



**NAM NGIEP 1
POWER COMPANY**

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

April 2022




					
A	15 May 2022	Hendra WINASTU	Wanidaporn RODE	Khamlar PHONSAVAT	Final
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EXECUTIVE SUMMARY

SGS (Lao) Sole Co., Ltd. submitted the ISO14001:2015 certification to NNP1PC on 25 April 2022 confirming that NNP1PC has been assessed and certified meeting all the requirements of ISO14001:2015 for the activities of the Generation and Distribution of Electricity from the 290 MW Hydropower Project. The certification is valid from 15 March 2022 until 15 March 2025 subject to satisfactory surveillance audits which is scheduled in March 2023 for the first surveillance audit.

During April 2022, one document was submitted to EMO for review and approval. EMO did not issue any Site Inspection Report of Observation of Non-Compliance (ONC) or Non-Compliance Reports (NCR) to the Contractor.

Due to the COVID-19 pandemic and increase in infected people in the project areas and communities surrounding the project, the regular joint site inspections continue to be suspended at some restricted areas such as in Zone 2UR. However, the regular joint site inspections of the Dam sites and NNP1PC's operation sites have been conducted as normal.

The operation and adjustment of the newly constructed wastewater treatment systems continued in April 2022. It is expected that the operation of the system can be adjusted to meet the effluent standards by Q2 of 2022.

EMO only monitored the surface water quality stations once during April 2022. At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 7.1 mg/L in the upper 8.5 m varying between 5.0 mg/L and 7.4 mg/L, and the oxycline was generally found at the depth of 8.0 m with DO concentrations decreasing from about 7 mg/L to 5 mg/L. In the Re-regulation Reservoir, a thermocline was observed at a depth of about 1.5 m where the DO concentrations dropped from about 4 mg/L to about 2.7 mg/L.

The DO measurements downstream the Re-regulation Dam were carried out during gate discharge which due to reaeration has likely contributed to the high DO concentrations above 7 mg/L in all downstream stations.

No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam.

In April 2022, the two local waste collection contractors provided training and awareness on waste management for villagers of the host villages and the resettlement village as well as continued collecting waste from the NNP1PC's operation sites and the nearby villages and operating the NNP1 Project Landfill and Houay Soup Landfill until their contracts were ended on 12 April 2022. The work included waste collection, segregation and disposal, waste cover and compaction, grass cutting and repairing the perimeter fences and landfill internal access road were successfully completed. The communities general waste collection and the Houay Soup Landfill operation is under handover process to be managed by the local authority (Bolikhaneh EMU) and the NNP1 waste collection and the Project Landfill continues to be conducted by the former contractor (Nilun Construction Co., Ltd.) with a one-year contract under the management of NNP1PC's Admin team.

A total of 11 m³ of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 6.4 m³ compared with March 2022. A total of 22.9 m³ of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at Houay Soup Landfill, a decrease of 1.4 m³ compared with March 2022. There was no trading of recyclable waste at the community recycle waste bank during the period of reporting.

The Xaysomboun Provincial Governor approved the restructure of Xaysomboun Watershed and Reservoir Protection Office Committee (WRPC) and Watershed and Reservoir Protection Office (WRPO) on 29 March 2022 and the internal meeting among Xaysomboun WRPC and WRPO was organized on 8 April 2022. Xaysomboun WRPO planned to organize the training for Participatory Land Use Plan (PLUP) and LUP improvement for Phonhom Village from the first week of April 2022 but it was postponed to May 2022 because the members responsible for it contracted COVID-19. There was no progress by Bolikhamxay WRPO because they have not received the fund for implementing the activities under the approved AIP2022 from DOF-MAF until end of April 2022. Bolikhamxay Nam Chouan-Nam Xang Biodiversity Offset Management Unit (NC-NX BOMU) carried out activities in April 2022 including the assessment for snare removal program and community outreach through radio at NC-NX districts and villages.

The fish catch monitoring for March 2022 in Nam Ngiep Watershed was dominated by *Oreochromis niloticus* and *Channa striata* and species groups of *Barbonymus* and *Hypsibarbus*, *Sikukia gudgeri* and *Amblyrhynchichthys truncates* and *Poropuntius*. They are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Sikukia gudgeri* which is classified as Data Deficient species (DD).

