

PROGRESS ON THE STATUS OF MRC DRAFT JEM PROGRAMME AND THE IMPLEMENTATION OF TWO JEM PILOTS

Background:

1. The proposal on the preparation of the Joint Environmental Monitoring for Mekong Mainstream Hydropower Projects (JEM) was presented for the first time at the 44th MRC JC Meeting on 27 July 2016 in Phnom Penh, Cambodia. The JC agreed to develop the JEM Programme and requested to pilot it on several mainstream hydropower projects before rolling it out at a basin scale. The overall objective of the JEM is to generate and share reliable and scientific data and information through an established basin wide JEM Programme on site-specific (trans-boundary) issues regarding five main disciplines: hydrology and hydraulics, sediment, water quality, aquatic ecology and fish and fisheries. The JEM concept was drafted by the MRCS ED team and was consulted and agreed upon by Member Countries at the regional meeting on 15 September 2017 in Vientiane, Lao PDR. Progress was reported to the Council in November 2018 in which the preliminary main objectives of the JEM were stated. After a series of national and regional consultations in 2018 and early 2019, a final draft JEM Programme, including the two pilot project proposals for Don Sahong and Xayaburi hydropower projects, was agreed upon in an Environmental Management Expert Group (EMEG) Meeting in Luang Prabang in May 2019, and the Meeting requested the MRC Secretariat to submit it to the 49th JC Meeting in September 2019 for information. The draft JEM Programme states several main purposes summarized below:

- I. have a common, standardised or scientifically robust programme for jointly monitoring key environmental indicators for impact assessment of Mekong mainstream hydropower projects on hydrology and hydraulics, sediment and geomorphology, water quality, aquatic ecology, and fisheries;
- II. support mainstream hydropower project proponents to collect sufficient and robust scientific environment data and information for project planning and design, construction and operation of sustainable hydropower projects;
- III. support MCs to monitor and report the transboundary environmental impacts of Mekong mainstream hydropower projects during construction and operation to inform mitigation and management measures;
- IV. after the completion of the six-month Prior consultation (PC) process to support the MRC Member Countries to establish formal coordination mechanisms to work with project proponents to collect and share fisheries and environment data and enable adaptive management of the operation of hydropower projects.

2. It was agreed that the final draft JEM Programme shall be piloted on both the Don Sahong and Xayaburi Hydropower projects, in line with the request from the 44th MRC JC. The pilot designs have been finalized and were agreed upon during the EMEG meeting in Luang Prabang in May 2019. The implementation of the two pilots will involve monitoring the five key environment disciplines mentioned above. The Fisheries monitoring discipline includes several monitoring activities: the monitoring of fish abundance and diversity (FADM), larvae drift and juvenile monitoring and the monitoring of fish passage efficiency and effectiveness. For the initial piloting the last activity, fish passage monitoring will be carried out only at the Don Sahong HPP. Further details of the JEM Pilots can be found in the sections below.

Process of Development:

3. During the first quarter of 2018 a JEM Coordination Team was established, and four international consultants were recruited in cooperation with and support by the GIZ-MRC Programme. After a kick-off meeting and site visit the process to draft the first JEM Programme was initiated. A Review of Environment Monitoring Activities in the Lower Mekong Basin was finalized in August 2018, which includes the strengths and weaknesses of the current MRC environmental

routine monitoring and provides key recommendations for the JEM on all five key environmental monitoring disciplines for assessment of impacts from hydropower projects. The first JEM Programme draft was finalized in December 2018 after extensive internal review processes by the MRCS JEM Team. The first draft JEM Programme, including the two pilot projects, was presented to the EMEG meeting in Vientiane on the 22nd and 23rd of January 2019. Developers of the Xayaburi, Don Sahong and Pak Lay Hydropower Projects were present. Key points that were discussed during said meeting were: (1) the background and main purpose of and requirements/recommendations for the process of the JEM Programme; (2) present and discuss the first draft of the JEM Programme and the two JEM Pilot Project designs; and (3) to obtain Member Countries' and Developers' views on the first draft of the JEM. The comments and suggestions made during the meeting were captured in a matrix and provided the necessary input to draft the second version of the JEM Programme and its two pilot projects.

