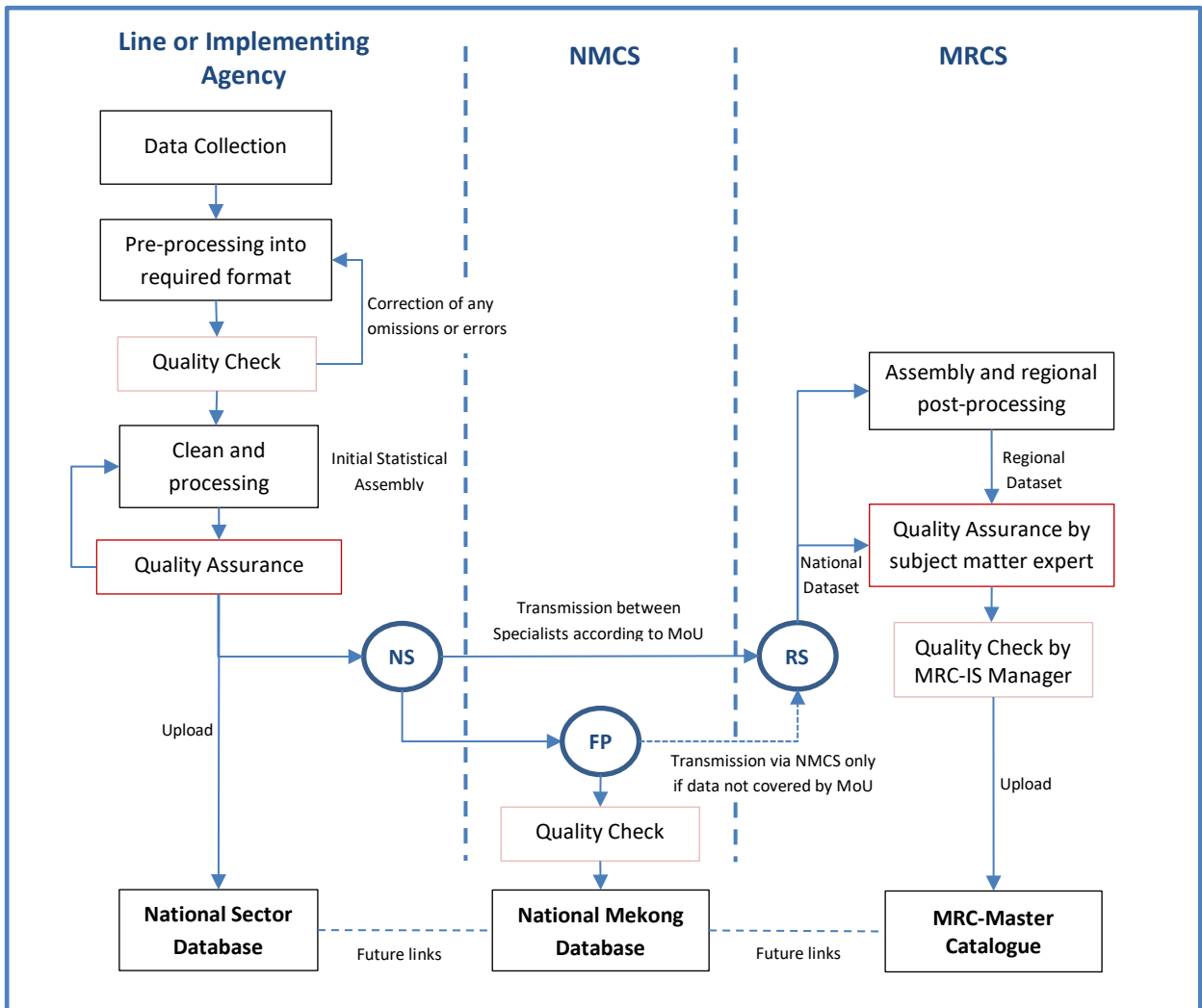
**Figure 5:** Quality Assurance and Control points in the management of data required to implement the MRB-IF. The Line or Implementing Agency referred to here is the Primary Data Custodian in accordance with the PDIES. FP refers to the relevant Focal Point in the NMCS; NS refers to the National Specialists as part of the national monitoring teams; and RS refers to the Regional Specialists at the MRCS

## 4.4 PART IV: ROLES AND RESPONSIBILITIES

### 4.4.1 Governance arrangements

Implementing this Action Plan in an efficient and effective way will require the highest level of commitment and oversight from the MRC and its Member Countries. The institutional arrangements involve the MRC Joint Committee (JC) as the body with overall responsibility for overseeing the implementation of the Action Plan and ensuring its objective and goals are achieved. This responsibility aligns with the Joint Committee's mandated function to "regularly obtain, update and exchange information and data necessary to implement this Agreement" (Article 24C of the *1995 Mekong Agreement*).

The JC will need to oversee the role of the Secretariat in implementing its responsibilities for this Action Plan, but each individual member will also need to take on a proactive role at the national level to coordinate and facilitate implementation by Member Countries. The JC is supported by the MRCS and the Expert Groups on Data, Modelling and Forecasting, on Basin Planning, and on Environmental Management to develop and continually improve the strategies, methodologies and approaches to data generation and assessment within each of their assigned areas of responsibility.

Within the MRCS, the CEO and Division Directors have a leadership role in prosecuting the MRC's function as a regional knowledge hub. This includes oversight and support for a 'culture of data stewardship' throughout the organisation. The CEO and Division Directors will be supported by a Data Coordination Committee, made up of the MRC Information System and Data Specialist, and the five existing Regional Specialists for: (i) hydrology, sediment, and climate; (ii) fisheries; (iii) ecological health; (iv) water quality; and (v) socio-economic factors, to support the coordination of data generation, acquisition, management and use across the MRCS (*Figure 6*). The committee will meet regularly to review progress and identify opportunities to improve implementation of this Action Plan.
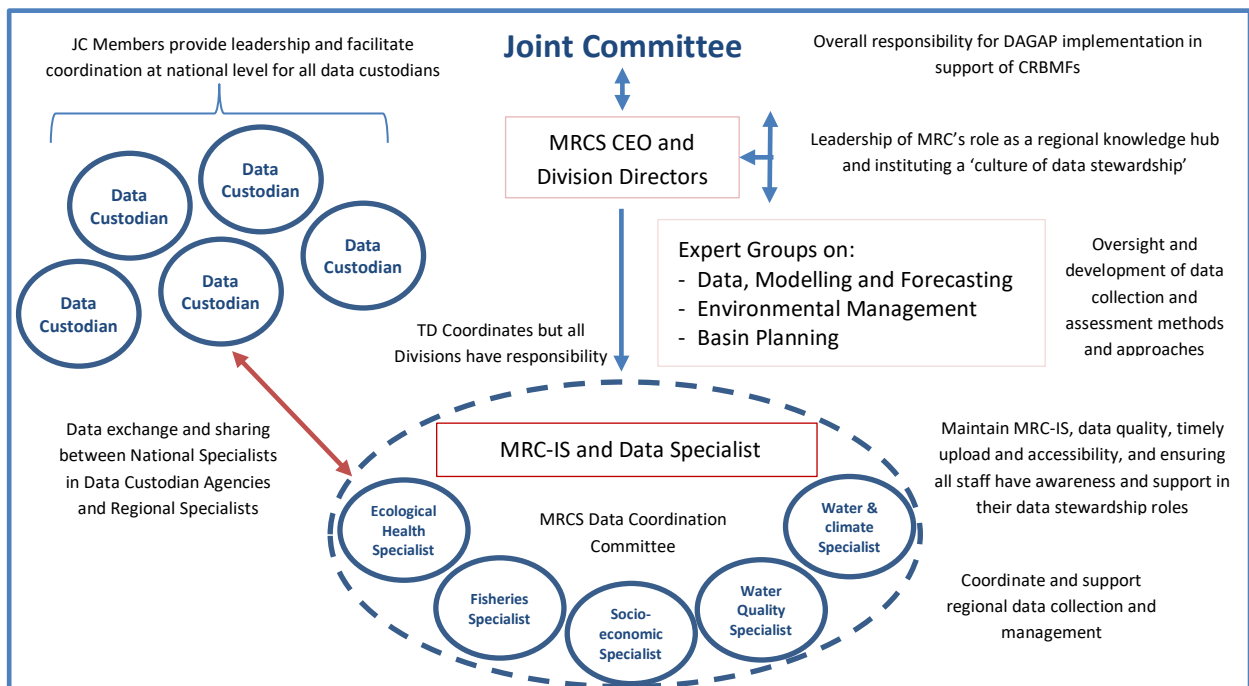


**Figure 6:** Summary of the proposed governance arrangements for the implementation of the Action Plan. All the positions identified are existing positions. For example, the Regional Specialists are the existing specialists for: (i) hydrology, sediment and climate; (ii) fisheries; (iii) ecological health; (iv) water quality; and (v) socio-economic factors

Regional Specialists have responsibility for the individual datasets relevant to their disciplinary role and functions within each division. Further detail on the roles of the MRC-Information System and Data Specialist, Regional Specialists and National Specialists is provided in the following sections. Note that none of these are new positions within the MRCS, but functions assigned to existing roles.

The roles and responsibilities for data acquisition and generation in this Action Plan are consistent with the MRC *Procedures for Information and Data Exchange and Sharing (PDIES)*. Roles are specified for the Mekong River Commission Secretariat (MRCS), National Mekong Committee Secretariats (NMCS) and relevant line or implementing agencies. As specified in the PDIES, the MRCS is the custodian of the MRC-IS and the primary data custodians are determined by each Member Country.

## 4.4.2    Roles and Responsibilities at the Regional Level

The MRCS, as custodian of the MRC-IS:

- Holds and manages all MRB-IF data on behalf of the Member Countries;
- Develops appropriate data standards in consultation with MCs; and
- Issues and regularly updates the detailed specifications required for each of the major data sharing groups, consistent with the requirements of the MRB-IF and this Action Plan.

MRCS, as coordinator for regional work planning and implementation:

- Leads work on data collection and assessment methodologies, including identification of new and innovative approaches and use of suitable third party datasets;
- Enters into data transmission agreements with NMCs, national line agencies and third parties specifying the requirements and schedule for data delivery to the MRCS;
- Reviews the data transmitted from Member Countries, undertakes quality assurance and then collates and uploads data to the MRC-IS;
- Ensures data transmitted from Member Countries is entered into the MRC-IS according to the agreed schedule, format, quality and coverage;
- Works with MCs to resolve discrepancies and address errors or omissions;
- Transmits regional datasets to Member Country line agency and NMC focal points, as requested by those agencies from time-to-time;
- Mobilises technical and financial resources for implementing this Action Plan; and
- Provides capacity building and technical support to Member Countries on data collection, processing and analysis.

MRC Expert Groups:

- Provide technical leadership and expert input on regional data collection and assessment methods relevant to their area of responsibility and Terms of Reference, especially for routine monitoring and periodic studies and assessments specified in the MRC Strategic Plan.

Within the MRCS, the following roles are proposed for individuals to facilitate coordination and implementation of this Action Plan.

(i)    MRC Information System and Data Specialist

The role of the Information System and Data Specialist in the Technical Support Division is, amongst other things, responsible for ensuring overall coordination of data and knowledge

management at the MRC and ensuring timely updates and quality control of datasets uploaded to the MRC Master Catalogue, and downloaded for use by MRCS Divisions, Member Countries and other stakeholders. In addition, the Information System and Data Specialist, with the support of the CEO, has responsibility for ensuring all personnel understand what is expected of them and have the support they need, whether through training, systems or tools, to undertake their data management functions. The position will coordinate data assembly and analysis for State of the Basin Reports and any scenario assessment work required by the Member Countries.

(ii)  Regional Specialists

Effective data oversight, management and control needs to be written into everyone's job description for the identified datasets that each person is responsible for in their disciplinary area of expertise. Regional Specialists are the primary point of contact at the MRCS for datasets related to their disciplinary and activity functions. They ensure data is collected, managed and transferred in a systematic way according to relevant procedures, guidelines and schedules. They apply their subject matter expertise to undertake quality assurance, regional processing and analysis of datasets received from Member Countries and others, and identify potential alternative datasets created and maintained by third parties and new cost effective monitoring approaches.

The Regional Specialists work closely with relevant Expert Groups to develop new techniques and methodologies for generating and analysing more cost effective regional datasets relevant to implementing the Mekong River Basin Indicator Framework as and when resourcing permits. A commitment to continual improvement and regular review of opportunities will be an important element to ensure cost effective and sustainable data collection over the long term.

Within the MRCS, each Division has separate but important responsibilities in implementing this Strategy.

Technical Support Division

- Overall coordination of data collection and management, uploading of datasets and maintenance of the MRC-IS and the web portal, and facilitating the exchange and sharing of information and data under PDIES;
- Overseeing data collection arrangements for all datasets assigned to the division as indicated in **Appendix E**, including the preparation of MoUs with relevant line agencies and NMCs;
- Work with MCs to ensure appropriate management of all datasets assigned to the division as indicated in **Appendix E,** including quality control and assurance, and facilitating capacity building activities;
- Coordinating regional monitoring activities for data collection activities assigned to the division as indicated in **Table 13**, including methodological design, budgeting, and work planning and capacity building; and
- Leading regional studies and assessments assigned to the division as indicated in **Table 15**, including methodological design, budgeting, work planning, and capacity building.

Environmental Management Division

- Coordinating the overall implementation of this Action Plan as well as the implementation and refinement of the MRB-IF (including technical guidance) and the State of the Basin Report;
- Overseeing the data collection arrangements for all datasets assigned to the division as indicated in **Appendix E**, including the preparation of MoUs with relevant line agencies and NMCs;

- Work with MCs to ensure appropriate management of all datasets assigned to the division as indicated in *Appendix E,* including quality control and assurance, facilitating capacity building activities and making data available to the TD for inclusion in the MRC-IS;
- Coordinating regional monitoring activities for data collection activities assigned to the division as indicated in *Table 13*, including methodological design, budgeting, work planning and capacity building; and
- Leading regional studies and assessments assigned to the division as indicated in *Table 15*, including methodological design, budgeting, work planning, and capacity building.

Planning Division

- Overseeing the data collection arrangements for all datasets assigned to the division as indicated in *Appendix E*, including the preparation of MoUs with relevant line agencies and NMCs;
- Works with MCs to ensure appropriate management of all datasets assigned to the division as indicated in *Appendix E,* including quality control and assurance, facilitating capacity building activities and making data available to the TD for inclusion in the MRC-IS;
- Coordinating regional monitoring activities for data collection activities assigned to the division as indicated in *Table 13*, including methodological design, budgeting, work planning and capacity building; and
- Leading regional studies and assessments assigned to the division as indicated in *Table 15*, including methodological design, budgeting, work planning, and capacity building.

Administration Division

- Overseeing the data collection arrangements for all datasets assigned to the division as indicated in *Appendix E*, including the preparation of MoUs with relevant line agencies and NMCs;
- Works with MCs to ensure appropriate management of all datasets assigned to the division as indicated in *Appendix E,* including quality control and assurance, facilitating capacity building activities and making data available to the TD for inclusion in the MRC-IS;
- Coordinating regional monitoring activities for data collection activities assigned to the division as indicated in *Table 13*, including methodological design, budgeting, work planning and capacity building; and
- Leading regional studies and assessments assigned to the division as indicated in *Table 15*, including methodological design, budgeting, work planning, and capacity building.

Office of CEO

- Overseeing the data collection arrangements for all datasets assigned to the division as indicated in *Appendix E*, including the preparation of MoUs with relevant line agencies and NMCs;
- Works with MCs to ensure appropriate management of all datasets assigned to the division as indicated in *Appendix E,* including quality control and assurance, facilitating capacity building activities and making data available to the TD for inclusion in the MRC-IS;
- Coordinating regional monitoring activities for data collection activities assigned to the division as indicated in *Table 13*, including methodological design, budgeting, work planning and capacity building;
- Leading regional studies and assessments assigned to the division as indicated in *Table 15*, including methodological design, budgeting, work planning, and capacity building.

### 4.4.3   Roles and Responsibilities at the National Level

The NMCS in each Member Country:

- Identifies the primary data custodians for each of the relevant datasets in the Member Countries;
- Coordinates data collection, assembly and management, as necessary between primary and secondary data custodians;
- Coordinates the development and implementation of transmission agreements between MRCS and line agencies on data collection and management;
- Enters into agreements on the datasets to be transmitted to the MRCS and uploaded to the MRC Master Catalogue;
- Agrees any further changes to initial datasets and enters into updated agreements accordingly;
- Participates in MRC Expert Groups to progress the agreed work plan and tasks of the group; and
- Coordinates the budget preparation at a national level to enable ongoing data collection.

Line or implementing agencies in each Member Country:

- as primary data custodians:
  - Develop and implement data collection and management plans in order to ensure the continuity of collection, processing and maintenance of necessary data and information to implement the MRB-IF;
  - Prepare budgets and seek funding to implement data collection and management plans;
  - Collect, process and organise data for use, and undertake data analysis at a national level; and
  - Actively participate in MRC Expert Groups in order to progress the agreed work plans and tasks of the group.

- as secondary data custodians (only when applicable):
  - Work with the primary data custodians to ensure accuracy and quality of data, and assemble in appropriate format for transmission.

Each data custodian is the authoritative source for the fundamental datasets in its care and is responsible for the integrity of the data, for maintaining agreed access, and establishing and exchanging meta-data in accordance with approved standards. Each custodian should nominate a National Specialist (NS) as the primary point of contact for relevant datasets they are responsible for. These National Specialists should have as a core part of their job description the collection, management, processing and transmission of data to the MRCS in accordance with agreed MoUs between relevant parties. However, at a national level, each Member Country is responsible for determining its own arrangements for coordinating data collection, processing, management and transmission arrangements.

### 4.4.4   Data Transmission Work Flow

Data transmission agreements (as standing MoUs with Terms of Reference) will be entered into between the MRCS, NMCs and line or implementing agencies. These agreements, signed by all parties, will cover the ongoing provision of data by Member Countries according to the agreed schedule.

Once these agreements are in place, the transmission of data in accordance with the Terms of Reference should follow the most efficient route possible, recognising the coordinating role of the NMCS in each country. This should be a relatively automatic process from the line or implementing agency to the NMCS

and on to the MRCS once all parties have agreed up-front to the required datasets and schedule of delivery (*Figure 7*).

Specialists for each dataset are established in each agency and at the MRCS. The MRCS will maintain a contact list of National and Regional Specialists, update it as advised from time to time by NMCs to accommodate changes in personnel and responsibilities, and distribute the list regularly to all parties.
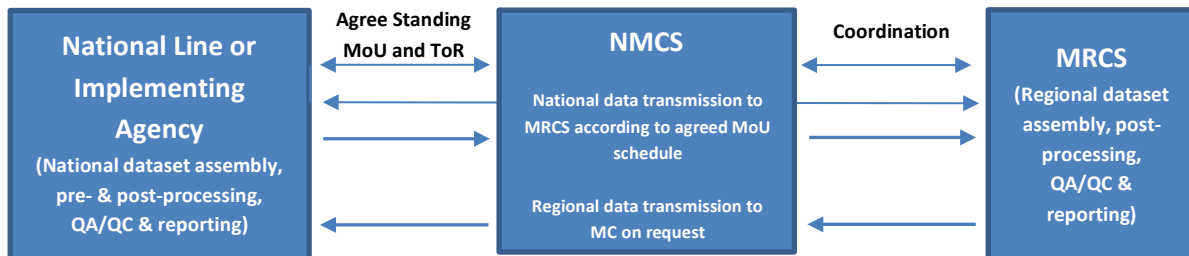


**Figure 7:** Summary of the high-level roles in the data transmission work flow between Member Countries and the MRCS for data generated through routine and periodic national monitoring, surveys and studies

# 5. ACTIONS REQUIRED AND SCHEDULE FOR DATA DELIVERY

This section describes the actions required to acquire and generate the data necessary for implementing the MRB-IF at each step of this Action Plan. The actions required generally fall into one of five categories:

1. Existing routine regional monitoring activities that need to continue;
2. Modifications that need to be made to routine regional monitoring activities;
3. Periodic regional studies or assessments that need to be conducted based on either: (i) existing assessment methodologies; or (ii) new assessment methodologies yet to be developed;
4. Existing routine or periodic national monitoring and reporting activities that need to continue;
5. Modifications that need to be made to routine or periodic national monitoring activities.

Routine monitoring requires regular collection of data according to an agreed framework. Some of this is carried out through MRC processes (referred to here as regional monitoring) and some is carried out through national processes and then transmitted to the MRC as secondary data. Periodic studies or reviews are those that do not necessarily require frequent, ongoing data collection and analysis in order to evaluate the Assessment Indicator of the MRB-IF. They can be addressed by agreement through the MRC work programme to the commissioning of a regional study on a relatively infrequent basis, but at least every five years. These regional studies may still require collection of data at a national level in addition to remote sensing and collation of other secondary data sources.

All data to be used in State of the Basin Reports should be available in the year prior to planned publication of the report. All data that needs to be transmitted to the MRCS from Member Countries should be transmitted by 31 March of the year following the last year of available data.

## 5.1 SUMMARY OF MONITORING AND ASSESSMENT ACTIVITIES TO BE IMPLEMENTED

### 5.1.1 Existing routine regional monitoring activities

The MRC already has several river monitoring activities and routine data collection processes in place to generate data relevant to the MRB-IF. These focus on the Environment and Cooperation dimensions of the MRB-IF (*Table 13*) and will need to continue if the MRB-IF is to be implemented in full.

**Table 13:** Existing regional monitoring activities that need to continue

| Regional Monitoring Activity | Data Collection Frequency | Assessment Frequency | Responsible MRCS Division |
|---|---|---|---|
| 1. Periodic transmission of socio-economic data to the MRCS | Annual | Five yearly | PD |
| 2. Hydro-meteorological monitoring | Daily[6] | Annual | TD |
| 3. Water quality monitoring[7] | Monthly | Annual | ED |
| 4. Ecological health monitoring | Biennial | Annual | ED |
| 5. Discharge and sediment monitoring | Annual | Annual | TD |
| 6. Fisheries monitoring | Annual | Annual | ED |

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[6] Data from HYCOS stations will continue to be transmitted every 15 minutes for river level and flood warning purposes. However, only daily data is necessary for implementation of the MRB-IF

[7] Additional monitoring parameters to be added for oil and grease, and phenols

| Regional Monitoring Activity | Data Collection Frequency | Assessment Frequency | Responsible MRCS Division |
|---|---|---|---|
| 7. Reporting of joint projects, projects of basin-wide significance and potential transboundary impacts | Annual | Annual | PD |
| 8. Extent of knowledge-sharing activities | Annual | Annual | OCEO |
| 9. Partnerships between the MRC and other parties | Annual | Annual | OCEO |
| 10. MRC budget contributions | Annual | Annual | AD |

With additional monitoring parameters added to the final MRB-IF, there are some relatively minor changes that need to be made to some of these monitoring activities (***Table 14***). In particular, additional parameters will need to be added to the hydro-meteorological monitoring activity to include the full suite of climate data, to the water quality monitoring activity to include data relevant to navigation and other pollution incidents, and to the information provided on joint projects to enable a more complete evaluation of their relative value. Clearer definitions of the data requirements for partnerships and knowledge-sharing will also be necessary. The periodic transmission of socio-economic data to the MRCS needs to be aligned with the data requirements of the MRB-IF and this Action Plan.

**Table 14:** Modifications that need to be made to existing regional monitoring activities

| Regional Monitoring | Required Modifications |
|---|---|
| 1. Periodic transmission of socio-economic data to the MRCS | Finalisation of MoU and alignment of all data transmission arrangements with social and economic dimensions of the MRB-IF and data requirements of this Action Plan |
| 2. Social Impact Monitoring and Vulnerability Assessment (SIMVA) | SIMVA data is not directly applicable at a basin-scale. Survey efforts currently employed for SIMVA may be better directed at enhancing the representativeness and water-related focus of national surveys and data analysis mechanisms at the provincial scale, as identified in Table 17 |
| 3. Hydro-meteorological monitoring | Add climate monitoring parameters necessary to ensure data is available to implement the MRB-IF |
| 4. Water quality monitoring | Add monitoring parameters for oils and grease, and phenols |
| 5. Quantity and value of joint and transboundary projects and projects of basin-wide significance[8] | Add reporting data for the annual value of expected future benefits and the expected timeframe of projects |
| 6. Extent of knowledge-sharing activities | Clearer definition of relevant activities and database for storing and retrieving statistics |
| 7. Partnerships between the MRC and other parties | Clearer definition of relevant activities and database for storing and retrieving statistics |

## 5.1.2   Periodic regional studies or assessments

The MRC has regularly undertaken periodic regional studies on behalf of the Member Countries. These studies are necessary where common standards and methods are required and where effective coordination facilitates understanding and integration of datasets and analytical approaches across Member Countries. Implementing the MRB-IF in full will require several regional studies to be undertaken. These studies provide data to inform an evaluation of Assessment Indicators across the Social, Environment, Economic and Climate Change Dimensions (Table 15).

The implementation of these regional studies and assessments will require approval through regular MRC work planning and budget processes, but they should follow a consistent methodology and regular

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[8] Number and investment value of projects are regularly reported to the MRC, but not their economic value

implementation schedule in order to best inform the MRC planning cycle and to evaluate conditions and trends over time.

**Table 15:** Periodic regional studies, reviews or assessments that need to be conducted

| Regional Study | Data Collection Frequency | Assessment Frequency | Responsible MRCS Division |
|---|---|---|---|
| 1. Drought risk assessment for water security | 5-yearly | 5-yearly | TD |
| 2. Multi-media contaminants – heavy metals and pesticides | 5-yearly | 5-yearly | ED |
| 3. Salinity intrusion in the delta[9] | Monthly | 5-yearly | TD |
| 4. Land cover assessment (including wetlands and forest types) | 5-yearly | 5-yearly | TD |
| 5. Riverine, estuarine and coastal habitats – sandy habitats, rocky habitats, deep pools, riparian vegetation, riverine and coastal erosion | 5-yearly | 5-yearly | ED |
| 6. Threatened water-dependent species and ecologically significant areas | 5-yearly | 5-yearly | ED |
| 7. Hydro-meteorological network analysis and design | 10-yearly | 10-yearly | TD |
| 8. Economic value of wetland ecosystem services | 5-yearly | 5-yearly | PD |
| 9. Fisheries yield assessment by habitat type | 5-yearly | 5-yearly | PD |
| 10. Extent and severity of flooding | Annual | Annual | TD |
| 11. Extent and severity of drought | Annual | Annual | TD |
| 12. Vulnerability to floods, droughts and storms | 5-yearly | 5-yearly | PD |

## 5.1.3    Existing routine national monitoring activities

National government agencies have responsibility for a range of data generation activities necessary to support national objectives (***Table 16***). Many of these processes have data highly relevant to the sustainable development, management and conservation of the Mekong River Basin, especially in relation to the Social and Economic dimensions of the MRB-IF. These data generation processes will need to continue if the MRB-IF is to be implemented in full and indeed some modifications could be made to these activities to better serve regional cooperation needs (***Table 17***).

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[9] Data collection is agreed through the water quality monitoring activity, but not the modelling assessment process to determine the affected area of the delta

**Table 16:** Routine or periodic national monitoring and reporting activities that need to continue

| | Cambodia | Lao PDR | Thailand | Viet Nam |
|---|---|---|---|---|
| **National routine or periodic monitoring activities** | - National Census<br>- Inter-censal population survey<br>- Cambodia Socio-Economic Survey<br>- Cambodia Demographic and Health Survey<br>- Cambodia National Malaria Control Programme<br>- Cambodia National Dengue Control Programme<br>- Agriculture Census<br>- Ministry of Agriculture Annual Report<br>- Monthly price bulletins<br>- Annual Tourism Sector Report<br>- National Accounts<br>- Annual Power Sector Report<br>- Company sand mining reports to Ministry<br>- MEF statistics on costs of floods and droughts<br>- MOWRAM Annual Report<br>- Hydro-meteorological monitoring<br>- MoE and line ministry data on policies, strategies and adaptation measures | - National Census<br>- Statistics Yearbook compilation<br>- Lao Expenditure and Consumption Survey<br>- National Development Plans<br>- Agriculture Census<br>- National forest data collection<br>- Energy generator and grid operator reports<br>- Provincial reporting processes<br>- National waterway database updates<br>- National irrigation database updates<br>- National Accounts<br>- Crop Statistics Reports<br>- Village surveys on flood and drought costs<br>- National Social welfare database updates<br>- National waterway database updates<br>- National irrigation database updates<br>- Hydro-meteorological monitoring<br>- SIMVA<br>- Waterways, MAF and MONRE databases | - National Census<br>- Registration Statistics<br>- Household Socio-Economic Survey<br>- Labour Force Survey<br>- Informal Employed Survey<br>- Health Statistics reporting<br>- Agriculture Statistics reporting<br>- Royal Irrigation Department statistics<br>- National Accounts<br>- Provincial Power Authority and EGAT data<br>- Fisheries Department data<br>- Department of Disaster Prevention and Mitigation statistics | - National Census<br>- Statistics Yearbook compilation<br>- Living Standards Survey<br>- Rural, Agriculture Census<br>- Labour Force Survey<br>- Economic Census<br>- Agriculture statistics reporting<br>- National Accounts<br>- Inland Waterways Administration Survey<br>- Forestry Administration Survey<br>- Agriculture and Rural Development Survey<br>- Department of Climate Change Survey |

**Table 17:** Potential modifications required to existing routine or periodic national monitoring activities[10]

| Country | National monitoring activity | Potential modifications to national monitoring activities |
|---|---|---|
| **Cambodia** | Cambodia Socio-Economic Survey | Increase sampling power to enable data representative of all provinces |
| | | Include questions on household asset values |
| | | Include questions on malnutrition |
| | | Disaggregate data on proportion of dietary energy from rice, undernourishment, and infant malnutrition at provincial level |
| | | Disaggregate data on drinking water sources and irrigation area by province |
| | | Disaggregate data on malnutrition and sanitation at provincial level |
| | | Disaggregate data on urban and rural electrification by province |
| | | Disaggregate data on working age population by province |
| | | Disaggregate data on household income and land ownership by province and collect new data on household asset value |
| | | Disaggregate data on jobs in each sector, primary school attendance, head of household and land ownership by province |

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[10] Note that Thailand did not identify any necessary modifications to national monitoring and survey processes

| Country | National monitoring activity | Potential modifications to national monitoring activities |
|---|---|---|
| | Annual MPWT reporting | Disaggregate data on cargo transport, passenger numbers and prices by province |
| | Annual MAF reporting | Disaggregate aquaculture production data by province |
| | | Disaggregate data on forestry production and price by province |
| | NCDM and MEF reporting | Disaggregate data on cost of flood at provincial scale |
| | | Disaggregate data on cost of drought at provincial scale |
| | MoE and line ministry reporting | Disaggregate data on flood protection measures at provincial scale |
| | | Disaggregate data on drought protection at provincial scale |
| | Commune Database | Disaggregate data on gender per sector |
| | Annual Power Sector Report | Disaggregate data on generation, export, consumption and price by province |
| **Lao PDR** | Statistics Yearbook Compilation | Disaggregate data on urban and rural electrification by province |
| | | Disaggregate price data for fish by province |
| | Labour Force Survey | Disaggregate data on working age population and gross-economic value of sectors by province |
| | Lao Expenditure and Consumption Survey | Include questions on food consumption by type and amount |
| | | Disaggregate data on proportion of dietary energy from rice, and undernourishment at provincial level |
| | National waterways database updates | Include data on the average value of land lost to bank erosion |
| | National Accounts | Disaggregate all relevant data by province |
| | Climate Change Book | Disaggregate national greenhouse gas data by province |
| | MPWT, MONRE and MAF Databases | Disaggregate climate adaptation data by province |
| | Market Surveys | Disaggregate price data of crops at a provincial level |
| **Thailand** | Multiple Indicators Cluster Survey | Disaggregate data on urban and rural electrification by province |
| | Household Socio-economic Survey | Disaggregate data on household income, asset value and land ownership by province |
| | | Disaggregate data on primary school attendance, head of household and land ownership by province |
| **Viet Nam** | Statistics Yearbook compilation | Disaggregate data on proportion of dietary energy from rice, undernourishment and infant malnutrition at provincial level |
| | | Disaggregate data on irrigation by province |
| | | Disaggregate data on malnutrition at provincial level |
| | | Disaggregate data on generation, export, consumption and price by province |
| | | Disaggregate data on sand mining volumes and prices by province |
| | GSO web statistics compilation | Disaggregate data on costs of bank and coastal erosion and floods and droughts by province |
| | | Disaggregate data on area of forestry by province |
| | | Disaggregate data on tourist visits by province and by source (domestic or international) |
| | | Include data on amount spent and duration of visits by source of tourists (domestic and international) |
| | | Disaggregate price data of crops at a provincial level |
| | | Disaggregate price data on fish by province |
| | Labour Force Survey | Disaggregate data by LMB water-related sectors |
| | | Disaggregate data on working age population at provincial level |
| | National Accounts | Identify the gross annual economic value of each LMB water-related sector and for each province |
| | | Disaggregate all relevant data by province |
| | Inland Waterways Administration Survey | Disaggregate data on cargo transport, passenger numbers and prices by province |
| | Forestry Administration Survey | Disaggregate data on forestry production and price by province |

| Country | National monitoring activity | Potential modifications to national monitoring activities |
|---|---|---|
| | Agriculture and Rural Development Survey | Disaggregate data on flood protection measures at provincial scale |
| | | Disaggregate data on drought protection at provincial scale |

In addition to the proposed modifications to existing national monitoring and data collection processes identified in Table 17, there are some new data collection and transmission processes from Member Countries to the MRCS that will be necessary to implement the MRB-IF in full (Table 18). Many of these new processes refer to the disaggregation of sub-categories of data that may already be collected, or could be assembled following further analysis of the original datasets (e.g. gross economic value of recession rice). Others may require further discussion and agreement about definitions (e.g. aquaculture and OAA production in Thailand). Additional monitoring and primary data collection may also need to be implemented in some cases (e.g. water bird monitoring).

**Table 18:** New data collection and transmission processes from Member Countries to the MRCS. Note that not all Member Countries need to undertake additional monitoring for each monitoring parameter as existing data collection processes are already in place in some countries and in some cases Member Countries have determined monitoring parameters not relevant to their part of the basin

| National Monitoring Activity | Data Collection Frequency | Assessment Frequency | Line Agencies Responsible[11] |
|---|---|---|---|
| **Environment Dimension** | | | |
| 1.  OAA/P abundance and diversity | Annual | 5-yearly | L: MAF (LARReC) <br> T: Dept. of Fisheries |
| 2.  Water bird abundance and diversity | Biennial | 5-yearly | C: MoE (PA/NCSD) & MAFF (IFREDI) <br> L: MAFF (DOF) <br> V: MONRE |
| **Economic Dimension** | | | |
| 3.  Gross economic value of production from riverbank gardens | Annual | 5-yearly | C: MAFF <br> L: MAF (DPC) <br> T: TNMCS |
| 4.  Navigation monitoring and reporting (cargo volumes and prices; passenger numbers and prices) | Annual | 5-yearly | T: Marine Department |
| 5.  Gross economic value of sand mining | Annual | 5-yearly | L: MPWT |
| 6.  Gross economic value of tourism | Annual | 5-yearly | C: Ministry of Tourism <br> L: Tourism Development Dept. <br> T: Thai Tourist Authority <br> V: GSO / Dept. of Travelling |
| 7.  Area and value of land lost to river bank and coastal erosion | Annual | 5-yearly | L: Department of Waterways <br> C: DWIPC-MPWT <br> T: Marine Department |
| 8.  Government reported costs of flood and drought damage | Annual | 5-yearly | C: MEF <br> L: MPI <br> T: MOI (DPM)/OAE/DDPM <br> V: DARD |
| **Climate Change Dimension** | | | |
| 9.  Greenhouse gas emissions by sector and gasses within the basin | 5-yearly | 5-yearly | C: MOE (DCC) <br> L: MONRE (DCC) <br> T: ONEP <br> V: MONRE (VEA) |

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[11] If a Member Country is not listed in this column it is because they already have a relevant data collection mechanism in place

| National Monitoring Activity | Data Collection Frequency | Assessment Frequency | Line Agencies Responsible[11] |
|---|---|---|---|
| 10. Drought protection measures (reservoir volumes for agriculture and urban use and demands for water during the dry season) | 5-yearly | 5-yearly | L: MAF (ID) & DWS |
| **Cooperation Dimension** | | | |
| 11. Expected future benefits from joint projects, transboundary projects and projects of basin-wide significance | Annual | 5-yearly | C: CNMCS<br>L: LNMCS<br>T: TNMCS<br>V: VNMCS |

## 5.2    NEED FOR CAPACITY BUILDING AT NATIONAL AND REGIONAL LEVELS

The implementation of the Mekong River Basin Indicator Framework in accordance with the technical guidance, including this Action Plan, may require additional capacity building support to Member Countries in relation to data collection, processing, and analysis. Technical training on field sampling and design, statistical analysis techniques, and data quality assurance and quality control may be beneficial to ensure good quality data is collected and transmitted in a consistent way according to the required standards.

In developing National Roadmaps for decentralisation, Member Countries undertook a comprehensive analysis of capacity building needs required to implement decentralisation of the core river basin management function monitoring activities. The capacity needs identified by Member Countries cover five main areas:

- Equipment procurement, set-up, handling, maintenance and repair;
- Field sampling and laboratory testing, analysis and interpretation;
- Data handling and management including QA/QC;
- Scientific report writing and communication skills including to local communities; and
- Management, coordination and oversight of monitoring activities.

In reviewing the progress of decentralisation, the Mid-Term Review (MTR) of the MRC's Strategic Plan 2016-2020 identified a need to prepare and implement capacity building plans for each monitoring activity with funding recommended of up to 20% of the cost of each of the activities. The proposed approach also advised recognising the differing levels of capacity between countries and the need for substantial use of country-to-country learning and knowledge-sharing.

In response to this recommendation of the MTR, this Action Plan includes under Step II implementation a proposed funding commitment of 15% of the costs of the MRC routine monitoring activities to be put towards the development and implementation of capacity building plans to improve data collection, generation and management. A needs assessment building on the previous work undertaken by Member Countries in the preparation of the National Decentralisation Roadmaps will need to be undertaken to inform these plans. This capacity needs assessment could also consider support for using various MRC tools and models commonly used in regional scenario assessment work including:

- The DSF suite of models (i.e. SWAT, IQQM, ISIS, WUP-FIN) as well as eWater Source and including any upgraded modelling tools as part of the MRC's reinvigoration of data management systems currently underway;
- Additional tools used to implement the Council Study including the DRIFT models and database, and the socio-economic assessment framework and approach; and
- Remote sensing data collection, generation and analysis.