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

SGS (Lao) Sole Co., Ltd. issued the ISO14001:2015 certification to NNP1PC on 25 April 2022 confirming that NNP1PC has been assessed and certified as meeting all the requirements of ISO14001:2015 for the activities of the Generation and Distribution of Electricity from the 290 MW Hydropower Project. The certification is valid from 15 March 2022 until 15 March 2025 subject to satisfactory surveillance audits which is scheduled in March 2023 for the first surveillance audit.

FIGURE 1-1: ISO 14001:2015 CERTIFICATION VALID FROM 15 MARCH 2022 UNTIL 15 MARCH 2025



1.2 COMPLIANCE MANAGEMENT

In April 2022, EMO received one Detail Work Program (DWP) and Site-Specific Environmental Management and Monitoring Plan (SS-ESMMP) for review and approval. In addition, EMO followed up on the other three pending revision and resubmission documents from the contractors. The status of the review is summarised in **Table 1-1**.

TABLE 1-1: SUMMARY OF DOCUMENT PENDING REVISION AND RESUBMISSION FOR REVIEW IN APRIL 2022

Title	Date Received	Latest Status of documents which are pending to be submitted after revising
DWP SS-ESMMP for Repairing of damaged irrigation canal and levelling the Access Roads in PHX Resettlement Village	10 February 2022 (2 nd submission)	No objection with comments on 21 February 2022. No update by the contractor. EMO coordinated with INFRA team to request the contractor to revise and resubmit by 6 May 2022.
DWP SS-ESMMP for Remedial Right Bank Abatement of Main Dam	07 January 2022 (1 st submission)	No objection with comments on 10 January 2022. The contractor responded to be resubmitted by 6 May 2022.
DWP SS-ESMMP for Maintenance Works 2022	20 January 2022 (1 st submission)	No objection with comments on 20 January 2022. The contractor responded to be resubmitted by 6 May 2022.
DWP SS-ESMMP for Construction of Water Supply and roads improvement for Pou Village in Zone 2UR	29 April 2022 (2 nd submission)	Closed. <i>The construction was completed.</i>

Due to the COVID-19 pandemic and an increase of infections in the project areas and the communities surrounding the project, the regular joint site inspections continued to be suspended at some restricted areas such as in Zone 2UR. However, the regular joint site inspections of the Dam sites and NNP1PC's operation were conducted as normal.

The operation and adjustment of the newly constructed wastewater treatment systems continued in April 2022. It is expected that the operation of the system can be adjusted to meet the effluent standards by Q2 of 2022.

EMO did not issue any Site Inspection Report of Observation of Non-Compliance (ONC) and Non-Compliance Reports (NCR) to the Contractor. The status of compliance reports (Observation of Non-Compliance or ONC; and Non-Compliance Report or NCR) issued by NNP1PC is summarized in **Table 1-2** and **Table 1-3** below.

TABLE 1-2: SUMMARY OF ONCs AND NCRs

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from March 2022	0	1	0	0
Newly Opened in March 2022	0	0	0	0
Total in February 2022	0	1	0	0
Resolved in March 2022	0	0	0	0
Carried over to April 2022	0	1	0	0
Unsolved Exceeding Deadlines	0	0	0	0

TABLE 1-3: SUMMARY OF THE ONC AND NCR ISSUED TO THE CONTRACTOR

Document Number / Date of Issue	Subject Description	Current Status at the end of April 2022
NC No. 01/22 Issued Date: 13-02-22 (NCR Level 1)	Some effluent discharge parameters continue to exceed the standards for almost 5 months following the completion of the improvement and modification in September 2021	<ul style="list-style-type: none"> Adding the proper sludges/seeds into the Aeration Tank at OSOV2 WWTS and the Biofilm Septic Tank at the Main Powerhouse System – In progress. Replacing the detergents used at the Main Powerhouse by lower phosphate detergents and the proper seeds will also be added into the Septic Tank – In progress Closely monitor the Influent to compare with the Effluent for the specific parameters to check their treatment effectiveness – In progress.