4. Four national consultations on the second revision of the JEM Programme were organized in the four MCs from March to April 2019 to discuss the following key points: (1) details of the background on the existing monitoring programmes in the Mekong region; (2) the key recommendations for further development of JEM Programme and its vision, out of the comments from the EMEG meeting in January; (3) key concepts for the development of joint environmental monitoring on five disciplines. The key recommendations from the four national consultations were that (1) the JEM should aim at aligning with and complementing developers monitoring plans; (2) JEM should aim at integrating and interlinking the parameters among different disciplines to provide a clear view of impacts on the basin; (3) that the long-term sustainability of the JEM needs to be ensured without excessive additional burden on Member Countries; and (4) that the integration of current monitoring efforts and JEM and the sharing of data with different stakeholders needs to be ensured.

5. With the comments provided during the four national consultations, the third draft JEM Programme and an update of the JEM Pilot designs were produced and have been discussed in the EMEG Meeting in Luang Prabang, Lao PDR on the 7th of May 2019. Key points for discussion were: (1) updated JEM Objectives and Vision; (2) the responses to the previous regional and national consultations; (3) status of the JEM Programme; (4) status of the JEM Pilots; (5) implementation procedures and resource needs; and (6) pending issues for finalization of the draft documents (JEM and Pilots). During this EMEG meeting all Member Countries agreed to the 3rd Draft JEM and the pilot designs, provided some minor comments from the meeting and the outcomes of the JEM training would be considered. The first regional JEM training was provided from the 8th to the 10th of May in Luang Prabang. The outcomes of the trainings (especially on capacity building needs) and the comments from the previously held EMEG meeting have been addressed and the 4th and final draft JEM Programme has been produced. The JEM Pilots have also been finalized and are ready for implementation in 2020 and 2021.

6. The members of the EMEG requested the MRCS to submit the final JEM Programme and Pilot designs to the 49th JC meeting to take note. The 49th JC held on the 4th of September took note of the progress on the JEM pilots and the final draft JEM Guidelines.

7. The **final draft JEM Programme** aims at (i) developing a common, standardized and scientifically robust joint programme for monitoring the effects of Mekong mainstream hydropower projects on key environmental indicators; (ii) filling the gaps of environmental data and information for Mekong mainstream hydropower project planning and design; (iii) supporting Member Countries to jointly monitor and report the transboundary environmental impacts of Mekong mainstream hydropower projects during construction and operation to inform mitigation and management measures; and (iv) facilitating environmental data, information sharing and exchange among the concerned Member Countries. For this, monitoring procedures on what and how to collect the appropriate standardized information for five key environmental disciplines ((i) *hydrology and hydraulics*, (ii) *sediment transport and geomorphology*, (iii) *water quality*, (iv) *aquatic ecology/ecological health* and (v) *fish, fisheries and fish passage* within the Mekong context have been identified and explained into detail within the JEM Programme document. The JEM Programme specifies which environmental parameters should be collected where and how (methodology) in order to improve the current regional environmental monitoring system. The JEM programme provides a strategic approach to monitoring which allows to identify and interpret

interrelationships between different subject areas based on standardized and robust environmental information. It builds upon previous and current MRC projects and is directly linked to the 1995 Mekong Agreement and the MRC Core River Basin Management Functions as it relies on and feeds into the successful implementation of the MRC Procedures.

8. The **Pilot Designs** are focused on two hydropower projects, namely the **Xayaburi HPP and the Don Sahong HPP**, with the aim of designing an environmental monitoring system that will capture the impacts of these specific projects. These two design documents specify - for each of the 5 disciplines and in alignment with the JEM Programme - which parameters should be collected at which location, following which methodologies and using which equipment. As with the JEM Programme, the two pilots have been defined considering the questions that need to be answered in terms of environmental impacts, the environmental monitoring systems already in place at national and regional levels, the know-how and facilities available in the countries and the budget constraints.

As mentioned above, both pilots have been presented to and discussed and accepted by the Member Countries through an iterative consultation process at regional and national levels. The national monitoring teams in Cambodia, Lao PDR and Thailand have been involved in the decision-making process and agree to be trained and carry out the new and expanded monitoring approaches to implement the JEM pilots as suggested in the pilot designs. All national teams have received one initial JEM training in May 2019. The national monitoring teams that will carry out the JEM pilots will receive further training on the new methodologies, and on data management and reporting. It is not foreseen to train national teams of all Member Countries at this stage, as the JEM Programme is likely to change in scope after the initial results of the pilots have been taken into account. The MRCS will draft new MoUs, or top-up existing routine monitoring MoUs, to finance the additional monitoring work under the JEM through the Basket Fund. GIZ will contribute to the Basket Fund to ensure sufficient funding is available. GIZ will also fully fund the service cost of international experts and the necessary equipment to carry out the JEM pilots.