It is important to recognise that the specific models and tools available to implement the MB Indicator Framework will change over time due to technological developments and changing needs. Capacity building activities will need to be flexible to this reality and continue to be designed and implemented as these needs change over time.

## 5.3    Key Actions Required for Step I Implementation

Step I of this Action Plan involves making the best use of the secondary data that is already available within Member Countries and continues existing data collection processes at both national and regional levels required to implement the MRB-IF. The key actions required at this step of implementation are:

1. Prepare and agree between the MRCS and MCs the Memoranda of Understanding and Terms of Reference for delivery of all data from national line or implementing agencies to the MRCS according to the specified data requirements and data delivery schedule in *Appendices A and B*.

2. Discuss and agree with relevant third party data holders arrangements for the periodic delivery of, or access to, data to support the implementation of this Action Plan, including as detailed in Table 12 and the data delivery schedules in *Appendices A and B*.

3. Continue to implement the following routine regional monitoring activities and review the approach to decentralisation, updating the budget accordingly:

    a. Hydro-meteorological monitoring;
    b. Water quality monitoring;
    c. Ecological health monitoring;
    d. Discharge and sediment monitoring; and
    e. Fisheries monitoring.

4. Following the piloting of the Joint Environmental Monitoring of mainstream hydropower, consider rolling out as a routine monitoring activity.

5. Modify regional monitoring activities and update Terms of Reference in order to:

    a. Add all relevant climate parameters to the hydro meteorological monitoring activity;
    b. Add additional parameters to water quality monitoring to include oils and grease, and phenols, consistent with the Procedures for Water Quality;
    c. Add data on the future economic benefits of joint projects, projects of basin-wide significance and with potential transboundary significance;
    d. Clarify definitions for knowledge-sharing activities and partnerships between MRC and other parties for inclusion in regional cooperation databases; and
    e. evaluate re-directing SIMVA resources to improved sub-basin scale coverage of national socio-economic monitoring and surveys.

6. Include the following regional studies, reviews and assessments within the MRC Strategic Plan and Annual Work Plans based on existing methodological designs. These are largely assessments which have been done before but need to be repeated on a periodic basis. Only two are completely new assessments, as indicated:

    a. Drought risk assessment for water security (consistent with previous MRC assessments);
    b. Multi-media contaminants assessment (based on the 2014 multi-media assessment);
    c. Modelling salinity intrusion in the delta (based on Council Study methodology);
    d. Riverine, estuarine and coastal habitats (including sandy habitats, rocky habitats, deep pools, riparian vegetation and river and coastal erosion) based on national reporting for specific case study sites;
    e. Land cover assessment, including wetland and forest types (drawing on national data but based on the 2010 methodology to ensure a regionally consistent approach);

f.  Review of threatened water-dependent species and the protection status of ecologically significant areas;

g.  Hydro-meteorological network assessment and design;

h.  Fisheries habitat yield assessment (based on the 2015 methodology);

i.  Extent and severity of flooding (based on previous flood mapping methodology); and

j.  Extent and severity of drought (based on the regional Drought Management Plan).

7.  Identify and collect the proxy data, estimation techniques and approved third party datasets that will be used to fill gaps in relation to each Assessment Indicator for the State of the Basin Report 2023 as reflected in *Appendix B* and identified by the Regional Specialists.

## 5.4    Key Actions Required at Step II Implementation

Step II of this Action Plan builds on Step I. It includes implementing all Step I actions but also involves designing improved approaches to national and regional reviews and assessments, and the data collection mechanisms that are necessary to inform those assessments. The key actions and priorities required at this level of implementation are:

1. Design and implement new regional assessment approaches and data collection requirements for the following studies:

   a. Riverine, estuarine and coastal habitats (including sandy habitats, rocky habitats, deep pools, riparian vegetation and river and coastal erosion) for the whole basin;
   b. Economic value of wetland ecosystem services; and
   c. Vulnerability to floods, droughts and storms.

2. Improve the design of regional assessment approaches for the Assessment Indicators as identified in the improvement strategies for each indicator in *Appendix B*; including by:

   a. Periodically ground-truthing habitat yield assessments for fisheries in different regions;
   b. Evaluating the extent of natural land cover types in ecologically significant areas and include consideration of species range distributions;
   c. Improving the multi-media monitoring assessment as recommended in previous reports; and
   d. Improving wetland extent and health mapping of the whole basin, based on work completed to date for MRC wetland health and ecosystem function project.

3. Prepare additional or modified national survey questions or data collection processes, disaggregate all relevant data by province, and increase the sampling power of national surveys to elicit additional socio-economic data applicable at a provincial level as indicated in *Table 17*, and detailed in *Table 19* for each Assessment Indicator, with a particular focus on the following national surveys and data collection processes:

   a. Cambodia Socio-economic Survey;
   b. Lao Expenditure and Consumption Survey;
   c. Viet Nam Living Standards Survey;
   d. Labour Force surveys for each country;
   e. The preparation of National Accounts for each country; and
   f. LMB water-related economic sector reporting for power generation and tourism.

4. Design new national data collection and transmission mechanisms for the data requirements identified *Table 18*, with a particular focus on:

   a. OAA/P abundance and diversity;
   b. Water bird abundance and diversity;
   c. Gross economic value of riverbank gardens;
   d. LMB water-related economic sector reporting for sand mining, navigation, forestry, and tourism;
   e. Greenhouse gas emissions by sector and by greenhouse gas, within the basin;
   f. The area and value of land lost to riverbank erosion; and
   g. Drought protection measures (reservoir volumes for agriculture and urban uses and demands for water during the dry season).

**Table 19:** Overview of key actions and priorities required by Member Countries at each implementation step for each Assessment Indicator

| Assessment Indicator | Step I | | Step II (incl. all Step I Actions and Priorities plus those below) |
|---|---|---|---|
| **1. Food Security** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on proportion of dietary energy from rice, undernourishment, infant malnutrition and household income at provincial level |
| | | Lao PDR | Disaggregate data on proportion of dietary energy from rice, and undernourishment at provincial level |
| | | Thailand | - |
| | | Viet Nam | Disaggregate data on proportion of dietary energy from rice, undernourishment and infant malnutrition at provincial level |
| **2. Water Security** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on drinking water sources and irrigation area by province |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | Disaggregate data on irrigation by province |
| **3. Water-related Health Security** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on malnutrition and sanitation at provincial level |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | Disaggregate data on malnutrition at provincial level |
| **4. Access to electricity** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on urban and rural electrification by province |
| | | Lao PDR | Disaggregate data on urban and rural electrification by province |
| | | Thailand | Disaggregate data on urban and rural electrification by province |
| | | Viet Nam | - |
| **5. Employment in LMB water-related sectors** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on working age population by province |
| | | Lao PDR | Disaggregate data on working age population and gross-economic value of sectors by province |
| | | Thailand | - |
| | | Viet Nam | Disaggregate data on working age population at provincial level |
| **6. Economic Security** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on household income and land ownership by province and collect new data household asset value |
| | | Lao PDR | - |
| | | Thailand | Disaggregate data on household income, asset value and land ownership by province |
| | | Viet Nam | - |
| **7. Gender equality in employment and economic engagement** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on jobs in each sector, primary school attendance, head of household and land ownership by province |
| | | Lao PDR | - |
| | | Thailand | Disaggregate data on primary school attendance, head of household and land ownership by province |
| | | Viet Nam | - |
| **8. Compliance of dry season flows with the PMFM** | Continue existing regional hydro-meteorological monitoring | Cambodia | - |
| | | Lao PDR | - |

| Assessment Indicator | Step I | Step II (incl. all Step I Actions and Priorities plus those below) | |
|---|---|---|---|
| | | Thailand | - |
| | | Viet Nam | - |
| **9. Compliance of flood season peak flows with the PMFM** | Continue existing regional hydro-meteorological monitoring and transmission of data to MRC | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **10. Compliance of Tonle Sap reverse flow** | Continue existing regional hydro-meteorological monitoring and transmission of data to MRC | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **11. Change in the timing of the onset of wet season flows** | Continue existing regional hydro-meteorological monitoring and transmission of data to MRC | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **12. Ecological health and water quality compliance with the PWQ** | - Continue existing regional water quality and ecological health monitoring and transmission of data to MRC<br>- Add new water quality parameters<br>- Undertake regional multi-media assessment | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **13. Changes in sediment transport** | Continue existing regional discharge and sediment monitoring and transmission of data to MRC | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **14. Extent of salinity intrusion in the delta** | Transmit salinity data as required to undertake regional assessments every five years | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **15. Extent of wetland area** | Undertake ground-truthing of land cover data as required to undertake regional assessments every five years | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **16. Condition of riverine, estuarine and coastal habitats** | Collect habitat data as required to undertake regional assessments every five years | Cambodia | Undertake regional activity to improve methodology and approach |
| | | Lao PDR | |
| | | Thailand | |
| | | Viet Nam | |
| **17. Condition and status of fisheries and other aquatic resources** | - Continue existing regional fisheries monitoring and transmission of data to the MRC;<br>- Transmit any OAA/P data collected at a national level | Cambodia | Design and implement new monitoring of water bird abundance and diversity |
| | | Lao PDR | Design and implement new monitoring of OAA/P and water bird abundance and diversity |
| | | Thailand | Design and implement new monitoring of OAA/P |

| Assessment Indicator | Step I | Step II (incl. all Step I Actions and Priorities plus those below) | |
|---|---|---|---|
| | - Transmit any data on dolphins collected at a national level | Viet Nam | Design and implement new monitoring of water bird abundance and diversity |
| 18. Condition and status of ecologically significant areas | Undertake ground-truthing of land cover data as required to undertake regional assessments every five years | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| 19. Economic value of agriculture | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Design and implement new data collection |
| | | Lao PDR | Disaggregate price data of crops at a provincial level; design and implement new data collection |
| | | Thailand | Design and implement new data collection |
| | | Viet Nam | Disaggregate price data of crops at a provincial level |
| 20. Economic value of hydropower | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on generation, export, consumption and price by province |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | Disaggregate data on generation, export, consumption and price by province |
| 21. Economic value of navigation | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on cargo transport, passenger numbers and prices by province |
| | | Lao PDR | - |
| | | Thailand | Design and implement new data collection on navigation |
| | | Viet Nam | Disaggregate data on cargo transport, passenger numbers and prices by province |
| 22. Economic value of sand mining | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | - |
| | | Lao PDR | Design and implement new data collection on sand mining |
| | | Thailand | - |
| | | Viet Nam | Disaggregate data on sand mining volumes and prices by province |
| 23. Economic value of wetlands | Undertake regional assessment using land cover data and MERFI valuation tool | Cambodia | Undertake regional activity to improve methodology and approach |
| | | Lao PDR | |
| | | Thailand | |
| | | Viet Nam | |
| 24. Economic value of capture fisheries | Undertake regional assessment using habitat yield approach every five years | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| 25. Economic value of aquaculture | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate aquaculture production data by province |
| | | Lao PDR | Disaggregate price data by province |
| | | Thailand | - |
| | | Viet Nam | Disaggregate price data by province |
| 26. Economic value of forestry | | Cambodia | Disaggregate data on forestry production and price by province |

| Assessment Indicator | Step I | Step II (incl. all Step I Actions and Priorities plus those below) | |
|---|---|---|---|
| | Transmit relevant data from regular national monitoring activities according to schedule | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | Disaggregate data on forestry production and price by province |
| **27. Economic value of tourism and recreation** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Design and implement new monitoring on basin tourism |
| | | Lao PDR | Design and implement new monitoring on basin tourism |
| | | Thailand | Design and implement new monitoring on basin tourism |
| | | Viet Nam | Design and implement new monitoring on basin tourism |
| **28. Economic cost of riverbank and coastal erosion** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Design and implement new monitoring on riverbank and coastal erosion costs |
| | | Lao PDR | Design and implement new monitoring on riverbank and coastal erosion costs |
| | | Thailand | Design and implement new monitoring on riverbank and coastal erosion costs |
| | | Viet Nam | - |
| **29. Economic cost of flooding** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on cost of flooding at provincial scale |
| | | Lao PDR | - |
| | | Thailand | Design and implement new monitoring on economic costs of flooding |
| | | Viet Nam | - |
| **30. Economic cost of drought** | Transmit relevant data from regular national monitoring activities according to schedule | Cambodia | Disaggregate data on cost of drought at provincial scale |
| | | Lao PDR | Design and implement new monitoring on economic costs of drought |
| | | Thailand | Design and implement new monitoring on economic costs of drought |
| | | Viet Nam | Design and implement new monitoring on economic costs of drought |
| **31. Contribution of LMB water-related sectors to basin, national and regional GDP** | Transmit relevant data from regular national monitoring activities; calculated from other parameters according to schedule | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **32. Contribution to food grain supply** | Transmit relevant data from regular national monitoring activities; calculated from other parameters according to schedule | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **33. Contribution to protein supply** | Transmit relevant data from regular national monitoring activities; calculated from other parameters according to schedule | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **34. Contribution to power supply** | Transmit relevant data from regular national monitoring activities; calculated from other parameters according to schedule | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **35. Greenhouse gas emissions from LMB water-related sectors** | Use national data available from Climate Watch | Cambodia | Design and implement approach to estimate emissions from each sector from the basin |

| Assessment Indicator | Step I | | Step II (incl. all Step I Actions and Priorities plus those below) |
|---|---|---|---|
| | | Lao PDR | Design and implement approach to estimate emissions from each sector from the basin |
| | | Thailand | Design and implement approach to estimate emissions from each sector from the basin |
| | | Viet Nam | Design and implement approach to estimate emissions from each sector from the basin |
| | | Cambodia | Design and implement approach to estimate emissions from each sector from the basin |
| **36. Relative contribution to global emissions** | Use national data available from Climate Watch | Lao PDR | Design and implement approach to estimate emissions from each sector from the basin |
| | | Thailand | Design and implement approach to estimate emissions from each sector from the basin |
| | | Viet Nam | Design and implement approach to estimate emissions from each sector from the basin |
| **37. Changes in tropical storm frequency and intensity, and storm-surge risk** | Use data available from the Joint Typhoon Warning Centre | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **38. Changes in temperature** | Continue national meteorological monitoring and transmit relevant data to MRCS | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **39. Changes in precipitation** | Continue national meteorological monitoring and transmit relevant data to MRCS | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **40. Extent and severity of flooding** | Design and Implement regional assessment | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **41. Extent and severity of drought** | Design and Implement regional assessment | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **42. Institutional response to the effects of climate change** | Assemble existing national data from line ministries and transmit to the MRCS | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| **43. Flood protection measures** | Assemble existing national data from line ministries and transmit to the MRCS | Cambodia | Disaggregate data on flood protection measures at provincial scale |
| | | Lao PDR | - |
| | | Thailand | - |

| Assessment Indicator | Step I | Step II (incl. all Step I Actions and Priorities plus those below) | |
|---|---|---|---|
| | | Viet Nam | Disaggregate data on flood protection measures at provincial scale |
| 44. Drought protection measures | Assemble existing national data from line ministries and transmit to the MRCS | Cambodia | Disaggregate data on drought protection at provincial scale |
| | | Lao PDR | Design and implement new data collection activity on drought protection measures |
| | | Thailand | Disaggregate data on drought protection at provincial scale |
| | | Viet Nam | Disaggregate data on drought protection at provincial scale |
| 45. Vulnerability to floods, droughts and storms | Use SIMVA data | Cambodia | Design and implement revised regional assessment |
| | | Lao PDR | |
| | | Thailand | |
| | | Viet Nam | |
| 46. Overall social benefits derived from each country's part of the basin | No specific data collection. Calculated from other parameters | | |
| 47. Overall environmental benefits derived from each country's part of the basin | No specific data collection. Calculated from other parameters | | |
| 48. Aggregate economic benefits derived from each water-related sector in each country's part of the basin | No specific data collection. Calculated from other parameters | | |
| 49. Joint efforts on projects of basin-wide significance and with potential transboundary impacts | Continue process of identifying projects through NIPs and reporting to the MRCS | Cambodia | Design and implement approach to estimating NPV of projects considering future income and costs |
| | | Lao PDR | Design and implement approach to estimating NPV of projects considering future income and costs |
| | | Thailand | Design and implement approach to estimating NPV of projects considering future income and costs |
| | | Viet Nam | Design and implement approach to estimating NPV of projects considering future income and costs |
| 50. Extent of knowledge-sharing activities | MRCS to design and implement regional data collection activity | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |
| 51. Partnerships between the MRC and other parties | Use existing MRCS records | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |

| Assessment Indicator | Step I | Step II (incl. all Step I Actions and Priorities plus those below) | |
|---|---|---|---|
| **52. Proportion of benefits derived from cooperation to total economic value of all LMB water-related sectors** | No specific data collection. Calculated from other parameters | | |
| **53. Proportion of MRC budget funded by national contributions during the current period** | No specific data collection. Calculated from MRC budget | Cambodia | - |
| | | Lao PDR | - |
| | | Thailand | - |
| | | Viet Nam | - |

**Table 20:** Overview of new and existing priority activities at Step I and Step II implementation

| | Step I | | Step II |
|---|---|---|---|
| | **Existing** | **New** | **New** |
| **Routine Regional Monitoring** | 1. Hydro-meteorological monitoring<br>2. Discharge and sediment monitoring<br>3. Water quality monitoring<br>4. Ecological health monitoring<br>5. Fisheries monitoring<br>6. SIMVA | 1. Periodic transmission of socio-economic data<br>2. Additional climate data included in routine monitoring<br>3. Additional water quality data included in routine monitoring<br>4. Additional project data included in routine project reporting through NIPs | Not applicable |
| **Periodic Regional Assessments** | | Use existing methodologies including existing national and regional data for:<br>1. Drought risk assessment for water security<br>2. Multi-media contaminants – heavy metals and pesticides<br>3. Salinity intrusion in the delta<br>4. Land cover assessment<br>5. Riverine, estuarine and coastal habitats<br>6. Threatened water-dependent species and ecologically significant areas<br>7. Hydro-meteorological network analysis and design<br>8. Economic value of ecosystem services<br>9. Fisheries yield assessment by habitat type<br>10. Extent and severity of flooding | Develop and implement new or improved regional assessment methodologies for:<br>1. Riverine, estuarine and coastal habitats<br>2. Economic value of ecosystem services<br>3. Vulnerability to floods, droughts and storms |

| | | | |
|---|---|---|---|
| | | 11. Extent and severity of drought<br>12. Vulnerability to floods, droughts and storms | |
| **National Monitoring and Data Assembly** | Continue existing national monitoring and data collection activities as specified in Table 16 | Transmit relevant data from existing national monitoring and data collection activities to MRCS according to agreed schedule | Changes to existing national monitoring activities as specified in Table 17<br><br>New national monitoring activities as specified in Table 18 |

## 5.5 OVERVIEW OF DATA DELIVERY SCHEDULE

**Table 21:** Overview of the schedule of data delivery required by dimension and data generation mechanism between 2020 and 2025 (years when data transmitted to MRCS)

| | | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|
| **Social** | **Routine national surveys and reporting** | - Ongoing social data collection through existing national monitoring and surveys | - Ongoing social data collection through existing national monitoring and surveys | - Ongoing social data collection through existing national monitoring & surveys<br>**- All social dimension data transmitted to the MRCS including additional or modified social dimension data as specified in Tables 17 and 18 as relevant to particular countries** | - Ongoing social data collection through existing national monitoring and surveys | - Ongoing social data collection through existing national monitoring and surveys | - Ongoing social data collection through existing national monitoring and surveys |
| | **Periodic regional assessments and studies** | | - Drought risk assessment for water security | | | | |
| **Environment** | **Routine regional monitoring and reporting** | - Ongoing monitoring and reporting to MRCS of hydro-meteorology, discharge and sediment, water quality, ecological health, and fisheries) | - Ongoing monitoring and reporting to MRCS of hydro-meteorology, discharge and sediment, water quality, ecological health, and fisheries) | - Ongoing monitoring and reporting to the MRCS of hydro-meteorology, discharge and sediment, water quality, ecological health, and fisheries)<br>**- Additional environment dimension data collected through new monitoring activities as identified in Table 18 and only as relevant to particular countries (i.e. OAA/P and water bird abundance and diversity) transmitted to the MRCS** | - Ongoing monitoring and reporting to the MRCS of hydro-meteorology, discharge and sediment, water quality, ecological health, and fisheries) | - Ongoing monitoring and reporting to the MRCS of hydro-meteorology, discharge and sediment, water quality, ecological health, and fisheries) | - Ongoing monitoring and reporting to the MRCS of hydro-meteorology, discharge and sediment, water quality, ecological health, and fisheries) |
| | **Periodic regional assessments and studies** | - Land cover assessment completed<br>- Hydro-met network analysis<br>- Salinity intrusion in the delta | - Multi-media contaminants study | - Review of other wetland-dependent biodiversity and ecologically significant areas<br>- Riverine, estuarine and coastal habitats assessment | | | - Land cover assessment completed<br>- Network analysis<br>- Salinity intrusion in the delta |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Economic** | **Routine national economic surveys and reporting** | - Ongoing economic data collection through existing national surveys and reporting | - Ongoing economic data collection through existing national surveys and reporting | - Ongoing economic data collection through existing national surveys and reporting<br>**- All economic dimension data transmitted to the MRCS including additional or modified economic dimension data as specified in Tables 17 and 18 as relevant to particular countries** | - Ongoing economic data collection through existing national surveys and reporting | - Ongoing economic data collection through existing national surveys and reporting | - Ongoing economic data collection through existing national surveys and reporting |
| | **Periodic regional assessments and studies** | - Fisheries habitat yield assessment | - Wetland ecosystem services assessment (design and trial) | | | | - Fisheries habitat yield assessment |
| **Climate Change** | **Routine national climate monitoring and reporting** | - Ongoing hydro-meteorological monitoring and reporting<br>- National flood and drought damage surveys | - Ongoing hydro-meteorological monitoring and reporting<br>- National flood and drought damage surveys | - Ongoing hydro-meteorological monitoring and reporting<br>- National flood and drought damage surveys<br>**- Additional or modified climate change dimension data as identified in Tables 17 and 18 and only as relevant to particular countries (i.e. greenhouse gas emissions and flood protection and drought protection measures) transmitted to the MRCS** | - Ongoing hydro-meteorological monitoring and reporting<br>- National flood and drought damage surveys | - Ongoing hydro-meteorological monitoring and reporting<br>- National flood and drought damage surveys | - Ongoing hydro-meteorological monitoring and reporting<br>- National flood and drought damage surveys |
| | **Periodic regional climate change assessments** | - Extent and severity of droughts | - Review of national GHG emissions data and institutional response to the effects of climate change | - Extent and severity of floods<br>- Vulnerability assessment to floods, droughts & storms (design and trial) | | | - Extent and severity of droughts |
| **Cooperation** | **Routine regional cooperation data collection** | - Project data reported to the MRCS **(including additional data from new monitoring activities identified in Table 18)**<br>- Engagement and partnership statistics collated<br>- MRC budget updated | - Project data reported to the MRCS **(including additional data from new monitoring activities identified in Table 18)**<br>- Engagement and partnership statistics collated<br>- MRC budget updated | - Project data reported to the MRCS **(including additional data from new monitoring activities identified in Table 18)**<br>- Engagement and partnership statistics collated<br>- MRC budget updated | - Project data reported to the MRCS **(including additional data from new monitoring activities identified in Table 18)**<br>- Engagement and partnership statistics collated<br>- MRC budget updated | - Project data reported to the MRCS **(including additional data from new monitoring activities identified in Table 18)**<br>- Engagement and partnership statistics collated<br>- MRC budget updated | - Project data reported to the MRCS **(including additional data from new monitoring activities identified in Table 18)**<br>- Engagement and partnership statistics collated<br>- MRC budget updated |

BDS 2021-2030
approved

SOBR 2023
approved

BDS 2021-2030
reviewed and updated

## 5.6 KEY PERFORMANCE INDICATORS FOR MRCS DIVISIONS OVERSEEING IMPLEMENTATION OF THEIR RESPECTIVE COMPONENTS

**Table 22:** Key Performance Indicators for each MRCS Division overseeing implementation of this *Data Acquisition and Generation Action Plan*

| | TD | ED | PD | AD | OCEO |
|---|---|---|---|---|---|
| **1. Coordinate national data collection efforts** | TD to coordinate overall data collection across divisions | | | | |
| | MoUs and ToRs agreed with MCs by end of 2020 for all datasets identified for national monitoring and under TD responsibility in Appendix E and in accordance with delivery schedule in **Appendix A** | MoUs and ToRs agreed with MCs by end of 2020 for all datasets identified for national monitoring and under TD responsibility in Appendix E and in accordance with delivery schedule in **Appendix A** | MoUs and ToRs agreed with MCs by end of 2020 for all datasets identified for national monitoring and under TD responsibility in Appendix E and in accordance with delivery schedule in **Appendix A** | MoUs and ToRs agreed with MCs by end of 2020 for all datasets identified for national monitoring and under TD responsibility in Appendix E and in accordance with delivery schedule in **Appendix A** | MoUs and ToRs agreed with MCs by end of 2020 for all datasets identified for national monitoring and under TD responsibility in Appendix E and in accordance with delivery schedule in **Appendix A** |
| **2. Implement routine regional monitoring in accordance with decentralised arrangements** | Long-term agreements in place with MCs by end of 2020 for the collection of decentralised data for all datasets identified for routine MRC monitoring and under TD responsibility in columns M and S of **Appendix E** | Long-term agreements in place with MCs by end of 2020 for the collection of decentralised data for all datasets identified for routine MRC monitoring and under ED responsibility in columns M and S of **Appendix E** | Long-term agreements in place with MCs by end of 2020 for the collection of decentralised data for all datasets identified for routine MRC monitoring and under PD responsibility in columns M and S of **Appendix E** | Long-term agreements in place with MCs by end of 2020 for the collection of decentralised data for all datasets identified for routine MRC monitoring and under AD responsibility in columns M and S of **Appendix E** | Long-term agreements in place with MCs by end of 2020 for the collection of decentralised data for all datasets identified for routine MRC monitoring and under OCEO responsibility in columns M and S of **Appendix E** |
| **3. Lead design and implementation of periodic regional assessments and studies** | ED to lead and coordinate divisions in design and implementation of periodic assessments and studies to support implementation and refinement of the MRB-IF | | | | |
| | For each regional assessment identified as TD responsibility in Table 15:<br>- Assessment methodology reviewed<br>- Concept note developed for methodology refinement (if needed), and implementation<br>- Budget requirements and work plan identified<br>Activity implemented before end of the year identified in **Table 23**. | For each regional assessment identified as ED responsibility in Table 15:<br>- Assessment methodology reviewed<br>- Concept note developed for methodology refinement (if needed), and implementation<br>- Budget requirements and work plan identified<br>Activity implemented before end of the year identified in **Table 23**. | For each regional assessment identified as PD responsibility in Table 15:<br>- Assessment methodology reviewed<br>- Concept note developed for methodology refinement (if needed), and implementation<br>- Budget requirements and work plan identified<br>Activity implemented before end of the year identified in **Table 23**. | Not applicable | Not applicable |
| **4. Lead refinement and development of any changes required to routine monitoring or periodic assessments and studies** | ED to lead and coordinate divisions in refinement and development of routine monitoring and periodic assessments and studies to support implementation and refinement of the MRB-IF | | | | |
| | - Implement modifications to routine monitoring in Table 14 for hydro-meteorological monitoring by end of 2022 through agreements with MCs and update ToRs where required<br>- Develop assessment methodology for hydro-met network analysis and implement by end of 2020 | - Implement modifications to routine monitoring in Table 14 for water quality monitoring by end of 2022 through agreements with MCs and update ToRs where required<br>- Develop improved assessment methodology for regional study on riverine, estuarine and coastal habitats by 2021 | - Implement modifications to routine monitoring in Table 14 for socio-economic monitoring and project database by end of 2022 through agreements with MCs and update ToRs where required<br>- Develop improved assessment methodology for regional study on economic value of wetland ecosystem services by 2021 | Not applicable | - Implement modifications to routine monitoring in Table 14 in relation to partnership and knowledge-sharing activities by end of 2022 through agreements with MCs and update ToRs where required |

| | TD | ED | PD | AD | OCEO |
|---|---|---|---|---|---|
| | | | - Develop improved assessment methodology for vulnerability to floods, droughts and storms by 2021 | | |
| **5. Coordinate MCs on the design and implementation of modified national data collection activities** | ED to lead and coordinate divisions in design and implementation of modified national data collection activities to support implementation and refinement of the MRB-IF and SOBR | | | | |
| | By 2023 for data requirements in Tables 17 and 18 that are under TD responsibility as identified in *Appendix E* | By 2023 for data requirements in Tables 17 and 18 that are under ED responsibility as identified in *Appendix E* | By 2023 for data requirements in Tables 17 and 18 that are under PD responsibility as identified in *Appendix E* | Not applicable | Not applicable |

# 6. BUDGET APPROACH – PRIORITIES AND STRATEGY

## 6.1 ADEQUATE FUNDING COMMITMENT

The MRC is facing a challenging budget situation over the period of the next Strategic Plan. By 2030, the MRC aims to be entirely funded by Member Country contributions, with a projected budget in that year of USD 9.8 million. This is approximately 35% less than the total budget in 2017, when 23% was contributed by Member Countries. Within this context, the budget priorities for data acquisition and generation should reflect the Strategic Priorities as described in Section 3.0 and the Key Actions required to implement each step of this Action Plan, as described in Section 5.0.

The *MRC Strategic Plan 2016-2020* identifies 13% of the total MRC budget as necessary for CRBMF 1. This is approximately USD 1.3 million per annum. Reducing this budget by 10% per year over the next Strategic Plan period, in line with the revised MRC decentralisation plan, will require a commitment from the MRC Council to average annual funding of approximately USD 1.3 million between 2020 and 2024 towards:

- Routine MRC data collection and assessment through core river monitoring activities;

- Periodic data collection and analysis in support of regional assessments, both from national agencies and other regional and international organisations;

- Assembly, processing and transmission of national datasets from Member Countries to the MRCS; and

- Maintaining the MRC Information System, once upgraded and aligned with the MRB-IF.

This level of funding is consistent with actual MRC expenditure in 2017 but also accounts for decentralisation and would cover the costs of data acquisition, generation and processing associated with CRBMF 1 (Table 13) as well as the relatively minor modifications that need to be made to existing routine monitoring activities (Table 14). Budget support for methodological development, regional assessments, analysis, modelling and forecasting activities should continue to occur through CRBMFs 2, 3, 4, and 5.

There are twelve regional assessments that need to be implemented at least once every five years in order to ensure data availability in accordance with the MRB-IF (Table 15). The average cost of these assessments is estimated at USD 100,000 each, requiring a total budget of USD 1.2 million. Implementation of this Action Plan to Step 1, encompassing both routine regional monitoring and periodic regional assessments would therefore require a total budget over the next five years of USD 6.52 million, or approximately **USD 1.32 million per annum**. This is substantially less than current funding because it covers all relevant CRBMFs necessary for implementing the MRB-IF, not only CRBMF 1. It is also only **USD 0.30 million per annum** more than is currently committed. The reduced level of funding is primarily due to the gradual decentralisation of routine monitoring activities until 2030.

**Step 1 Budget Requirements over the next MRC SP period (2021-2025)**

Implementation of this Action Plan to Step 2 requires additional resources to be committed over the next MRC SP period in order to make changes to national data collection processes as identified in *Table 17*, including the disaggregation of provincial scale data where this is not otherwise reported, designing and implementing new questions for national survey processes, and undertaking additional sampling efforts to increase the representativeness of datasets at a sub-basin scale. In addition, new targeted monitoring activities may be required as identified in *Table 18*.

Based on estimates by Member Countries of the approximate costs to: (i) disaggregate required data from existing datasets; (ii) design and implement new or modified survey questions; (iii) design and implement new targeted national monitoring or reporting activities; and (iv) to increase the sampling effort of national monitoring activities and surveys, the budget necessary to make these changes to national data collection processes is estimated at approximately USD 1.3 million over five years (*Table 23*).

**Table 23:** Budget requirements under Step 1 implementation of the DAGAP

|  | Av. Annual Budget over five years (USD) | |
| --- | --- | --- |
|  | **Already Committed** | **Additional Requirement** |
| All routine regional monitoring activities (13% of MRC budget minus decentralisation) | 1.02 million | 0.06 million |
| Regional assessments (USD 100k x twelve assessments) | - | 0.24 million |
| **TOTAL:** | **1.02 million** | **0.30 million** |

Additional design work for three Step 2 regional studies: (i) Riverine, estuarine and coastal habitats; (ii) Economic value of wetland ecosystem services; and (iii) Vulnerability to floods, droughts and storms is estimated at approximately USD 100,000 for each activity. This brings the total estimated budget for Step 2 implementation to USD 2.75 million over the next strategic plan period, or USD 0.55 million per annum (*Table 24*), notwithstanding that much of the work will need to be completed over three years in order to meet timeframes for the next SOBR. This additional expenditure for Step 2 brings the total estimated budget for both Steps I and II to **USD 1.85 million per annum** over the next strategic plan period. Further detail on cost estimates for Step 1 and Step 2 is provided at *Appendix D*.

**Step 2 Budget Requirements over the next MRC SP period (2021-2025)**

**Table 24:** Additional budget requirements under Step 2 implementation of the DAGAP

|  | Av. Annual Budget over five years (USD) | |
| --- | --- | --- |
|  | **Already Committed** | **Additional Requirement** |
| Updates to regional assessments (USD 100k x three assessments) | - | 0.06 million |
| Changes to national survey processes | - | 0.14 million |
| New national monitoring activities (USD 11k for each country for each activity) | - | 0.13 million |
| Capacity Building (15% of routine monitoring budget) | - | 0.22 million |
| **TOTAL:** | **-** | **0.55 million** |

Note that these estimates above are subject to change based on confirmation by Member Countries of: (i) existing national datasets and monitoring and survey activities; and the resources required for (ii) changes to existing new national monitoring activities; and (iii) new national monitoring activities.

For funding that is necessary to support the collection, extraction or processing of national datasets to be transferred from Member Countries, estimates of the costs necessary to do this shall be included within relevant Memoranda of Understanding and Terms of Reference as agreed between the parties and as part of the routine regional monitoring and regional assessment budgets identified above. As a general rule, any support for funding should be reduced over time in line with the general handover of responsibilities from the MRCS to the Member Countries, with these costs fully financed by national budgets by 2030.

Based on the estimates above, it is anticipated that the expenditure of additional resources for changes to existing national survey processes and new national monitoring activities will be USD 0.49 million for Cambodia, USD 0.56 million for Lao PDR, USD 0.51 million for Thailand and USD 0.45 million for Viet Nam. These estimates are informed by consultation with national line or implementing agencies in the preparation of this Strategy. The approach that was taken was to ask individual officers at the national meetings to provide a rough estimate, based on their experience, of the approximate costs either in dollars or in work-days that would be necessary to undertake the relevant modifications or implement new activities as required to fill the identified data gaps. The estimates identified by Member Countries are reflected in *Appendix E*.

Given the difficulty associated with estimating work requirements in this way, and the large differences estimated by different countries for the same piece of work, the overall budget required for Step 2, as indicated above, has applied the highest estimate by a single country for each dataset to all countries for that same dataset, subject to some variation in the number of provinces (i.e. there is a set cost for each dataset for each province). This estimate should therefore provide the upper level of what is required in order to ensure sufficient resources, and is a starting point for further negotiation between Member Countries and the MRCS in the preparation of MoUs.

## 6.2    SEQUENCING REQUIREMENTS

The proposed approach to budget strategy involves scheduling the delivery of design and implementation work so that as far as possible, large regional assessments, reviews, and studies are scheduled to avoid any MRC division being required to do more than three assessments in a single year (*Table 25*). Where possible, large regional assessments will also be sequenced across the MRCS to ensure adequate budget is available to undertake the necessary work in any given year. This will help smooth the budget demand over the planning cycle and avoid conflicts and delays in delivery of outputs.

**Table 25:** Work plan and budget sequencing for periodic regional assessments

| Regional Study | Division | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|
| 1. Drought risk assessment for water security | TD | | ▓ | | | | |
| 2. Multi-media contaminants – heavy metals and pesticides | ED | | ▓ | ▓ | | | |
| 3. Salinity intrusion in the delta[12] | TD | ▓ | | | | | ▓ |
| 4. Land cover assessment (including wetlands and forest types) | TD | | | | | | ▓ |
| 5. Riverine, estuarine and coastal habitats | TD | | | ▓ | ▓ | | |
| 6. Threatened water-dependent species and ecologically significant areas | ED | | | | | | |
| 7. Hydro-meteorological network analysis and design | TD | ▓ | | | | | |
| 8. Economic value of wetland ecosystem services | PD | | ▓ | | | | |

---

[12] Data collection is agreed through the water quality monitoring activity, but not the modelling assessment process to determine the affected area of the delta

| Regional Study | Division | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|
| 9. Fisheries yield assessment by habitat type | ED | ■ | | | | | ■ |
| 10. Extent and severity of flooding | TD | | | ■ | | | |
| 11. Extent and severity of drought | TD | ■ | | | | | ■ |
| 12. Vulnerability to floods, droughts and storms | PD | | | ■ | | | |

In determining the sequence, linkages between assessments have been taken into account. For example, the regional evaluation of wetland ecosystem services needs to take place after the land cover assessment in order to use the data on the area of different wetland types as an input. The vulnerability assessment for floods, droughts and storms, should follow on from the review of the extent and severity of droughts and floods, including an assessment of flood and drought mitigation measures.

Budget development and approval at a regional level will follow the normal processes involving scrutiny by the Budget Committee, and approval by the MRC Council on an annual basis.

## 6.3 RISK IDENTIFICATION

Failure to implement this *Data Acquisition and Generation Action Plan* presents risks to the MRC as identified in **Table 26**. These risks should be considered by the JC in discussing and agreeing a way forward.