1.2.1 Site Inspection by Environment Management Unit (EMU)

The monthly site visit by the EMU of Bolikhan District and the quarterly site visit by the EMU of Xaysomboun Province were not carried out in April 2022.

1.2.2 Site Decommissioning and Rehabilitation

Since the rehabilitation of the two sites of former LILAMA10 camp and the Irrigation Canal's rock and spoil disposal of Phouhomxay village were accepted by the GoL-EMU, the inspection and monitoring frequency was adjusted from a monthly basic to be a quarterly basis. No inspection and monitoring during this reporting period of April 2022. The next inspection will be conducted in June 2022.

1.3 WATER QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD₅), Faecal Coliform Bacteria, Total Coliform Bacteria and *E.coli* have been carried out by NNP1PC's environmental laboratory since August 2017.

All data are reported to the Ministry of Natural Resources and Environment (MONRE) monthly, and quarterly to the ADB. The reports are also published on the Company's website at <https://namngiep1.com/resources/monitoring-reports/>

Due to the COVID-19 pandemic and increasing infections in the project area and the communities nearby the project, water sampling mission was taken in late April 2022. Therefore, the results of COD, TOC, Ammonia-Nitrogen, Total Nitrogen, Total Phosphorus, Hydrogen Sulphide, Nitrate-Nitrogen, Phytoplankton Biomass, and Oil & Grease will be reported in May 2022 report.

1.3.1 Effluent Discharge from Camps and Construction Sites

Detailed monitoring results are provided in the **Annex A** of this Report. The status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities are summarized in **Table 1-4**.

TABLE 1-4: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT WWTSs IN APRIL 2022

Site	Sampling ID	Status	Corrective Actions (Expected Completion Date)
OSOV1	EF01	Non-compliance for faecal coliform and total coliform in one out of two samplings.	1) Completed proper fencing installation to prevent the cattle's encroachment in the OSOV1 wetlands' ponds (31 March 2022).
OSOV2	EF13	Fully complied with the standard (BOD ₅ , TSS, faecal coliform and total coliform).	2) Completed additional planting of reeds in the OSOV1 wetlands' ponds (31 March 2022).
Main Powerhouse	EF19	Fully complied with the standard (BOD ₅ , TSS, faecal coliform and total coliform).	3) Adding the proper sludge seeds into the Aeration Tank at OSOV2 WWTS and the Biofilm Septic Tank at the Main Powerhouse System – Still under contract with the supplier (Q2 of 2022). 4) Replacing the detergent materials in the Main Powerhouse by using lower phosphate detergent (30 April 2022). 5) Closely monitor the Residual Chlorine content in the effluents of OSOV2 and the Main Powerhouse WWTS and adjust as necessary (30 April 2022).

Site	Sampling ID	Status	Corrective Actions (Expected Completion Date)
			6) Closely monitor the Influent to compare with the Effluent for the specific parameters to check the treatment effectiveness (Q2 of 2022).