9. On the 26th of August 2019 the Lao National Mekong Committee Secretariat (LNMCS) facilitated a meeting between the MRCS and the following Line Ministries to discuss the proposed monitoring sites for the pilot implementation:

- Ministry of Energy and Mines (MEM):
 - i. Department of Energy Business
 - ii. Department of Energy Planning and Policy
- Ministry of Agriculture and Forestry (MAF):
 - i. Department of Livestock and Fisheries
 - ii. Living Aquatic Resources Research Center
- Ministry of Natural Resources and Environment (MoNRE):
 - i. Institute of Natural Resources and Environment
 - ii. Department of Meteorology and Hydrology
 - iii. Office of Natural Resources and Environment Monitoring and Inspection
- Faculty of Natural Science of the National University of Laos.

During this meeting the Department of Energy Business of MEM requested the MRCS to provide detailed locations for the monitoring sites for all disciplines in order to verify whether they fall within the concession area. The remaining Line Agencies stated their conformity with the proposed approach to the implementation of the pilot projects.

On the 23rd of September 2019 the preparation for the JEM pilots reached a key milestone when the Department of Energy Business (DEB) of MEM, signatory to the contracts between the hydropower developers and the GoL, informed the LNMC that they do not oppose the implementation of the JEM pilots as proposed. They confirmed and approved of the indicated monitoring locations as they

do not fall within the delimited concession area and thus no agreement with developers is needed. Furthermore, if future coordination with the developers is required the DEB expressed their willingness to facilitate the process.

Currently the LNMCS is coordinating the process to carry out site surveys to confirm the technical adequacy and logistic feasibility of the proposed monitoring locations. It is expected to conduct the field surveys during the last quarter of 2019 and January 2020 and to have the exact and final locations for the JEM monitoring sites for all five disciplines by February 2020.

10. The procurement of international experts to support the JEM piloting process is ongoing and expected to be finalized by November 2019. The international tender, run by GIZ, closed on the 19th of September and the technical and financial bids have been assessed. The GIZ contracting department is currently drafting the contract for the awarded bid. The kick-off for the JEM pilot implementation phase is expected to be held by end of November – beginning of December 2019. The kick-off meeting will be followed by an inception phase after which the procurement of monitoring equipment and the preparation for capacity building for all five monitoring disciplines will be initiated.

11. The MRCS Environmental Division and the Technical Support Division have been revising and drafting new “top-up” MOUs to agree on the technical and financial implementation arrangements for the monitoring of five environmental disciplines under the JEM pilots. The MOUs will be agreed upon between the MRCS, the LNMCS, the CNMCS and the TNMC together with the implementing agencies of each Member Country under which the national monitoring teams for routine monitoring are deployed, which will be the same teams that will carry out the monitoring for the JEM pilots. It is expected to have final and signed MOUs by January 2020, after finalizing the site surveys and agreeing on exact monitoring locations.

A snapshot of the final draft JEM Programme

The Lower Mekong River and surrounding basin are undergoing rapid development pressures, with hydropower a significant growth area. From a basin-scale perspective, information is needed about the availability and condition of the water resources and their linkages with environmental conditions in the basin, how these are changing over time, and how they may change under present and future hydropower developments. These inputs can potentially inform hydropower project siting and design, prediction of changes relating to the project operation, and development, application and evaluation of mitigation and management measures. This information will provide a common basis for constructive discussions by communities and Member Countries on the implications of hydropower development and for the successful implementation of the 1995 Mekong Agreement.

The main purposes of the JEM have been mentioned in the background section above. For monitoring to be informative, it must have well defined objectives measured against agreed indicators to check the progress or quality of a development or activity over a period of time. The current JEM document provides a framework to help Member Countries consider whether hydropower projects are having any impacts, and if there are concerns, to build confidence about any proposals to implement revised management approaches (i.e. adaptive management). This is particularly important because most monitoring by developers appears to be localised around the dam development site, whilst MRC monitoring offers more holistic basin-wide assessments. For the JEM to be a success as a regional monitoring programme, the quality of information available from the MRC and stakeholders must be from the appropriate locations to be able to detect change, and be reliable, continuous and available in a timely manner.

The JEM programme builds on existing LMB-wide monitoring that has been undertaken under the auspices of the MRC, either directly by MRC or in collaboration with the other partners. To implement this initiative successfully, active support and participation from the national Mekong committees, and national Line Ministries as for example the Lao Ministry of Natural Resources and

Environment (MONRE), Lao Ministry of Mine and Energy (MME), and from the developers of Hydropower Projects is required.