**Table 26:** Risks involved in not undertaking each step of this action plan

| Risks involved in _not_ undertaking Step I | Risks involved in _not_ undertaking Step II |
|---|---|
| **All** risks identified in not undertaking Step 2, as well as<br><br>- Incomplete 2023 State of the Basin report with substantial lack of data in the social and economic dimensions and strategic questions on the conditions and trends in the basin left unanswered;<br>- Large gaps and reduced quality and reliability of MRC studies, products and assessments;<br>- Inaccuracies and discrepancies in all MRC findings and recommendations inhibiting the promotion of trust and transparency among MCs and with the MRCS;<br>- Social and economic data for a limited set of indicators generally only available at national scale, reducing the relevance and validity of assessments;<br>- Additional significant costs required for international consultants to compile datasets for the next State of the Basin Report and any future scenario assessments and studies. Costs much higher compared to the proposed budget for the DAGAP;<br>- Incomplete capacity to adequately identify the spatial impacts, particularly on poor, resource dependent people, of water resource development from any future scenario assessments;<br>- Reduced confidence of stakeholders in the MRC's capacity to fulfil its regional knowledge hub role and to demonstrate its comparative advantage relative to other regional water cooperation platforms; and | - Some data gaps will remain, particularly for parameters identified in Table 18:<br>  o OAA/P abundance and diversity<br>  o Water bird abundance and diversity<br>  o Economic value of riverbank gardens, navigation, sand mining, tourism<br>  o Costs of riverbank erosion, flooding and drought<br>  o Greenhouse gas emissions<br>  o Drought protection measures<br>  o Expected future value of joint and significant projects.<br>- Some misalignment in temporal and spatial scales, particularly for social and economic dimension parameters identified in Table 17, resulting in incomplete capacity to identify the spatial impacts of water resource development from scenario assessments;<br>- Costs associated with any specific studies that may need to be commissioned from time to time to answer questions requiring the above data;<br>- Incomplete understanding of the impacts of ecosystem functions and services in the basin;<br>- Inaccurate assessment of environment, social and economic implications due to changes in ecosystem functions and services; |

| Risks involved in _not_ undertaking Step I | Risks involved in _not_ undertaking Step II |
|---|---|
| - Additional costs for both national agencies and the MRCS associated with duplicated data requests, clarifying requirements and collection of data which is unnecessary or not useful to assessments. | - Equity of benefit sharing for sustainable development according to the MA 1995 not accurately and transparently defined;<br>- Substantial gaps in defining economic valuations in various MRC water and related sectors; and<br>- Lack of trust in the MRC by stakeholders and MCs. |

# APPENDIX A: SPECIFIC DATA DELIVERY SCHEDULES

**Data delivery schedule by Monitoring Parameter for the Social Dimension**

| 5-yearly Transmission by 31 March each fifth year | Data required | Transmission years |
|---|---|---|
| Population (No.) <br> Quantity of rice produced for food (production – exports) (Tonne) <br> Proportion of dietary energy coming from rice (%) <br> Household income / expenditure (USD/day/HH) <br> Household size (No./HH) <br> Proportion of population undernourished (%) <br> Proportion of population suffering malnutrition (%) <br> Proportion of children <5 yrs old exhibiting stunting (%) <br> Proportion of children <5 yrs old exhibiting wasting (%) <br> Households with access to water supplies from an improved source (No.) <br> Households with access to water supplies that meet drinking water standards (No.) <br> Households with access to sanitation facilities (No.) <br> Total number of households (No.) <br> Total number of rural households (No.) <br> Total number of urban households (No.) <br> Irrigation area (km$^2$) <br> Number of reported cases of malaria (No.) <br> Number of reported cases of dengue fever (No.) <br> Number of reported outbreaks of cholera (No.) <br> Urban households with access to electricity supplies (No.) <br> Rural households with access to electricity supplies (No.) <br> Working age population (15-64 yrs) (No.) <br> Number of people primarily employed in each LMB water-related sector (No.) <br> Number of jobs in each LMB water-related sector (No.) <br> Number of jobs held by females in each LMB water-related sector (No.) <br> Employment rate (%) <br> Gross annual economic value of each LMB water-related sector (USD/annum) <br> Household asset value (USD/HH) <br> Number of rural households owning land (No.) <br> Number of girls and boys attending primary education (No.) <br> Number of boys and girls of primary school age in the community (No.) <br> Number of agricultural households headed by males (No.) <br> Number of agricultural households headed by females (No.) <br> Number of agricultural households headed by males that own land (No.) <br> Number of agricultural households headed by females that own land (No.) | For 2022, all years of data up to and including the year prior to the transmission year <br><br> After 2022, only each additional year as updated | 2022 <br> 2027 |

Where available, all Social Dimension data is required:

> ➤ for each year it is available
> ➤ at the provincial scale
> ➤ in MS Excel format
> ➤ disaggregated by gender
> ➤ disaggregated by urban and rural households

**Data delivery schedule by Monitoring Parameter for the Environment Dimension**

| Annual Transmission by 31 March each year | Data required | Transmission years |
|---|---|---|
| Channel Cross-sectional area (m²)<br>Concentration of Suspended Sediments (mg/L)<br>Stage height (m)<br>Flow (m³/s)<br>Volume of bed material (Ton)<br>Quantity of sand in suspended sample (g)<br>Quantity of silt in suspended sample (g)<br>Quantity of clay in suspended sample (g)<br>Quantity of sand in bed sample (g)<br>Quantity of silt in bed sample (g)<br>Quantity of clay in bed sample (g)<br>Quantity of gravel in bed sample (g)<br><br>Biomass of migratory landed fish (Tonne)<br>Biomass of non-migratory landed fish (Tonne)<br>Biomass of each species and guild caught (kg and %)<br>Biomass of introduced species caught (kg and %)<br>Number of introduced species caught (No.)<br>Time spent fishing per gear (gillnets) (hours)<br>Total amount of gear used (gillnets) (m²)<br>Average length of fish caught (cm)<br><br>Biomass of OAA/P harvested (Tonne)<br>Time spent harvesting OAA/P (hours)<br>Harvest of crabs, shrimp, water snakes and other OAA/P (kg and %) | For 2020, all years of data up to and including the year prior to the transmission year<br><br>After 2020, only each additional year as updated | 2020<br>2021<br>2022<br>2023<br>2024<br>2025<br>2026<br>2027<br>2028<br>2029<br>2030 |
| **Biennial Transmission by 31 March each second year** | **Data required** | **Transmission years** |
| Number of diatoms (No.)<br>Number of benthic invertebrates (No.)<br>Number of littoral invertebrates (No.)<br>Number of zooplankton (No.)<br><br>Number of dolphins (No.)<br>Number of water birds (No.)<br>Species of water birds (-) | For 2020, data for 2019<br><br>After 2020, only each additional year as updated | 2020<br>2022<br>2024<br>2026<br>2028<br>2030 |
| **Monthly Transmission by the 15th of each month** | **Data required** | **Transmission months** |
| DO (mg/L)<br>pH (-)<br>COD (mg/L)<br>BOD (mg/L)<br>NH₄-N (mg/L)<br>Temp (°C)<br>NO₂₃-N (mg/L)<br>Total Phosphorous (mg/L)<br>Total Nitrogen (mg/L)<br>Total Suspended Solids (mg/L)<br>Electrical Conductivity (mS/L)<br>Faecal Coliforms (mg/L)<br>Oil and Grease (mg/L)<br>Phenol (mg/L) | All months up to and including the December prior to the transmission date | January<br>February<br>March<br>April<br>May<br>June<br>July<br>August<br>September<br>October<br>November<br>December |
| **Daily Transmission** | **Data required** | **Transmission year** |
| Daily water levels at PMFM stations (m)<br>Date (day) | All days up to and including the 31 December prior to the transmission date | yyyy/mm/dd for each day of the year |

Environment Dimension data is required for:

➢ each station specified in the technical requirements for hydro meteorological, discharge and sediment, water quality, ecological health and fisheries monitoring activities

**Data delivery schedule by Monitoring Parameter for the Economic Dimension**

| 5-yearly Transmission by 31 March each fifth year | Data required | Transmission years |
|---|---|---|
| Total cropped area for each irrigated crop (km²) <br> Total cropped area for each rain-fed crop (km²) <br> Total cropped area for recession rice (km²) <br> Total cropped area for each riverbank garden crop (km²) <br> Annual crop yield for each irrigated crop (Tonne/ha) <br> Annual yield for each rain-fed crop (Tonne/ha) <br> Annual yield for recession rice (Tonne/ha) <br> Annual yield for each riverbank garden crop (Tonne/ha) <br> Average annual prices for each irrigated, rain-fed, recession rice and riverbank garden crop (Tonne/ha) <br> Total production of meat from livestock (Tonne) <br><br> Total production of hydropower for domestic consumption (MWh) <br> Total production of hydropower exported (MWh) <br><br> Total quantity of ITW cargo transported along the mainstream (Tonne) <br> Total number of passenger trips made along the mainstream (No.) <br> Average price of transporting cargo (USD/Tonne) <br> Average price of each passenger trip (USD/Trip) <br><br> Total quantity of aggregates, sand and gravel abstracted for commercial purposes (Tonne) <br> Average price of aggregates, sand and gravel abstracted for commercial purposes (USD/Tonne) <br><br> Total production of fish from aquaculture (Tonne) <br> Total production of shrimp from aquaculture (Tonne) <br> Total production of other aquatic animals from aquaculture (Tonne) <br> Average price of each main capture fish species (USD/Tonne) <br> Average price of each main culture fish species (USD/Tonne) <br> Average price of shrimp from aquaculture (USD/Tonne) <br> Average price of other aquatic animals from aquaculture (USD/Tonne) <br><br> Total area of forestry (km²) <br> Average unit timber log production (m³/ha) <br> Average timber log unit price (USD/m³) <br> Average value of other non-timber forest products (USD) <br><br> Number of domestic tourists visiting the LMB (No.) <br> Number of international tourists visiting the LMB (No.) <br> Average trip length for domestic tourists (days) <br> Average trip length for international tourists (days) <br> Average spend per trip-day by domestic tourists (USD/day) <br> Average spend per trip-day by international tourists (USD/day) <br><br> Area lost to riverbank erosion (km²) <br> Average value of land lost to riverbank erosion (USD/ha) <br> Area lost to coastal erosion (km²) <br> Average value of land lost to coastal erosion (USD/ha) <br><br> Cost of lost production due to flooding (USD) <br> Cost of lost production due to drought (USD) <br> Total costs of flooding (USD) <br> Total costs of drought (USD) <br><br> Gross Domestic Product (USD) | For 2022, all years of data up to and including the year prior to the transmission year <br><br> After 2022, only each additional year as updated | 2022 <br> 2027 |

Where available, all **Economic Dimension** data is required:

  ➢ for each year it is available; and for each province
  ➢ in MS Excel format
  ➢ in metric units (i.e. metric tons or tonnes), and in US Dollars, where relevant

**Data delivery schedule by Monitoring Parameter for the Climate Change Dimension**

| 5-yearly Transmission by 31 March each fifth year | Data required | Transmission years |
|---|---|---|
| Greenhouse gas emissions from energy generation (tCO$_2$-e)<br>Greenhouse gas emissions from agriculture (tCO$_2$-e)<br>Greenhouse gas emissions from land use, land use change and forestry (tCO$_2$-e)<br>Total hydropower generation (MWh)<br>Emissions of Carbon Dioxide (CO$_2$) (tCO$_2$-e)<br>Emissions of Methane (CH$_4$) (tCO$_2$-e)<br>Emissions of Nitrous Oxide (N$_2$O) (tCO$_2$-e)<br><br>Population in flood-affected areas (No.)<br>Population in drought-affected areas (No.)<br>Population in storm-affected areas (No.)<br>Total storm-affected area (km$^2$)<br>Time households affected by floods (days)<br>Time households affected by drought (days)<br>Time households affected by storms (days)<br>Asset damage and lost production due to floods (USD)<br>Asset damage and lost production due to droughts (USD)<br>Asset damage and lost production due to storms (USD)<br>Population below the national poverty line in flood-affected areas (No.)<br>Population below the national poverty line in drought-affected areas (No.)<br>Population below the national poverty line in storm-affected areas (No.)<br><br>Number of climate change awareness-raising activities (No.)<br>Receipt of international climate finance (USD)<br>Land classified as urban land (-)<br>Land classified as agricultural land (-)<br>Digital Elevation Model with flood mapping (-)<br>Location, height and length of embankments/levees (-)<br><br>Are of irrigated land (km$^2$)<br>Area of irrigable land (km$^2$)<br><br>Volume of water reservoirs for agricultural use (m$^3$)<br>Volume of water for urban use (m$^3$)<br>Agricultural water-use demand over the dry season (m$^3$)<br>Domestic water-use demand over the dry season (m$^3$)<br><br>Existence of national disaster risk management plans (Yes/No)<br>Existence of local disaster risk management plans (Yes/No) | For 2021, all years of data up to and including the year prior to the transmission year<br><br>After 2021, only each additional year as updated | 2021<br>2026 |
| **Annual Transmission by 31 March each year** | **Data required** | **Transmission years** |
| Mean sea level at the delta coast (m)<br>Daily maximum temperature (˚C)<br>Daily minimum temperature (˚C)<br>Daily rainfall (mm)<br><br>Daily water levels at all basin hydro-meteorological stations (m) | For 2020, all years of data up to and including the year prior to the transmission year<br><br>After 2020, only each additional year as updated | 2020<br>2021<br>2022<br>2023<br>2024<br>2025<br>2026<br>2027<br>2028<br>2029<br>2030 |

Climate Change Dimension data is required for:

➢ each hydro-meteorological station with good quality data as identified in: *Analysis of historical trends, variability and changes in hydroclimatic conditions for the Lower Mekong Basin* (MRC, 2017)

➢ for each year it is available; and for each province

➢ in MS Excel format

## Data delivery schedule by Monitoring Parameter for the Cooperation Dimension

| Annual Transmission by 31 March each year | Data required | Transmission years |
|---|---|---|
| Number of joint projects and projects of basin-wide significance (No.)<br><br>Number of transboundary projects notified (No.)<br><br>For projects of basin-wide significance, joint and transboundary projects:<br>    Cost of project investment (USD)<br>    Expected future cash flow from the project (USD)<br>    Government discount rate (%)<br>    Time period over which the project is expected to generate returns (years)<br><br>Number of knowledge-sharing events (symposia, fora, training) involving more than one Member Country (No.)<br>Number of joint studies undertaken with another Member Country (No.) | For 2020, all years of data up to and including the year prior to the transmission year<br><br>After 2020, only each additional year as updated | 2020<br>2021<br>2022<br>2023<br>2024<br>2025<br>2026<br>2027<br>2028<br>2029<br>2030 |

# APPENDIX B: INDIVIDUAL DATA REQUIREMENTS

The data tables in Appendix B identify the specific data requirements that need to be acquired or generated for each MRB-IF Assessment Indicator.

- B1: Data Tables for periodic regional studies and assessments
- B2: Data Tables for routine national monitoring (by country)
- B3: Data Tables for routine regional monitoring

For national monitoring activities, the data generation mechanisms and datasets that most closely meet the requirements of the MRB-IF have been identified where these are known. These should, however, only be used as a guide to each national agency in fulfilling the needs of the DAGAP. Where a national agency is aware of alternative datasets that more closely meet the requirements of the MRB-IF (e.g. for spatial or temporal scales), then these alternatives should be used instead.

In cases where national datasets do not meet the spatial and temporal scale requirements, the datasets that are closest to the requirements should be provided. For example, many socio-economic surveys are not carried out every year. Some are conducted every two years, some every five years and in the case of the National Census, every ten years. To fill gaps in spatial and temporal requirements, the guidelines in Part III of Section 4.0 of this Action Plan will be applied.

The full data requirements for the MRB-IF can be found in an accompanying spreadsheet entitled *DAGAP Data Requirements and Availability*, with separate worksheets for each Member Country.

## B1: Periodic regional studies and assessments

**Dimension:** Environment

**Strategic Indicator:** Water quality and sediment conditions in the mainstream | **Assessment Indicator:** Ecological health, and water quality compliance with the PWQ

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** Water, sediment and biota sampling by specialised contractor

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Heavy Metals | Arsenic | mg/L | Water Quality Stations | Five yearly | Field sampling by contractor | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Heavy Metals | Lead | mg/L | Water Quality Stations | Five yearly | Field sampling by contractor | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Heavy Metals | Cadmium | mg/L | Water Quality Stations | Five yearly | Field sampling by contractor | MRCS ED | MRC SP and AWP | R | MS Excel | Data required from |
| Heavy Metals | Mercury | mg/L | Water Quality Stations | Five yearly | Field sampling by contractor | MRCS ED | MRC SP and AWP | R | MS Excel | water, sediment |
| Heavy Metals | Cyanide | mg/L | Water Quality Stations | Five yearly | Field sampling by contractor | MRCS ED | MRC SP and AWP | R | MS Excel | and biota samples |
| Heavy Metals | Chromium Hexavalent | mg/L | Water Quality Stations | Five yearly | Field sampling by contractor | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Pesticides | Pesticides | mg/L | Water Quality Stations | Five yearly | Field sampling by contractor | MRCS ED | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency | |
|---|---|---|---|
| Cambodia | All monitoring parameters at sampling locations in Cambodia | MOWRAM (DHRW) | |
| Lao PDR | All monitoring parameters at sampling locations in Lao PDR | NRERI | |
| Thailand | All monitoring parameters at sampling locations in Thailand | Department of Water Resources | |
| Viet Nam | All monitoring parameters at sampling locations in Viet Nam | SRHMC | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| Cambodia | n/a | | |
| Lao PDR | n/a | | |
| Thailand | n/a | | |
| Viet Nam | n/a | | |
| | **Data Processing Arrangements within MRCS including QA/QC** | **Organisations** | **Transmission** |
| | As described in *Multi-media (water, sediment, biota) monitoring and assessment report (2014)* prepared by the MRC | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Apply same methodology and sampling as in 2011 study for the specified monitoring parameters and data requirements | Develop an improved methodology considering recommendations in 2011 report relating to: <br> 1) Review and mapping of point and non-point pollution sources throughout the basin <br> 2) Additional sampling locations, particularly in relation to large cities, large irrigation or intensive agricultural areas and major tributaries <br> 3) Intensive bed sediment sampling in locations with fine bed samples (e.g. Tonle Sap) <br> 4) Additional groups of aquatic life consumed by humans (e.g. crustaceans) <br> 5) Training and capacity building for Member Countries |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

| Dimension: Environment | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Strategic Indicator:** Status of environmental assets | | | **Assessment Indicators:** Extent of wetland area; Condition and status of ecologically significance areas | | | | | | |
| **Assessment Mechanism:** Periodic MRC study every five years | | | | | | | | | |
| **Data Collection Mechanism:** Periodic acquisition of satellite imagery and ground-truthing by Member Countries | | | | | | | | | |

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Area of flooded forest | Polygons of class type FF | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | Field data points and satellite imagery acquired or generated and maintained at MCs |
| Area of inundated grassland | Polygons of class type GR | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of marsh or swamp | Polygons of class type M/S | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of inundated rice fields | Polygons of class type PR | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of mangrove | Polygons of class type Mn | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of water bodies | Polygons of class type WA | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of aquaculture ponds | Polygons of class type AQ | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of broadleaved deciduous forest | Polygons of class type BD | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of broadleaved evergreen forest | Polygons of class type BE | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of industrial plantation | Polygons of class type IP | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of forest plantation | Polygons of class type FP | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of bamboo forest | Polygons of class type BaF | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of coniferous forest | Polygons of class type CoF | km$^2$ | Basin; Country | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |

| | Specified Datasets | National Agency | |
|---|---|---|---|
| **Cambodia** | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Ministry of Environment | |
| **Lao PDR** | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Department of Forestry | |
| **Thailand** | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Land Development Department | |
| **Viet Nam** | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Sub-NIAPP | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| **Cambodia** | Ministry of Environment (REDD+ Secretariat) transmit by email to MRCS focal point according to Environment Data MoU once every five years starting 2020 | SERVIR-Mekong land cover map USGS – Global Land cover project FAO – Global classification | |
| **Lao PDR** | Department of Forestry by email to MRCS focal point according to Environment Data MoU once every five years starting 2020 | | |
| **Thailand** | Land Development Department transmit by email to MRCS focal point according to Environment Data MoU once every five years starting 2020 | | |
| **Viet Nam** | Sub-National Institute of APP transmit by email to MRCS focal point according to Environment Data MoU once every five years starting 2020 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisations** | **Transmission** |
| | As described in *MRC Land Cover Map of the Lower Mekong Basin – Technical Paper No. 59 (2016)* for the preparation of the LMB land cover map | Asian Disaster Preparedness Centre (ADPC); USGS; FAO | Direct download from website as KML file |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| Use existing MRC land cover assessment methodology for wetland and forest classes:<br>　1) MCs to acquire satellite imagery and undertake field surveys to construct polygons of agreed wetland and forest classes<br>　2) MCs to submit polygons of agreed wetland and forest classes to MRCS for regional compilation<br>　3) MRCS to undertake regional land cover assessment by consolidating national land cover data according to MRC (2016)<br><br>For extent of natural land cover in ecologically significant areas, initially apply only natural forest cover from MRC land cover assessments | Develop and implement a common LMB wetland extent and health assessment methodology using consistent data across countries based on the current MRC wetland health and ecosystem function project by:<br>　1) Developing a common wetland classification system considering ecosystem function<br>　2) Identifying remote sensing tools and methods to delineate specific wetland categories, including inundated grasslands<br>　3) Ground-truthing methodology to validate remote sensing approach<br><br>For extent of natural land cover in ecologically significant areas, define and identify additional categories of natural land cover including in relation to: i) vegetation (natural and plantation); ii) water bodies; and iii) geologic features; and develop and test a methodology to distinguish features from remote sensing imagery |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Dimension:** Environment

**Strategic Indicator:** Status of environmental assets | **Assessment Indicator:** Condition of riverine, estuarine and coastal habitats

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** Periodic acquisition of satellite imagery, aerial photography and bathymetric surveys with ground-truthing by Member Countries

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Area of sandy habitat | Area of exposed sandy habitat | km$^2$ | Mainstream | Five yearly | Remote sensing imagery | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of sandy habitat | Area of inundated sandy habitat | km$^2$ | Mainstream | Five yearly | Remote sensing imagery | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of sandy habitat | Daily maximum water level | m | Mainstream | Five yearly | MRC hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Area of sandy habitat | Daily minimum water level | m | Mainstream | Five yearly | MRC hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Area of rocky habitat | Area of rocky habitat | km$^2$ | Mainstream | Five yearly | Remote sensing imagery | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of rocky habitat | Daily maximum water level | m | Mainstream | Five yearly | MRC hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | Field data points |
| Area of rocky habitat | Daily minimum water level | m | Mainstream | Five yearly | MRC hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | and satellite |
| Depth of deep pools | Location of deep pools | lat.long | Mainstream | Five yearly | MRC Basin Atlas data | MRCS TD | n/a | P | GIS Shape File & Tables | imagery acquired |
| Depth of deep pools | Daily maximum water level | m | Mainstream | Five yearly | MRC hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | or generated and |
| Depth of deep pools | Daily minimum water level | m | Mainstream | Five yearly | MRC hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | maintained at |
| Area of vegetated riparian habitat | Area of riparian vegetation | km$^2$ | Mainstream | Five yearly | Remote sensing imagery | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | MCs |
| Area of vegetated riparian habitat | Total area of riparian zone | km$^2$ | Mainstream | Five yearly | MRC Basin Atlas data | MRCS TD | n/a | R | GIS Shape File & Tables | |
| Mangrove area | Polygons of class type Mn | km$^2$ | Basin | Five yearly | MC land cover assessment | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of riverbank erosion | Net area lost to riverbank erosion | km$^2$ | Mainstream | Five yearly | Remote sensing imagery | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Area of coastal erosion | Net area lost to coastal erosion | km$^2$ | Mainstream | Five yearly | Remote sensing imagery | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |

| | Specified Datasets | National Agency | |
|---|---|---|---|
| Cambodia | Shapefile polygons of sandy habitat, rocky habitat, riparian vegetation cover, and riverbank erosion | Ministry of Environment | |
| Lao PDR | Shapefile polygons of sandy habitat, rocky habitat, riparian vegetation cover, and riverbank erosion | Department of Waterways / Forestry | |
| Thailand | Shapefile polygons of sandy habitat, rocky habitat, riparian vegetation cover, and riverbank erosion | Land Development Department | |
| Viet Nam | Shapefile polygons of sandy habitat, rocky habitat, riparian vegetation cover, mangroves, and riverbank and coastal erosion | Sub-NIAPP | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| Cambodia | Ministry of Environment transmit by email to MRCS focal point according to Environment Data MoU, every five years starting 2024 | SERVIR-Mekong land cover map | |
| Lao PDR | Department of Waterways and Department of Forestry by email to MRCS focal point according to Environment Data MoU, every five years starting 2024 | USGS – Global Land cover project | |
| Thailand | Land Development Department transmit by email to MRCS focal point according to Environment Data MoU, every five years starting 2024 | FAO – Global classification | |
| Viet Nam | Sub-National Institute of APP transmit by email to MRCS focal point according to Environment Data MoU, every five years starting 2024 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisations** | **Organisations** |
| | To be determined through development of methodological and technical guidelines | Asian Disaster Preparedness Centre (ADPC); USGS; FAO | Asian Disaster Preparedness Centre (ADPC); USGS; FAO |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Develop and trial methodology for basin-scale assessment of channel habitats, riparian and coastal vegetation and riverbank and coastal erosion using remote sensing imagery and ground-truthing, with an initial focus on case studies at key locations identified and reported by Member Countries.<br><br>Prepare technical guidelines and procedures. | Develop and implement methodology for basin-scale assessment of channel habitats, riparian and coastal vegetation and riverbank and coastal erosion across the whole Basin, using remote sensing imagery and ground-truthing. |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Dimension:** Environment

**Strategic Indicator:** Status of environmental assets | **Assessment Indicators:** Condition and status of fisheries and other aquatic resources; Condition and status of ecologically significant areas

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** Periodic review by MRCS of IUCN Red List and UNEP-WCMC Protected Areas Database

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Protection status of ecologically significant areas | Area of IUCN protection category 1a (SNR) | km² | Basin; Country | Five yearly | UNEP-WCMC Protected Areas database | MRCS ED | MRC SP and AWP | P | GIS Shape File & Tables | Cross-checking of data with Member Country databases of protected areas and threatened species |
| Protection status of ecologically significant areas | Area of IUCN protection category 1b (Wilderness area) | km² | Basin; Country | Five yearly | UNEP-WCMC Protected Areas database | MRCS ED | MRC SP and AWP | P | GIS Shape File & Tables | |
| Protection status of ecologically significant areas | Area of IUCN protection category II (National Park) | km² | Basin; Country | Five yearly | UNEP-WCMC Protected Areas database | MRCS ED | MRC SP and AWP | P | GIS Shape File & Tables | |
| Protection status of ecologically significant areas | Area of IUCN protection category III (NMF) | km² | Basin; Country | Five yearly | UNEP-WCMC Protected Areas database | MRCS ED | MRC SP and AWP | P | GIS Shape File & Tables | |
| Protection status of ecologically significant areas | Area of IUCN protection category IV (H/SMA) | km² | Basin; Country | Five yearly | UNEP-WCMC Protected Areas database | MRCS ED | MRC SP and AWP | P | GIS Shape File & Tables | |
| Protection status of ecologically significant areas | Area of IUCN protection category V (PL/S) | km² | Basin; Country | Five yearly | UNEP-WCMC Protected Areas database | MRCS ED | MRC SP and AWP | P | GIS Shape File & Tables | |
| Protection status of ecologically significant areas | Area of IUCN protection category VI (PA-SU) | km² | Basin; Country | Five yearly | UNEP-WCMC Protected Areas database | MRCS ED | MRC SP and AWP | P | GIS Shape File & Tables | |
| Abundance of other wetland-dependent biodiversity | Number of extinct aquatic species | No. | Basin; Country | Five yearly | IUCN Red List | MRCS ED | MRC SP and AWP | P | Map Polygon & Tables | |
| Abundance of other wetland-dependent biodiversity | Number of critically endangered aquatic species | No. | Basin; Country | Five yearly | IUCN Red List | MRCS ED | MRC SP and AWP | P | Map Polygon & Tables | |
| Abundance of other wetland-dependent biodiversity | Number of endangered aquatic species | No. | Basin; Country | Five yearly | IUCN Red List | MRCS ED | MRC SP and AWP | P | Map Polygon & Tables | |
| Abundance of other wetland-dependent biodiversity | Number of vulnerable aquatic species | No. | Basin; Country | Five yearly | IUCN Red List | MRCS ED | MRC SP and AWP | P | Map Polygon & Tables | |

| | Specified Datasets – Threatened Species | Data Processing – Threatened Species | National Agency |
|---|---|---|---|
| Cambodia | Shapefile polygons and MS Excel of protected areas of each IUCN category in the LMB in Cambodia | i) Download dataset from website and sort protected area database by country code | Ministry of Environment |
| Lao PDR | Shapefile polygons and MS Excel of protected areas of each IUCN category in the LMB in Lao PDR | ii) Identify and assign code to protected areas within Lower Mekong Basin and those outside | Department of Forestry |
| Thailand | Shapefile polygons and MS Excel of protected areas of each IUCN category in the LMB in Thailand | iii) Cross-check dataset with Member Country data of protected areas | Land Development Department |
| Viet Nam | Shapefile polygons and MS Excel of protected areas of each IUCN category in the LMB in Viet Nam | iv) Identify IUCN category and area for each protected area | Sub-NIAPP |
| | Specified Datasets – Protected Areas | Data Processing – Protected Areas | National Agency |
| Cambodia | IUCN Red List database with basin boundaries drawn within Cambodia using IUCN website mapping tool | i) Draw boundary around each country's part of the basin using IUCN mapping tool | Ministry of Environment |
| Lao PDR | IUCN Red List database with basin boundaries drawn within Lao PDR using IUCN website mapping tool | | LARReC |
| Thailand | IUCN Red List database with basin boundaries drawn within Thailand using IUCN website mapping tool | ii) Identify and count water-dependent species in each IUCN category based on agreed definition | |
| Viet Nam | IUCN Red List database with basin boundaries drawn within Viet Nam using IUCN website mapping tool | | MONRE |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Clarify the methodological process including by: <br> 1) Determining the definition and characteristics of 'wetland-dependent' species (i.e. it will include all fish and amphibians but only a subset of mammals, birds, reptiles and plants) <br> 2) Documenting the approach in a technical guideline to enable replicability in future assessments <br> Implement based on documented approach | - Work with Member Countries to ensure assignment of IUCN category to each protected area within the country <br> - Develop and trial a revised methodology including an assessment of species range distribution, in addition to species numbers, based on IUCN Red List assessments |

**Dimension:** Economic

**Strategic Indicator:** Economic performance of MRC sectors | **Assessment Indicator:** Economic value of wetlands

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** MRC land cover assessments and periodic literature review of the economic value of wetlands within the region

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Flooded forest ecosystem service production | Polygons of class type FF | km² | Basin; Country | Five yearly | MC land cover assessment | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Flooded forest services prices | Unit area productive value of flooded forest | USD/km² | Basin; Country | Five yearly | Literature review/benefit transfer | MRCS PD | MRC SP and AWP | P | GIS Shape File & Tables | |
| Inundated grassland ecosystem service production | Polygons of class type GR | km² | Basin; Country | Five yearly | MC land cover assessment | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Inundated grassland services prices | Unit area productive value of inundated grassland | USD/km² | Basin; Country | Five yearly | Literature review/benefit transfer | MRCS PD | MRC SP and AWP | P | GIS Shape File & Tables | Field data points and satellite imagery acquired or generated and maintained at MCs |
| Marshes and swamps ecosystem service production | Polygons of class type M/S | km² | Basin; Country | Five yearly | MC land cover assessment | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Marshes and swamps services prices | Unit area productive value of marshes and swamps | USD/km² | Basin; Country | Five yearly | Literature review/benefit transfer | MRCS PD | MRC SP and AWP | P | GIS Shape File & Tables | |
| Mangroves ecosystem service production | Polygons of class type Mn | km² | Basin; Country | Five yearly | MC land cover assessment | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Mangrove services prices | Unit area productive value of mangroves | USD/km² | Basin; Country | Five yearly | Literature review/benefit transfer | MRCS PD | MRC SP and AWP | P | GIS Shape File & Tables | |
| Water bodies ecosystem service production | Polygons of class type WA | km² | Basin; Country | Five yearly | MC land cover assessment | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Water bodies services prices | Unit area productive value of water bodies | USD/km² | Basin; Country | Five yearly | Literature review/benefit transfer | MRCS PD | MRC SP and AWP | P | GIS Shape File & Tables | |

| | Specified Datasets | National Agency |
|---|---|---|
| Cambodia | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Ministry of Environment |
| Lao PDR | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Department of Forestry |
| Thailand | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Land Development Department |
| Viet Nam | Shapefile polygons using FAO land cover classification types at 1:50,000 scale based on Landsat imagery (30m) and ground truthed with field data | Sub-NIAPP |
| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence |
| Cambodia | Ministry of Environment (REDD+ Secretariat) transmit by email to MRCS focal point according to Environment Data MoU once every five years starting 2022 | SERVIR-Mekong land cover map USGS – Global Land cover project FAO – Global classification MERFI – Ecosystem valuation tool |
| Lao PDR | Department of Forestry by email to MRCS focal point according to Environment Data MoU once every five years starting 2022 | |
| Thailand | Land Development Department transmit by email to MRCS focal point according to Environment Data MoU once every five years starting 2022 | |
| Viet Nam | Sub-National Institute of APP transmit by email to MRCS focal point according to Environment Data MoU once every five years starting 2022 | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisations | Transmission |
|---|---|---|---|
| | Wetland areas as described in *MRC Land Cover Map of the Lower Mekong Basin – Technical Paper No. 59 (2016)* for the preparation of the LMB land cover map. Unit area values for different wetland types acquired from literature and managed within MRC-IS | Asian Disaster Preparedness Centre (ADPC); USGS; FAO; MERFI | Direct download from website as KML file; Web tool |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Apply the MERFI ecosystem valuation tool for total wetland area | Develop and trial regionally-specific methodology and technical guidance for determining unit area value of different wetland types based on benefit-transfer methodologies considering any additional studies and building on MERFI work |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Dimension:** Economic

**Strategic Indicator:** Economic performance of MRC sectors | **Assessment Indicator:** Economic value of capture fisheries

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** Routine MRC and MC monitoring of fish yields and fish prices

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Fisheries production from rivers and major flood zones | Fish yield from rivers and major flood zones | Tonne/ha | Basin; Country | Five yearly | MC fish yield surveys | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Fisheries production from rivers and major flood zones | Area of rivers and major flood zones | km² | Basin; Country | Five yearly | MRC GIS datasets | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Fisheries production from rain-fed zones | Fish yield from rain-fed zones | Tonne/ha | Basin; Country | Five yearly | MC fish yield surveys | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Fisheries production from rain-fed zones | Area of rain-fed zones | km² | Basin; Country | Five yearly | MRC GIS datasets | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Fisheries production from large water bodies and reservoirs | Fish yield from large water bodies and reservoirs | Tonne/ha | Basin; Country | Five yearly | MC fish yield surveys | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Fisheries production from large water bodies and reservoirs | Areas of large water bodies and reservoirs | km² | Basin; Country | Five yearly | MRC GIS datasets | MRCS ED | MRC SP and AWP | R | MS Excel | |
| Capture fisheries prices | Average fish price | USD/ Tonne | Basin; Country | Five yearly | MC market surveys | MRCS PD | MRC SP and AWP | P | MS Excel | |

| | **Specified Datasets** | **National Agency** |
|---|---|---|
| Cambodia | MRC land cover and flood extent datasets; MC fish yield surveys from habitats in Cambodia; fish prices from routine market surveys | MAFF / FiA |
| Lao PDR | MRC land cover and flood extent datasets; MC fish yield surveys from habitats in Lao PDR; fish prices from routine market surveys | Lao Bureau of Statistics |
| Thailand | MRC land cover and flood extent datasets; MC fish yield surveys from habitats in Thailand; fish prices from routine market surveys | Dept. of Fisheries |
| Viet Nam | MRC land cover and flood extent datasets; MC fish yield surveys from habitats in Viet Nam; fish prices from routine market surveys | Dept. of Agriculture & Rural Development |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| Cambodia | Fisheries Administration transmit by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | MRC Fish Abundance and Diversity Monitoring |
| Lao PDR | Lao Bureau of Statistics by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | |
| Thailand | Department of Fisheries transmit by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | |
| Viet Nam | Department of Agriculture and Rural Development transmit by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | |

| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisations** | **Transmission** |
|---|---|---|---|
| | As described in *Fisheries Habitat and Yield in the Lower Mekong Basin (2015)* prepared by the MRC | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Apply methodology using yield assessments from literature as described in 2015 technical report | Design and trial methodology for field surveys of different habitat types to update habitat yield estimates and take account of regional differences at smaller spatial scales |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Dimension:** Climate Change

**Strategic Indicator:** Climate change trends and extremes | **Assessment Indicator:** Extent and severity of flooding

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** Routine MRC hydro-meteorological monitoring, periodic land cover assessments and periodic national population surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Annual maximum flooded area | Daily water levels | m | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Annual maximum flooded area | Polygons of class type FF | km² | Tonle Sap | Five yearly | Landsat imagery + field survey | MRCS TD | MRC SP and AWP | R | GIS Shape File & Tables | |
| Average flood depth | Daily water levels | m | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Average flood duration | Daily water levels | m | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Population affected by flooding | Population in flood-affected areas | No. | District | Five yearly | National Statistics Offices | MRCS PD | National budget | P | MS Excel | |
| Timing of onset of flood | Date of onset of flood | Day | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Timing of offset of flood | Date of offset of flood | day | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |

| | | Specified Datasets | National Agency | |
|---|---|---|---|---|
| | Cambodia | Population at the smallest spatial scale available; hydro-met data according to MRC hydro-meteorological monitoring activity | National Institute of Statistics / MOWRAM (DHRW) | |
| | Lao PDR | Population at the smallest spatial scale available; hydro-met data according to MRC hydro-meteorological monitoring activity | Lao Bureau of Statistics / DMH | |
| | Thailand | Population at the smallest spatial scale available; hydro-met data according to MRC hydro-meteorological monitoring activity | National Statistics Office / DWR | |
| | Viet Nam | Population at the smallest spatial scale available; hydro-met data according to MRC hydro-meteorological monitoring activity | General Statistics Office / MONRE (VEA) | |
| | | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
| | Cambodia | National Institute of Statistics transmit by email to MRCS focal point according to Social Data MoU, every five years from 2022 | IWMI Flood Risk Mapping Tool for South-East Asia | |
| | Lao PDR | Lao Bureau of Statistics by email to MRCS focal point according to Social Data MoU, every five years from 2022 | WRI Aqueduct Global Flood Analyzer | |
| | Thailand | National Statistics Office by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | Dartmouth Flood Observatory Daily Surface Water Monitoring | |
| | Viet Nam | General Statistics Office transmit by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | | |
| | | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisations | Transmission |
| | | Apply MRC Decision Support Framework (DSF) to map the extent, duration and timing of flooding across the basin at the smallest spatial unit possible. Overlay population data across the basin and areas of flooded forest around Tonle Sap. | International Water Management Institute World Resource Institute Dartmouth Flood Observatory | Online Tool Satellite images downloadable |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Design improvements to the MRC DSF through data and information system review and improvement strategy<br>2) Update baseline hydro-meteorological data to the most recent year available<br>Develop and implement routine annual mapping of flood extent and depths using satellite imagery and up-to-date Digital Elevation Models covering the entire basin, or otherwise apply the IWMI flood mapping tool for annual flood extent as available on the IWMI website | Implement improvements to the MRC DSF according to agreed data and information system review and improvement strategy;<br>Continue to update baseline hydro-meteorological data to the most recent year available |