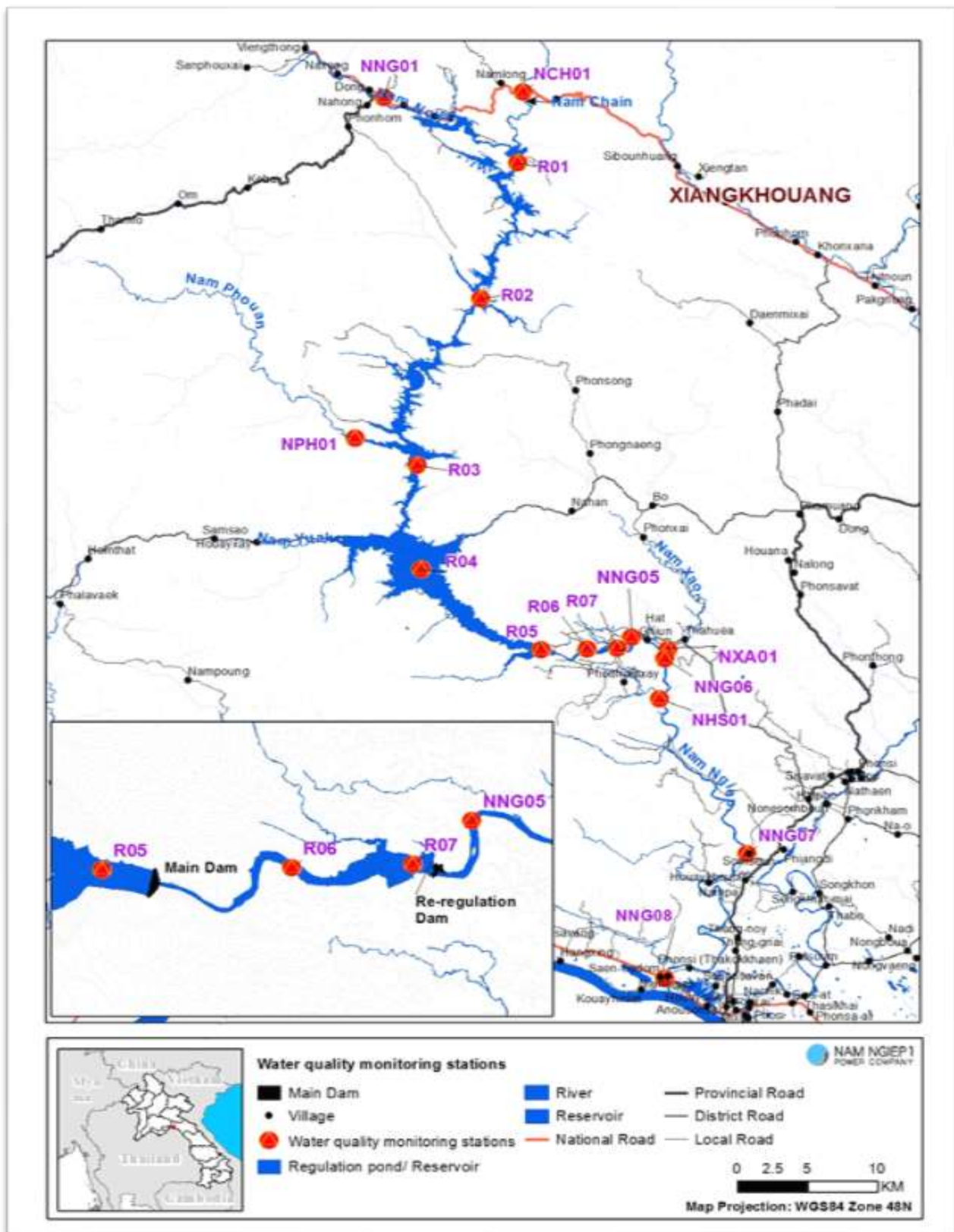
1.3.2 Ambient Surface Water and Reservoir Water Quality Monitoring

The ambient surface water and reservoir water quality monitoring programme comprises five monitoring stations in the main reservoir (R01-R05), two stations in the Re-regulation Reservoir (R06 and R07), five stations in the mainstream Nam Ngiep (NNG01 and NNG05 to NNG08) and four stations in the main tributaries to Nam Ngiep (Nam Chiane [NCH01], Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]).

Weekly depth profile monitoring (pH, DO, conductivity and temperature) has been undertaken since 18 September 2018 for stations located in the Re-regulation reservoir and the main reservoir. The locations of the monitoring stations are shown in **Figure 1-2**. However, during April 2022, EMO only monitored the river and reservoir stations once.

The monitoring results for key parameters (DO, TSS and BOD₅) during April 2022 are presented in **Table 1-5, Table 1-6 and Table 1-7**. The full set of data for April 2022 is attached in **Annex A**. In addition, the trends of DO depth profile timeseries measurement graph for R05 station is shown in **Figure 1-3**, the results for DO timeseries are presented as line graphs in **Figure 1-4** and DO Long Profile graphs in **Figure 1-5**.