The benefits of such collaborative monitoring are:

- Countries and projects can use the same parameters and methods for more detailed data and information collection;
- Results of more detailed information collection can be fit into the larger picture for interpretation purposes;
- Results of more detailed information collection can be verified against quality assured basin information;
- Information sharing, comparison and transboundary evaluation is facilitated;
- Good information at all levels supports good decisions;

Furthermore, the JEM aims at addressing the complexity of the relationships between environmental drivers and their influence on socio-economic factors such as livelihoods and food security. Through integrative and transdisciplinary analysis approaches, it is expected to provide the necessary information for all involved parties and in particular for Member Countries.

For each of the five main monitoring disciplines ((i) *hydrology and hydraulics*, (ii) *sediment transport and geomorphology*, (iii) *water quality*, (iv) *aquatic ecology/ecological health* and (v) *fish, fisheries and fish passage*) the JEM Programme has defined the main expected outputs and identified and described best-practice methodologies, suitable for the Mekong context, to achieve said outputs (i.e. key questions have been asked for each discipline, and several ways to answer these questions have been proposed). The level of detail provided includes both methodological aspects such as parameters and frequencies as well as up-to-date equipment specifications. The annexes of the JEM Programme provides more details on how to deploy the proposed equipment and how to implement detailed steps within the proposed methodologies.

It should be noted that for each different Hydropower Project the most appropriate methodological approach will vary depending on the concrete environmental conditions and context. Therefore, although the JEM provides an overall framework, the concrete approach and implementation procedure will need to be decided for every new project as was done for the two pilots. To account for this, the JEM Programme provides more than one possible method and approach to monitor each of the different disciplines.

A snapshot of the Xayaburi pilot design

The Xayaburi dam is the third dam in the hydropower cascade of the six proposed mainstream projects in the territory of Lao PDR upstream Vientiane. Xayaburi Hydropower Project (XBR) is located between Luang Prabang in its upstream reach and Pak Lay potential project dam site downstream. Xayaburi is a run-of-river scheme designed to provide hydropower generation capability comprising seven turbine-generator units with a total of 1225 MW for export to Thailand, and one unit of 60 MW capacity for use in Lao PDR. Construction of the dam and powerhouse has created a 93-km long impoundment. The main facilities are the dam structure itself (820 m long, 32.6 m high, rated head of 18.3 m), the spillway for discharge of river flow greater than the powerhouse discharge capacity, sluices for bypassing of suspended sediment at the powerhouse inlets, a navigation lock, and fish bypass facilities.

The Xayaburi pilot design proposes to trial the draft JEM Programme for all five environmental monitoring disciplines by enhancing and expanding the current routine monitoring activities in the river reaches upstream (u/s) and downstream (d/s) of the project site. In order to do so, the Xayaburi pilot design proposes to add several new monitoring stations or locations and a few new

monitoring parameters. New stations and locations include: two new HYCOS stations, one u/s of the current Luang Prabang station to avoid backwater effects of the impoundment and one d/s at approximately 5-10 km of the HPP; to have one new sediment monitoring location at the new HYCOS station d/s of the dam site and to move the LPB monitoring location u/s to the new HYCOS site, outside of the backwater effects of the impoundment; to monitor the river cross-section at three new locations between Chiang Khan and Vientiane; to include five new Water Quality monitoring stations (one located within the dam impoundment one u/s of the impoundment influence and three d/s of which one should be before directly after the dam wall (500 m) and one soon after the first significant tributary, the third should be in between these two); to include up to six new Aquatic Ecology monitoring sites of which one should be u/s of the impoundment area, one should be located within the dam impoundment area and four sites should be d/s of the dam. The d/s station locations should be similar to water quality sites with one close to the dam, in this case two between the next significant tributary and the dam and one after the first major tributary; and to identify and monitor fisheries (FADM & Larvae and Juveniles) at three new sites (one located within the dam impoundment, one u/s of the impoundment and one d/s of the dam site). The fish passage efficiency and effectiveness monitoring methodology has been included in the draft but is currently not foreseen to be piloted yet due to budgetary constraints. For all the proposed sites it is clearly indicated in the pilot design that the exact locations will have to be determined during field visits together with the monitoring teams. New parameters include bedload movement and photographic monitoring of riverbed morphology for Sediment Monitoring; Chlorophyll and Turbidity for Water Quality Monitoring; Phytoplankton for Aquatic Ecology Monitoring; and Larvae Drift and Juvenile monitoring in Lao PDR for Fisheries Monitoring.