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**Dimension:** Climate Change

**Strategic Indicator:** Climate change trends and extremes | **Assessment Indicator:** Extent and severity of drought

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** Routine MRC hydro-meteorological monitoring, periodic land cover assessments and periodic national population surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Annual area of meteorological drought | Daily rainfall | mm | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Annual area of meteorological drought | Daily rainfall | mm | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Annual area of meteorological drought | Daily rainfall | mm | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Annual area of hydrological drought | Total runoff | km³ | Sub-basin | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Annual area of hydrological drought | Total runoff | km³ | Sub-basin | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Annual area of hydrological drought | Total runoff | km³ | Sub-basin | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Annual area of agricultural drought | Soil moisture | Index | Basin; Country | Five yearly | Satellite data | MRCS TD | MRC SP and AWP | R | Gridded raster | |
| Annual area of agricultural drought | Soil moisture | Index | Basin; Country | Five yearly | Satellite data | MRCS TD | MRC SP and AWP | R | Gridded raster | |
| Annual area of agricultural drought | Soil moisture | Index | Basin; Country | Five yearly | Satellite data | MRCS TD | MRC SP and AWP | R | Gridded raster | |
| Timing of onset of drought | Date of onset of drought | day | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Timing of offset of drought | Date of offset of drought | day | Station | Five yearly | MRC Hydromet monitoring | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Population affected by drought | Population affected by drought | No. | District | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Annual drought severity at Tonle Sap | Soil moisture | Index | Basin; Country | Five yearly | Satellite data | MRCS TD | MRC SP and AWP | R | Gridded raster | |

| | Specified Datasets | National Agency |
|---|---|---|
| Cambodia | Population at the smallest spatial scale available; hydro-met and satellite data according to MRC Drought Management Plan | National Institute of Statistics / MOWRAM (DHRW) |
| Lao PDR | Population at the smallest spatial scale available; hydro-met and satellite data according to MRC Drought Management Plan | Lao Bureau of Statistics / DMH |
| Thailand | Population at the smallest spatial scale available; hydro-met and satellite data according to MRC Drought Management Plan | National Statistics Office / DWR |
| Viet Nam | Population at the smallest spatial scale available; hydro-met and satellite data according to MRC Drought Management Plan | General Statistics Office / MONRE (VEA) |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| Cambodia | National Institute of Statistics transmit by email to MRCS focal point according to Social Data MoU, every five years from 2022 | |
| Lao PDR | Lao Bureau of Statistics by email to MRCS focal point according to Social Data MoU, every five years from 2022 | |
| Thailand | National Statistics Office by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | |
| Viet Nam | General Statistics Office transmit by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisations | Transmission |
|---|---|---|---|
| | Apply the methodology described in the MRC Drought Management Plan to identify the severity class of each type of drought. Overlay population data across the basin and areas of drought severity around Tonle Sap | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Implement monitoring and reporting component of MRC Drought Management Plan | Review and refine drought monitoring and reporting, as necessary |

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**Dimension:** Climate Change

**Strategic Indicator:** Adaptation to climate change | **Assessment Indicator:** Vulnerability to floods, droughts and storms

**Assessment Mechanism:** Periodic MRC study every five years

**Data Collection Mechanism:** Routine MRC hydro-meteorological monitoring, and periodic national monitoring and surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Exposure to floods | Total flood-affected area | km$^2$ | Basin; Country | Five yearly | MRC Hydromet | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Exposure to floods | Time households affected by flood | days | Basin; Country | Five yearly | MRC Hydromet | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Exposure to floods | Population in flood-affected area | No. | District | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Exposure to droughts | Total drought-affected area | km$^2$ | Basin; Country | Five yearly | MRC Hydromet | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Exposure to droughts | Time households affected by drought | days | Basin; Country | Five yearly | MRC Hydromet | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Exposure to droughts | Population in drought-affected area | No. | District | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Exposure to storms | Total storm-affected area | km$^2$ | Basin; Country | Five yearly | MRC Hydromet | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Exposure to storms | Time households affected by storms | days | Basin; Country | Five yearly | MRC Hydromet | MRCS TD | MRC SP and AWP | R | MS Excel | |
| Exposure to storms | Population in storm-affected area | No. | District | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Sensitivity to floods | Asset damage and lost production due to floods | USD | Basin; Country | Five yearly | National surveys | MRCS PD | National budget | R | MS Excel | |
| Sensitivity to droughts | Asset damage and lost production due to droughts | USD | Basin; Country | Five yearly | National surveys | MRCS PD | National budget | R | MS Excel | |
| Sensitivity to storms | Asset damage and lost production due to storms | USD | Basin; Country | Five yearly | National surveys | MRCS PD | National budget | R | MS Excel | |
| Adaptive capacity to floods | Population below the national poverty line in flood-affected areas | No. | District | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Adaptive capacity to droughts | Population below the national poverty line in drought-affected areas | No. | District | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Adaptive capacity to storms | Population below the national poverty line in storm-affected areas | No. | District | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Disaster risk management planning at national and local levels | Existence of national disaster risk management plans for flood, drought and storms | Yes/No | National; Local | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |
| Disaster risk management planning at national and local levels | Existence of local disaster risk management plans for flood, drought and storms | Yes/No | National; Local | Five yearly | National surveys | MRCS PD | National budget | P | MS Excel | |

| | Specified Datasets | National Agency | |
|---|---|---|---|
| Cambodia | Population at smallest spatial scale available; hydro-met data according to routine MRC monitoring; flood, drought and storm damages database | National Institute of Statistics / MOWRAM (DHRW) | |
| Lao PDR | Population at smallest spatial scale available; hydro-met data according to routine MRC monitoring; flood, drought and storm damages database | Lao Bureau of Statistics / DMH | |
| Thailand | Population at smallest spatial scale available; hydro-met data according to routine MRC monitoring; flood, drought and storm damages database | National Statistics Office / DWR | |
| Viet Nam | Population at smallest spatial scale available; hydro-met data according to routine MRC monitoring; flood, drought and storm damages database | General Statistics Office / MONRE (VEA) | |
| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
| Cambodia | National Institute of Statistics transmit by email to MRCS focal point according to Social Data MoU, every five years from 2022 | LandScan Global Population Distribution | |
| Lao PDR | Lao Bureau of Statistics by email to MRCS focal point according to Social Data MoU, every five years from 2022 | | |
| Thailand | National Statistics Office by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | | |
| Viet Nam | General Statistics Office transmit by email to MRCS focal point according to Environment Data MoU, every five years from 2020 | | |
| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisations | Transmission |
| | To be determined based on methodological design. | Oak Ridge National Laboratory | Download |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Design methodology for vulnerability assessment to floods, droughts and storms based on the indicators and monitoring parameters above. Use existing SIMVA data, if national data not available | Trial, review and refine methodology for vulnerability assessment based on the indicators and monitoring parameters above |

## B2: Routine National Monitoring by Country

**Cambodia Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Food security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of dietary energy supply | Population | No. | Province | Annual | National Census and annual projection by NIS | National Institute of Statistics | National Budget | P | MS Excel | |
| Adequacy of dietary energy supply | Quantity of rice produced for food | Tonne | Province | Annual | Agriculture Census | Ministry of Agriculture, Forestry and Fisheries | National Budget | P | MS Excel | |
| Adequacy of dietary energy supply | Proportion of dietary energy from rice | % | Province | Annual | FAOSTAT | | National Budget | P | MS Excel | |
| Income per person | Household income/ expenditure | USD/day/HH | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | Use 'other rural' where provincial scale household data not available |
| Income per person | Household size | No./HH | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Prevalence of undernourishment | Proportion of population undernourished | % | Province | Annual | FAOSTAT | National Institute of Statistics | National Budget | P | MS Excel | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting wasting | % | Province | Annual | TBC | National Institute of Statistics | National Budget | ? | MS Excel | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting stunting | % | Province | Annual | TBC | National Institute of Statistics | National Budget | ? | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. National Census and Inter-censal population survey<br>2. Cambodia Socio-Economic Survey | Population by province (No.)<br>Average monthly household disposable income for 'other rural' households (USD/day/HH)<br>Average household size by province (No./HH)<br>Cambodia Demographic and Health Survey datasets, 2014 | National Institute of Statistics |
| 3. Agriculture Census | Rice production by province (tonne)<br>Food supply by all items consumed (kcal/capita/day) | Ministry of Agriculture |

| Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
|---|---|---|
| NIS and MAFF to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | FAOSTAT | |
| **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | FAO | Download from FAOSTAT website |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use 2014 CDHS or FAOSTAT national data for malnutrition | 1) Expand survey sampling power to enable representative data at provincial level where data for only national level or urban/rural or a few big provinces is available<br>2) Develop and implement new monitoring activity to identify malnutrition and undernourishment of the population as a whole, including wasting and stunting in children <5 yrs old |

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**Cambodia Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Water security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys and regional drought risk assessment by MRC

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of domestic water supply | Households with access to water supply from an improved source | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Adequacy of domestic water supply | Number of households within each spatial unit | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | Use 'other rural' where provincial scale household data not available |
| Sufficiency of water for farming | Irrigation area within each spatial unit | km² | Province | Annual | TBC | Ministry of Agriculture, Forestry and Fisheries | National Budget | P | MS Excel | |
| Sufficiency of water for farming | Area of moderate/high drought risk within each spatial unit | km² | Province | Five yearly | MRC drought risk assessment | MRCS TD | MRC SP and AWP | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Cambodia Socio-Economic Survey | Number of households by province (No.) <br> Households with access to improved water source (No.) | | National Institute of Statistics |
| 2. TBC | Irrigation area within each spatial unit (km²) | | Ministry of Agriculture |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | NIS and MAFF to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national level or urban/rural or a few big provinces is available |

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**Cambodia Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Water-related health security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Access to safe water supplies | Households with access to water supplies that meet drinking water standards | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Access to safe water supplies | Number of households within each spatial unit | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Prevalence of malnutrition | Proportion of population suffering malnutrition | % | Province | Annual | FAOSTAT | National Institute of Statistics | National Budget | P | MS Excel | |
| Access to sanitation | Households with access to sanitation facilities | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | Use 'other rural' where provincial scale household data not available |
| Access to sanitation | Number of households within each spatial unit | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Population | No. | Province | Annual | National Census and annual projection by NIS | National Institute of Statistics | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported cases of malaria | No. | Province | Annual | Cambodia National Malaria Control Programme | National Centre for Parasitology, Entomology and Malaria Control | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported cases of dengue fever | No. | Province | Annual | Cambodia National Dengue Control Programme | | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported outbreaks of cholera | No. | Province | Annual | Mekong Basin Disease Surveillance | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. National Census and Inter-censal population survey<br>2. Cambodia Socio-Economic Survey | Population by province (No.)<br>Number of households by province (No.)<br>Households with access to water supplies that meet drinking water standards (No.)<br>Households with access to sanitation facilities (No.) | National Institute of Statistics |
| 3. Cambodia National Malaria Control Programme<br>4. Cambodia National Dengue Control Programme<br>5. Mekong Basin Disease Surveillance | Number of reported cases of malaria (No.)<br>Number of reported cases of dengue fever (No.)<br>Number of outbreaks of cholera (No.) | National Institute for Parasitology, Entomology and Malaria Control |

| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
|---|---|---|---|
| | NIS and NIPEMC to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use FAOSTAT national data for malnutrition | 1) Expand survey sampling power to enable representative data at provincial level where data for only national level or urban/rural or a few big provinces is available<br>2) Develop new monitoring activity to identify malnutrition and undernourishment of the population as a whole |

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**Cambodia Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Access to electricity

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Urban household electrification rate | Urban households with access to electricity | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Urban household electrification rate | Number of urban households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Rural household electrification rate | Rural households with access to electricity | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Rural household electrification rate | Number of rural households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Cambodia Socio-Economic Survey | Main sources of lighting for urban households by geographical zone (No.)<br>Number of urban households by province (No.)<br>Main sources of lighting for rural households by geographical zone (No.)<br>Number of rural households by province (No.) | National Institute of Statistics |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | NIS to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** \| **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national level or urban/rural or a few big provinces is available |

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**Cambodia Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Employment in LMB water-related sectors; Gender equality in employment and economic engagement

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of working age population employed in water-related sectors | Working age population | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Number of people primarily employed in each LMB water-related sector | No. | Province | Annual | National Census and inter-censal survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Employment rate across the basin | % | Province | Annual | National Census and inter-censal survey | National Institute of Statistics | National Budget | P | MS Excel | Use 'other rural' where provincial scale household data not available |
| Proportion of working age population employed in water-related sectors | Gross annual economic value of each sector | USD | Province | Annual | TBC | National Institute of Statistics | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector | No. | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector occupied by females | No. | Province | Annual | National Census and inter-censal survey | National Institute of Statistics | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. National Census and Inter-censal population survey<br>2. Cambodia Socio-Economic Survey | Population and labour force by sex and geographical domain (No.)<br>Employed population by industrial sector (No.)<br>Employed population by geographical domain and sex (No.) | | National Institute of Statistics |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | NIS to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Expand survey sampling power to enable representative data at provincial level where data for only national level or urban/rural or a few big provinces is available<br>2) Develop approach to disaggregate labour force data by sector for each industry |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Cambodia Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Economic security; Gender equality in employment and economic engagement

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Sufficiency of household income | Household income/ expenditure | USD/day/HH | Province | Annual | Cambodia Socio-Economic Survey | National Institute of Statistics | National Budget | P | MS Excel | Use 'other rural' where provincial scale household data not available |
| Sufficiency of household income | Household size | No./HH | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Household asset value | USD | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households owning land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in education | Number of girls and boys attending primary education | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in education | Number of primary age girls and boys in the community | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. National Census and Inter-censal population survey 2. Cambodia Socio-Economic Survey | Average monthly household consumption/disposable income (USD/month/HH) Average household size (No./HH) Type of residential building material (-) Number of households owning land (No.) Number of rural and urban households (No.) Net attendance rates in primary school by geographical domain and sex (%) Number of primary age girls and boys in the community (No.) Number of agricultural households headed by males (No.) and females (No.) Number of agricultural households headed by males (No.) and females (No.) that own land | National Institute of Statistics |

| Data Transmission Arrangements from MCs to MRCS | Secondary evidence |
|---|---|
| NIS to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |

| Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|
| Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary 2) Use type of residential building material a proxy for household asset value | 1) Expand survey sampling power to enable representative data at provincial level where data for only national level or urban/rural or a few big provinces is available 2) Develop and implement questions for inclusion in CSES on household asset value |

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**Cambodia Routine National Monitoring**

**Dimension:** Environment

**Strategic Indicator:** Status of environmental assets | **Assessment Indicator:** Condition and status of fisheries and other aquatic resources

**Assessment Mechanism:** Regional assessment for fisheries reporting every year

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| OAA/P abundance | Biomass of OAA/P harvested | Tonne | Province | Annual | TBC | MAFF (FiA) | National Budget | - | MS Excel | Where specific OAA/P monitoring is not available, data from aquaculture production may be used |
| OAA/P harvest effort | Time spent harvesting OAA/P | hours | | | | | | | | |
| OAA/P diversity | Harvest of crabs | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of shrimp | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of water-snakes | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of other OAA/P | kg and % | | | | | | | | |
| Abundance of other wetland-dependent biodiversity | Number of dolphins | No. | Basin | Annual | Dolphin Population Monitoring with WWF | MAFF (FiA) | National Budget | P | MS Excel | |
| Abundance of other wetland-dependent biodiversity | Number of water-birds | No. | Basin | Biennial | TBC | MAFF (FiA) | National Budget | - | MS Excel | |
| Abundance of other wetland-dependent biodiversity | Number of water-bird species | No. | Basin | Biennial | TBC | MAFF (FiA) | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. FiA and WWF Dolphin Population Monitoring programme | Number of dolphins recorded at monitoring sites on the Mekong mainstream | | Ministry of Agriculture (Fisheries Administration) |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | FiA to send by email to MRCS focal point according to Environment Data MoU once every year | | MRC Fisheries Abundance and Diversity Monitoring Asian Water Bird Census |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by ED focal point and uploaded to MRC-IS by MRCS data manager | Wetlands International | Download from online database |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use existing national estimates of OAA/P harvest, where available<br>2) Use Asian Water Bird Census at a national level for estimate of changes in water bird numbers | 1) Develop and implement methodology for monitoring and reporting on OAA/P abundance and diversity at a provincial scale<br>2) Develop and implement methodology for monitoring and reporting on water bird numbers and species of water birds |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of agriculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Irrigated agriculture production | Total cropped area for each crop | km² | Province | Annual | Agriculture Census and annual report | National Institute of Statistics and Ministry of Agriculture, Forestry and Fisheries | National Budget | P | MS Excel | If yield and area data is not available, can supply total production (Tons) instead |
| Irrigated agriculture production | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Recession rice production | Total cropped area for each crop | km² | | | | | | | | |
| Recession rice production | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Riverbank gardens | Total cropped area for each crop | km² | | | | | | | | |
| Riverbank gardens | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Rain fed cultivation | Total cropped area for each crop | km² | | | | | | | | |
| Rain fed cultivation | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Agriculture prices | Average farm gate price for each irrigated crop | USD/Tonne | Province | Annual | Monthly price bulletin | Ministry of Agriculture, Forestry and Fisheries | National Budget | P | MS Excel | |
| Agriculture prices | Average farm gate price for recession rice | | | | | | | | | |
| Agriculture prices | Average farm gate price for each riverbank garden crop | | | | | | | | | |
| Agriculture prices | Average farm gate price for each rain-fed crop | | | | | | | | | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Agriculture Census and Annual Report | Area of crops planted and harvested (ha) Area irrigated (ha) | | National Institute of Statistics |
| 2. Monthly price bulletin | Commodity wholesale prices (USD) | | Ministry of Agriculture |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | NIS and MAFF to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | **FAOSTAT** |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | FAO | Download from FAOSTAT website |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| Use datasets as produced through existing national agricultural surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Design and implement methodology to disaggregate production of irrigated rice, rain-fed cultivation, recession rice and riverbank gardens from total production of each crop<br>2) Develop plan for acquiring data on input costs for agriculture to enable future assessment of net economic value<br>3) Disaggregate all data by province |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of hydropower

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Hydropower production for domestic consumption | Total production of hydropower for domestic consumption | MWh | Province | Annual | Annual Power Sector Report generation | Electricity Authority of Cambodia | National Budget | P | MS Excel | If data is not disaggregated by domestic consumption and export, use only total amount generated and domestic prices |
| Hydropower production for export | Total production of hydropower exported | MWh | Province | Annual | Annual Power Sector Report generation | Electricity Authority of Cambodia | National Budget | P | MS Excel | |
| Hydropower prices | Average unit price of power in domestic consumption | USD/kWh | Province | Annual | Annual Power Sector Report generation | Electricity Authority of Cambodia | National Budget | P | MS Excel | |
| Hydropower prices | Average unit price of power in import countries | USD/kWh | Province | Annual | Annual Power Sector Report generation | Electricity Authority of Cambodia | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| 1. Annual Power Sector Report generation | Generation of electricity by hydropower (MWh)<br>Tariff applied to national grid (USD/kwh) | | Electricity Authority of Cambodia | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | EAC to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Implement an approach to disaggregate data by province and by use for domestic consumption and export<br>2) Develop and implement plan for acquiring data on input costs for hydropower to enable future assessment of net economic value |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of navigation

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume of cargo transport | Annual total quantity of ITW cargo transported along the mainstream | Tonnes | Province | Annual | TBC | Department of Waterways, Infrastructure and Port Construction | National Budget | - | MS Excel | |
| Passenger transport numbers | Annual total number of passenger trips along the mainstream | No. | Province | Annual | TBC | Department of Waterways, Infrastructure and Port Construction | National Budget | - | MS Excel | |
| Navigation prices | Average price of transporting cargo | USD/tonne | Province | Annual | TBC | Phnom Penh Autonomous Port | National Budget | - | MS Excel | |
| Navigation prices | Average price of each passenger trip | USD/trip | Province | Annual | TBC | Phnom Penh Autonomous Port | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Department of Waterways, Infrastructure and Port Construction | |
| TBC | TBC | | Phnom Penh Autonomous Port | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | DWIPC and PPAP to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Disaggregate all data by province<br>2) Develop and implement plan for acquiring data on input costs for navigation to enable future assessment of net economic value |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of sand mining

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Sand mining production | Annual total quantity of aggregates, sand and gravel extracted for commercial purposes | Tonnes | Province | Annual | Company production reports | Department of Sand Mining and Construction | National Budget | R | MS Excel | |
| Sand mining prices | Average selling price of aggregates, sand and gravel | USD/tonne | Province | Annual | Company production receipts | Department of Sand Mining and Construction | National Budget | R | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| 1. Company reports submitted to the Department of Sand Mining and Construction | Amount of aggregates, sand and gravel extracted (tonnes) <br> Price of aggregates, sand and gravel sold (USD/tonne) | | Department of Sand Mining and Construction | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | DSMC to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Disaggregate all data by province <br> 2) Develop and implement plan for acquiring data on input costs for sand mining to enable future assessment of net economic value |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicators:** Economic value of capture fisheries; Economic value of aquaculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Capture fisheries prices | Market prices of fish | USD/kg | Province | Annual | Monthly price bulletin | Ministry of Agriculture, Forestry and Fisheries (FiA) | National Budget | P | MS Excel | If production values not available by species of category, use total production values and average prices |
| Aquaculture production | Total annual production of fish | Tonnes | Province | Annual | Annual report preparation | Ministry of Agriculture, Forestry and Fisheries (FiA) | National Budget | P | MS Excel | |
| Aquaculture production | Total annual production of shrimp | Tonnes | Province | Annual | Annual report preparation | Ministry of Agriculture, Forestry and Fisheries (FiA) | National Budget | P | MS Excel | |
| Aquaculture production | Total annual production of other OAA | Tonnes | Province | Annual | Annual report preparation | Ministry of Agriculture, Forestry and Fisheries (FiA) | National Budget | P | MS Excel | |
| Aquaculture prices | Farm gate prices of fish | USD/kg | Province | Annual | Monthly price bulletin | Ministry of Agriculture, Forestry and Fisheries (FiA) | National Budget | P | MS Excel | |
| Aquaculture prices | Farm gate prices of shrimp | USD/kg | Province | Monthly | Monthly price bulletin | Ministry of Agriculture, Forestry and Fisheries (FiA) | National Budget | P | MS Excel | |
| Aquaculture prices | Farm gate prices of other OAA | USD/kg | Province | Monthly | Monthly price bulletin | Ministry of Agriculture, Forestry and Fisheries (FiA) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Annual report preparation<br>2. Monthly price bulletin | Market prices of main capture fish species (USD/kg)<br>Market prices of main aquaculture fish species (USD/kg)<br>Market prices of shrimp (USD/kg)<br>Average market prices of other OAAs (USD/kg)<br>Total annual production of aquaculture fish (tonne)<br>Total annual production of aquaculture shrimp (tonne)<br>Total annual production of aquaculture OAA (tonne) | Ministry of Agriculture, Forestry and Fisheries (FiA) |

| Data Transmission Arrangements from MCs to MRCS | | Secondary evidence | |
|---|---|---|---|
| FiA to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| Use datasets as produced through existing national surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Disaggregate all data by province<br>2) Develop and implement plan for acquiring data on input costs for capture fisheries and aquaculture to enable future assessment of net economic value |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of forestry

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Forestry production | Total area of forestry | km² | Province | Annual | Annual report preparation | Ministry of Agriculture, Forestry and Fisheries (FD) | National Budget | P | MS Excel | |
| Forestry production | Average unit timber log production | m³/ha | Province | Annual | Annual report preparation | Ministry of Agriculture, Forestry and Fisheries (FD) | National Budget | P | MS Excel | Can use total production volume of timber, if available |
| Forestry prices | Average timber log unit price | USD/m³ | Province | Annual | Annual report preparation | Ministry of Agriculture, Forestry and Fisheries (FD) | National Budget | P | MS Excel | |
| Forestry prices | Average value of non-timber forest products | USD | Province | Annual | Annual report preparation | Ministry of Agriculture, Forestry and Fisheries (FD) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Annual report preparation | Total area of forestry (km²)<br>Total annual production of timber (m³)<br>Average price of timber (USD/m³) | | Ministry of Agriculture, Forestry and Fisheries (Forestry Department) |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | FD to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Disaggregate all data by province<br>2) Develop and implement plan for acquiring data on input costs for forestry to enable future assessment of net economic value |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of tourism

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Tourism and recreation revenue | Number of domestic tourists visiting the basin | No. | Province | Annual | Annual report preparation | Ministry of Tourism | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Number of international tourists visiting the basin | No. | Province | Annual | Annual report preparation | Ministry of Tourism | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist length of trip | days | Province | Annual | Annual report preparation | Ministry of Tourism | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average international tourist length of trip | days | Province | Annual | Annual report preparation | Ministry of Tourism | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist spend per trip-day | USD/day | Province | Annual | Annual report preparation | Ministry of Tourism | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average international tourist spend per trip-day | USD/day | Province | Annual | Annual report preparation | Ministry of Tourism | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency | |
|---|---|---|---|
| 1. Annual tourism report preparation | Number of tourists (No.) Revenue from tourism (USD) | Ministry of Tourism | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| | MoT to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Identify and agree an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB. For example, using data on hotel stays | 1) Implement an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB<br>2) Develop and implement plan for acquiring data on input costs for tourism to enable future assessment of net economic value<br>3) Disaggregate all data by province |

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**Cambodia Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicators:** Economic cost of flood; Economic cost of drought

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Annual cost of flood damages | Cost of lost production for each crop type due to flooding | USD | Province | Annual | Village surveys | TBC | National Budget | P | MS Excel | |
| Annual cost of flood damages | Government reported costs of flood damage to public and private infrastructure | USD | Province | Annual | Village surveys | TBC | National Budget | P | MS Excel | |
| Annual cost of drought damages | Cost of lost production for each crop type due to drought | USD | Province | Annual | Village surveys | TBC | National Budget | P | MS Excel | |
| Annual cost of drought damages | Government reported costs of drought damage | USD | Province | Annual | Village surveys | TBC | National Budget | P | MS Excel | |
| Riverbank erosion losses | Area lost to riverbank erosion | km$^2$ | Province | Annual | MRC channel habitats assessment | MRCS TD | National Budget | P | MS Excel | |
| Riverbank erosion losses | Average value of land lost to riverbank erosion | USD/ha | Province | Annual | TBC | TBC | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| n/a | n/a | | TBC | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | TBC to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Disaggregate all data by province |

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| **Cambodia Routine National Monitoring** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Economic | | | | | | | | | | | |
| **Strategic Indicator:** Economic Performance of MRC Sectors | | **Assessment Indicator:** Contribution of LMB water-related sectors to basin, national and regional GDP | | | | | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national monitoring and reporting | | | | | | | | | | | |
| | | | | | | | | | | | |
| **Monitoring Parameters** | **Data requirements** | **Units** | **Spatial Scale** | **Collection Frequency** | **Data Source** | **Responsible** | **Resourcing** | **A\*** | **Format** | **Notes** | |
| Proportion of basin, national and regional GDP met from basin resources | Gross Domestic Product (GDP) | USD | National; Province | Annual | National Accounts | National Institute of Statistics | National Budget | P | MS Excel | | |
| n/a | GDP growth rate | USD | National; Province | Annual | National Accounts | National Institute of Statistics | National Budget | P | MS Excel | | |
| Proportion of basin, national and regional GDP met from basin resources | GDP by LMB water-related sector | USD | National; Province | Annual | National Accounts | National Institute of Statistics | National Budget | P | MS Excel | | |

| **National Collection Mechanisms** | **Specified Existing Datasets** | | **National Agency** | |
|---|---|---|---|---|
| National Accounts | National Gross Domestic Product (USD)<br>National GDP growth rate (US%/annum) | | National Institute of Statistics | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | NIS to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| Use datasets as produced through existing national agricultural surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Develop and implement approach to disaggregate Gross Domestic Product by province and for each LMB water-related economic sector |

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**Cambodia Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Greenhouse gas emissions | **Assessment Indicators:** Greenhouse gas emissions from LMB water-related sectors; Relative contribution to global emissions

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Greenhouse gas emissions from energy | Emissions from energy generation | $tCO_2$-e | Basin; Country | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Greenhouse gas emissions from agriculture | Emissions from agriculture | $tCO_2$-e | Basin; Country | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Greenhouse gas emissions from other land use, land use change and forestry | Emissions from land use, land use change and forestry | $tCO_2$-e | Basin; Country | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Reduced greenhouse gas emissions from energy due to hydropower | Total amount of hydropower generated | MWh | Basin; Country | Annual | Annual Power Sector Report | Electricity Authority of Cambodia | National Budget | P | MS Excel | |
| Emissions of carbon dioxide | Annual basin emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Emissions of carbon dioxide | Annual global emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | Ministry of Environment (DCC) | National Budget | P | MS Excel | |
| Emissions of methane | Annual basin emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Emissions of methane | Annual global emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | Ministry of Environment (DCC) | National Budget | P | MS Excel | |
| Emissions of nitrous oxide | Annual basin emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Emissions of nitrous oxide | Annual global emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | Ministry of Environment (DCC) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Ministry of Environment (Department of Climate Change) | |
| Annual Power Sector Report | Total amount of hydropower generated (MWh) | | Electricity Authority of Cambodia | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | DCC and EAC to send by email to MRCS focal point according to Climate Change Data MoU, every five years starting in 2022 | | Climate Watch historical greenhouse gas emissions by sector and gas | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | World Resources Institute | Download from website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Implement an approach to estimating greenhouse gas emissions in the basin by apportioning national emissions by the relative output of each sector within the basin to national output | Develop and implement an approach to estimate greenhouse gas emissions at a sub-national level that could be applied to the basin or province |

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**Cambodia Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Adaptation to climate change | **Assessment Indicator:** Institutional response to the effects of climate change

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Periodic national review

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Policies and strategies for climate change response | National climate change strategies | No. | National | Five yearly | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Provincial climate change strategies | No. | Province | Five yearly | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Sectoral climate change strategies | No. | National | Five yearly | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Budget for climate change response | National climate change budget | USD | National | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Budget for climate change response | Provincial climate change budget | USD | Province | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Budget for climate change response | Sectoral climate change budget | USD | National | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Number of awareness-raising activities | Number of awareness-raising activities | No. | Basin | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Access to climate finance | Receipt of international climate finance | USD | National | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| TBC | TBC | Ministry of Environment (Department of Climate Change) |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | DCC to send by email to MRCS focal point according to Climate Change Data MoU once every five years starting in 2022 | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** \| **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| TBC | TBC |

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**Cambodia Routine National Monitoring**

**Dimension:** Climate Change

| **Strategic Indicator:** Adaptation to climate change | **Assessment Indicators:** Flood protection measures; Drought protection measures |
|---|---|

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Periodic national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Area of urban land protected by embankments/levees | Land classification as urban land | Class | Basin | Five yearly | TBC | Ministry of Land Management, Urban Planning and Construction | National Budget | - | MS Excel | |
| Area of urban land protected by embankments/levees | Digital elevation model with flood mapping | DEM | Basin | Once | TBC | Ministry of Land Management, Urban Planning and Construction | National Budget | - | MS Excel | |
| Area of urban land protected by embankments/levees | Location, height and length of embankments | lat.long; m | Basin | Five yearly | TBC | Ministry of Public Works and Transport (DWIP) and MOWRAM | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Land classification as agricultural land | Class | Basin | Five yearly | TBC | Ministry of Agriculture, Forestry and Fisheries (GDA) | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Digital elevation model with flood mapping | DEM | Basin | Once | TBC | Ministry of Land Management, Urban Planning and Construction | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Location, height and length of embankments | lat.long; m | Basin | Five yearly | TBC | Ministry of Public Works and Transport (DWIP) and MOWRAM | National Budget | - | MS Excel | |
| Proportion of irrigable land that is irrigated | Area of irrigated land | km$^2$ | Province | Five yearly | TBC | MOWRAM | National Budget | - | MS Excel | |
| Proportion of irrigable land that is irrigated | Area of irrigable land | km$^2$ | Province | Five yearly | TBC | MOWRAM | National Budget | - | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for urban use | m$^3$ | Province | Five yearly | TBC | MOWRAM | National Budget | - | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for agricultural use | m$^3$ | Province | Five yearly | TBC | MOWRAM | National Budget | - | MS Excel | |
| Volume of available water storage | Domestic water-use demands over the dry season | m$^3$ | Province | Five yearly | TBC | MIH and MRD | National Budget | - | MS Excel | |
| Volume of available water storage | Agricultural water-use demands over the dry season | m$^3$ | Province | Five yearly | TBC | Ministry of Agriculture, Forestry and Fisheries and MOWRAM | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| TBC | TBC | | Ministry of Land Management, Urban Planning and Construction |
| TBC | TBC | | Ministry of Public Works and Transport |
| TBC | TBC | | Ministry of Water Resources and Meteorology |
| TBC | TBC | | Ministry of Agriculture |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | MLMUPC, MPWT, MOWRAM and MAFF to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |
| **Data Acquisition and Generation Improvement Strategy** | | | |
| *Step 1* | | *Step 2* | |
| TBC | | TBC | |

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**Lao PDR Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Food security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of dietary energy supply | Population | No. | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Adequacy of dietary energy supply | Quantity of rice produced for food | Tonne | Province | Annual | Statistics Yearbook preparation | Ministry of Agriculture and Forestry (DPC) | National Budget | P | MS Excel | |
| Adequacy of dietary energy supply | Proportion of dietary energy from rice | % | Province | Annual | FAOSTAT | Ministry of Health (DPC) | National Budget | P | MS Excel | |
| Income per person | Household income/ expenditure | USD/ day/HH | Province | Annual | Lao Expenditure and Consumption Survey | Lao Bureau of Statistics | National Budget | P | MS Excel | MICS subject to Development Partner funding (i.e. UNICEF, World Bank) |
| Income per person | Household size | No./HH | Province | Annual | Lao Expenditure and Consumption Survey | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Prevalence of undernourishment | Proportion of population undernourished | % | Province | Annual | FAOSTAT | Ministry of Health (DPC) | National Budget | P | MS Excel | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting wasting | % | Province | Annual | Multiple Indicators Cluster Survey | Ministry of Health (DPC) | National Budget | P | MS Excel | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting stunting | % | Province | Annual | Multiple Indicators Cluster Survey | Ministry of Health (DPC) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency | |
|---|---|---|---|
| 1. Statistics yearbook preparation 2. Lao Expenditure and Consumption Survey | Population by province (No.) Household income and expenditure by province (USD/day/HH) Average household size by province (No./HH) | Lao Bureau of Statistics | |
| 3. Statistics Yearbook preparation | Rice production by province (tonne) | Ministry of Agriculture and Forestry (DPC) | |
| 4. Multiple Indicators Cluster Survey | Prevalence of stunting (moderate and severe) in children <5 yrs old (%) Prevalence of wasting (moderate and severe) in children <5 yrs old | Ministry of Health (DPC) | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| | LBS, MAF and MoH to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | FAOSTAT | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | FAO | Download from FAOSTAT website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary 2) Use FAOSTAT national data for malnutrition and MICS data for undernourishment in children | 1) Expand survey sampling power to enable representative data at provincial level where data for only national is available 2) Develop and implement new monitoring activity to identify undernourishment of the population as a whole by province and proportion of dietary energy from rice |

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| **Lao PDR Routine National Monitoring** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Social | | | | | | | | | | |
| **Strategic Indicator:** Livelihoods and wellbeing | | | | | **Assessment Indicator:** Water security | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national surveys and regional drought risk assessment by MRC | | | | | | | | | | |

| **Monitoring Parameters** | **Data requirements** | **Units** | **Spatial Scale** | **Collection Frequency** | **Data Source** | **Responsible** | **Resourcing** | **A\*** | **Format** | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of domestic water supply | Households with access to water supply from an improved source | No. | Province | Annual | Lao Expenditure and Consumption Survey | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Adequacy of domestic water supply | Number of households within each spatial unit | No. | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Sufficiency of water for farming | Irrigation area within each spatial unit | km$^2$ | Province | Annual | National Development Plans | Ministry of Agriculture and Forestry | National Budget | P | MS Excel | |
| Sufficiency of water for farming | Area of moderate/high drought risk within each spatial unit | km$^2$ | Province | Five yearly | MRC drought risk assessment | MRCS TD | MRC SP and AWP | P | MS Excel | |

| **National Collection Mechanisms** | **Specified Existing Datasets** | **National Agency** | |
|---|---|---|---|
| 1. Lao Expenditure and Consumption Survey | Number of households by province (No.)<br>Households with access to improved water source (No.) | Lao Bureau of Statistics | |
| 2. National Development Plans | Irrigation area within each spatial unit (km$^2$) | Ministry of Agriculture and Forestry | |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| | LBS and MAF to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national is available |

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**Lao PDR Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Water-related health security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Access to safe water supplies | Households with access to water supplies that meet drinking water standards | No. | Province | Annual | Lao Expenditure and Consumption Survey | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Access to safe water supplies | Number of households within each spatial unit | No. | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Prevalence of malnutrition | Proportion of population suffering malnutrition | % | Province | Annual | FAOSTAT | Ministry of Health (DPC) | National Budget | P | MS Excel | |
| Access to sanitation | Households with access to sanitation facilities | No. | Province | Annual | Lao Expenditure and Consumption Survey | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Access to sanitation | Number of households within each spatial unit | No. | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Population | No. | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported cases of malaria | No. | Province | Annual | Lao Expenditure and Consumption Survey | Ministry of Health (DPC) | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported cases of dengue fever | No. | Province | Annual | Lao Expenditure and Consumption Survey | Ministry of Health (DPC) | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported outbreaks of cholera | No. | Province | Annual | Lao Expenditure and Consumption Survey | Ministry of Health (DPC) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Lao Expenditure and Consumption Survey<br>2. Statistics Yearbook preparation | Population by province (No.)<br>Number of households by province (No.)<br>Households with access to water supplies that meet drinking water standards (No.)<br>Households with access to sanitation facilities (No.) | | Lao Bureau of Statistics |
| 1. Lao Expenditure and Consumption Survey (TBC) | Number of reported cases of malaria (No.)<br>Number of reported cases of dengue fever (No.)<br>Number of outbreaks of cholera (No.) | | Ministry of Health (DPC) |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | LBS and MoH to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use FAOSTAT national data for malnutrition | 1) Expand survey sampling power to enable representative data at provincial level where data for only national is available<br>2) Develop and implement new monitoring activity to identify undernourishment of the population as a whole by province |