FIGURE 1-2: SURFACE WATER AND RE-REGULATION RESERVOIR WATER QUALITY MONITORING STATIONS

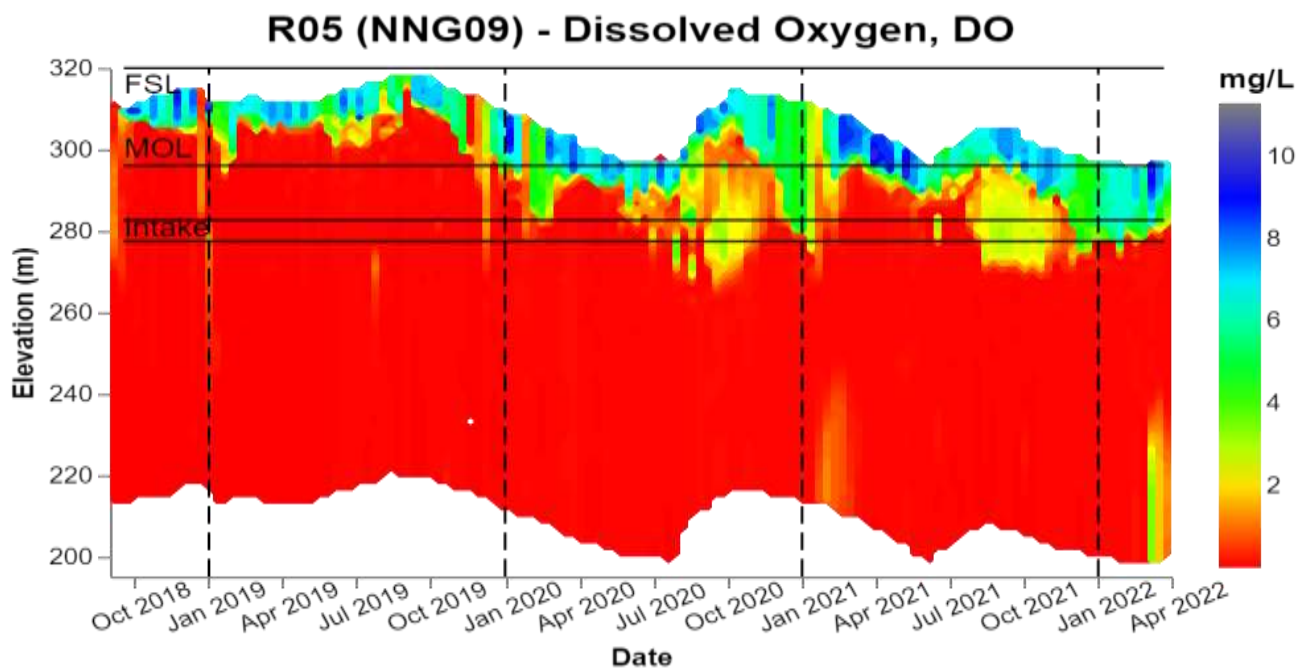


Main Reservoir

From 01 to 30 April 2022, the main reservoir water level decreased with 1.10 m from El. 299.71 m asl to El. 298.61 m.

At R05 (in the Main Reservoir approx. 0.5 Km upstream the Main Dam), the average DO concentration was 7.1 mg/L in the upper 8.5 m varying between 5.0 mg/L and 7.4 mg/L, and the oxycline was generally found at the depth of 8.0 m with DO concentrations decreasing from about 7 mg/L to 5 mg/L. DO concentrations below 0.5 mg/L (anoxic condition) were recorded at depth of 18 m which correspond to the centre line of the intake.

FIGURE 1-3: DO DEPTH PROFILES TIME SERIES IN R05 (SINCE SEPTEMBER 2018 TO APRIL 2022)



At R04, the DO levels in the upper 9.0 m varied between 5.0 mg/L and 7.6 mg/L with oxycline at depth of 8.0 m below surface and DO concentrations generally less than 2 mg/L at depths below 14 m.

At R03, the DO levels in the upper 5.5 m were above 6 mg/L, and in the depth interval from 6 m to 20 m the DO concentrations gradually dropped to about 3 mg/L. Below 20 m, the DO levels decreased to below 1 mg/L.