Monitoring frequencies for routine Sediment and Ecological Health Monitoring are suggested to increase, both for new stations and some current stations up and down stream of the dam site. Specifically, the Chiang Khan station will increase the sediment sampling frequencies during the pilot phase, the monitoring methodology will be updated, and new equipment will be bought. The Luang Prabang monitoring location for sediment will be moved u/s and sampling frequency will be increased too.

A snapshot of the Don Sahong pilot design

Don Sahong Hydropower Plant (DSH) is a run-of-river scheme located in Lao PDR in the middle reach of the Mekong River in the southern area of Khong District, Champasak Province, 150 km downstream of the provincial capital, Pakse, just about 2 km above the Lao-Cambodian border. This area is generally known as Si Phan Don (Four Thousand Islands): a relatively flat and level land surface, into which the Mekong River has eroded seven main channels and numerous smaller channels forming a complex of islands along about 10 km of the Mekong. The Don Sahong Dam is located on one of the seven main channels: the 5-km-long Hou Sahong channel. The power plant is proposed to have a nominal installed capacity of 260 MW, developed by discharging the design flow of 1600 m³/s operating at the rated head of 17.8 m. Power output will vary with the seasonal flow variation.

The Don Sahong pilot design proposes to trial the draft JEM Programme for all five environmental monitoring disciplines by enhancing and expanding the current routine monitoring activities in the river reaches u/s and d/s of the project site. In order to do so, the DSH pilot design proposes to add: one new HYCOS station approximately 45 km d/s of the dam, (u/s of the 3S convergence)(covered by HYCOS routine programme as location overlaps with HYCOS expansion); one new sediment monitoring location u/s of the 3S convergence, preferably where the new HYCO station will be installed; include cross section monitoring of dolphin pools in Cambodia; include four new Water Quality monitoring stations (one located within the dam impoundment, one site immediately u/s of the dam, one immediately d/s of the dam and one further d/s); include up to four new Aquatic

Ecology monitoring sites, one site upstream and two sites downstream of the dam, immediately below the dam wall and on the edge of the next enlarged section of the stream and one site located within the dam impoundment; two new fisheries monitoring sites upstream and downstream of the Khone Falls; and to assess the effectiveness and efficiency of the modified channels for fish migration (fish passage monitoring). For all the proposed sites it is clearly indicated in the pilot design that the exact locations will have to be determined during field visits together with the monitoring teams. New parameters include bedload movement and photographic monitoring of riverbed morphology (sediment); Chlorophyll and Turbidity (Water Quality); Phytoplankton (Aquatic Ecology); Larvae Drift and Juvenile monitoring in Lao PDR and Cambodia (Fish); and fish passage monitoring (Fish).

Monitoring frequencies for routine Sediment and Ecological Health Monitoring are suggested to increase, both for new stations and some current stations up and down stream of the dam site. Specifically, the Pakse station will increase the sediment sampling frequencies during the pilot phase, and the monitoring methodology will be updated, and new equipment will be bought. The new HYCOS station and sediment and discharge monitoring location u/s of the 3S convergence and Stung Treng will also increase the sampling frequency. The Cambodian team will also be asked to carry out cross-section samples twice a year at the dolphin pools on the Cambodian side.

For fish passage monitoring the international experts that will support the piloting process (contracted by GIZ) will need to deploy about 30-50 acoustic tag receivers throughout the different river channels in the Si Pan Don area, a few of which will have to be located close to the dam site and the upper entrance of the project impoundment. The international experts will train and collaborate with Lao fisheries staff in fish capture and tagging, including fish surgeries. For the purpose of the pilot the analysis and data collection for fish passage monitoring will be carried out by the consultants. For the long-term JEM programme either the national teams will be trained on a case-by-case (dam-by-dam) basis to carry out such monitoring, or regional or international experts shall be hired.

Next Steps:

12. The following are next steps:

- GIZ finalizes the procurement of international experts for the two pilot projects;
- MRCS and national monitoring teams carry out field surveys to verify proposed monitoring locations;
- MRCS and NMCs finalize and sign the top up MOUs with National Monitoring Teams;
- Comprehensive trainings are provided to JEM monitoring teams and new equipment is deployed at both pilot sites;
- Consult the JEM piloting progress/achievements and results, with different stakeholders;
- Report the JEM piloting progress and achievements to JC;
- Finalize the JEM Programme based on the results from the above two piloting projects; and
- Submit the Final JEM Programme to JC for consideration of further long-term application.