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| | | | | | | | | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|

**Lao PDR Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Access to electricity

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Urban household electrification rate | Urban households with access to electricity | No. | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | Does not distinguish between urban and rural households with access to electricity |
| Urban household electrification rate | Number of urban households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Rural household electrification rate | Rural households with access to electricity | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Rural household electrification rate | Number of rural households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Statistics Yearbook preparation | Households with access to electricity by province (No.) Number of urban households by province (No.) Number of rural households by province (No.) | Lao Bureau of Statistics |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | LBS to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|---|
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data of urban and rural households within each province |

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**Lao PDR Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Employment in LMB water-related sectors; Gender equality in employment and economic engagement

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of working age population employed in water-related sectors | Working age population | No. | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Number of people primarily employed in each LMB water-related sector | No. | Province | Annual | Statistics Yearbook preparation | Ministry of Labour and Social Welfare (DPC) | National Budget | P | MS Excel | Sub-sectors include: Agricultural cropping, livestock and livestock products, forestry & logging, fishing |
| Proportion of working age population employed in water-related sectors | Employment rate across the basin | % | Province | Annual | Statistics Yearbook preparation | Ministry of Labour and Social Welfare (DPC) | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Gross annual economic value of each sector | USD | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector | No. | Province | Annual | Statistics Yearbook preparation | Ministry of Labour and Social Welfare (DPC) | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector occupied by females | No. | Province | Annual | Statistics Yearbook preparation | Ministry of Labour and Social Welfare (DPC) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Statistics Yearbook preparation | Population and labour force by sex, age group and province (No.)<br>Employees by sex and sector (No.)<br>Employed persons (No.)<br>GDP at current market prices by economic sector (USD) | | Lao Bureau of Statistics<br>Ministry of Labour and Social Welfare (DPC) |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | LBS and MLSW to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national level |

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**Lao PDR Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Economic security; Gender equality in employment and economic engagement

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Sufficiency of household income | Household income/ expenditure | USD/day/HH | Province | Annual | Lao Expenditure and Consumption Survey | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Sufficiency of household income | Household size | No./HH | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Household asset value | USD | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households owning land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in education | Number of girls and boys attending primary education | No. | Province | Annual | Statistics Yearbook preparation | Ministry of Labour and Social Welfare (DPC) | National Budget | P | MS Excel | |
| Gender equality in education | Number of primary age girls and boys in the community | No. | Province | Annual | | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males | No. | Province | Annual | Lao Expenditure and Consumption Survey | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Lao Expenditure and Consumption Survey<br>2. Statistics Yearbook preparation | Average monthly household consumption/disposable income (USD/month/HH)<br>Average household size (No./HH)<br>Value of common households items (USD)<br>Number of households owning land (No.)<br>Number of rural and urban households (No.)<br>Number of primary age girls and boys in the community (No.)<br>Number of agricultural households headed by males (No.) and females (No.)<br>Number of agricultural households headed by males (No.) and females (No.) that own land | Lao Bureau of Statistics |
| 3. Statistics Yearbook preparation | Number of students enrolled in primary school by grade and sex (No.) | Ministry of Labour and Social Welfare (DPC) |

| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
|---|---|---|---|
| | LBS and MLSW to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Value of common items a proxy for household asset value | 1) Expand survey sampling power to enable representative data at provincial level where data for only national is available<br>2) Develop and implement questions for inclusion in LECS on household asset value |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Lao PDR Routine National Monitoring**

**Dimension:** Environment

**Strategic Indicator:** Status of environmental assets | **Assessment Indicator:** Condition and status of fisheries and other aquatic resources

**Assessment Mechanism:** Regional assessment for fisheries reporting every year

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| OAA/P abundance | Biomass of OAA/P harvested | Tonne | Province | Annual | TBC | LARReC | National Budget | - | MS Excel | Where specific OAA/P monitoring is not available, data from aquaculture production may be used |
| OAA/P harvest effort | Time spent harvesting OAA/P | hours | | | | | | | | |
| OAA/P diversity | Harvest of crabs | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of shrimp | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of water-snakes | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of other OAA/P | kg and % | | | | | | | | |
| Abundance of other wetland-dependent biodiversity | Number of dolphins | No. | Basin | Annual | Cambodian Dolphin Population Monitoring with WWF | DLF | National Budget | P | MS Excel | |
| Abundance of other wetland-dependent biodiversity | Number of water-birds | No. | Basin | Biennial | TBC | Ministry of Agriculture and Forestry (DF) | National Budget | - | MS Excel | |
| Abundance of other wetland-dependent biodiversity | Number of water-bird species | No. | Basin | Biennial | TBC | Ministry of Agriculture and Forestry (DF) | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | LARReC | |
| 1. Cambodia and WWF Dolphin Population Monitoring programme | Number of dolphins recorded at monitoring sites on the Mekong mainstream | | DLF | |
| TBC | TBC | | Ministry of Agriculture and Forestry (Department of Forestry) | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | FiA to send by email to MRCS focal point according to Environment Data MoU once every year | | MRC Fisheries Abundance and Diversity Monitoring Asian Water Bird Census | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by ED focal point and uploaded to MRC-IS by MRCS data manager | | Wetlands International | Download from online database |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Develop and implement methodology for monitoring and reporting on OAA/P abundance and diversity at a provincial scale<br>2) Develop and implement methodology for monitoring and reporting on water bird numbers and species of water birds | Nil |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of agriculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Irrigated agriculture production | Total cropped area for each crop | km² | Province | Annual | Statistics Yearbook preparation | Ministry of Agriculture and Forestry (DPC) | National Budget | P | MS Excel | If yield and area data is not available, use total production (Tonnes) instead |
| Irrigated agriculture production | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Recession rice production | Total cropped area for each crop | km² | | | | | | | | |
| Recession rice production | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Riverbank gardens | Total cropped area for each crop | km² | | | | | | | | |
| Riverbank gardens | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Rain fed cultivation | Total cropped area for each crop | km² | | | | | | | | |
| Rain fed cultivation | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Agriculture prices | Average farm gate price for each irrigated crop | USD/Tonne | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Agriculture prices | Average farm gate price for recession rice | | | | | | | | | |
| Agriculture prices | Average farm gate price for each riverbank garden crop | | | | | | | | | |
| Agriculture prices | Average farm gate price for each rain-fed crop | | | | | | | | | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Statistics Yearbook preparation | Area of crops planted and harvested (ha) <br> Crop yield by province (Tonne/ha) <br> Production by province (Tonne) | Ministry of Agriculture and Forestry (Department of Planning and Cooperation) |
| 2. Statistics Yearbook preparation | Market prices by commodity (USD) | Lao Bureau of Statistics |

| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
|---|---|---|---|
| | LBS and MAF to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | FAOSTAT | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | FAO | Download from FAOSTAT website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national agricultural surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Design methodology to disaggregate production of irrigated rice, rain-fed cultivation recession rice and riverbank gardens from total production of each crop <br> 2) Disaggregate all data by province <br> 3) Develop and implement plan for acquiring data on input costs for agriculture to enable future assessment of net economic value |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of hydropower

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Hydropower production for domestic consumption | Total production of hydropower for domestic consumption | MWh | Province | Annual | Reporting by generators and grid operators | Ministry of Energy and Mines (DEPP) | National Budget | P | MS Excel | If data is not disaggregated by domestic consumption and export, use only total amount generated and domestic prices |
| Hydropower production for export | Total production of hydropower exported | MWh | Province | Annual | Reporting by generators and grid operators | Ministry of Energy and Mines (DEPP) | National Budget | P | MS Excel | |
| Hydropower prices | Average unit price of power in domestic consumption | USD/kWh | Province | Annual | National reporting | Ministry of Energy and Mines (DEPP) | National Budget | R | MS Excel | |
| Hydropower prices | Average unit price of power in import countries | USD/kWh | Province | Annual | National reporting | Ministry of Energy and Mines (DEPP) | National Budget | R | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Reporting by generators and grid operators<br>2. National reporting | Power generation by source and consumption (MWh)<br>Prices by type of user, for domestic consumption and for export (USD/kwh) | | Ministry of Energy and Mines (Department of Energy Policy and Planning) |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | MEM to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** — **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | 1) Disaggregate all data by province<br>2) Develop and implement plan for acquiring data on input costs for hydropower to enable future assessment of net economic value |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of navigation

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume of cargo transport | Annual total quantity of ITW cargo transported along the mainstream | Tonnes | Province | Annual | Provincial data collection | Ministry of Public Works and Transport (DPC) | National Budget | R | MS Excel | |
| Passenger transport numbers | Annual total number of passenger trips along the mainstream | No. | Province | Annual | Provincial data collection | Ministry of Public Works and Transport (DPC) | National Budget | R | MS Excel | |
| Navigation prices | Average price of transporting cargo | USD/tonne | Province | Annual | Provincial data collection | Ministry of Public Works and Transport (DPC) | National Budget | R | MS Excel | |
| Navigation prices | Average price of each passenger trip | USD/trip | Province | Annual | Provincial data collection | Ministry of Public Works and Transport (DPC) | National Budget | R | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Provincial data collection | Volume of cargo transported (Tonnes) <br> Volume of passengers transported (No.) <br> Total economic returns on navigation (USD) | Ministry of Public Works and Transport (Department of Planning and Cooperation) |
| | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | MPWT to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|---|
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | 1) Disaggregate all data by province <br> 2) Develop and implement plan for acquiring data on input costs for navigation to enable future assessment of net economic value |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of sand mining

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Sand mining production | Annual total quantity of aggregates, sand and gravel extracted for commercial purposes | Tonnes | Province | Annual | TBC | TBC | National Budget | - | MS Excel | |
| Sand mining prices | Average selling price of aggregates, sand and gravel | USD/tonne | Province | Annual | TBC | TBC | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| TBC | TBC | | TBC |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | TBC to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | 1) Disaggregate all data by province<br>2) Develop plan for acquiring data on input costs for sand mining to enable future assessment of net economic value |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicators:** Economic value of capture fisheries; Economic value of aquaculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Capture fisheries prices | Market prices of fish | USD/kg | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Aquaculture production | Total annual production of fish | Tonnes | Province | Annual | Statistics Yearbook preparation | Ministry of Agriculture and Forestry/LARReC (DPC) | National Budget | P | MS Excel | If production values not available by species or category, use total production values and average prices |
| Aquaculture production | Total annual production of shrimp | Tonnes | Province | Annual | Statistics Yearbook preparation | Ministry of Agriculture and Forestry/LARReC (DPC) | National Budget | P | MS Excel | |
| Aquaculture production | Total annual production of other OAA | Tonnes | Province | Annual | Statistics Yearbook preparation | Ministry of Agriculture and Forestry/LARReC (DPC) | National Budget | P | MS Excel | |
| Aquaculture prices | Farm gate prices of fish | USD/kg | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Aquaculture prices | Farm gate prices of shrimp | USD/kg | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Aquaculture prices | Farm gate prices of other OAA | USD/kg | Province | Annual | Statistics Yearbook preparation | Lao Bureau of Statistics | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Statistics Yearbook preparation | Market prices by commodity (USD/kg)<br>Total annual production of aquaculture fish (tonne) | | Ministry of Agriculture and Forestry /LARReC (Department of Cooperation and Planning) |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | MAF to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | 1) Disaggregate all data by province<br>2) Develop plan for acquiring data on input costs for capture fisheries and aquaculture to enable future assessment of net economic value |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors    **Assessment Indicator:** Economic value of forestry

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Forestry production | Total area of forestry | km² | Province | Annual | Provincial data collection | Ministry of Agriculture and Forestry (DPC) | National Budget | P | MS Excel | Can use total production volume of timber, if available |
| Forestry production | Average unit timber log production | m³/ha | Province | Annual | Provincial data collection | Ministry of Agriculture and Forestry (FD) | National Budget | P | MS Excel | |
| Forestry prices | Average timber log unit price | USD/m³ | Province | Annual | Provincial data collection | Ministry of Agriculture and Forestry (FD) | National Budget | P | MS Excel | |
| Forestry prices | Average value of non-timber forest products | USD | Province | Annual | Provincial data collection | TBC | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Annual report preparation | Total planted and reforested areas (km²)<br>Volume of timber produced (m³)<br>Average price of timber (USD/m³)<br>Biodiversity products (USD) | | Ministry of Agriculture and Forestry (Department of Planning and Cooperation and Forestry Department) |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | MAF to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | 1) Disaggregate all data by province<br>2) Develop plan for acquiring data on input costs for forestry to enable future assessment of net economic value |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of tourism

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Tourism and recreation revenue | Number of domestic tourists visiting the basin | No. | Province | Annual | Statistics Yearbook preparation | | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Number of international tourists visiting the basin | No. | Province | Annual | Statistics Yearbook preparation | | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist length of trip | days | Province | Annual | Statistics Yearbook preparation | Tourism Development Department | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average international tourist length of trip | days | Province | Annual | Statistics Yearbook preparation | | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist spend per trip-day | USD/day | Province | Annual | Statistics Yearbook preparation | | National Budget | P | MS Excel | |
| Tourism and recreation revenue | Average international tourist spend per trip-day | USD/day | Province | Annual | Statistics Yearbook preparation | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Statistics Yearbook preparation | Number of tourist arrivals (No.)<br>Length of stay for regional tourists (days)<br>Length of stay for international tourists (days)<br>Revenue from tourism (USD) | | Tourism Development Department |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | TDD to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Identify and agree an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB. For example, using data on hotel stays | 1) Disaggregate all data by province<br>2) Implement an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB<br>3) Develop and implement plan for acquiring data on input costs for tourism to enable future assessment of net economic value |

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**Lao PDR Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicators:** Economic cost of flood; Economic cost of drought

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Annual cost of flood damages | Cost of lost production for each crop type due to flooding | USD | Province | Annual | Village surveys | MPI, MoH and MAF | National Budget | P | MS Excel | |
| Annual cost of flood damages | Government reported costs of flood damage to public and private infrastructure | USD | Province | Annual | Village surveys | MPI, MoH and MAF | National Budget | P | MS Excel | |
| Annual cost of drought damages | Cost of lost production for each crop type due to drought | USD | Province | Annual | Village surveys | MPI, MoH and MAF | National Budget | P | MS Excel | |
| Annual cost of drought damages | Government reported costs of drought damage | USD | Province | Annual | Village surveys | MPI, MoH and MAF | National Budget | P | MS Excel | |
| Riverbank erosion losses | Area lost to riverbank erosion | km$^2$ | Province | Annual | MRC channel habitats assessment | MRCS TD | National Budget | P | MS Excel | |
| Riverbank erosion losses | Average value of land lost to riverbank erosion | USD/ha | Province | Annual | TBC | TBC | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Village surveys | Calculated costs based on reported losses of inventory (USD) | Ministry of Planning and Investment<br>Ministry of Health<br>Ministry of Agriculture and Forestry |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | MPI to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** / **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | 1) Disaggregate all data by province<br>2) Design and implement revised survey approach to disaggregate data by type of loss due to flood and drought (i.e. agricultural production, infrastructure, assets) |

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| **Lao PDR Routine National Monitoring** |
|---|

| **Dimension:** Economic |
|---|

| **Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Contribution of LMB water-related sectors to basin, national and regional GDP |
|---|---|

| **Assessment Mechanism:** Regional assessment for SOBR every five years |
|---|

| **Data Collection Mechanism:** Routine national monitoring and reporting |
|---|

| **Monitoring Parameters** | **Data requirements** | **Units** | **Spatial Scale** | **Collection Frequency** | **Data Source** | **Responsible** | **Resourcing** | **A\*** | **Format** | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of basin, national and regional GDP met from basin resources | Gross Domestic Product (GDP) | USD | National; Province | Annual | National Accounts | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| n/a | GDP growth rate | USD | National; Province | Annual | National Accounts | Lao Bureau of Statistics | National Budget | P | MS Excel | |
| Proportion of basin, national and regional GDP met from basin resources | GDP by LMB water-related sector | USD | National; Province | Annual | National Accounts | Lao Bureau of Statistics | National Budget | P | MS Excel | |

| **National Collection Mechanisms** | **Specified Existing Datasets** | | **National Agency** | |
|---|---|---|---|---|
| National Accounts | National Gross Domestic Product (USD)<br>National GDP growth rate (US%/annum)<br>Gross Domestic Product at current market prices by economic sector (USD) | | Lao Bureau of Statistics | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | LBS to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | Develop and implement methodology to disaggregate GDP data by province |

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**Lao PDR Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Greenhouse gas emissions | **Assessment Indicators:** Greenhouse gas emissions from LMB water-related sectors; Relative contribution to global emissions

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Greenhouse gas emissions from energy | Emissions from energy generation | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (DDMCC) | National Budget | - | MS Excel | |
| Greenhouse gas emissions from agriculture | Emissions from agriculture | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (DDMCC) | National Budget | - | MS Excel | |
| Greenhouse gas emissions from other land use, land use change and forestry | Emissions from land use, land use change and forestry | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (DDMCC) | National Budget | - | MS Excel | |
| Reduced greenhouse gas emissions from energy due to hydropower | Total amount of hydropower generated | MWh | Basin; Country | Annual | Reporting by generators and grid operators | Ministry of Energy and Mines (DEPP) | National Budget | P | MS Excel | |
| Emissions of carbon dioxide | Annual basin emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (DDMCC) | National Budget | - | MS Excel | |
| Emissions of carbon dioxide | Annual global emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | MONRE (DDMCC) | National Budget | P | MS Excel | |
| Emissions of methane | Annual basin emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (DDMCC) | National Budget | - | MS Excel | |
| Emissions of methane | Annual global emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | MONRE (DDMCC) | National Budget | P | MS Excel | |
| Emissions of nitrous oxide | Annual basin emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (DDMCC) | National Budget | - | MS Excel | |
| Emissions of nitrous oxide | Annual global emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | MONRE (DDMCC) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Ministry of Natural Resources and Environment (Department of Disaster Management and Climate Change) | |
| Reporting by generators and grid operators | Total amount of hydropower generated (MWh) | | Ministry of Energy and Mines (Department of Energy Policy and Planning) | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | MONRE and MEM to send by email to MRCS focal point according to Climate Change Data MoU, every five years starting in 2022 | | Climate Watch historical greenhouse gas emissions by sector and gas | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | World Resources Institute | Download from website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Implement an approach to estimating greenhouse gas emissions in the basin by apportioning national emissions by the relative output of each sector within the basin to national output | Develop and implement an approach to estimate greenhouse gas emissions at a sub-national level that could be applied to the basin or province |

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**Lao PDR Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Adaptation to climate change | **Assessment Indicator:** Institutional response to the effects of climate change

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Periodic national review

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Policies and strategies for climate change response | National climate change strategies | No. | National | Five yearly | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Provincial climate change strategies | No. | Province | Five yearly | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Sectoral climate change strategies | No. | National | Five yearly | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Budget for climate change response | National climate change budget | USD | National | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Budget for climate change response | Provincial climate change budget | USD | Province | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Budget for climate change response | Sectoral climate change budget | USD | National | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Number of awareness-raising activities | Number of awareness-raising activities | No. | Basin | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |
| Access to climate finance | Receipt of international climate finance | USD | National | Annual | TBC | Ministry of Environment (DCC) | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| TBC | TBC | | Ministry of Natural Resources and Environment (Department of Disaster Management and Climate Change) |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | DDMCC to send by email to MRCS focal point according to Climate Change Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | TBC |

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**Lao PDR Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Adaptation to climate change | **Assessment Indicators:** Flood protection measures; Drought protection measures

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Periodic national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Area of urban land protected by embankments/levees | Land classification as urban land | Class | Basin | Five yearly | TBC | TBC | National Budget | - | MS Excel | |
| Area of urban land protected by embankments/levees | Digital elevation model with flood mapping | DEM | Basin | Once | TBC | NREDI | National Budget | - | MS Excel | |
| Area of urban land protected by embankments/levees | Location, height and length of embankments | lat.long m | Basin | Five yearly | TBC | Department of Waterways (DPB) | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Land classification as agricultural land | Class | Basin | Five yearly | TBC | Ministry of Agriculture and Forestry | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Digital elevation model with flood mapping | DEM | Basin | Once | TBC | NREDI | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Location, height and length of embankments | lat.long m | Basin | Five yearly | TBC | Department of Waterways | National Budget | - | MS Excel | |
| Proportion of irrigable land that is irrigated | Area of irrigated land | km² | Province | Five yearly | TBC | Irrigation Department | National Budget | - | MS Excel | |
| Proportion of irrigable land that is irrigated | Area of irrigable land | km² | Province | Five yearly | TBC | Irrigation Department | National Budget | - | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for urban use | m³ | Province | Five yearly | TBC | Irrigation Department | National Budget | - | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for agricultural use | m³ | Province | Five yearly | TBC | Irrigation Department | National Budget | - | MS Excel | |
| Volume of available water storage | Domestic water-use demands over the dry season | m³ | Province | Five yearly | TBC | Irrigation Department | National Budget | - | MS Excel | |
| Volume of available water storage | Agricultural water-use demands over the dry season | m³ | Province | Five yearly | TBC | Irrigation Department | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| TBC | TBC | Ministry of Agriculture and Forestry |
| TBC | TBC | NREDI |
| TBC | TBC | Department of Waterways (Division of Planning and Budget |
| TBC | TBC | Irrigation Department |
| | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | MAF, NREDI, DW and ID to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|---|
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | TBC |

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**Thailand Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Food security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of dietary energy supply | Population | No. | Province | Annual | Registration Statistics | Department of Provincial Administration | National Budget | P | MS Excel | MICS subject to Development Partner funding (i.e. UNICEF, World Bank) |
| Adequacy of dietary energy supply | Quantity of rice produced for food | Tonne | Province | Annual | NSO web statistics compilation | Office of Agricultural Economics | National Budget | P | MS Excel | |
| Adequacy of dietary energy supply | Not Applicable for Thailand | | | | | | | | | |
| Income per person | Household income/ expenditure | USD/ day/HH | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Income per person | Household size | No./HH | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Prevalence of undernourishment | Not Applicable for Thailand | | | | | | | | | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting wasting | % | Province | Annual | Multiple Indicators Cluster Survey | National Statistics Office | National Budget | P | MS Excel | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting stunting | % | Province | Annual | Multiple Indicators Cluster Survey | National Statistics Office | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Registration Statistics | Population by province (No.) | Department of Provincial Administration |
| 2. NSO web statistics compilation | Rice production by province (tonne) | Office of Agricultural Economics |
| 3. Household Socio-Economic Survey<br>4. Multiple Indicators Cluster survey | Household income and expenditure by province (USD/day/HH)<br>Average household size by province (No./HH)<br>Prevalence of stunting (moderate and severe) in children <5 yrs old (%)<br>Prevalence of wasting (moderate and severe) in children <5 yrs old (%) | National Statistics Office |

| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
|---|---|---|---|
| | DPA, OAE and NSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | FAOSTAT | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | FAO | Download from FAOSTAT website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use FAOSTAT national data for malnutrition and MICS data for undernourishment in children | 1) Expand survey sampling power to enable representative data at provincial level where data for only national level is available |

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**Thailand Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Water security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys and regional drought risk assessment by MRC

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of domestic water supply | Households with access to water supply from an improved source | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Adequacy of domestic water supply | Number of households within each spatial unit | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Sufficiency of water for farming | Irrigation area within each spatial unit | km$^2$ | Province | Annual | RID Statistics | Royal Irrigation Department | National Budget | - | MS Excel | |
| Sufficiency of water for farming | Area of moderate/high drought risk within each spatial unit | km$^2$ | Province | Five yearly | MRC drought risk assessment | MRCS TD | MRC SP and AWP | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Lao Expenditure and Consumption Survey | Number of households by province (No.)<br>Households with access to improved water source (No.) | National Statistics Office |
| 2. National Development Plans | Irrigation area within each spatial unit (km$^2$) | Royal Irrigation Department |
| | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | NSO and RID to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |

| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
|---|---|---|---|
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national is available |

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**Thailand Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Water-related health security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Access to safe water supplies | Households with access to water supplies that meet drinking water standards | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Access to safe water supplies | Number of households within each spatial unit | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Prevalence of malnutrition | Proportion of population suffering malnutrition | % | Province | Annual | FAOSTAT | Ministry of Health | National Budget | P | MS Excel | |
| Access to sanitation | Households with access to sanitation facilities | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Access to sanitation | Number of households within each spatial unit | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Not Applicable for Thailand | | | | | | | | | |
| Incidence of water-borne disease | Not Applicable for Thailand | | | | | | | | | |
| Incidence of water-borne disease | Not Applicable for Thailand | | | | | | | | | |
| Incidence of water-borne disease | Not Applicable for Thailand | | | | | | | | | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Household Socio-Economic Survey | Number of households by province (No.)<br>Households with access to water supplies that meet drinking water standards (No.)<br>Households with access to sanitation facilities (No.) | National Statistics Office |
| 3. Registration Statistics | Population by province (No.) | Department of Provincial Administration |
| | | |
| | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | LNSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** / **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use FAOSTAT national data for malnutrition | 1) Expand survey sampling power to enable representative data at provincial level where data for only national is available<br>2) Develop and implement new monitoring activity to identify undernourishment of the population as a whole by province |

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| **Thailand Routine National Monitoring** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Social | | | | | | | | | | | |
| **Strategic Indicator:** Livelihoods and wellbeing | | | | | | **Assessment Indicator:** Access to electricity | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national surveys | | | | | | | | | | | |

| **Monitoring Parameters** | **Data requirements** | **Units** | **Spatial Scale** | **Collection Frequency** | **Data Source** | **Responsible** | **Resourcing** | **A\*** | **Format** | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|
| Urban household electrification rate | Urban households with access to electricity | No. | Province | Annual | Multiple Indicators Cluster Survey | National Statistics Office | National Budget | P | MS Excel | MICS subject to Development Partner funding (i.e. UNICEF, World Bank) |
| Urban household electrification rate | Number of urban households within each spatial unit | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Rural household electrification rate | Rural households with access to electricity | No. | Province | Annual | Multiple Indicators Cluster Survey | National Statistics Office | National Budget | P | MS Excel | |
| Rural household electrification rate | Number of rural households within each spatial unit | No. | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |

| **National Collection Mechanisms** | **Specified Existing Datasets** | | **National Agency** |
|---|---|---|---|
| 1. Multiple Indicators Cluster Survey<br>2. Household Socio-Economic Survey | Households with access to electricity by province (No.)<br>Number of urban households by province (No.)<br>Number of rural households by province (No.) | | National Statistics Office |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | NSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data of urban and rural households within each province |

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| **Thailand Routine National Monitoring** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Social | | | | | | | | | | | |
| **Strategic Indicator:** Livelihoods and wellbeing | | | | | **Assessment Indicator:** Employment in LMB water-related sectors; Gender equality in employment and economic engagement | | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national surveys | | | | | | | | | | | |

| **Monitoring Parameters** | **Data requirements** | **Units** | **Spatial Scale** | **Collection Frequency** | **Data Source** | **Responsible** | **Resourcing** | **A\*** | **Format** | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of working age population employed in water-related sectors | Working age population | No. | Province | Annual | Labour Force Survey | National Statistics Office | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Number of people primarily employed in each LMB water-related sector | No. | Province | Annual | Labour Force Survey | National Statistics Office | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Employment rate across the basin | % | Province | Annual | Labour Force Survey | National Statistics Office | National Budget | P | MS Excel | Agriculture, fisheries and forestry treated as a single sector |
| Proportion of working age population employed in water-related sectors | Gross annual economic value of each sector | USD | Province | Annual | National Accounts | Office of National Economics and Social Development Council | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector | No. | Province | Annual | Statistics Yearbook preparation | National Statistics Office | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector occupied by females | No. | Province | Annual | Statistics Yearbook preparation | National Statistics Office | National Budget | P | MS Excel | |

| **National Collection Mechanisms** | **Specified Existing Datasets** | **National Agency** |
|---|---|---|
| 1. Labour Force Survey<br>2. Informal Employed Survey | Population 15 yrs and over by age group, labour force status and region (No.)<br>Number of formal and informal employed by industry, sex and region (No.) | National Statistics Office |
| 3. National Accounts | Aggregate economic output of agriculture, fisheries and forestry (USD) | Office of National Economics and Social Development Council |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | NSO and ONESDC to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** — **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national level and to disaggregate industry data by LMB water-related sectors (incl. for agriculture, fisheries and forestry) |

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**Thailand Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Economic security; Gender equality in employment and economic engagement

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Sufficiency of household income | Household income/ expenditure | USD/ day/HH | Province | Annual | Household Socio-Economic Survey | National Statistics Office | National Budget | P | MS Excel | |
| Sufficiency of household income | Household size | No./HH | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Household asset value | USD | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households owning land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in education | Number of girls and boys attending primary education | No. | Province | Annual | National Census | | National Budget | P | MS Excel | |
| Gender equality in education | Number of primary age girls and boys in the community | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males | No. | Province | Annual | Household Socio-Economic Survey | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. National Census<br>2. Household Socio-Economic Survey | Average monthly income/expenditure by type of expenditure (USD/month/HH)<br>Value of household assets by area (USD)<br>Number of municipal and non-municipal households (No.)<br>Population aged 3 years and over by educational attendance and age group (No.)<br>Percentage of households by major household characteristics and area (%) | National Statistics Office |

| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
|---|---|---|---|
| | NSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Expand survey sampling power to enable representative data at provincial level where data for only national or regional level<br>2) Develop estimation techniques to fill temporal gaps between National Census |

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| Thailand Routine National Monitoring | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Environment | | | | | | | | | | | |
| **Strategic Indicator:** Status of environmental assets | | | | | **Assessment Indicator:** Condition and status of fisheries and other aquatic resources | | | | | | |
| **Assessment Mechanism:** Regional assessment for fisheries reporting every year | | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national monitoring and reporting | | | | | | | | | | | |
| | | | | | | | | | | | |
| **Monitoring Parameters** | | **Data requirements** | **Units** | **Spatial Scale** | **Collection Frequency** | **Data Source** | **Responsible** | **Resourcing** | **A\*** | **Format** | **Notes** |
| OAA/P abundance | | Biomass of OAA/P harvested | Tonne | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | Where specific OAA/P monitoring is not available, data from aquaculture production may be used |
| OAA/P harvest effort | | Time spent harvesting OAA/P | hours | | | | | | | | |
| OAA/P diversity | | Harvest of crabs | kg and % | | | | | | | | |
| OAA/P diversity | | Harvest of shrimp | kg and % | | | | | | | | |
| OAA/P diversity | | Harvest of water-snakes | kg and % | | | | | | | | |
| OAA/P diversity | | Harvest of other OAA/P | kg and % | | | | | | | | |
| Abundance of other wetland-dependent biodiversity | | Not Applicable in Thailand | | | | | | | | | |
| Abundance of other wetland-dependent biodiversity | | Not Applicable in Thailand | | | | | | | | | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Department of Fisheries | |
| | | | | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | DF to send by email to MRCS focal point according to Environment Data MoU once every year | | MRC Fisheries Abundance and Diversity Monitoring | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by ED focal point and uploaded to MRC-IS by MRCS data manager | | | |
| **Data Acquisition and Generation Improvement Strategy** | | | | |
| *Step 1* | | | *Step 2* | |
| 1) Develop and implement methodology for monitoring and reporting on OAA/P abundance and diversity at a provincial scale | | | TBC | |

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**Thailand Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of agriculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Irrigated agriculture production | Total cropped area for each crop | km$^2$ | Province | Annual | Agriculture Statistics | Office of Agricultural Economics | National Budget | P | MS Excel | If yield and area data is not available, use total production (Tonnes) instead |
| Irrigated agriculture production | Annual yield for each crop | Tonne/km$^2$ | | | | | | | | |
| Riverbank gardens | Total cropped area for each crop | km$^2$ | | | | | | | | |
| Riverbank gardens | Annual yield for each crop | Tonne/km$^2$ | | | | | | | | |
| Rain fed cultivation | Total cropped area for each crop | km$^2$ | | | | | | | | |
| Rain fed cultivation | Annual yield for each crop | Tonne/km$^2$ | | | | | | | | |
| Agriculture prices | Average farm gate price for each irrigated crop | USD/Tonne | Province | Annual | Agriculture Statistics | Office of Agricultural Economics | National Budget | P | MS Excel | |
| Agriculture prices | Average farm gate price for each riverbank garden crop | | | | | | | | | |
| Agriculture prices | Average farm gate price for each rain-fed crop | | | | | | | | | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency | |
|---|---|---|---|
| 1. Agriculture Statistics | Area of crops planted and harvested (ha)<br>Crop yield by province (Tonne/ha)<br>Production by province (Tonne)<br>Commodity prices (USD) | Office of Agricultural Economics | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| | OAE to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | FAOSTAT | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | FAO | Download from FAOSTAT website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national agricultural surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Design and implement methodology to disaggregate production of irrigated rice, rain-fed cultivation, recession rice and riverbank gardens from total production of each crop<br>2) Develop and implement plan for acquiring data on input costs for agriculture to enable future assessment of net economic value<br>3) Disaggregate all data by province |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Thailand Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of hydropower

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Hydropower production for domestic consumption | Total production of hydropower for domestic consumption | MWh | Province | Annual | TBC | Electricity Generating Authority of Thailand | National Budget | - | MS Excel | If data is not disaggregated by domestic consumption and export, use only total amount generated and domestic prices |
| Hydropower prices | Average unit price of power in domestic consumption | USD/kWh | Province | Annual | TBC | Office of the Energy Regulatory Commission | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| TBC | TBC | | Office of the Energy Regulatory Commission |
| TBC | TBC | | Electricity Generating Authority of Thailand |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | PEA, OERC and EGAT to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | 1) Develop and implement plan for acquiring data on input costs for hydropower to enable future assessment of net economic value<br>2) Disaggregate all data by province |

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**Thailand Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of navigation

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume of cargo transport | Annual total quantity of ITW cargo transported along the mainstream | Tonnes | Province | Annual | TBC | Harbour Department | National Budget | - | MS Excel | |
| Passenger transport numbers | Annual total number of passenger trips along the mainstream | No. | Province | Annual | TBC | Harbour Department | National Budget | - | MS Excel | |
| Navigation prices | Average price of transporting cargo | USD/tonne | Province | Annual | TBC | Harbour Department | National Budget | - | MS Excel | |
| Navigation prices | Average price of each passenger trip | USD/trip | Province | Annual | TBC | Harbour Department | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Harbour Department | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | HD to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | 1) Develop and implement plan for acquiring data on input costs for navigation to enable future assessment of net economic value<br>2) Disaggregate all data by province |

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**Thailand Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicators:** Economic value of capture fisheries; Economic value of aquaculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Capture fisheries prices | Market prices of fish | USD/kg | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | If production values not available by species or category, use total production values and average prices |
| Aquaculture production | Total annual production of fish | Tonnes | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | |
| Aquaculture production | Total annual production of shrimp | Tonnes | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | |
| Aquaculture production | Total annual production of other OAA | Tonnes | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | |
| Aquaculture prices | Farm gate prices of fish | USD/kg | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | |
| Aquaculture prices | Farm gate prices of shrimp | USD/kg | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | |
| Aquaculture prices | Farm gate prices of other OAA | USD/kg | Province | Annual | TBC | Department of Fisheries | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| TBC | TBC | | Department of Fisheries |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | DF to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| TBC | 1) Develop plan for acquiring data on input costs for capture fisheries and aquaculture to enable future assessment of net economic value |
| | 2) Disaggregate all data by province |

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**Thailand Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of tourism

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Tourism and recreation revenue | Number of domestic tourists visiting the basin | No. | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Number of international tourists visiting the basin | No. | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist length of trip | days | Province | Annual | TBC | Thai Tourist Authority | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average international tourist length of trip | days | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist spend per trip-day | USD/day | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average international tourist spend per trip-day | USD/day | Province | Annual | TBC | | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| TBC | TBC | | Thai Tourist Authority |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | TTA to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Identify and agree an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB. For example, using data on hotel stays | 1) Implement an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB<br>2) Develop and implement plan for acquiring data on input costs for tourism to enable future assessment of net economic value<br>3) Disaggregate all data by province |

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**Thailand Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicators:** Economic cost of flood; Economic cost of drought

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Annual cost of flood damages | Cost of lost production for each crop type due to flooding | USD | Province | Annual | TBC | TBC | National Budget | - | MS Excel | |
| Annual cost of flood damages | Government reported costs of flood damage to public and private infrastructure | USD | Province | Annual | TBC | Department of Disaster Prevention and Mitigation | National Budget | - | MS Excel | |
| Annual cost of drought damages | Cost of lost production for each crop type due to drought | USD | Province | Annual | TBC | TBC | National Budget | - | MS Excel | |
| Annual cost of drought damages | Government reported costs of drought damage | USD | Province | Annual | TBC | Department of Disaster Prevention and Mitigation | National Budget | - | MS Excel | |
| Riverbank erosion losses | Area lost to riverbank erosion | km$^2$ | Province | Annual | TBC | Marine Department | National Budget | - | MS Excel | |
| Riverbank erosion losses | Average value of land lost to riverbank erosion | USD/ha | Province | Annual | TBC | Marine Department | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency | |
|---|---|---|---|
| TBC | TBC | Department of Disaster Prevention and Mitigation | |
| TBC | TBC | Marine Department | |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| | DDPM and HD to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | 1) Expand survey sampling power to enable representative data at provincial level where data for only regional or national level is available<br>2) Design revised survey approach to disaggregate data by type of loss due to flood and drought (i.e. agricultural production, infrastructure, assets)<br>3) Disaggregate all data by province |

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**Thailand Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Contribution of LMB water-related sectors to basin, national and regional GDP