At R02, the DO levels in the entire water column varied between 4.6 mg/L and 8.1 mg/L with a mean of 6.3 mg/L.

At R01, the DO level at the water surface was 7.6 mg/L.

As expected, the TSS concentrations in the main reservoir have been consistently low since the start of impounding with a mean of 5 mg/L compared with the high flow season means of about 100 – 250 mg/L and low flow season means of 20 mg/L - 50 mg/L.

The BOD₅ measurements at R01, R02, R03, R04 and R05 in epilimnion were less than 1.0 mg/L. In the hypolimnion at station R03, R04 and R05, the BOD₅ results were less than 1 mg/L, 7.71 mg/L and 7.32 mg/L respectively.

Re-regulation Reservoir

In April 2022, the turbine discharges from the Main Powerhouse varied between 57 and 231 m³/s usually interrupted by night-time periods with no discharge.

At R06 and R07 in the Re-regulation Reservoir, a thermocline was observed at a depth of about 1.5 m where the DO concentrations dropped from about 4 mg/L to about 2.7 mg/L.

The mean DO concentration in the water column were 2.9 mg/L in both R06 and R07.

The BOD₅ concentrations in both R06 and R07 were less than 1.0 mg/L.

Nam Ngiep Downstream

During April 2022, the discharge from the Re-regulation Dam was gate discharge at all times. The DO measurements downstream the Re-regulation Dam were carried out during gate discharge which due to reaeration has likely contributed to the high DO concentrations above 7 mg/L in all downstream stations thus complying with the surface water quality standard.

No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam.

The BOD₅ in the downstream station (NNG05) was less than 1 mg/L and complied with the national surface water quality standard.

Main Tributaries to Nam Ngiep

All monitored parameters in the Nam Phouan (NPH01), Nam Xao (NXA01) and Nam Houaysoup (NHS01) complied with the standards.

FIGURE 1-4: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO APRIL 2022

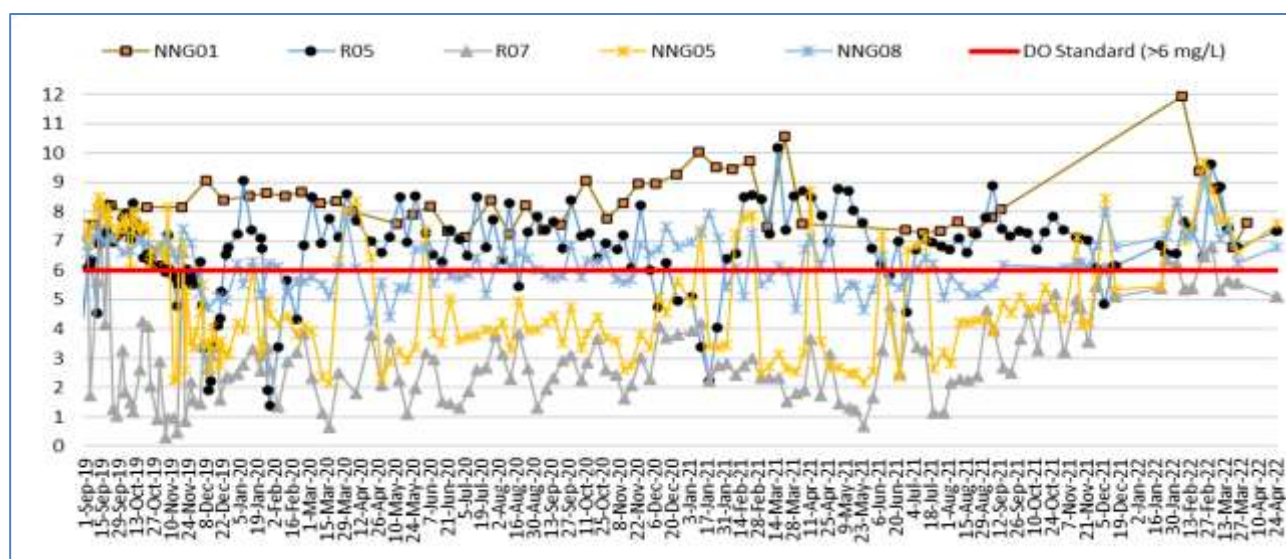


FIGURE 1-5: DISSOLVED OXYGEN (MG/L) LONG PROFILE IN MARCH 2022 (FROM IMMEDIATELY UPPER MAIN DAM TO LOWER NAM NGIEP RIVER)

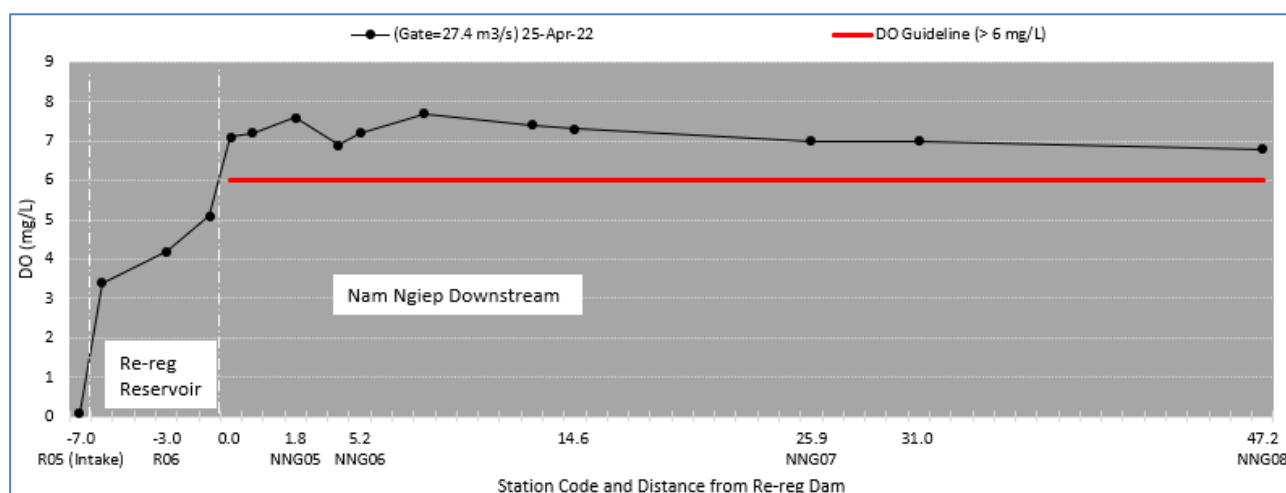


TABLE 1-5: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
1-Apr-22	7.62												7.61			
23-Apr-22		7.64	7.15	7.81										7.95		
24-Apr-22					7.52	7.35	4.24	5.09								
25-Apr-22									7.6	7.22	7.08	6.79			6.02	6.63

TABLE 1-6: RESULTS OF SURFACE WATER QUALITY MONITORING FOR TOTAL SUSPENDED SOLIDS (MG/L)

Total Suspended Solids (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
1-Apr-22	6.43												7.4			
23-Apr-22		17.3 3		<5										9.14		
23-Apr-22 Bottom				<5												
24-Apr-22					<5	<5	<5	<5								
24-Apr-22 Bottom					<5	<5										
25-Apr-22									<5	<5	<5	7.77			5.46	<5

TABLE 1-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD₅ (MG/L) - WATER QUALITY STANDARD: < 1.5 MG/L

BOD ₅ (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
1-Apr-22	<1												<1			
23-Apr-22		<1		<1										<1		
23-Apr-22 Bottom				<1												
24-Apr-22					<1	<1	<1	1.19								
24-Apr-22 Bottom					7.71	7.32										
25-Apr-22									<1	<1	<1	<1			<1	<1

1.3.3 Groundwater Quality Monitoring

During April 2022, community groundwater quality analyses were carried out for seven wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village. The community groundwater samples were taken from household water taps (except in Phouhomxay Village).