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of basin, national and regional GDP met from basin resources | Gross Domestic Product (GDP) | USD | National; Province | Annual | National Accounts | Office of National Economic and Social Development Council | National Budget | P | MS Excel | |
| n/a | GDP growth rate | USD | National; Province | Annual | National Accounts | Office of National Economic and Social Development Council | National Budget | P | MS Excel | |
| Proportion of basin, national and regional GDP met from basin resources | GDP by LMB water-related sector | USD | National; Province | Annual | National Accounts | Office of National Economic and Social Development Council | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| National Accounts | National Gross Domestic Product (USD)<br>Gross Domestic Product by Province (USD)<br>National GDP growth rate (US%/annum)<br>Gross Domestic Product at current market prices by economic sector (USD) | | Office of National Economic and Social Development Council |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | ONESDC to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | Develop and implement methodology to disaggregate GDP data by province and for each LMB water-related economic sector, if not already available |

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**Thailand Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Greenhouse gas emissions | **Assessment Indicators:** Greenhouse gas emissions from LMB water-related sectors; Relative contribution to global emissions

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Greenhouse gas emissions from energy | Emissions from energy generation | $tCO_2$-e | Basin; Country | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Greenhouse gas emissions from agriculture | Emissions from agriculture | $tCO_2$-e | Basin; Country | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Greenhouse gas emissions from other land use, land use change and forestry | Emissions from land use, land use change and forestry | $tCO_2$-e | Basin; Country | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Reduced greenhouse gas emissions from energy due to hydropower | Total amount of hydropower generated | MWh | Basin; Country | Annual | TBC | Electricity Generating Authority of Thailand | National Budget | - | MS Excel | |
| Emissions of carbon dioxide | Annual basin emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Emissions of carbon dioxide | Annual global emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | ONEP | National Budget | P | MS Excel | |
| Emissions of methane | Annual basin emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Emissions of methane | Annual global emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | ONEP | National Budget | P | MS Excel | |
| Emissions of nitrous oxide | Annual basin emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Emissions of nitrous oxide | Annual global emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | ONEP | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Office of Natural Resources and Environment Policies and Planning | |
| TBC | Total amount of hydropower generated (MWh) | | Electricity Generating Authority of Thailand | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | ONEP and EGAT to send by email to MRCS focal point according to Climate Change Data MoU, every five years starting in 2022 | | Climate Watch historical greenhouse gas emissions by sector and gas | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | World Resources Institute | Download from website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Implement an approach to estimating greenhouse gas emissions in the basin by apportioning national emissions by the relative output of each sector within the basin to national output | Develop and implement an approach to estimate greenhouse gas emissions at a sub-national level that could be applied to the basin or province |

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**Thailand Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Adaptation to climate change | **Assessment Indicator:** Institutional response to the effects of climate change

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Periodic national review

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Policies and strategies for climate change response | National climate change strategies | No. | National | Five yearly | TBC | ONEP | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Provincial climate change strategies | No. | Province | Five yearly | TBC | ONEP | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Sectoral climate change strategies | No. | National | Five yearly | TBC | ONEP | National Budget | - | MS Excel | |
| Budget for climate change response | National climate change budget | USD | National | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Budget for climate change response | Provincial climate change budget | USD | Province | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Budget for climate change response | Sectoral climate change budget | USD | National | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Number of awareness-raising activities | Number of awareness-raising activities | No. | Basin | Annual | TBC | ONEP | National Budget | - | MS Excel | |
| Access to climate finance | Receipt of international climate finance | USD | National | Annual | TBC | ONEP | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Office of Natural Resources and Environment Policies and Planning | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | ONEP to send by email to MRCS focal point according to Climate Change Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | TBC |

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| Thailand Routine National Monitoring | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Climate Change | | | | | | | | | | | |
| **Strategic Indicator:** Adaptation to climate change | | | | **Assessment Indicators:** Flood protection measures; Drought protection measures | | | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | | |
| **Data Collection Mechanism:** Periodic national monitoring and reporting | | | | | | | | | | | |

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of irrigable land that is irrigated | Area of irrigated land | km$^2$ | Province | Five yearly | TBC | Royal Irrigation Department | National Budget | - | MS Excel | |
| Proportion of irrigable land that is irrigated | Area of irrigable land | km$^2$ | Province | Five yearly | TBC | Royal Irrigation Department | National Budget | - | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for urban use | m$^3$ | Province | Five yearly | TBC | Provincial Water Authorities | National Budget | R | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for agricultural use | m$^3$ | Province | Five yearly | TBC | Royal Irrigation Department | National Budget | R | MS Excel | |
| Volume of available water storage | Domestic water-use demands over the dry season | m$^3$ | Province | Five yearly | TBC | OWMR | National Budget | R | MS Excel | |
| Volume of available water storage | Agricultural water-use demands over the dry season | m$^3$ | Province | Five yearly | TBC | Royal Irrigation Department | National Budget | R | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Provincial Water Authorities | |
| TBC | TBC | | OWMR | |
| TBC | TBC | | Royal Irrigation Department | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | PWA, OWMR and RID to send by email to MRCS focal point according to Social Data MoU every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |
| **Data Acquisition and Generation Improvement Strategy** | | | | |
| *Step 1* | | *Step 2* | | |
| TBC | | TBC | | |

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**Viet Nam Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Food security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of dietary energy supply | Population | No. | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | P | MS Excel | |
| Adequacy of dietary energy supply | Quantity of rice produced for food | Tonne | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | P | MS Excel | |
| Adequacy of dietary energy supply | Proportion of dietary energy from rice | % | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | P | MS Excel | |
| Income per person | Household income/ expenditure | USD/ day/HH | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | Child malnutrition only available by urban and rural population |
| Income per person | Household size | No./HH | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | |
| Prevalence of undernourishment | Proportion of population undernourished | % | Province | Annual | FAOSTAT | General Statistics Office | National Budget | P | MS Excel | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting wasting | % | Province | Annual | GSO web statistics compilation | General Statistics Office | National Budget | P | MS Excel | |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting stunting | % | Province | Annual | GSO web statistics compilation | General Statistics Office | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Statistics Yearbook preparation<br>2. Living Standards Survey<br>3. GSO web statistics compilation | Population by province (No.)<br>Rice production by province (tonne)<br>Average monthly consumption of some main goods per capita<br>Monthly average living expenditure (USD/day/HH)<br>Household size by region (No./HH)<br>Prevalence of stunting (moderate and severe) in children <5 yrs old (%)<br>Prevalence of wasting (moderate and severe) in children <5 yrs old (%) | General Statistics Office |

| Data Transmission Arrangements from MCs to MRCS | | Secondary evidence | |
|---|---|---|---|
| GSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | FAOSTAT | |
| **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | FAO | Download from FAOSTAT website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use FAOSTAT national data for malnutrition | 1) Expand survey sampling power to enable representative data at provincial level where data for only national level is available<br>2) Develop and implement new monitoring activity to identify undernourishment of the population as a whole by province |

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**Viet Nam Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Water security

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys and regional drought risk assessment by MRC

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequacy of domestic water supply | Households with access to water supply from an improved source | No. | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | |
| Adequacy of domestic water supply | Number of households within each spatial unit | No. | Province | Annual | National Census; Rural and Agricultural Census | General Statistics Office | National Budget | P | MS Excel | |
| Sufficiency of water for farming | Irrigation area within each spatial unit | km² | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | |
| Sufficiency of water for farming | Area of moderate/high drought risk within each spatial unit | km² | Province | Five yearly | MRC drought risk assessment | MRCS TD | MRC SP and AWP | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Living Standards Survey<br>2. National Census; Rural and Agricultural Census | Number of households by province (No.)<br>Structure of households by main source of drinking water (No.)<br>Irrigation area within each spatial unit (km²) | | General Statistics Office |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | NSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national level is available |

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| Viet Nam Routine National Monitoring | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Social | | | | | | | | | | |
| **Strategic Indicator:** Livelihoods and wellbeing | | | **Assessment Indicator:** Water-related health security | | | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national surveys | | | | | | | | | | |

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Access to safe water supplies | Households with access to water supplies that meet drinking water standards | No. | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | |
| Access to safe water supplies | Number of households within each spatial unit | No. | Province | Annual | National Census; Rural and Agricultural Census | General Statistics Office | National Budget | P | MS Excel | |
| Prevalence of malnutrition | Proportion of population suffering malnutrition | % | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | |
| Access to sanitation | Households with access to sanitation facilities | No. | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | |
| Access to sanitation | Number of households within each spatial unit | No. | Province | Annual | National Census; Rural and Agricultural Census | General Statistics Office | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Population | No. | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported cases of malaria | No. | Province | Annual | Statistics Yearbook preparation | National Institute of Malariology, Parasitology and Entomology | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported cases of dengue fever | No. | Province | Annual | | National Institute of Malariology, Parasitology and Entomology | National Budget | P | MS Excel | |
| Incidence of water-borne disease | Number of reported outbreaks of cholera | No. | Province | Annual | Mekong Basin Disease Surveillance | General Statistics Office | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Living Standards Survey<br>2. National Census; Rural and Agricultural Census<br>3. Statistics Yearbook preparation | Number of households by province (No.)<br>Households with access to water supplies that meet drinking water standards (No.)<br>Households with access to sanitation facilities (No.)<br>Population density by province (No.)<br>Incidence of cholera (No.) | General Statistics Office |
| 4. Statistics Yearbook preparation | Number of reported cases of malaria (No.)<br>Number of reported cases of dengue fever (No.) | National Institute of Malariology, Parasitology and Entomology |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | GSO and NIMPE to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** / **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use FAOSTAT national data for malnutrition | 1) Expand survey sampling power to enable representative data at provincial level where data for only national level is available<br>2) Develop and implement new monitoring activity to identify undernourishment of the population as a whole by province |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Viet Nam Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Access to electricity

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Urban household electrification rate | Urban households with access to electricity | No. | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | |
| Urban household electrification rate | Number of urban households within each spatial unit | No. | Province | Annual | National Census | General Statistics Office | National Budget | P | MS Excel | |
| Rural household electrification rate | Rural households with access to electricity | No. | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | |
| Rural household electrification rate | Number of rural households within each spatial unit | No. | Province | Annual | National Census; Rural and Agricultural Census | General Statistics Office | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Living Standards Survey<br>2. National Census; Rural and Agricultural Census | Percentage of households using electricity by residence and region (%)<br>Number of households by household size, residence, region and province (No.) | General Statistics Office |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | GSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** · **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data of urban and rural households within each province |

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**Viet Nam Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Employment in LMB water-related sectors; Gender equality in employment and economic engagement

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of working age population employed in water-related sectors | Working age population | No. | Province | Annual | Labour Force Survey; National Census | General Statistics office | National Budget | P | MS Excel | Agriculture, fisheries and forestry treated as a single sector |
| Proportion of working age population employed in water-related sectors | Number of people primarily employed in each LMB water-related sector | No. | Province | Annual | Labour Force Survey; Living Standards Survey | General Statistics office | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Employment rate across the basin | % | Province | Annual | Labour Force Survey | General Statistics office | National Budget | P | MS Excel | |
| Proportion of working age population employed in water-related sectors | Gross annual economic value of each sector | USD | Province | Annual | Living Standards Survey | General Statistics office | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector | No. | Province | Annual | Labour Force Survey; Living Standards Survey | General Statistics office | National Budget | P | MS Excel | |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector occupied by females | No. | Province | Annual | | General Statistics office | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Labour Force Survey<br>2. National Census<br>3. Living Standards Survey | Labour force by sex, rural/urban and region (No.)<br>Structure of population aged over 15 yrs by main economic activity (No.)<br>Number employed by industrial sector (No.)<br>Employed population by sex, rural/urban and region (No.)<br>Value of each sector by province (USD) | General Statistics Office |

| Data Transmission Arrangements from MCs to MRCS | | Secondary evidence |
|---|---|---|
| GSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | |

| Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|
| Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | Expand survey sampling power to enable representative data at provincial level where data for only national level and to disaggregate industry data by LMB water-related sectors (incl. for agriculture, fisheries and forestry) |

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**Viet Nam Routine National Monitoring**

**Dimension:** Social

**Strategic Indicator:** Livelihoods and wellbeing | **Assessment Indicator:** Economic security; Gender equality in employment and economic engagement

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national surveys

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Sufficiency of household income | Household income/ expenditure | USD/ day/HH | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household income | Household size | No./HH | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Household asset value | USD | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households owning land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Sufficiency of household assets | Number of rural households within each spatial unit | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in education | Number of girls and boys attending primary education | No. | Province | Annual | Living Standards Survey | General Statistics Office | National Budget | P | MS Excel | |
| Gender equality in education | Number of primary age girls and boys in the community | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by males that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |
| Gender equality in ownership of land | Number of agricultural households headed by females that own land | No. | Province | Annual | | | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Living Standards Survey | Monthly average living expenditure (USD/month/HH)<br>Household size by region (No./HH)<br>Type of house or ownership of durable goods (-)<br>Number of households by household size, residence, region and province (No.)<br>Population aged 5 years and over currently attending school by level and province (No.)<br>Population by age group, sex and province (No.)<br>Structure of household by sex of household head (No.) | General Statistics Office |

| | Data Transmission Arrangements from MCs to MRCS | | Secondary evidence | |
|---|---|---|---|---|
| | GSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | | |
| | Data Processing Arrangements within MCs and at MRCS including QA/QC | | Organisation | Transmission |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| 1) Use datasets as produced through existing national socio-economic and livelihood surveys and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary<br>2) Use type of house or ownership of durable goods as proxy for value of household assets | 1) Expand survey sampling power to enable representative data at provincial level where data for only national or regional level<br>2) Develop and implement questions for inclusion in LSS on household asset value |

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**Viet Nam Routine National Monitoring**

**Dimension:** Environment

**Strategic Indicator:** Status of environmental assets | **Assessment Indicator:** Condition and status of fisheries and other aquatic resources

**Assessment Mechanism:** Regional assessment for fisheries reporting every year

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| OAA/P abundance | Biomass of OAA/P harvested | Tonne | Province | Annual | TBC | Provincial Fisheries | National Budget | - | MS Excel | Where specific OAA/P monitoring is not available, data from aquaculture production may be used |
| OAA/P harvest effort | Time spent harvesting OAA/P | hours | | | | | | | | |
| OAA/P diversity | Harvest of crabs | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of shrimp | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of water-snakes | kg and % | | | | | | | | |
| OAA/P diversity | Harvest of other OAA/P | kg and % | | | | | | | | |
| Abundance of other wetland-dependent biodiversity | Number of water-birds | No. | Basin | Biennial | TBC | Ministry of Natural Resources and Environment | National Budget | - | MS Excel | |
| Abundance of other wetland-dependent biodiversity | Number of water-bird species | No. | Basin | Biennial | TBC | | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency | |
|---|---|---|---|
| TBC | TBC | Provincial Fisheries | |
| TBC | TBC | Ministry of Natural Resources and Environment | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| | PA and MONRE to send by email to MRCS focal point according to Environment Data MoU once every year | MRC Fisheries Abundance and Diversity Monitoring Asian Water Bird Census | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by ED focal point and uploaded to MRC-IS by MRCS data manager | Wetlands International | Download from online database |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| 1) Develop methodology for monitoring and reporting on OAA/P abundance and diversity at a provincial scale 2) Develop methodology for monitoring and reporting on water bird numbers and species of water birds | Nil |

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**Viet Nam Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of agriculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Irrigated agriculture production | Total cropped area for each crop | km² | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | P | MS Excel | If yield and area data is not available, use total production (Tonnes) instead |
| Irrigated agriculture production | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Recession rice production | Total cropped area for each crop | km² | | | | | | | | |
| Recession rice production | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Riverbank gardens | Total cropped area for each crop | km² | | | | | | | | |
| Riverbank gardens | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Rain fed cultivation | Total cropped area for each crop | km² | | | | | | | | |
| Rain fed cultivation | Annual yield for each crop | Tonne/km² | | | | | | | | |
| Agriculture prices | Average farm gate price for each irrigated crop | USD/Tonne | Province | Annual | GSO web statistics compilation | Department of Agriculture and Rural Development | National Budget | R | MS Excel | |
| Agriculture prices | Average farm gate price for recession rice | | | | | | | | | |
| Agriculture prices | Average farm gate price for each riverbank garden crop | | | | | | | | | |
| Agriculture prices | Average farm gate price for each rain-fed crop | | | | | | | | | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| 1. Statistics Yearbook preparation | Area of crops planted and harvested (ha) <br> Crop yield by province (Tonne/ha) <br> Production by province (Tonne) | General Statistics Office |
| 2. GSO web statistics compilation | Gross output of agriculture at current prices (USD) | Department of Agriculture and Rural Development |
| | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | GSO and DARD to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | FAOSTAT |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** \| **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | FAO \| Download from FAOSTAT website |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Use datasets as produced through existing national agricultural surveys and data collection processes and apply standard upscaling and downscaling, interpolation and extrapolation, as necessary | 1) Design and implement methodology to disaggregate production of irrigated crops, rain-fed cultivation, recession rice and riverbank gardens from total production of each crop <br> 2) Develop and implement plan for acquiring data on input costs for agriculture to enable future assessment of net economic value <br> 3) Disaggregate all data by province |

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**Viet Nam Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of hydropower

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Hydropower production for domestic consumption | Total production of hydropower for domestic consumption | MWh | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | If data is not disaggregated by domestic consumption and export, use only total amount generated and domestic prices |
| Hydropower production for export | Total production of hydropower exported | MWh | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | |
| Hydropower prices | Average unit price of power in domestic consumption | USD/kWh | Province | Annual | TBC | Vietnam Electricity | National Budget | - | MS Excel | |
| Hydropower prices | Average unit price of power in import countries | USD/kWh | Province | Annual | TBC | Vietnam Electricity | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | General Statistics Office | |
| TBC | TBC | | Vietnam Electricity | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | GSO and VE to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| TBC | 1) Disaggregate all data by province<br>2) Develop and implement plan for acquiring data on input costs for hydropower to enable future assessment of net economic value |

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| Viet Nam Routine National Monitoring | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Economic | | | | | | | | | | |
| **Strategic Indicator:** Economic Performance of MRC Sectors | | **Assessment Indicator:** Economic value of navigation | | | | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national monitoring and reporting | | | | | | | | | | |
| | | | | | | | | | | |
| **Monitoring Parameters** | **Data requirements** | **Units** | **Spatial Scale** | **Collection Frequency** | **Data Source** | **Responsible** | **Resourcing** | **A\*** | **Format** | **Notes** |
| Volume of cargo transport | Annual total quantity of ITW cargo transported along the mainstream | Tonnes | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | |
| Passenger transport numbers | Annual total number of passenger trips along the mainstream | No. | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | |
| Navigation prices | Average price of transporting cargo | USD/tonne | Province | Annual | TBC | Department of Transport | National Budget | - | MS Excel | |
| Navigation prices | Average price of each passenger trip | USD/trip | Province | Annual | TBC | Department of Transport | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | General Statistics Office | |
| TBC | TBC | | Department of Transport | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | GSO and DoT to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |
| **Data Acquisition and Generation Improvement Strategy** | | | | |
| *Step 1* | | *Step 2* | | |
| TBC | | 1) Disaggregate all data by province 2) Develop and implement plan for acquiring data on input costs for navigation to enable future assessment of net economic value | | |

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**Viet Nam Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of sand mining

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Sand mining production | Annual total quantity of aggregates, sand and gravel extracted for commercial purposes | Tonnes | Province | Annual | TBC | Department of Natural Resources and Environment | National Budget | - | MS Excel | |
| Sand mining prices | Average selling price of aggregates, sand and gravel | USD/tonne | Province | Annual | TBC | Department of Natural Resources and Environment | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Department of Natural Resources and Environment | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | DNRE to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | 1) Disaggregate all data by province |
| | 2) Develop plan for acquiring data on input costs for sand mining to enable future assessment of net economic value |

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**Viet Nam Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicators:** Economic value of capture fisheries; Economic value of aquaculture

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Capture fisheries prices | Market prices of fish | USD/kg | Province | Annual | GSO web statistics compilation | Department of Agriculture and Rural Development / Fisheries Research Institutes | National Budget | - | MS Excel | If production values not available by species or category, use total production values and average prices |
| Aquaculture production | Total annual production of fish | Tonnes | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | - | MS Excel | |
| Aquaculture production | Total annual production of shrimp | Tonnes | Province | Annual | Statistics Yearbook preparation | Department of Agriculture and Rural Development / Fisheries Research Institutes | National Budget | - | MS Excel | |
| Aquaculture production | Total annual production of other OAA | Tonnes | Province | Annual | Statistics Yearbook preparation | | National Budget | - | MS Excel | |
| Aquaculture prices | Farm gate prices of fish | USD/kg | Province | Annual | GSO web statistics compilation | Department of Agriculture and Rural Development / Fisheries Research Institutes | National Budget | - | MS Excel | |
| Aquaculture prices | Farm gate prices of shrimp | USD/kg | Province | Annual | GSO web statistics compilation | | National Budget | - | MS Excel | |
| Aquaculture prices | Farm gate prices of other OAA | USD/kg | Province | Annual | GSO web statistics compilation | | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Statistics Yearbook preparation | Production of aquaculture fish by province (tonnes) | | General Statistics Office |
| 2. Statistics Yearbook preparation 3. GSO web statistics compilation | Gross output of fishing at current prices (USD) Production of aquaculture shrimp by province (tonnes) Production of aquaculture by province (tonnes) | | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | GSO and DARD/FRI to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | 1) Disaggregate all data by province 2) Develop and implement plan for acquiring data on input costs for capture fisheries and aquaculture to enable future assessment of net economic value |

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**Viet Nam Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of forestry

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Forestry production | Total area of forestry | km$^2$ | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | - | MS Excel | Can use total production volume of timber, if available |
| Forestry production | Average unit timber log production | m$^3$/ha | Province | Annual | Statistics Yearbook preparation | General Statistics Office | National Budget | - | MS Excel | |
| Forestry prices | Average timber log unit price | USD/m$^3$ | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | |
| Forestry prices | Average value of non-timber forest products | USD | Province | Annual | TBC | General Statistics Office | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| 1. Statistics Yearbook preparation | Production of wood by province | | General Statistics Office<br>Department of Agriculture and Rural Development |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | GSO to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

**Data Acquisition and Generation Improvement Strategy**

| Step 1 | Step 2 |
|---|---|
| TBC | 1) Disaggregate all data by province<br>2) Develop and implement plan for acquiring data on input costs for forestry to enable future assessment of net economic value |

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| **Viet Nam Routine National Monitoring** |
|---|

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Economic value of tourism

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Tourism and recreation revenue | Number of domestic tourists visiting the basin | No. | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Number of international tourists visiting the basin | No. | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist length of trip | days | Province | Annual | TBC | General Statistics Office / Department of Travelling | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average international tourist length of trip | days | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average domestic tourist spend per trip-day | USD/day | Province | Annual | TBC | | National Budget | - | MS Excel | |
| Tourism and recreation revenue | Average international tourist spend per trip-day | USD/day | Province | Annual | TBC | | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency |
|---|---|---|
| TBC | TBC | General Statistics Office Department of Travelling |
| | | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| | GSO to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | |

| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
|---|---|---|---|
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| Identify and agree an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB. For example, using data on hotel stays | 1) Implement an approach to disaggregate data by international and domestic tourists and identify visitors to the LMB<br>2) Develop and implement plan for acquiring data on input costs for tourism to enable future assessment of net economic value<br>3) Disaggregate all data by province |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

| Viet Nam Routine National Monitoring | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension:** Economic | | | | | | | | | | | |
| **Strategic Indicator:** Economic Performance of MRC Sectors | | | **Assessment Indicators:** Economic cost of flood; Economic cost of drought | | | | | | | | |
| **Assessment Mechanism:** Regional assessment for SOBR every five years | | | | | | | | | | | |
| **Data Collection Mechanism:** Routine national monitoring and reporting | | | | | | | | | | | |

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Annual cost of flood damages | Cost of lost production for each crop type due to flooding | USD | Province | Annual | TBC | Department of Agriculture and Rural Development | National Budget | - | MS Excel | |
| Annual cost of flood damages | Government reported costs of flood damage to public and private infrastructure | USD | Province | Annual | TBC | Department of Agriculture and Rural Development | National Budget | - | MS Excel | |
| Annual cost of drought damages | Cost of lost production for each crop type due to drought | USD | Province | Annual | TBC | Department of Agriculture and Rural Development | National Budget | - | MS Excel | |
| Annual cost of drought damages | Government reported costs of drought damage | USD | Province | Annual | TBC | Department of Agriculture and Rural Development | National Budget | - | MS Excel | |
| Riverbank erosion losses | Area lost to riverbank erosion | km$^2$ | Province | Annual | TBC | Department of Transport | National Budget | - | MS Excel | |
| Riverbank erosion losses | Average value of land lost to riverbank erosion | USD/ha | Province | Annual | TBC | Department of Transport | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Department of Agriculture and Rural Development | |
| TBC | TBC | | Department of Transport | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | DARD and DoT to send by email to MRCS focal point according to Economic Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | 1) Disaggregate all data by province<br>2) Design revised survey approach to disaggregate data by type of loss due to flood and drought (i.e. agricultural production, infrastructure, assets) |

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**Viet Nam Routine National Monitoring**

**Dimension:** Economic

**Strategic Indicator:** Economic Performance of MRC Sectors | **Assessment Indicator:** Contribution of LMB water-related sectors to basin, national and regional GDP

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of basin, national and regional GDP met from basin resources | Gross Domestic Product (GDP) | USD | National; Province | Annual | National Accounts | General Statistics Office | National Budget | P | MS Excel | |
| n/a | GDP growth rate | USD | National; Province | Annual | National Accounts | General Statistics Office | National Budget | P | MS Excel | |
| Proportion of basin, national and regional GDP met from basin resources | GDP by LMB water-related sector | USD | National; Province | Annual | National Accounts | General Statistics Office | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| National Accounts | Gross Domestic Product at current prices (USD) National GDP growth rate (US%/annum) Gross Domestic Product at current prices by economic sector (USD) | | General Statistics Office | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | GSO to send by email to MRCS focal point according to Social Data MoU once every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | Develop and implement methodology to disaggregate GDP data by province |

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**Viet Nam Routine National Monitoring**

**Dimension:** Climate Change

**Strategic Indicator:** Greenhouse gas emissions | **Assessment Indicators:** Greenhouse gas emissions from LMB water-related sectors; Relative contribution to global emissions

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Routine national monitoring and reporting

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Greenhouse gas emissions from energy | Emissions from energy generation | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Greenhouse gas emissions from agriculture | Emissions from agriculture | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Greenhouse gas emissions from other land use, land use change and forestry | Emissions from land use, land use change and forestry | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Reduced greenhouse gas emissions from energy due to hydropower | Total amount of hydropower generated | MWh | Basin; Country | Annual | TBC | General Statistic Office / Vietnam Electricity | National Budget | - | MS Excel | |
| Emissions of carbon dioxide | Annual basin emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Emissions of carbon dioxide | Annual global emissions of $CO_2$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | MONRE (VEA) | National Budget | P | MS Excel | |
| Emissions of methane | Annual basin emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Emissions of methane | Annual global emissions of $CH_4$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | MONRE (VEA) | National Budget | P | MS Excel | |
| Emissions of nitrous oxide | Annual basin emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Emissions of nitrous oxide | Annual global emissions of $N_2O$ | $tCO_2$-e | Basin; Country | Annual | Climate Watch | MONRE (VEA) | National Budget | P | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency |
|---|---|---|---|
| TBC | TBC | | Ministry of Natural Resource and Environment (Vietnam Environment Administration) |
| TBC | TBC | | General Statistics Office Vietnam Electricity |
| | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** |
| | GSO and MONREA to send by email to MRCS focal point according to Climate Change Data MoU, every five years starting in 2022 | | Climate Watch historical greenhouse gas emissions by sector and gas |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | World Resources Institute | Download from website |
| **Data Acquisition and Generation Improvement Strategy** | | | |

| *Step 1* | *Step 2* |
|---|---|
| Implement an approach to estimating greenhouse gas emissions in the basin by apportioning national emissions by the relative output of each sector within the basin to national output | Develop an approach to estimate greenhouse gas emissions at a sub-national level that could be applied to the basin or province |

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| Viet Nam Routine National Monitoring | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Dimension:** Climate Change

**Strategic Indicator:** Adaptation to climate change | **Assessment Indicator:** Institutional response to the effects of climate change

**Assessment Mechanism:** Regional assessment for SOBR every five years

**Data Collection Mechanism:** Periodic national review

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Policies and strategies for climate change response | National climate change strategies | No. | National | Five yearly | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Provincial climate change strategies | No. | Province | Five yearly | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Policies and strategies for climate change response | Sectoral climate change strategies | No. | National | Five yearly | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Budget for climate change response | National climate change budget | USD | National | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Budget for climate change response | Provincial climate change budget | USD | Province | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Budget for climate change response | Sectoral climate change budget | USD | National | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Number of awareness-raising activities | Number of awareness-raising activities | No. | Basin | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |
| Access to climate finance | Receipt of international climate finance | USD | National | Annual | TBC | MONRE (VEA) | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | National Agency | | |
|---|---|---|---|---|
| TBC | TBC | Ministry of Natural Resource and Environment (Vietnam Environment Administration) | | |
| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | | |
| | MONRE to send by email to MRCS focal point according to Climate Change Data MoU once every five years starting in 2022 | | | |
| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | | Transmission |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| TBC | TBC |

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| **Viet Nam Routine National Monitoring** |
|---|

| **Dimension:** Climate Change |
|---|

| **Strategic Indicator:** Adaptation to climate change | **Assessment Indicators:** Flood protection measures; Drought protection measures |
|---|---|

| **Assessment Mechanism:** Regional assessment for SOBR every five years |
|---|

| **Data Collection Mechanism:** Periodic national monitoring and reporting |
|---|

| Monitoring Parameters | Data requirements | Units | Spatial Scale | Collection Frequency | Data Source | Responsible | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Area of urban land protected by embankments/levees | Land classification as urban land | Class | Basin | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Area of urban land protected by embankments/levees | Digital elevation model with flood mapping | DEM | Basin | Once | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Area of urban land protected by embankments/levees | Location, height and length of embankments | lat.long; m | Basin | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Land classification as agricultural land | Class | Basin | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Digital elevation model with flood mapping | DEM | Basin | Once | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Area of agricultural land protected by embankments/levees | Location, height and length of embankments | lat.long; m | Basin | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Proportion of irrigable land that is irrigated | Area of irrigated land | km$^2$ | Province | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Proportion of irrigable land that is irrigated | Area of irrigable land | km$^2$ | Province | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for urban use | m$^3$ | Province | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Volume of available water storage | Total volume of water reservoirs for agricultural use | m$^3$ | Province | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Volume of available water storage | Domestic water-use demands over the dry season | m$^3$ | Province | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |
| Volume of available water storage | Agricultural water-use demands over the dry season | m$^3$ | Province | Five yearly | TBC | Vietnam Disaster Management Authority | National Budget | - | MS Excel | |

| National Collection Mechanisms | Specified Existing Datasets | | National Agency | |
|---|---|---|---|---|
| TBC | TBC | | Vietnam Disaster Management Authority | |
| | | | | |
| | **Data Transmission Arrangements from MCs to MRCS** | | **Secondary evidence** | |
| | DPWTCP, LDD, DDPM and RID to send by email to MRCS focal point according to Social Data MoU every five years starting in 2022 | | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | | Organisation | Transmission |
| | Datasets prepared according to current practice. Data reviewed by PD focal point and uploaded to MRC-IS by MRCS data manager | | | |
| **Data Acquisition and Generation Improvement Strategy** | | | | |
| *Step 1* | | *Step 2* | | |
| TBC | | TBC | | |

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## B3: Routine MRC Monitoring

**Dimension:** Environment

**Strategic Indicators:** Water quality and sediment conditions in the mainstream; Climate Change Trends and Extremes

**Assessment Indicators:** Compliance of dry season flows with the PMFM; Compliance of flood season peak flows with the PMFM; Compliance of Tonle Sap reverse flows with the PMFM; Change in the timing of onset of wet season flows; Changes in temperature; Changes in Precipitation

**Assessment Mechanism:** Periodic MRC analysis

**Data Collection Mechanism:** Routine data collection under the hydro-meteorological monitoring activity

| Monitoring Parameters | Data requirements | Units | Assessment Scale | Collection Frequency | Data Source | MRCS Division | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Dry season water levels | Daily water levels | m | Mainstream Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Total Discharge | Date of onset | day | Mainstream Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Total Discharge | Date of offset | day | Mainstream Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Daily maximum temperature | Daily maximum temperature | ˚C | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Daily minimum temperature | Daily minimum temperature | ˚C | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Number of hot days | Daily maximum temperature | ˚C | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Number of cold nights | Daily maximum temperature | ˚C | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Number of cold days | Daily maximum temperature | ˚C | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Number of warm nights | Daily maximum temperature | ˚C | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Daily total rainfall | Daily rainfall | mm | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| 1-day maximum | Daily rainfall | mm | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| 5-day maximum | Daily rainfall | mm | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Consecutive wet days | Daily rainfall | mm | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |
| Consecutive dry days | Daily rainfall | mm | Basin Station | Annual | MRC Hydromet activity | TD | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency |
|---|---|---|
| Cambodia | As above for hydromet stations specified in ToR | Department of Hydrology and River Works; Department of Meteorology |
| Lao PDR | As above for hydromet stations specified in ToR | Department of Meteorology and Hydrology |
| Thailand | As above for hydromet stations specified in ToR | Department of Water Resources; Department of Meteorology |
| Viet Nam | As above for hydromet stations specified in ToR | Southern Region Hydro meteorological Centre; MONRE (Vietnam Environment Administration) |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| Cambodia | DHRW to transmit by email to MRCS focal point according to Environment Data MoU every day and DOM to transmit every year | |
| Lao PDR | DMH to transmit by email to MRCS focal point according to Environment Data MoU every day or every year, as necessary | |
| Thailand | DWR to transmit by email to MRCS focal point according to Environment Data MoU every day and DOM to transmit every year | |
| Viet Nam | SRHMC to transmit by email to MRCS focal point according to Environment Data MoU every day and VEA to transmit every year | |

| Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|
| As described in MRC Technical Guidelines for hydro-meteorological monitoring activity | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Nil | Nil |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

**Dimension:** Environment

**Strategic Indicator:** Water quality and sediment conditions in the mainstream | **Assessment Indicator:** Changes in Sediment Transport

**Assessment Mechanism:** Periodic MRC analysis

**Data Collection Mechanism:** Routine data collection under the Discharge and Sediment Monitoring activity

| Monitoring Parameters | Data requirements | Units | Assessment Scale | Collection Frequency | Data Source | MRCS Division | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Suspended sediment load | Concentration of suspended sediments | mg/L | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |
| Suspended sediment load | Stage | m | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |
| Suspended sediment load | Cross-sectional area | m² | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |
| Suspended sediment load | Flow | m³/s | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |
| Bed load | Volume of bed material | Ton | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | Technical |
| Grain-size distribution of suspended sediment load | Quantity of sand in suspended sediment sample | g | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | guidelines and methodology |
| Grain-size distribution of suspended sediment load | Quantity of silt in suspended sediment sample | g | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | still be agreed as part of |
| Grain-size distribution of suspended sediment load | Quantity of clay in suspended sediment sample | g | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | decentralisation process |
| Grain-size distribution of bed load | Quantity of sand in bed load sample | g | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |
| Grain-size distribution of bed load | Quantity of silt in bed load sample | g | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |
| Grain-size distribution of bed load | Quantity of clay in bed load sample | g | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |
| Grain-size distribution of bed load | Quantity of gravel in bed load sample | g | Station | Annual | MRC DSMP | TD | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency |
|---|---|---|
| Cambodia | As above for MRC Discharge and Sediment Monitoring Program at sampling locations specified in ToR | Department of Hydrology and River Works |
| Lao PDR | As above for MRC Discharge and Sediment Monitoring Program at sampling locations specified in ToR | Department of Meteorology and Hydrology |
| Thailand | As above for MRC Discharge and Sediment Monitoring Program at sampling locations specified in ToR | Department of Water Resources |
| Viet Nam | As above for MRC Discharge and Sediment Monitoring Program at sampling locations specified in ToR | Southern Region Hydro meteorological Centre |

| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence |
|---|---|---|
| Cambodia | Department of Hydrology and River Works to transmit by email to MRCS focal point according to Environment Data MoU every year starting in 2020 | MRC Water Quality monitoring of Total Suspended Sediments (TSS) |
| Lao PDR | Department of Meteorology and Hydrology to transmit by email to MRCS focal point according to Environment Data MoU once every year starting in 2020 | |
| Thailand | Department of Water Resources to transmit by email to MRCS focal point according to Environment Data MoU once every year starting 2020 | |
| Viet Nam | SRHMC to transmit by email to MRCS focal point according to Environment Data MoU once every year starting in 2020 | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|---|
| | As described in MRC Discharge and Sediment Monitoring Program Methodology and Technical Guidelines | MRC | Water Quality Monitoring Activity |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Agree to scope of methodology design and implement consistent with DSMP and ToR | Investigate expansion of discharge and sediment monitoring to sampling locations on major tributaries, especially in consideration of coordination hydropower operations |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

| **Dimension:** Environment | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Strategic Indicator:** Water quality and sediment conditions in the mainstream | | | | **Assessment Indicator:** Ecological health, and water quality compliance with the PWQ | | | | | |
| **Assessment Mechanism:** Periodic MRC analysis | | | | | | | | | |
| **Data Collection Mechanism:** Routine data collection under the water quality monitoring activity | | | | | | | | | |

| Monitoring Parameters | Data requirements | Units | Assessment Scale | Collection Frequency | Data Source | MRCS Division | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| DO | DO | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| pH | pH | - | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| COD | COD | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| BOD | BOD | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| $NH_3$ | $NH_4$-N | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | Oil and grease and phenols need to be added to routine data collection |
| $NH_3$ | Temp | °C | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| $NH_3$ | pH | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| $NO_{2\,3}$-N | $NO_{2\,3}$-N | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Total Phosphorous | Total Phosphorous | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Total Nitrogen | Total Nitrogen | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Total Suspended Solids | Total Suspended Solids | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Electrical Conductivity | Electrical Conductivity | mS/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Faecal coliforms | Faecal coliforms | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Oil and grease | Oil and grease | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Phenol | Phenol | mg/L | Station | Monthly | MRC Water Quality Monitoring | ED | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency |
|---|---|---|
| Cambodia | As above for MRC water quality monitoring at sampling locations specified in ToR | Department of Hydrology and River Works |
| Lao PDR | As above for MRC water quality monitoring at sampling locations specified in ToR | Ministry of Natural Resources and Environment |
| Thailand | As above for MRC water quality monitoring at sampling locations specified in ToR | Department of Water Resources |
| Viet Nam | As above for MRC water quality monitoring at sampling locations specified in ToR | Southern Region Hydro meteorological Centre |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** |
| Cambodia | Department of Hydrology and River Works to transmit by email to MRCS focal point according to Environment Data MoU every year | MRC Discharge and Sediment Monitoring for Concentration of Suspended Sediments |
| Lao PDR | Department of Meteorology and Hydrology to transmit by email to MRCS focal point according to Environment Data MoU once every year | |
| Thailand | Department of Water Resources to transmit by email to MRCS focal point according to Environment Data MoU once every year | |
| Viet Nam | SRHMC to transmit by email to MRCS focal point according to Environment Data MoU once every year | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|---|
| | As described in MRC Water Quality Monitoring Methodology and Technical Guidelines | MRC | DSMP Monitoring Activity |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| Develop and implement technical guidelines and methods for including oil and grease and phenol within routine MRC water quality monitoring | Nil |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

| Dimension: Environment | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Strategic Indicator:** Water quality and sediment conditions in the mainstream | | | | **Assessment Indicator:** Ecological health, and water quality compliance with the PWQ | | | | | | |
| **Assessment Mechanism:** Periodic MRC analysis | | | | | | | | | | |
| **Data Collection Mechanism:** Routine data collection under the water quality monitoring activity | | | | | | | | | | |

| Monitoring Parameters | Data requirements | Units | Assessment Scale | Collection Frequency | Data Source | MRCS Division | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of diatoms | Number of diatoms | No. | Station | Biennial | MRC EHM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Number of benthic macroinvertebrates | Number of benthic macroinvertebrates | No. | Station | Biennial | MRC EHM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Number of littoral macroinvertebrates | Number of littoral macroinvertebrates | No. | Station | Biennial | MRC EHM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Zooplankton | Zooplankton | No. | Station | Biennial | MRC EHM Monitoring | ED | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency | |
|---|---|---|---|
| Cambodia | As above for MRC EHM at sampling locations specified in ToR | Ministry of Agriculture, Forestry and Fisheries (FiA) | |
| Lao PDR | As above for MRC EHM at sampling locations specified in ToR | NRERI | |
| Thailand | As above for MRC EHM at sampling locations specified in ToR | Department of Water Resources | |
| Viet Nam | As above for MRC EHM at sampling locations specified in ToR | Southern Region Hydro meteorological Centre | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| Cambodia | FiA to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| Lao PDR | NRERI to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| Thailand | Department of Water Resources to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| Viet Nam | SRHMC to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | As described in EHM Methodology and Technical Guidelines | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| Nil | Nil |

A* = Accessibility (P: Public; R: Restricted; C: Confidential)

| **Dimension:** Environment | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Strategic Indicator:** Water quality and sediment conditions in the mainstream | | | | | **Assessment Indicator:** Ecological health, and water quality compliance with the PWQ | | | | | |
| **Assessment Mechanism:** Periodic MRC analysis | | | | | | | | | | |
| **Data Collection Mechanism:** Routine data collection under the water quality monitoring activity | | | | | | | | | | |

| **Monitoring Parameters** | **Data requirements** | **Units** | **Assessment Scale** | **Collection Frequency** | **Data Source** | **MRCS Division** | **Resourcing** | **A\*** | **Format** | **Notes** |
|---|---|---|---|---|---|---|---|---|---|---|
| Fish abundance | Biomass of migratory fish landed | Tonne | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fish abundance | Biomass of non-migratory fish landed | Tonne | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fish abundance | Number of larvae/juvenile in drift | No. | Basin | Annual | MRC Larvae Drift Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fishing effort | Time spent fishing per gear (gillnets) | hours | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fishing effort | Total amount of gear used (gillnets) | m$^2$ | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fish size | Average length of fish caught | cm | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fish diversity by species | Composition of catch by species | kg and % | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fish diversity by species | Number of larvae/juvenile species in drift | No. | Basin | Annual | MRC Larvae Drift Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fish diversity by guild | Composition of catch by guild | kg and % | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |
| Fish diversity by exotics | Composition of catch by exotic species | kg and % | Basin | Annual | MRC FADM Monitoring | ED | MRC SP and AWP | R | MS Excel | |

| | **Specified Datasets** | **National Agency** | |
|---|---|---|---|
| Cambodia | As above for MRC FADM and LADM at sampling locations specified in ToR | Ministry of Agriculture, Forestry and Fisheries (FiA) | |
| Lao PDR | As above for MRC FADM and LADM at sampling locations specified in ToR | LARReC | |
| Thailand | As above for MRC FADM and LADM at sampling locations specified in ToR | Department of Fisheries | |
| Viet Nam | As above for MRC FADM and LADM at sampling locations specified in ToR | National Fisheries Administration | |
| | **Data Transmission Arrangements from MCs to MRCS** | **Secondary evidence** | |
| Cambodia | FiA to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| Lao PDR | LARReC to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| Thailand | Department of Fisheries to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| Viet Nam | National Fisheries Administration to transmit by email to MRCS focal point according to Environment Data MoU every year | | |
| | **Data Processing Arrangements within MCs and at MRCS including QA/QC** | **Organisation** | **Transmission** |
| | As described in FADM and LADM Methodology and Technical Guidelines | | |

| **Data Acquisition and Generation Improvement Strategy** | |
|---|---|
| *Step 1* | *Step 2* |
| Implement new methodology for consistent mesh size across sampling locations | Nil |

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| **Dimension:** Cooperation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Strategic Indicator:** Benefits derived from cooperation | | | | | **Assessment Indicator:** Joint efforts on projects of basin-wide significance and with potential transboundary impacts; Partnerships between the MRC and other parties; Proportion of benefits derived from cooperation to total economic value of all LMB water-related sectors | | | | | | |
| **Assessment Mechanism:** Periodic MRC analysis | | | | | | | | | | | |
| **Data Collection Mechanism:** Routine data collection under the basin planning activity | | | | | | | | | | | |

| Monitoring Parameters | Data requirements | Units | Assessment Scale | Collection Frequency | Data Source | MRCS Division | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Quantity of projects of basin-wide significance | Number of joint projects and projects of basin-wide significance | No. | Basin | Annual | National Indicative Plans | PD | MRC SP and AWP | R | MS Excel | |
| Value of projects of basin-wide significance | Cost of project investment | USD | Basin | Annual | National Indicative Plans | PD | MRC SP and AWP | R | MS Excel | |
| Value of projects of basin-wide significance | Expected future cash flow from project | USD/ annum | Basin | Annual | National Indicative Plans | PD | MRC SP and AWP | R | MS Excel | |
| Value of projects of basin-wide significance | Discount rate | % | Basin | Annual | National Accounts | PD | MRC SP and AWP | R | MS Excel | |
| Value of projects of basin-wide significance | Time period of returns | years | Basin | Annual | National Indicative Plans | PD | MRC SP and AWP | R | MS Excel | |
| Quantity of transboundary projects notified | Number of transboundary projects notified | No. | Basin | Annual | PNPCA notifications | PD | MRC SP and AWP | R | MS Excel | |
| Value of transboundary projects notified | Cost of project investment | USD | Basin | Annual | PNPCA notifications | PD | MRC SP and AWP | R | MS Excel | |
| Value of transboundary projects notified | Expected future cash flow from project | USD/a nnum | Basin | Annual | PNPCA notifications | PD | MRC SP and AWP | R | MS Excel | |
| Value of transboundary projects notified | Discount rate | % | Basin | Annual | National Accounts | PD | MRC SP and AWP | R | MS Excel | |
| Value of transboundary projects notified | Time period of returns | years | Basin | Annual | PNPCA notifications | PD | MRC SP and AWP | R | MS Excel | |
| Number of joint projects with other parties | Number of joint projects with other parties | No. | Basin | Annual | National reporting | PD | MRC SP and AWP | R | MS Excel | |
| Value of joint projects with other parties | Cost of project investment | USD | Basin | Annual | National reporting | PD | MRC SP and AWP | R | MS Excel | |
| Value of joint projects with other parties | Expected future cash flow from project | USD/a nnum | Basin | Annual | National reporting | PD | MRC SP and AWP | R | MS Excel | |
| Value of joint projects with other parties | Discount rate | % | Basin | Annual | National Accounts | PD | MRC SP and AWP | R | MS Excel | |
| Value of joint projects with other parties | Time period of returns | years | Basin | Annual | National reporting | PD | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency | |
|---|---|---|---|
| Cambodia | n/a | CNMCS | |
| Lao PDR | n/a | LNMCS | |
| Thailand | n/a | TNMCS | |
| Viet Nam | n/a | VNMCS | |
| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
| Cambodia | National Indicative Plans submitted by CNMC at start of planning cycle; PNCPA notifications submitted, as required | | |
| Lao PDR | National Indicative Plans submitted by LNMC at start of planning cycle; PNCPA notifications submitted, as required | | |
| Thailand | National Indicative Plans submitted by TNMC at start of planning cycle; PNCPA notifications submitted, as required | | |
| Viet Nam | National Indicative Plans submitted by VNMC at start of planning cycle; PNCPA notifications submitted, as required | | |
| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
| | According to standard arrangements for MRC Project database | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| Implement using simple financial analysis of project costs and expected future returns | Develop and implement methodology and data collection approach to consider the full economic costs and benefits of projects, enabling Net Present Value to be determined |

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**Dimension:** Cooperation

**Strategic Indicator:** Benefits derived from cooperation | **Assessment Indicator:** Extent of knowledge-sharing activities

**Assessment Mechanism:** Periodic MRC analysis

**Data Collection Mechanism:** Routine data collection

| Monitoring Parameters | Data requirements | Units | Assessment Scale | Collection Frequency | Data Source | MRCS Division | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of events (symposia, fora, training) | Number of events (symposia, fora, training) | No. | Basin | Annual | Internal MRCS Statistics | OCEO | MRC SP and AWP | R | MS Excel | |
| Number of joint studies and assessments undertaken | Number of joint studies and assessments undertaken | No. | Basin | Annual | Internal MRCS Statistics | OCEO | MRC SP and AWP | R | MS Excel | |
| Number of information products disseminated | Number of information products disseminated | No. | Basin | Annual | Internal MRCS Statistics | OCEO | MRC SP and AWP | R | MS Excel | |
| Number of data downloads | Number of data downloads from outside the MRCS | No. | Basin | Annual | Internal MRCS Statistics | OCEO | MRC SP and AWP | R | MS Excel | |
| Number of partnerships and agreements in place | Number of partnerships and agreements in place | No. | Basin | Annual | Internal MRCS Statistics | OCEO | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency |
|---|---|---|
| Cambodia | n/a | CNMCS |
| Lao PDR | n/a | LNMCS |
| Thailand | n/a | TNMCS |
| Viet Nam | n/a | VNMCS |
| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence |
| Cambodia | n/a | |
| Lao PDR | n/a | |
| Thailand | n/a | |
| Viet Nam | n/a | |

| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
|---|---|---|---|
| | According to standard arrangements for MRC cooperation database | | |

**Data Acquisition and Generation Improvement Strategy**

| *Step 1* | *Step 2* |
|---|---|
| Agree definitions and scope of each monitoring parameter and collect data through routine annual report coordination mechanisms | Identify opportunities to expand scope from internal MRCS events and products to broader cooperation between Member Countries and other parties |

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| Dimension: Cooperation | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|

**Strategic Indicator:** Self-finance of the MRC     **Assessment Indicator:** Proportion of MRC budget funded by national contributions during the current period

**Assessment Mechanism:** Periodic MRC analysis

**Data Collection Mechanism:** Routine data collection

| Monitoring Parameters | Data requirements | Units | Assessment Scale | Collection Frequency | Data Source | MRCS Division | Resourcing | A* | Format | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| MRC budget (basket and earmarked funds) | Total MRC budget over defined period | USD | Basin | Annual | MRCS Budget | AD | MRC SP and AWP | R | MS Excel | |
| Total of national contributions to MRC budget | National contributions to MRC budget over defined period | USD | Basin | Annual | MRCS Budget | AD | MRC SP and AWP | R | MS Excel | |

| | Specified Datasets | National Agency | |
|---|---|---|---|
| Cambodia | n/a | CNMCS | |
| Lao PDR | n/a | LNMCS | |
| Thailand | n/a | TNMCS | |
| Viet Nam | n/a | VNMCS | |
| | Data Transmission Arrangements from MCs to MRCS | Secondary evidence | |
| Cambodia | n/a | | |
| Lao PDR | n/a | | |
| Thailand | n/a | | |
| Viet Nam | n/a | | |
| | Data Processing Arrangements within MCs and at MRCS including QA/QC | Organisation | Transmission |
| | According to standard MRC budget arrangements | | |

| Data Acquisition and Generation Improvement Strategy | |
|---|---|
| *Step 1* | *Step 2* |
| Nil | Nil |

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# APPENDIX C: LIST OF DATA CUSTODIANS

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
| --- | --- | --- | --- | --- | --- |
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Adequacy of dietary energy supply | Population | National Institute of Statistics | Lao Bureau of Statistics | Department of provincial administration | General Statistics Office |
| Adequacy of dietary energy supply | Quantity of rice produced for food | Ministry of Agriculture | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Office of Agricultural Economics | General Statistics Office |
| Adequacy of dietary energy supply | Proportion of dietary energy coming from rice | Ministry of Agriculture | Department of Planning and Cooperation, Ministry of Health | n/a | General Statistics Office |
| Income per person | Household income/expenditure | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Income per person | Household size | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Prevalence of undernourishment | Proportion of population undernourished | | Department of Planning and Cooperation, Ministry of Health | n/a | General Statistics Office |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting stunting | National Institute of Statistics | Department of Planning and Cooperation, Ministry of Health / Ministry of Education? | National Statistics Office | General Statistics Office |
| Prevalence of infant malnutrition | Proportion of children <5 yrs old exhibiting wasting | National Institute of Statistics | Department of Planning and Cooperation, Ministry of Health / Ministry of Education? | National Statistics Office | General Statistics Office |
| Adequacy of domestic water supply | Households with access to water supplies from an improved source | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Adequacy of domestic water supply | Total number of households within each spatial unit | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Sufficiency of water for farming | Irrigation area within each spatial unit | Ministry of Agriculture / MOWRAM | Ministry of Agriculture and Forestry | Royal Irrigation Department | General Statistics Office |
| Sufficiency of water for farming | Area with moderate/high risk of drought within each spatial unit | Mekong River Commission | Mekong River Commission | Mekong River Commission, National disaster prevention | Mekong River Commission |
| Access to safe water supplies | Households with access to water supplies that meet drinking water standards | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Access to safe water supplies | Total number of households within each spatial unit | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Prevalence of malnutrition | Proportion of population suffering malnutrition | | Department of Cooperation and Planning, Ministry of Health | Department of Health, NSO | General Statistics Office |
| Access to sanitation | Households with access to sanitation facilities | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Access to sanitation | Total number of households within each spatial unit | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Incidence of water-borne disease | Population | National Institute of Statistics | Lao Bureau of Statistics | Department of Health | General Statistics Office |
| Incidence of water-borne disease | No. of reported cases of malaria | National Centre for Parasitology, Entomology and Malaria Control | Department of Cooperation and Planning, Ministry of Health | Department of Disease Control | National Institute of Malariology, parasitology, and entomology |
| Incidence of water-borne disease | No. of reported cases of dengue | National Centre for Parasitology, Entomology and Malaria Control | Department of Cooperation and Planning, Ministry of Health | Department of Disease Control | National Institute of Malariology, parasitology, and entomology |
| Incidence of water-borne disease | No. of reported outbreaks of cholera | National Centre for Parasitology, Entomology and Malaria Control | Department of Cooperation and Planning, Ministry of Health | Department of Disease Control | General Statistics Office |
| Urban household electrification rate | Urban households with access to electricity supply | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Urban household electrification rate | Total number of urban households within each spatial unit | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Rural household electrification rate | Rural households with access to electricity supply | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Rural household electrification rate | Total number of rural households within each spatial unit | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Proportion of working age population employed in water-related sectors | Working age population | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Proportion of working age population employed in water-related sectors | No. of people primarily employed in each LMB water-related sector | National Institute of Statistics | Department of Planning and Cooperation, Ministry of Labour and Social Welfare | National Statistics Office | General Statistics Office |
| Proportion of working age population employed in water-related sectors | Employment rate across the basin | National Institute of Statistics | Department of Planning and Cooperation, Ministry of Labour and Social Welfare | National Statistics Office | General Statistics Office |
| Proportion of working age population employed in water-related sectors | Gross annual economic value of each sector | National Institute of Statistics | Lao Bureau of Statistics | Office of national economics and social development council | General Statistics Office |
| Sufficiency of household income | Household income/expenditure | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Sufficiency of household income | Household size | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Sufficiency of household assets | Household asset value | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Sufficiency of household assets | No. of rural households owning land | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Sufficiency of household assets | Total number of rural households within each spatial unit | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Female-male ratio of people employed in LMB water-related sectors | Number of jobs in each LMB water-related sector occupied by females | National Institute of Statistics | Department of Planning and Cooperation, Ministry of Labour and Social Welfare | National Statistics Office | General Statistics Office |
| Gender equality in education | Number of girls and boys attending primary education | National Institute of Statistics | Statistics of Information and Technology Center, Ministry of Education and Sports | National Statistics Office | General Statistics Office |
| Gender equality in education | Number of primary age girls and boys in the community | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Gender equality in ownership of land | Number of agricultural households headed by males | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Gender equality in ownership of land | Number of agricultural households headed by females | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Gender equality in ownership of land | Number of agricultural households headed by males that own land | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Gender equality in ownership of land | Number of agricultural households headed by females that own land | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Dry season water levels | Daily water levels | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Stage | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Channel cross-sectional area | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Flow | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Flood season water levels | Daily water levels | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Stage | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Channel cross-sectional area | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Flow | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Accumulated reverse flow volume | Daily water levels | MOWRAM | DMH | n/a | Southern Regional Hydrometeorological services |
| Accumulated reverse flow volume | Channel cross-sectional area | MOWRAM | Dept. of Waterways | n/a | Southern Regional Hydrometeorological services |
| Accumulated reverse flow volume | Flow | MOWRAM | DMH | n/a | Southern Regional Hydrometeorological services |

| Monitoring Parameter | Dataset | Cambodia | Lao PDR | Thailand | Viet Nam |
|---|---|---|---|---|---|
| | | | **Data Custodian in Each Country** | | |
| Discharge | Daily water levels | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Channel cross-sectional area | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Flow | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Date of onset | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Discharge | Date of offset | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| DO | DO | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| pH | pH | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| COD | COD | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| BOD | BOD | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| $NH_3$ | $NH_4$-N | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| $NH_3$ | Temp | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| $NH_3$ | pH | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| $NO_{2-3}$-N | $NO_{2-3}$-N | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| Total Phosphorous | Total Phosphorous | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| Total Nitrogen | Total Nitrogen | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| Total Suspended Solids | Total Suspended Solids | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| Electrical Conductivity | Electrical Conductivity | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| Heavy Metals | Arsenic | MOWRAM | NRERI | | |
| Heavy Metals | Lead | MOWRAM | NRERI | | |
| Heavy Metals | Cadmium | MOWRAM | NRERI | | |
| Heavy Metals | Mercury | MOWRAM | NRERI | | |
| Heavy Metals | Cyanide | MOWRAM | NRERI | | |
| Heavy Metals | Chromium Hexavalent | MOWRAM | NRERI | | |
| Faecal coliforms | Faecal coliforms | MOWRAM | MONRE | Department of Water Resources | Southern Regional Hydrometeorological services |
| Pesticides | Pesticides | MOWRAM | NRERI | | |
| Oil and grease | Oil and grease | MOWRAM | Department of Waterways | | |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Phenol | Phenol | MOWRAM | Department of Waterways | | |
| Diatoms | No. of diatoms | MAFF | NRERI | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Benthic macroinvertebrates | No. of benthic invertebrates | MAFF | NRERI | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Littoral macroinvertebrates | No. of littoral invertebrates | MAFF | NRERI | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Zooplankton | No. of zooplankton | MAFF | NRERI | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Suspended sediment load | Concentration of suspended sediments | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Suspended sediment load | Stage | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Suspended sediment load | Channel cross-sectional area | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Suspended sediment load | Flow | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Bed load | Volume of bed material | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Grain-size distribution of suspended sediment load | Quantity of sand in suspended sample | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Grain-size distribution of suspended sediment load | Quantity of silt in suspended sample | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Grain-size distribution of suspended sediment load | Quantity of clay in suspended sample | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Grain-size distribution of bed load | Quantity of sand in bed sample | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Grain-size distribution of bed load | Quantity of silt in bed sample | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Grain-size distribution of bed load | Quantity of clay in bed sample | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Grain-size distribution of bed load | Quantity of gravel in bed sample | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorologic al services |
| Area affected by salinity >1 mg/L | Electrical Conductivity at delta monitoring stations | MOWRAM | N/A | n/a | Southern Regional Hydrometeorologic al services |
| Area affected by salinity >4 mg/L | Electrical Conductivity at delta monitoring stations | MOWRAM | N/A | n/a | Southern Regional Hydrometeorologic al services |
| Flooded forest area | Polygons of FAO land cover class type FF | MoE | DWR (non-Ramsar); DEQP (Ramsar) | Land Development Department (LDD)/ONEP | |
| Flooded forest area | Polygons of FAO land cover class type FF | MoE | DWR (non-Ramsar); DEQP (Ramsar) | Land Development Department (LDD)/ONEP | |
| Inundated grassland area | Polygons of FAO land cover class type GR | MoE | DWR (non-Ramsar); DEQP (Ramsar) | Land Development Department (LDD)/ONEP | |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Marsh or swamp area | Polygons of FAO land cover class type M/S | MoE | DWR (non-Ramsar); DEQP (Ramsar) | Land Development Department (LDD)/ONEP | |
| Inundated rice field area | Polygons of FAO land cover class type PR | MAFF-DPS | DWR (non-Ramsar); DEQP (Ramsar) | Land Development Department (LDD)/ONEP | |
| Mangrove area | Polygons of FAO land cover class type Mn | MAFF-DPS | DWR (non-Ramsar); DEQP (Ramsar) | | |
| Water body area | Polygons of FAO land cover class type WA | | DWR (non-Ramsar); DEQP (Ramsar) | Land Development Department (LDD)/ ONEP | |
| Aquaculture area | Polygons of FAO land cover class type AQ | MAFF-FiA | DWR (non-Ramsar); DEQP (Ramsar) | Land Development Department (LDD)/ ONEP | |
| Area of sandy habitat | Area of exposed sandy habitat | MoE & MAFF | Department of Waterways | | |
| Area of sandy habitat | Area of inundated sandy habitat | MoE & MAFF | Department of Waterways | | |
| Area of sandy habitat | Daily maximum water level | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Area of sandy habitat | Daily minimum water level | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Area of rocky habitat | Area of rocky habitats | MPWT-DWIP & MAFF -FiA | Department of Waterways | | |
| Area of rocky habitat | Daily maximum water level | MOWRAM | DMH | Department of Water Resources | |
| Area of rocky habitat | Daily minimum water level | MOWRAM | DMH | Department of Water Resources | |
| Depth of deep pools | Location of deep pools | MPWT-DWIP & MAFF -FiA | LARReC | | |
| Depth of deep pools | Daily maximum water level | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Depth of deep pools | Daily minimum water level | MOWRAM | DMH | Department of Water Resources | Southern Regional Hydrometeorological services |
| Area of vegetated riparian habitat | Area of riparian zone containing vegetation | Ministry of Environment | | | |
| Area of vegetated riparian habitat | Total area of riparian zone | Ministry of Environment | | | |
| Mangrove area | Polygons of FAO land cover class type Mn | MAFF-DPS | DWR (non-Ramsar); DEQP (Ramsar) | n/a | |
| Area of riverbank erosion | Net area of land lost to riverbank erosion | MPWT-DWIP & MOWRAM | Department of Waterways - Division of planning and budgeting | TNMCS | |
| Area of coastal erosion | Net area of land lost to coastal erosion | n/a | n/a | n/a | |
| Fish abundance | Biomass of migratory fish landed | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish abundance | Biomass of non-migratory fish landed | FiA | LARReC | | National Fisheries Administration |
| Fish abundance | Number of larvae/juvenile in drift | FiA | LARReC | | National Fisheries Administration |
| Fishing effort | Time spent fishing per gear (gillnets) | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fishing effort | Total amount of gear used (gillnets) | FiA | LARReC | Department of Fisheries | National Fisheries Administration |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Fish size | Average length of fish caught | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of catch by species | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of white fish | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of grey fish | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of black fish | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of generalists | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of estuarine residents | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of anadromous fish | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of catadromous fish | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of marine visitors | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Fish diversity | Composition of exotic species | FiA | LARReC | | National Fisheries Administration |
| Fish diversity | Number of larvae/juvenile species in drift | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| OAA/P abundance | Biomass of OAA/P harvested | FiA | LARReC | Department of Fisheries | Provincial Fisheries |
| OAA/P harvest effort | Time spent harvesting OAA/P | FiA | LARReC | Department of Fisheries | Provincial Fisheries |
| OAA/P diversity | Harvest of Crabs | FiA | LARReC | Department of Fisheries | Provincial Fisheries |
| OAA/P diversity | Harvest of Shrimp | FiA | LARReC | Department of Fisheries | Provincial Fisheries |
| OAA/P diversity | Harvest of Water Snakes | FiA | LARReC | Department of Fisheries | Provincial Fisheries |
| OAA/P diversity | Harvest of Other OAA/P | FiA | LARReC | Department of Fisheries | Provincial Fisheries |
| Diversity and abundance of introduced species | Biomass of introduced species caught | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Diversity and abundance of introduced species | Number of different introduced species caught | FiA | LARReC | Department of Fisheries | National Fisheries Administration |
| Abundance of other wetland-dependent biodiversity | No. of Dolphins | FiA | DLF | n/a | |
| Abundance of other wetland-dependent biodiversity | No. of water-birds | MoE & MAFF | Department of forestry | n/a | MONRE |
| Abundance of other wetland-dependent biodiversity | No. of water-bird species | MoE & MAFF | Department of forestry | n/a | MONRE |
| Abundance of other wetland-dependent biodiversity | No. of threatened aquatic species extinct | IUCN | IUCN | IUCN | IUCN |
| Abundance of other wetland-dependent biodiversity | No. of threatened aquatic species critically endangered | IUCN | IUCN | IUCN | IUCN |
| Abundance of other wetland-dependent biodiversity | No. of threatened aquatic species endangered | IUCN | IUCN | IUCN | IUCN |
| Abundance of other wetland-dependent biodiversity | No. of threatened aquatic species vulnerable | IUCN | IUCN | IUCN | IUCN |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Extent of natural land cover in ecologically significant areas | Area of natural land cover | MoE | Department of Forestry | Department of Forestry/ DNP | |
| Extent of natural land cover in ecologically significant areas | Total area of environmentally significant areas | MoE | Department of Forestry | Department of Forestry/ DNP | |
| Protection status of ecologically significant areas | Area of each environmentally significant area covered by IUCN protection category | UNEP | UNEP | UNEP | UNEP |
| Protection status of ecologically significant areas | Area of each environmentally significant area covered by IUCN protection category | UNEP | UNEP | UNEP | UNEP |
| Protection status of ecologically significant areas | Area of each environmentally significant area covered by IUCN protection category | UNEP | UNEP | UNEP | UNEP |
| Protection status of ecologically significant areas | Area of each environmentally significant area covered by IUCN protection category | UNEP | UNEP | UNEP | UNEP |
| Protection status of ecologically significant areas | Area of each environmentally significant area covered by IUCN protection category | UNEP | UNEP | UNEP | UNEP |
| Protection status of ecologically significant areas | Area of each environmentally significant area covered by IUCN protection category | UNEP | UNEP | UNEP | UNEP |
| Protection status of ecologically significant areas | Area of each environmentally significant area covered by IUCN protection category | UNEP | UNEP | UNEP | UNEP |
| Area of broadleaved deciduous | Polygons of FAO land cover class type BD | MoE & MAFF | Department of Forestry | Department of Forestry/ DNP | |
| Area of broadleaved evergreen | Polygons of FAO land cover class type BE | MoE & MAFF | Department of Forestry | Department of Forestry/ DNP | |
| Area of industrial plantation | Polygons of FAO land cover class type IP | MoE & MAFF | Department of Forestry | Department of Forestry/ DNP | |
| Area of forest plantation | Polygons of FAO land cover class type FP | MoE & MAFF | Department of Forestry | Department of Forestry/ DNP | |
| Area of bamboo forest | Polygons of FAO land cover class type BaF | MoE & MAFF | Department of Forestry | Department of Forestry/ DNP | |
| Area of coniferous forest | Polygons of FAO land cover class type CoF | MoE & MAFF | Department of Forestry | Department of Forestry/ DNP | |
| Irrigated agriculture production | Total cropped area for each crop | National Institute of Statistics and MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Office of Agricultural Economics | General Statistics Office |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Irrigated agriculture production | Annual yield for each crop | National Institute of Statistics and MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Office of Agricultural Economics | General Statistics Office |
| Recession rice production | Total cropped area | National Institute of Statistics and MAFF | n/a | n/a | General Statistics Office |
| Recession rice production | Annual yield | National Institute of Statistics and MAFF | n/a | n/a | General Statistics Office |
| Riverbank gardens | Total cropped area for each crop | MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | TNMCS | General Statistics Office |
| Riverbank gardens | Annual yield for each crop | MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | TNMCS | General Statistics Office |
| Rain fed cultivation | Total cropped area for each crop | National Institute of Statistics and MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Office of Agricultural Economics | General Statistics Office |
| Rain fed cultivation | Annual yield for each crop | National Institute of Statistics and MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Office of Agricultural Economics | General Statistics Office |
| Agricultural prices | Average farm gate price for each irrigated crop | | Department of Industry and Commerce, Lao Bureau of Statistics | Office of Agricultural Economics | Department of Agriculture and Rural Development |
| Agricultural prices | Average farm gate price for recession rice | | n/a | Office of Agricultural Economics | Department of Agriculture and Rural Development |
| Agricultural prices | Average farm gate price for each riverbank garden crop | | Department of Industry and Commerce, Lao Bureau of Statistics | n/a | Department of Agriculture and Rural Development |
| Agricultural prices | Average farm gate price for each rain-fed crop | | Department of Industry and Commerce, Lao Bureau of Statistics | Office of Agricultural Economics | Department of Agriculture and Rural Development |
| Hydropower production for domestic consumption | Total production of hydropower for domestic consumption | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand | General Statistics Office; Vietnam Electricity |
| Hydropower production for export | Total production of hydropower exported | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand | General Statistics Office; Vietnam Electricity |
| Hydropower prices | Average unit price of power in domestic consumption | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Office of Energy Regulatory Commission | Vietnam Electricity |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Hydropower prices | Average unit price of power in import countries | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand | Vietnam Electricity |
| Volume of cargo transport | Annual total quantity of ITW cargo transported along the mainstream | Ministry of Public Works and Transport | Department of Planning and Cooperation, Ministry of Public Works and Transport | Marine Department | General Statistics Office |
| Passenger transport numbers | Annual total number of passenger trips made along the mainstream | Ministry of Public Works and Transport | Department of Planning and Cooperation, Ministry of Public Works and Transport | Marine Department | General Statistics Office |
| Navigation prices | Average price of transporting cargo | Phnom Penh Autonomous Port | Department of Planning and Cooperation, Ministry of Public Works and Transport | Marine Department | Department of Transport |
| Navigation prices | Average price of each passenger trip | Phnom Penh Autonomous Port | Department of Planning and Cooperation, Ministry of Public Works and Transport | Marine Department | Department of Transport |
| Sand mining production | Annual total quantity of aggregates, sands and sediments abstracted for commercial purposes | Department of Sand Mining and Construction | Ministry of Public Works and Transport | n/a | Department of Natural Resources and Environment |
| Sand mining prices | Average selling price of aggregates, sands and sediments | Department of Sand Mining and Construction | Ministry of Public Works and Transport | n/a | Department of Natural Resources and Environment |
| Flooded forest ecosystem services production | Total area of flooded forest | | | Royal Forest Department | General Statistics Office; Forest Inventory and Planning Institute |
| Wetland ecosystem services prices | Unit area productive value of flooded forests | | | Royal Forest Department | General Statistics Office; Forest Inventory and Planning Institute |
| Inundated grassland ecosystem services production | Total area of inundated grassland | | | Royal Forest Department | Department of Agriculture and Rural Development / Agriculture Research Institutes |
| Wetland ecosystem services prices | Unit area productive value of inundated grassland | | | Royal Forest Department | Department of Agriculture and Rural Development / Agriculture Research Institutes |
| Marshes and swamps ecosystem services production | Total area of marshes and swamps | | | Royal Forest Department | Forest Inventory and Planning Institute |
| Wetland ecosystem services prices | Unit area productive value of marshes and swamps | | | Royal Forest Department | Department of Natural Resources and Environment / Forest Inventory and Planning Institute |

| Monitoring Parameter | Dataset | Cambodia | Lao PDR | Thailand | Viet Nam |
|---|---|---|---|---|---|
| | | | **Data Custodian in Each Country** | | |
| Mangrove ecosystem services production | Total area of mangrove | | | Royal Forest Department | General Statistics Office; Forest Inventory and Planning Institute |
| Wetland ecosystem services prices | Unit area productive value of mangroves | | | Royal Forest Department | General Statistics Office; Forest Inventory and Planning Institute |
| Water bodies ecosystem services production | Total area of water bodies | | | Marine Department | General Office of Irrigation |
| Wetland ecosystem services prices | Unit area productive value of water bodies | | | Marine Department | General Office of Irrigation |
| Fisheries production from rivers and major flood zones | Fish yield from rivers and major flood zones | FiA/ MAFF | LARReC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| Fisheries production from rivers and major flood zones | Area of rivers and major flood zones | FiA/ MAFF | LARReC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| Fisheries production from rain-fed zones | Fish yield from rain-fed zones | FiA/ MAFF | LARReC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| Fisheries production from rain-fed zones | Area of rain-fed zones | FiA/ MAFF | LARReC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| Fisheries production from large water bodies including reservoirs | Fish yield from large water bodies including reservoirs | FiA/ MAFF | LARReC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| Fisheries production from large water bodies including reservoirs | Area of large water bodies including reservoirs | FiA/ MAFF | LARReC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| Capture fisheries prices | Average price of fish species and OAAs at landing site | FiA/ MAFF | Lao Bureau of Statistics | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research Institutes |
| Aquaculture production | Total annual production for each of the main fish species and OAAs | FiA/ MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry - LARREC | Department of Fisheries | General Statistics Office |
| Aquaculture production | Total annual production for each of the main fish species and OAAs | FiA/ MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry - LARREC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research/Planning Institutes |
| Aquaculture production | Total annual production for each of the main fish species and OAAs | FiA/ MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry - LARREC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research/Planning Institutes |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Aquaculture prices | Average price of fish species and OAAs at farm gate | FiA/ MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry - LARREC | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research/Planning Institutes |
| Aquaculture prices | Average price of fish species and OAAs at farm gate | FiA/ MAFF | | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research/Planning Institutes |
| Aquaculture prices | Average price of fish species and OAAs at farm gate | FiA/ MAFF | | Department of Fisheries | Department of Agriculture and Rural Development / Fisheries Research/Planning Institutes |
| Forestry production | Total area of forestry | FA/ MAFF | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | n/a | General Statistics Office |
| Forestry production | Average unit timber log production | FA/ MAFF | Department of Forestry | n/a | General Statistics Office/Department of Agriculture and Rural Development |
| Forestry prices | Average timber log unit price | FA/ MAFF | Department of Forestry | n/a | General Statistics Office/Department of Agriculture and Rural Development |
| Forestry prices | Average value of other non-timber forest products | FA/ MAFF | | n/a | General Statistics Office/Department of Agriculture and Rural Development |
| Tourism and recreation revenue | No. of tourists visiting the basin | Ministry of Tourism | Tourism Development Department | Thai Tourist Authority | General Statistics Office/Department of Travelling |
| Tourism and recreation revenue | No. of tourists visiting the basin | Ministry of Tourism | Tourism Development Department | Thai Tourist Authority | General Statistics Office/Department of Travelling |
| Tourism and recreation revenue | Average length of trip | Ministry of Tourism | Tourism Development Department | Thai Tourist Authority | General Statistics Office/Department of Travelling |
| Tourism and recreation revenue | Average length of trip | Ministry of Tourism | Tourism Development Department | Thai Tourist Authority | General Statistics Office/Department of Travelling |
| Tourism and recreation revenue | Average spend per trip-day | Ministry of Tourism | Tourism Development Department | Thai Tourist Authority | General Statistics Office/Department of Travelling |
| Tourism and recreation revenue | Average spend per trip-day | Ministry of Tourism | Tourism Development Department | Thai Tourist Authority | General Statistics Office/Department of Travelling |
| River bank erosion losses | Annual area lost to river bank erosion | DWIPC-MPWT | Department of Waterways - Division of planning and budgeting | TNMCS | Department of Nature and Environment; Irrigation Research Institutes |
| River bank erosion losses | Average value of land lost to bank erosion | DWIPC-MPWT | | TNMCS | Department of Natural and Environment; Irrigation Research Institutes |
| Coastal erosion losses | Annual area lost to coastal erosion | n/a | n/a | n/a | Department of Natural and |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| | | | | | Environment; Irrigation Research Institutes |
| Coastal erosion losses | Average value of land lost to coastal erosion | n/a | n/a | n/a | Department of Natural and Environment; Irrigation and Agriculture Planning Research Institutes |
| Annual cost of flood damages | Annual cost of lost production for each crop type due to flooding | MEF | Ministry of Planning and Investment, Public Health and Agriculture - work together for survey | Office of Agricultural Economics | Department of Agriculture and Rural Development/Department of Natural Resources and Environment |
| Annual cost of flood damages | Government reported costs of flood damage to public and private infrastructure | MEF | Ministry of Planning and Investment, Public Health and Agriculture - work together for survey | Department of disaster prevention and mitigation | Department of Transport |
| Annual cost of drought damages | Government reported costs of drought damage | MAFF | | Department of disaster prevention and mitigation | Department of Agriculture and Rural Development/Department of Natural Resources and Environment |
| Total cost of drought damage and total cost of agriculture production loss | Production loss from agriculture to drought | MAFF | | | |
| Total cost of drought damage and total cost of agriculture production loss | Total damage and losses due to drought | MAFF | | | |
| Proportion of basin GDP from LMB water-related sectors | Aggregate gross value of production of each LMB water-related sector | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Proportion of basin GDP from LMB water-related sectors | Aggregate gross value of production in the basin | National Institute of Statistics | | Office of National Economic and Social Development Council | General Statistics Office |
| Proportion of national GDP from LMB water-related sectors | Aggregate gross value of production of each LMB water-related sector | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Proportion of national GDP from LMB water-related sectors | National GDP | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Proportion of regional GDP from LMB water-related sectors | Aggregate gross value of production of each LMB water-related sector | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Proportion of regional GDP from LMB water-related sectors | National GDP | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Proportion of basin food grain demand met from basin resources | Basin food grain demand (total produced + imported) | | | Office of Agricultural Economics | General Statistics Office/General Custom/Research Institutes |

| Monitoring Parameter | Dataset | Cambodia | Lao PDR | Thailand | Viet Nam |
|---|---|---|---|---|---|
| | | | **Data Custodian in Each Country** | | |
| | | | Lao PDR | Thailand | Viet Nam |
| Proportion of basin food grain demand met from basin resources | Annual basin food grain production | | | Office of Agricultural Economics | General Statistics Office/General Custom/Research Institutes |
| Proportion of national food grain demand met from basin resources | National food grain demand (total produced + imported | | | Office of Agricultural Economics | General Statistics Office/Department of Crop Production |
| Proportion of national food grain demand met from basin resources | Annual basin food grain production | | | Office of Agricultural Economics | General Statistics Office/Department of Crop Production |
| Proportion of regional food grain demand met from basin resources | National food grain demand (total produced + imported) | | | Office of Agricultural Economics | General Statistics Office/General Custom |
| Proportion of regional food grain demand met from basin resources | Annual basin food grain production | | | Office of Agricultural Economics | General Statistics Office/Department of Agriculture and Rural Development |
| Proportion of basin protein demand met form basin resources | Basin protein demand (total produced + imported) | | | Office of Agricultural Economics | General Statistics Office/Department of Agriculture and Rural Development/General of Custom |
| Proportion of basin protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | General Statistics Office/Department of Agriculture and Rural Development/National Institute of Nutrition |
| Proportion of basin protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | General Statistics Office/Department of Agriculture and Rural Development/National Institute of Nutrition |
| Proportion of basin protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | General Statistics Office/Department of Agriculture and Rural Development/National Institute of Nutrition |
| Proportion of national protein demand met form basin resources | National protein demand (total produced + imported) | | | Ministry of Agriculture and cooperatives | Ministry of Health/Department of Agriculture and Rural Development/General of Custom/National Institute of Nutrition |
| Proportion of national protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | VNMC with relevant line agencies |
| Proportion of national protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of | Ministry of Agriculture and cooperatives | VNMC with relevant line agencies |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| | | | Agriculture and Forestry | | |
| Proportion of national protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | VNMC with relevant line agencies |
| Proportion of regional protein demand met form basin resources | National protein demand (total produced + imported) | | | Ministry of Agriculture and cooperatives | VNMC with relevant line agencies |
| Proportion of regional protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | VNMC with relevant line agencies |
| Proportion of regional protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | VNMC with relevant line agencies |
| Proportion of regional protein demand met form basin resources | Annual basin protein production | | Department of Planning and Cooperation, Ministry of Agriculture and Forestry | Ministry of Agriculture and cooperatives | VNMC with relevant line agencies |
| Proportion of basin power demand met from basin hydroelectric resources | Basin electric power demand (total produced + imported - exported) | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand and EPPO | VNMC with relevant line agencies |
| Proportion of basin power demand met from basin hydroelectric resources | Annual basin hydroelectric generation | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand and EPPO | VNMC with relevant line agencies |
| Proportion of national power demand met from basin hydroelectric resources | National electric power demand (total produced + imported - exported) | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand and EPPO | VNMC with relevant line agencies |
| Proportion of national power demand met from basin hydroelectric resources | Annual basin hydroelectric generation | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand and EPPO | VNMC with relevant line agencies |
| Proportion of regional power demand met from basin hydroelectric resources | National electric power demand (total produced + imported - exported) | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand and EPPO | VNMC with relevant line agencies |
| Proportion of regional power demand met from basin hydroelectric resources | Annual basin hydroelectric generation | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand and EPPO | VNMC with relevant line agencies |
| Greenhouse gas emissions from energy | Emissions from energy generation | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Greenhouse gas emissions from agriculture | Emissions from agriculture | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Greenhouse gas emissions from other land use, land use change and forestry | Emissions from land use, land use change and forestry | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Reduced greenhouse gas emissions from energy due to hydropower | Emissions from hydropower relative to power produced | | Department of Disaster Management and Climate Change | | |
| Reduced greenhouse gas emissions from energy due to hydropower | Emissions from other power sources relative to power produced | | Department of Disaster Management and Climate Change | | |
| Reduced greenhouse gas emissions from energy due to hydropower | Total amount of hydropower generated | Electricity Authority of Cambodia | Department of Energy Policy and Planning, Ministry of Energy and Mines | Electricity Generating Authority of Thailand | |
| Emissions of carbon dioxide | Annual basin emissions of $CO_2$ | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Emissions of carbon dioxide | Annual global emissions of $CO_2$ | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Emissions of methane | Annual basin emissions of $CH_4$ | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Emissions of methane | Annual global emissions of $CH_4$ | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Emissions of nitrous oxide | Annual basin emissions of $N_2O$ | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Emissions of nitrous oxide | Annual global emissions of $N_2O$ | World Resources Institute | World Resources Institute | World Resources Institute | World Resources Institute |
| Number and wind strength of tropical storms | Annual number of tropical storms | United States Navy | United States Navy | United States Navy | United States Navy |
| Number and wind strength of tropical storms | Intensity (wind speed) of each tropical storm | United States Navy | United States Navy | United States Navy | United States Navy |
| Number and wind strength of severe tropical storms | Annual number of severe tropical storms | United States Navy | United States Navy | United States Navy | United States Navy |
| Number and wind strength of severe tropical storms | Intensity (wind speed) of each severe tropical storm | United States Navy | United States Navy | United States Navy | United States Navy |
| Number and wind strength of typhoons | Annual number of typhoons | United States Navy | United States Navy | United States Navy | United States Navy |
| Number and wind strength of typhoons | Intensity (wind speed) of each typhoon | United States Navy | United States Navy | United States Navy | United States Navy |
| Sea-level rise | Mean sea-level at the delta coast | n/a | n/a | n/a | MONRE-Vietnam Environment Administration |
| Daily maximum temperature | Daily maximum temperature | MOWRAM-DOM | DMH | DWR | MONRE-Vietnam Environment Administration |
| Daily minimum temperature | Daily minimum temperature | MOWRAM-DOM | DMH | DWR | MONRE-Vietnam Environment Administration |
| Number of hot days | Daily maximum temperature | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| Number of cold nights | Daily minimum temperature | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| Number of cold days | Daily maximum temperature | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Number of warm nights | Daily minimum temperature | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| Daily total rainfall | Daily rainfall | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| 1-day maximum | Daily rainfall | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| 5-day maximum | Daily rainfall | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| Consecutive wet days | Daily rainfall | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| Consecutive dry days | Daily rainfall | MOWRAM-DOM | DMH | Department of Meteorology | MONRE-Vietnam Environment Administration |
| Annual maximum flooded area | Daily water levels | Mekong River Commission & MOWRAM | DMH | Department of Water Resources | Mekong River Commission |
| Average flood depth | Daily water levels | Mekong River Commission & MOWRAM | DMH | Department of Water Resources | Mekong River Commission |
| Average flood duration | Daily water levels | Mekong River Commission & MOWRAM | DMH | Department of Water Resources | Mekong River Commission |
| Population affected by flood | Population in flood-affected areas | National Institute of Statistics | Mekong River Commission-Department of social welfare-MAF | National Statistics Office | General Statistics Office |
| Timing of onset of flood | Date of onset of flood | Mekong River Commission & MOWRAM | Mekong River Commission-DMH | Department of Water Resources | Mekong River Commission |
| Timing of offset of flood | Date of offset of flood | Mekong River Commission & MOWRAM | Mekong River Commission-DMH | Department of Water Resources | Mekong River Commission |
| Annual maximum flooded area at Tonle Sap | Daily water levels | Mekong River Commission & MOWRAM | n/a | n/a | n/a |
| Annual maximum flooded area at Tonle Sap | Flooded forest around Tonle Sap | MoE | n/a | n/a | n/a |
| Annual area of meteorological drought | Daily rainfall | MOWRAM-DOM | Mekong River Commission | Mekong River Commission | Mekong River Commission |
| Annual area of meteorological drought | Daily rainfall | MOWRAM-DOM | Mekong River Commission | Mekong River Commission | Mekong River Commission |
| Annual area of meteorological drought | Daily rainfall | MOWRAM-DOM | Mekong River Commission | Mekong River Commission | Mekong River Commission |
| Annual area of hydrological drought | Total Runoff | Mekong River Commission & MOWRAM | Mekong River Commission | Mekong River Commission | Mekong River Commission |
| Annual area of hydrological drought | Total Runoff | Mekong River Commission & MOWRAM | Mekong River Commission | Mekong River Commission | Mekong River Commission |
| Annual area of hydrological drought | Total Runoff | Mekong River Commission & MOWRAM | Mekong River Commission | Mekong River Commission | Mekong River Commission |
| Annual area of agricultural drought | Soil Moisture | MAFF | MAF-DALaM | Department of Disaster Prevention and Mitigation | MONRE-Vietnam Environment Administration |
| Annual area of agricultural drought | Soil Moisture | MAFF | MAF-DALaM | Department of Disaster Prevention and Mitigation | MONRE-Vietnam Environment Administration |

| Monitoring Parameter | Dataset | Cambodia | Lao PDR | Thailand | Viet Nam |
|---|---|---|---|---|---|
| | | | Data Custodian in Each Country | | |
| Annual area of agricultural drought | Soil Moisture | MAFF | MAF-DALaM | Department of Disaster Prevention and Mitigation | MONRE-Vietnam Environment Administration |
| Timing of onset of drought | Date of onset of drought | Mekong River Commission & MOWRAM | DMH | Department of Disaster Prevention and Mitigation | MONRE-Vietnam Environment Administration |
| Timing of offset of drought | Date of offset of drought | Mekong River Commission & MOWRAM | DMH | Department of Disaster Prevention and Mitigation | MONRE-Vietnam Environment Administration |
| Annual drought severity at Tonle Sap | Soil Moisture | National Institute of Statistics | Mekong River Commission-Department of social welfare-MAF | Mekong River Commission | MONRE-Vietnam Environment Administration |
| Population affected by drought | Population in drought-affected areas | | n/a | National Statistics Office | General Statistics Office |
| Policies and strategies for climate change response | Basin climate change strategies | MOE & MRCS | Mekong River Commission | Mekong River Commission | Mekong River Commission |
| Policies and strategies for climate change response | National climate change strategies | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Policies and strategies for climate change response | Provincial climate change strategies | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Policies and strategies for climate change response | Sectoral climate change strategies | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Policies and strategies for climate change response | Sectoral climate change strategies | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Policies and strategies for climate change response | Sectoral climate change strategies | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Budget for climate change response | National climate change budgets | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Budget for climate change response | Provincial climate change budgets | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Budget for climate change response | Sectoral climate change budgets | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Budget for climate change response | Sectoral climate change budgets | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Budget for climate change response | Sectoral climate change budgets | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Number of awareness-raising activities | Awareness-raising activities | MOE | Department of Disaster Management and Climate change | ONEP | MONRE-Vietnam Environment Administration |
| Access to climate finance | Receipt of international climate finance | MOE | Department of Disaster | ONEP | MONRE-Vietnam Environment Administration |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| | | | Management and Climate change | | |
| Area of urban land protected by embankments/levees | Land classification as urban land | MLMUPC | MPWT | n/a | Vietnam Disaster Management Authority |
| Area of urban land protected by embankments/levees | Digital elevation model with flood mapping | MLMUPC | NRERI | n/a | Vietnam Disaster Management Authority |
| Area of urban land protected by embankments/levees | Location, height and length of embankments | MPWT & MOWRAM | Department of Waterways - Division of planning and budgeting | n/a | Vietnam Disaster Management Authority |
| Area of agricultural land protected by embankments/levees | Land classification as agricultural land | MAFF | MAF | n/a | Vietnam Disaster Management Authority |
| Area of agricultural land protected by embankments/levees | Digital elevation model with flood mapping | MLMUPC | NRERI | n/a | Vietnam Disaster Management Authority |
| Area of agricultural land protected by embankments/levees | Location, height and length of embankments | MPWT & MOWRAM | Department of Waterways - Division of planning and budgeting | n/a | Vietnam Disaster Management Authority |
| Proportion of irrigable land that is irrigated | Area of irrigated land | Ministry of Agriculture | Irrigation Department | Royal Irrigation Department | Vietnam Disaster Management Authority |
| Proportion of irrigable land that is irrigated | Area of irrigable land | MOWRAM | Irrigation Department | Royal Irrigation Department | Vietnam Disaster Management Authority |
| Volume of available water storage | Total volume of water reservoirs for agricultural use | MOWRAM | Irrigation Department/Department of Water Supply | Royal Irrigation Department | Vietnam Disaster Management Authority |
| Volume of available water storage | Total volume of water reservoirs for urban use | MOWRAM | MPWT | Provincial Water Authorities | Vietnam Disaster Management Authority |
| Volume of available water storage | Domestic water-use demands over the dry season | MIH & MRD | Department of Water Supply | OMWR | Vietnam Disaster Management Authority |
| Volume of available water storage | Agricultural water-use demands over the dry season | MAFF and MOWRAM | Irrigation Department | Royal Irrigation Department | Vietnam Disaster Management Authority |
| Exposure to floods | Total flood-affected area | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Exposure to floods | Time households affected by flood | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Exposure to floods | Population in flood-affected areas | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Exposure to droughts | Total drought-affected area | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Exposure to droughts | Time households affected by drought | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Exposure to droughts | Population in drought-affected areas | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Exposure to storms | Total storm-affected area | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Exposure to storms | Time households affected by storm | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Exposure to storms | Population in storm-affected areas | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Sensitivity to floods | Asset damage and lost production due to floods | NCDD & NIS & NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Sensitivity to droughts | Asset damage and lost production due to drought | NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Sensitivity to storms | Asset damage and lost production due to storms | NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Adaptive capacity to floods | Population below the national poverty line in flood-affected areas | National Statistics Office | Mekong River Commission - Department of Social Welfare-MAF | National Statistics Office | General Statistics Office |
| Adaptive capacity to droughts | Population below the national poverty line in drought-affected areas | National Statistics Office | Mekong River Commission - Department of Social Welfare-MAF | National Statistics Office | General Statistics Office |
| Adaptive capacity to storms | Population below the national poverty line in storm-affected areas | National Statistics Office | Mekong River Commission - Department of Social Welfare-MAF | National Statistics Office | General Statistics Office |
| Disaster risk management planning at national and local levels | Existence of national disaster risk management plans for floods, droughts and storms | NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Disaster risk management planning at national and local levels | Existence of local disaster risk management plans for floods, droughts and storms | NCDM | Mekong River Commission - Department of Social Welfare-MAF | Department of Disaster Prevention and Mitigation | Vietnam Disaster Management Authority |
| Quantity of projects of basin-wide significance | Number of projects of basin-wide significance | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of projects of basin-wide significance | Cost of project investment | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of projects of basin-wide significance | Expected future cash flow from the project | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of projects of basin-wide significance | Discount rate | National Bank of Cambodia | Bank of Lao | Bank of Thailand | State Bank of Viet Nam |
| Value of projects of basin-wide significance | Time period over which the project is expected to generate returns | CNMCS | LNMCS | TNMCS | VNMCS |
| Quantity of trans-boundary projects notified | Number of trans-boundary projects notified | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of trans-boundary projects notified | Cost of project investment | CNMCS | LNMCS | TNMCS | VNMCS |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Value of trans-boundary projects notified | Expected future cash flow from the project | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of trans-boundary projects notified | Discount rate | National Bank of Cambodia | Bank of Lao | Bank of Thailand | State Bank of Viet Nam |
| Value of trans-boundary projects notified | Time period over which the project is expected to generate returns | CNMCS | LNMCS | TNMCS | VNMCS |
| Number of joint projects with other parties | Joint projects with other parties | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of joint projects with other parties | Cost of project investment | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of joint projects with other parties | Expected future cash flow from the project | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of joint projects with other parties | Discount rate | National Bank of Cambodia | Bank of Lao | Bank of Thailand | State Bank of Viet Nam |
| Value of joint projects with other parties | Time period over which the project is expected to generate returns | CNMCS | LNMCS | TNMCS | VNMCS |
| Value of joint projects, transboundary projects and projects of basin-wide significance | Net Present Value of projects | CNMCS | LNMCS | TNMCS | VNMCS |
| Aggregate economic value of LMB water-related sectors | Aggregate net annual economic value of MRC sectors | CNMCS | LNMCS | TNMCS | VNMCS |
| Aggregate economic value of LMB water-related sectors | Discount rate | National Bank of Cambodia | LNMCS | Bank of Thailand | State Bank of Viet Nam |
| Aggregate economic value of LMB water-related sectors | Time period agreed for assessment | CNMCS | LNMCS | TNMCS | VNMCS |
| Population overview | Total basin population by country | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Population overview | Population by age group by country | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Population overview | Urban and rural basin populations by country | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Population overview | Migration rate rural to urban | National Institute of Statistics | Ministry of Labour | | General Statistics Office |
| Population density | Population density by smallest spatial unit available | National Institute of Statistics | Ministry of Labour | | General Statistics Office |
| Food security for each country | Adequacy of dietary energy (dietary energy as a % of dietary requirements) | National Institute of Statistics | | National Statistics Office | |
| Food security for each country | Average dietary protein | National Institute of Statistics | | National Statistics Office | |
| Food security for each country | Prevalence of under-nourishment | National Institute of Statistics | | National Statistics Office | |
| Food security for each country | Value of food imports as a percentage of total value of exported goods | National Institute of Statistics | | National Statistics Office | |
| Poverty levels | Percentage of population earning | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |

| Monitoring Parameter | Dataset | Data Custodian in Each Country | | | |
|---|---|---|---|---|---|
| | | Cambodia | Lao PDR | Thailand | Viet Nam |
| Poverty levels | less than USD1.25/day Percentage of population earning less than USD2.00/day | National Institute of Statistics | Lao Bureau of Statistics | National Statistics Office | General Statistics Office |
| Income distribution | Gini coefficient | National Institute of Statistics | World Bank | Office of National Economic and Social Development Council | General Statistics Office |
| Population life expectancy Population life expectancy | Male life expectancy at birth Female life expectancy at birth | National Institute of Statistics National Institute of Statistics | Lao Bureau of Statistics Lao Bureau of Statistics | National Statistics Office National Statistics Office | General Statistics Office General Statistics Office |
| Gross Domestic Product | GDP by country | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Gross Domestic Product | National GDP by MRC sector | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Gross Domestic Product | GDP growth rate of each country | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Gross Domestic Product | National GDP/capita | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |
| Gross Domestic Product | Basin GDP/capita | National Institute of Statistics | Lao Bureau of Statistics | Office of National Economic and Social Development Council | General Statistics Office |

# APPENDIX D: INDICATIVE BUDGET ESTIMATES

# DAGAP cost estimates for implementation of MRB-IF

| Option 1 | | | | | Total cost over 5 years: | $6,721,000 |
|---|---|---|---|---|---|---|

| | | | | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|
| | | | | $1,704,000 | $1,611,600 | $1,549,200 | $991,800 | $864,400 |

| MRCS | Item | Description | | Cost estimate | Cost per day | Days | Meetings | |
|---|---|---|---|---|---|---|---|---|
| TD | Establish new position | Chief Data and Knowledge Management Officer | | $100,000 | $452 | 221 | | |

**Existing regional periodic assessments, surveys or studies**

| MRCS | Item | Description | | Cost estimate | Cost per day | Days | Meetings | |
|---|---|---|---|---|---|---|---|---|
| TD (Drough expert) | Regional assessment | Drought risk assessment for water security | Social | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (WQO) | Regional assessment | Multi-media contaminants - heavy metals and pesticides | Environment | $130,000 | $500 | 200 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (WQO) | Regional assessment | Salinity intrusion in the Delta | Environment | $40,000 | $500 | 20 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| TD (GIS expert) | Regional assessment | Land cover assessment (including wetlands and forest types) | Environment | $130,000 | $500 | 200 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (EWS) | Regional assessment | Riverine, estuarine and coastal habitats | Environment | $155,000 | $500 | 250 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (EWS) | Regional assessment | Threatened water-dependent species and ecologically significant species | Environment | $40,000 | $500 | 20 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (SES) | Regional assessment | Economic value of wetland ecosystem services | Economic | $155,000 | $500 | 250 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (FMS) | Regional assessment | Fisheries yield assessment by habitat type | Economic | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (WCS) | Regional assessment | Extent and severity of flooding | Climate Change | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ED (WCS) | Regional assessment | Extent and severity of drought | Climate Change | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (SES) | Regional assessment | Vulnerability to floods, droughts and storms | Climate Change | $155,000 | $500 | 250 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| | | | | **$1,125,000** | | | | |

**Existing regional monitoring activities**

| | | | | |
|---|---|---|---|---|
| TD | Routine monitoring and forecasting | Hydro-meteorological monitoring | Environment | (incl. in total) |
| TD | Routine monitoring and forecasting | Discharge and sediment monitoring | Environment | (incl. in total) |
| ED | Routine monitoring and forecasting | Water quality monitoring | Environment | (incl. in total) |
| ED | Routine monitoring and forecasting | Ecological health monitoring | Environment | (incl. in total) |
| ED | Routine monitoring and forecasting | Fisheries monitoring | Environment | (incl. in total) |
| PD | Routine monitoring and forecasting | Periodic transmission of socio-economic data | Social/Economic | (incl. in total) |
| PD | Routine monitoring and forecasting | Reporting of joint project, projects of basin-wide significance and potential transboundary projects | Cooperation | $0 |
| OCEO | Routine monitoring and forecasting | Reporting of knowledge sharing activities | Cooperation | $0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OCEO | Routine monitoring and forecasting | Partnerships between the MRC and other parties | Cooperation | $0 | | | |
| AD | Routine monitoring and forecasting | MRC budget contributions | Cooperation | $0 | | | |
| TD | Other CRBMF1 functions | MRC-IF data and knowledge management; portal management, SOBR preparation | All | $255,343 | | | |
| | | | | **$1,130,152** | | | Based on 2017 MRC Budget Expenditures |

**Modifications to existing regional monitoring activities**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TD | Routine monitoring and forecasting | Additional climate parameters | Climate Change | $9,680 | $121 | 20 | 4 Secondary data collection, processing and analysis |
| ED | Routine monitoring and forecasting | Additional water quality parameters | Environment | $70,000 | $250 | 70 | 4 Includes design, training, systems, primary data collection, processing, and analysis |
| PD | Routine monitoring and forecasting | Additional parameters for quantity and value of joint and trans-boundary projects and projects of basin-wide significance | Cooperation | $2,420 | $121 | 5 | 4 Secondary data collection, processing and analysis |
| | | | | **$82,100** | | | |
| | Contingency | | | $61,748 | | | |
| | | Total for data collection, analysis and reporting under CRBMF 1 | All | **$1,274,000** | | | 13% of total MRC budget |

# DAGAP cost

Total cost over  **$9,042,570**

| | **2020** | **2021** | **2022** | **2023** | **2024** |
|---|---|---|---|---|---|
| | $2,377,857 | $2,385,457 | $2,423,057 | $991,800 | $864,400 |

| MRCS | Item | Description | Dimension | Cost | Cost per day | Days | Meetings | |
|---|---|---|---|---|---|---|---|---|
| TD | Establish new position | Chief Data and Knowledge | | $100,000 | $452 | 221 | | |
| **Existing regional periodic assessments.** | | | | | | | | |
| TD (Drough expert-RFDMC) | Regional assessment | Drought risk assessment for water security | Social | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (WQO) | Regional assessment | Multi-media contaminants - heavy metals and pesticides | Environment | $130,000 | $500 | 200 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (WQO) | Regional assessment | Salinity intrusion in the Delta | Environment | $40,000 | $500 | 20 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| TD (GIS expert) | Regional assessment | Land cover assessment (including wetlands and forest types) | Environment | $130,000 | $500 | 200 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (EWS) | Regional assessment | Riverine, estuarine and coastal habitats | Environment | $155,000 | $500 | 250 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (EWS) | Regional assessment | Threatened water-dependent species and ecologically significant species | Environment | $40,000 | $500 | 20 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |

| | | | Dimension | Cost estimate | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| ED (EWS) | Regional assessment | Economic value of wetland ecosystem services | Economic | $155,000 | $500 | 250 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED (FMS) | Regional assessment | Fisheries yield assessment by habitat type | Economic | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| TD (WCS+RFDMC) | Regional assessment | Extent and severity of flooding | Climate Change | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| TD (WCS+RFDMC) | Regional assessment | Extent and severity of drought | Climate Change | $80,000 | $500 | 100 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| PD (SES+CCAS) | Regional assessment | Vulnerability to floods, droughts and storms | Climate Change | $155,000 | $500 | 250 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| | | | | **$1,125,000** | | | | |

**New/updated design for regional periodic assessments.**

| | | | Dimension | Cost estimate | | | | Comments |
|---|---|---|---|---|---|---|---|---|
| ED | Regional assessment | Riverine, estuarine and coastal habitats | Environment | $100,000 | $500 | 140 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED | Regional assessment | Economic value of wetland ecosystem services | Economic | $100,000 | $500 | 140 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| ED | Regional assessment | Vulnerability to floods, droughts and storms | Climate Change | $100,000 | $500 | 140 | $30,000 | Includes MRCS staff, national and international consultants, regional and national meetings |
| | | | | **$300,000** | | | | |

**Existing regional monitoring**

| | | | **Dimension** | **Cost estimate** |
|---|---|---|---|---|

| | | | Dimension | Cost estimate | Cost per day | Days | Countries | |
|---|---|---|---|---|---|---|---|---|
| TD | Routine monitoring and forecasting | Hydro-meteorological monitoring | Environment | (incl. in total) | | | | |
| TD | Routine monitoring and forecasting | Discharge and sediment monitoring | Environment | (incl. in total) | | | | |
| ED | Routine monitoring and forecasting | Water quality monitoring | Environment | (incl. in total) | | | | |
| ED | Routine monitoring and forecasting | Ecological health monitoring | Environment | (incl. in total) | | | | |
| ED | Routine monitoring and forecasting | Fisheries monitoring | Environment | (incl. in total) | | | | |
| PD | Routine monitoring and forecasting | Periodic transmission of socio-economic data | Social/Economic | (incl. in total) | | | | |
| PD | Routine monitoring and forecasting | Reporting of joint project, projects of basin-wide | Cooperation | $0 | | | | |
| OCEO | Routine monitoring and forecasting | Reporting of knowledge sharing activities | Cooperation | $0 | | | | |
| OCEO | Routine monitoring and forecasting | Partnerships between the MRC and other parties | Cooperation | $0 | | | | |
| AD | Routine monitoring and forecasting | MRC budget contributions | Cooperation | $0 | | | | |
| TD | Other CRBMF1 functions | MRC-IF data and knowledge management; portal | All | $255,343 | | | | |
| | | | | **$1,130,152** | | | | Based on 2017 MRC Budget Expenditures |

| **Modifications to existing regional monitoring** | | | **Dimension** | **Cost estimate** | **Cost per day** | **Days** | **Countries** | |
|---|---|---|---|---|---|---|---|---|
| TD | Routine monitoring and forecasting | Additional climate parameters | Climate Change | $9,680 | $121 | 20 | 4 | Secondary data collection, processing and analysis |
| ED | Routine monitoring and forecasting | Additional water quality parameters | Environment | $70,000 | $250 | 70 | 4 | Includes design, training, systems, primary data collection, processing, and analysis |

| | | | | Cost | Cost per day | Days | Provinces | Tasks required |
|---|---|---|---|---|---|---|---|---|
| PD | Routine monitoring and forecasting | Additional parameters for quantity and value of joint and trans-boundary projects and projects of basin-wide significance | Cooperation | $2,420 | $121 | 5 | 4 | Secondary data collection, processing and analysis |
| | | | | **$82,100** | | | | |
| | Contingency | | | $61,748 | | | | |
| | | **Total for data collection, analysis and reporting under CRBMF 1 (13% of total MRC budget)** | All | **$1,274,000** | | | | 13% of total MRC budget |

| **Modifications to Country Cambodia** | **National monitoring** | **Potential modifications** | **Dimension** | **Cost** | **Cost per day** | **Days** | **Provinces** | **Tasks required** |
|---|---|---|---|---|---|---|---|---|
| | Cambodia Socio-Economic Survey | Increase sampling power to enable data representative of all provinces | Social | $111,320 | $121 | 40 | 23 | Includes additional primary data collection in every province |
| | | Include questions on labour force for separate LMB water-related sectors | Social | $25,000 | $250 | 100 | n/a | Includes design, training, systems, collection and processing |
| | | Include questions on household asset values | Social | $25,000 | $250 | 100 | n/a | Includes design, training, systems, collection and processing |
| | | Include questions on migration from rural to urban areas | Foundation | $25,000 | $250 | 100 | n/a | Includes design, training, systems, collection and processing |
| | Cambodia Demographic and Health Survey | Repeat at regular intervals or include questions on malnutrition within Cambodia Socio-Economic | Social | $25,000 | $250 | 100 | n/a | Includes design, training, systems, collection and processing |
| | Cambodia National Malaria Control Programme | Disaggregate data on incidence of malaria by province | Social | $13,915 | $121 | 5 | 23 | Includes data processing |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Cambodia National Dengue Control Programme | Disaggregate data on incidence of dengue fever by province | Social | $13,915 | $121 | 5 | 23 Includes data processing |
| | Mekong Basin Disease Surveillance | Disaggregate data on incidence of cholera by province | Social | $13,915 | $121 | 5 | 23 Includes data processing |
| | National Accounts | Identify the gross annual economic value of each LMB water-related sector and for each province | Social | $13,915 | $121 | 5 | 23 Includes data processing |
| | | Disaggregate all relevant data by province | Economic | $13,915 | $121 | 5 | 23 Includes data processing |
| | Annual Power Sector Report | Disaggregate all relevant data by province | Economic | $13,915 | $121 | 5 | 23 Includes data processing |
| | | Include data on amount of power exported (if any) and prices paid by importing countries | Economic | $13,915 | $121 | 5 | 23 Includes data processing |
| | Annual Tourism Sector Report | Disaggregate data on tourist visits by province and by source (domestic or international) | Economic | $13,915 | $121 | 5 | 23 Includes data processing |
| | | Include data on amount spent and duration of visits by source of tourists (domestic and international) | Economic | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| Lao PDR | Statistics Yearbook compilation | Increase sampling power to enable data representative of all provinces | Social | $87,120 | $121 | 40 | 18 Includes additional primary data collection in every province |
| | | Disaggregate all data by province | Social | $10,890 | $121 | 5 | 18 Includes data processing |

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|---|---|---|---|---|---|---|
| | Disaggregate data on crop production by crop type and production system | Economic | $10,890 | $121 | 5 | 18 Includes data processing |
| | Disaggregate data on culture fish production and price by type/species | Economic | $10,890 | $121 | 5 | 18 Includes data processing |
| | Disaggregate data on tourist visits by province and by source (domestic or international) | Economic | $10,890 | $121 | 5 | 18 Includes data processing |
| | Include data on amount spent and duration of visits by source of tourists (domestic and international) | Economic | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| Lao Expenditure and Consumption Survey | Include questions on food consumption by type and amount | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | Include questions on household asset values | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | Include questions on malnutrition and undernourishment by age (weight and height for age) | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | Estimate annual value for intervening years between 5-yearly samples | Social | $10,890 | $121 | 5 | 18 Includes data processing |
| National waterways database updates | Include data on the average value of land lost to bank erosion | Economic | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| National Accounts | Disaggregate all relevant data by province | Economic | $15,730 | $121 | 5 | 26 Includes data processing |

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|---|---|---|---|---|---|---|---|
| **Thailand** | Household socio-economic survey | Disaggregate all relevant data by province | Social | $15,730 | $121 | 5 | 26 Includes data processing |
| | | Include questions on food consumption by type and amount | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | | Include questions on malnutrition and undernourishment by age (weight and height for age) | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | | Include questions on household electrification for rural and urban households | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | | Include questions on primary school attendance rate of boys and girls | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | | Include questions on migration from rural to urban areas | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | NSO web statistics compilation | Disaggregate patients by disease type (malaria, dengue fever, cholera) by province | Social | $15,730 | $121 | 5 | 26 Includes data processing |
| | | Disaggregate rice production data by rain-fed, irrigated and recession rice | Economic | $15,730 | $121 | 5 | 26 Includes data processing |
| | | Disaggregate all data by province | Economic | $15,730 | $121 | 5 | 26 Includes data processing |
| | Labour Force Survey and Informal Employed Survey | Disaggregate data by LMB water-related sectors | Social | $15,730 | $121 | 5 | 26 Includes data processing |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | National Accounts | Identify the gross annual economic value of each LMB water-related sector and for each province | Economic | $15,730 | $121 | 5 | 26 Includes data processing |
| | | Disaggregate all relevant data by province | Economic | $15,730 | $121 | 5 | 26 Includes data processing |
| **Viet Nam** | Living Standards Survey | Disaggregate all relevant data by province | Social | $13,310 | $121 | 5 | 22 Includes data processing |
| | | Disaggregate data by LMB water-related sectors | Social | $13,310 | $121 | 5 | 22 Includes data processing |
| | | Include questions on malnutrition and undernourishment by age (weight and height for age) | Social | $25,000 | $250 | 100 | n/a Includes design, training, systems, collection and processing |
| | | Disaggregate data electrification rate by urban and rural households | Social | $13,310 | $121 | 5 | 22 Includes data processing |
| | GSO web statistics compilation | Disaggregate data on stunting and wasting in children by province | Social | $13,310 | $121 | 5 | 22 Includes data processing |
| | | Disaggregate data on agricultural production for each crop by province | Economic | $13,310 | $121 | 5 | 22 Includes data processing |
| | | Disaggregate data on area of forestry by province | Economic | $13,310 | $121 | 5 | 22 Includes data processing |
| | | Disaggregate data on tourist visits by province and by source (domestic or international) | Economic | $13,310 | $121 | 5 | 22 Includes data processing |

| | | Dimension | Cost | Cost per day | Days | Countries | Tasks required |
|---|---|---|---|---|---|---|---|
| | Include data on amount spent and duration of visits by source of tourists (domestic and international) | Economic | $25,000 | $250 | 100 | n/a | Includes design, training, systems, collection and processing |
| Mekong Basin Disease Surveillance | Disaggregate data on incidence of cholera by province | Social | $13,310 | $121 | 5 | 22 | Includes data processing |
| Labour Force Survey | Disaggregate data by LMB water-related sectors | Social | $13,310 | $121 | 5 | 22 | Includes data processing |
| | Disaggregate all relevant data by province | Social | $13,310 | $121 | 5 | 22 | Includes data processing |
| National Accounts | Identify the gross annual economic value of each LMB water-related sector and for each province | Economic | $13,310 | $121 | 5 | 22 | Includes data processing |
| | Disaggregate all relevant data by province | Economic | $13,310 | $121 | 5 | 22 | Includes data processing |

**$1,074,770**

| New national | Item | Description | Dimension | Cost | Cost per day | Days | Countries | Tasks required |
|---|---|---|---|---|---|---|---|---|
| | New activity | Water quality monitoring in relation to drinking water standards | Social | $100,000 | $250 | 100 | 4 | Includes design, training, systems, primary data collection, processing, and analysis |
| | New activity | Irrigation area by province | Social | $7,260 | $121 | 20 | 3 | Secondary data collection, processing and analysis |
| | New activity | OAA/P abundance and diversity | Environment | $100,000 | $250 | 100 | 4 | Includes design, training, systems, primary data collection, processing, and analysis |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| New activity | Water bird abundance and diversity | Environment | $100,000 | $250 | 100 | 4 | Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | Gross economic value of production of recession rice | Economic | $9,680 | $121 | 20 | 4 | Secondary data collection, processing and analysis |
| New activity | Gross economic value of production from riverbank gardens | Economic | $9,680 | $121 | 20 | 4 | Secondary data collection, processing and analysis |
| New activity | Gross economic value of hydropower (amount produced, imported, exported and prices) | Economic | $4,840 | $121 | 20 | 2 | Secondary data collection, processing and analysis |
| New activity | Navigation monitoring and reporting (cargo volumes and prices; passenger numbers and prices) | Economic | $7,260 | $121 | 20 | 3 | Secondary data collection, processing and analysis |
| New activity | Gross economic value of sand mining | Economic | $75,000 | $250 | 100 | 3 | Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | Gross economic value of aquaculture (production and prices of fish and OAA) | Economic | $25,000 | $250 | 100 | 1 | Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | Gross economic value of forestry (forested area, timber production, price of timber, value of NTFP) | Economic | $50,000 | $250 | 100 | 2 | Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | Gross economic value of tourism | Economic | $50,000 | $250 | 100 | 2 | Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | Area and value of land lost to river bank and coastal erosion | Economic | $75,000 | $250 | 100 | 3 | Includes design, training, systems, primary data collection, processing, and analysis |

| | | | | | | |
|---|---|---|---|---|---|---|
| New activity | Government reported costs of flood and drought damage | Economic | $75,000 | $250 | 100 | 3 Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | Greenhouse gas emissions by sector and gas within the basin | Climate Change | $100,000 | $250 | 100 | 4 Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | Temperature and rainfall data from LMB stations | Climate Change | $100,000 | $250 | 100 | 4 Includes design, training, systems, primary data collection, processing, and analysis |
| New activity | National, provincial and sectoral climate change policies and strategies | Climate Change | $9,680 | $121 | 20 | 4 Secondary data collection, processing and analysis |
| New activity | National, provincial; and sectoral climate change budgets | Climate Change | $9,680 | $121 | 20 | 4 Secondary data collection, processing and analysis |
| New activity | Climate change awareness-raising activities and receipt fo international climate finance | Climate Change | $9,680 | $121 | 20 | 4 Secondary data collection, processing and analysis |
| New activity | Flood protection measures (areas protected by embankments) | Climate Change | $9,680 | $121 | 20 | 4 Secondary data collection, processing and analysis |
| New activity | Drought protection measures (reservoir volumes for agriculture and urban uses and demands for water | Climate Change | $9,680 | $121 | 20 | 4 Secondary data collection, processing and analysis |
| New activity | Expected future benefits from joint projects, transboundary projects and projects of basin-wide | Climate Change | $9,680 | $121 | 20 | 4 Secondary data collection, processing and analysis |
| | | | **$946,800** | | | |

# APPENDIX E: DATA REQUIREMENTS AND AVAILABILITY

*Please click to this link to get the Data Requirements and Availability in the Excel format.*