The results indicate that:

- Both wells in Phouhomxay Village (GPHX01 and GPHX02) complied with the National Standards.
- The well in Somsuen Village fully complied with the Standards.
- The well in Nam Pa Village and the well in Thong Noy Village did not comply with the Standard for faecal coliform and *E. Coli* bacteria.
- Both wells (GPOU01 and GPOU02) in Pou Village complied with the Standards.

The community groundwater quality monitoring results are presented in **Table 1-8**.

The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be boiled or otherwise treated before it would be suitable for drinking. The villagers generally use tap water for washing and cleaning. They were informed about the monitoring results and recommended to carry out the operation and maintenance improvement as well as were encouraged to boil water before drinking.

TABLE 1-8: GROUNDWATER QUALITY MONITORING RESULTS IN SOM SUEN, NAM PA, THONG NOY AND POU VILLAGES

	Site Name	Phouhomxay Village		Somseun Village	Nampa Village	ThongNoy Village	Pou Village	
Parameter (Unit)	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01	GPOU02
	Guideline	26-Apr-22	26-Apr-22	26-Apr-22	26-Apr-22	26-Apr-22	01-Apr-22	01-Apr-22
pH	6.5 - 9.2	6.93	6.95	7.00	6.84	6.73	6.64	7.28
Sat. DO (%)				70.9	82.7	52.3	73.2	82.7
DO (mg/L)		1.83	2	5.26	6.38	3.99	5.97	6.75
Conductivity (µS/cm)		417	452	385	405	403	21	314
Temperature (°C)		26.22	25.83	30.13	28.78	29.41	26.19	25.64
Turbidity (NTU)	<20	1.25	2.91	1.04	0.37	1.05	1.29	0.71
Faecal coliform (MPN/100ml)	0	0	0	0	4.5	11	0	0
<i>E.coli</i> Bacteria (MPN/100ml)	0	0	0	0	4.5	7.8	0	0

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

The results of the water quality analyses are presented in **Table 1-9**.

Faecal Coliform and *E.coli* exceeded the standards in the water supply of Thaheua Village (WTHH02), Hat Gniun Village (WHGN02) and Phouhomxay Village (WPHX02 – Primary School Water Tap and WPHX03 – Household Water Tap). Note here that all water taps were disinfected before sampling and during sampling of tap water in Phouhomxay Village, surface water from Houay Soup Stream was still supplied into the system and the samples likely represent a mixture of surface water and groundwater from the boreholes, where, as mentioned in **Section 1.3.3** and as shown in **Table 1-8**, the groundwater samples from the two wells in Phouhomxay Village both complied with the GOL Drinking Water Standards for *E.coli* and faecal coliform bacteria.

As observed in the field during water sampling, livestock are roaming around the water intake areas which may contribute to the presence of Faecal Coliform Bacteria and *E.coli* in GFWS samples. The villagers were advised to boil water before drinking in accordance with the Law as mentioned in **1.3.3** as well as recommended to carry out the operation and maintenance improvement.

TABLE 1-9: RESULTS OF THE GRAVITY FED WATER SUPPLY QUALITY MONITORING

	Site Name	Thaheua Village	Hat Gniun Village	Phouhomxay Village	
	Station	WTHH02	WHGN02	WPHX02	WPHX03
Parameter (Unit)	Guideline	26-Apr-22	26-Apr-22	26-Apr-22	26-Apr-22
pH	6.5 - 8.5	7.03	7.17	7.1	7.06
Sat. DO (%)		88.5	85.2	65.7	70
DO (mg/L)		6.9	6.62	5.32	6.47
Conductivity (µS/cm)	<1,000	76	127	108	96
Temperature (°C)	<35	28.29	28.48	26.52	28.3
Turbidity (NTU)	<10	1.48	1.17	0.65	0.73
Faecal Coliform (MPN/100 mL)	0	79	79	26	9.3
<i>E.coli</i> Bacteria (MPN/100 mL)	0	49	49	22	6.8

1.3.5 Landfill Leachate Monitoring

During April 2022, there was no landfill leachate monitoring at NNP1 Project Landfill (Last pond - LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6) due to the monitoring team was in the quarantine period and have to apply the COVID19 measures.

1.4 DISCHARGE MONITORING

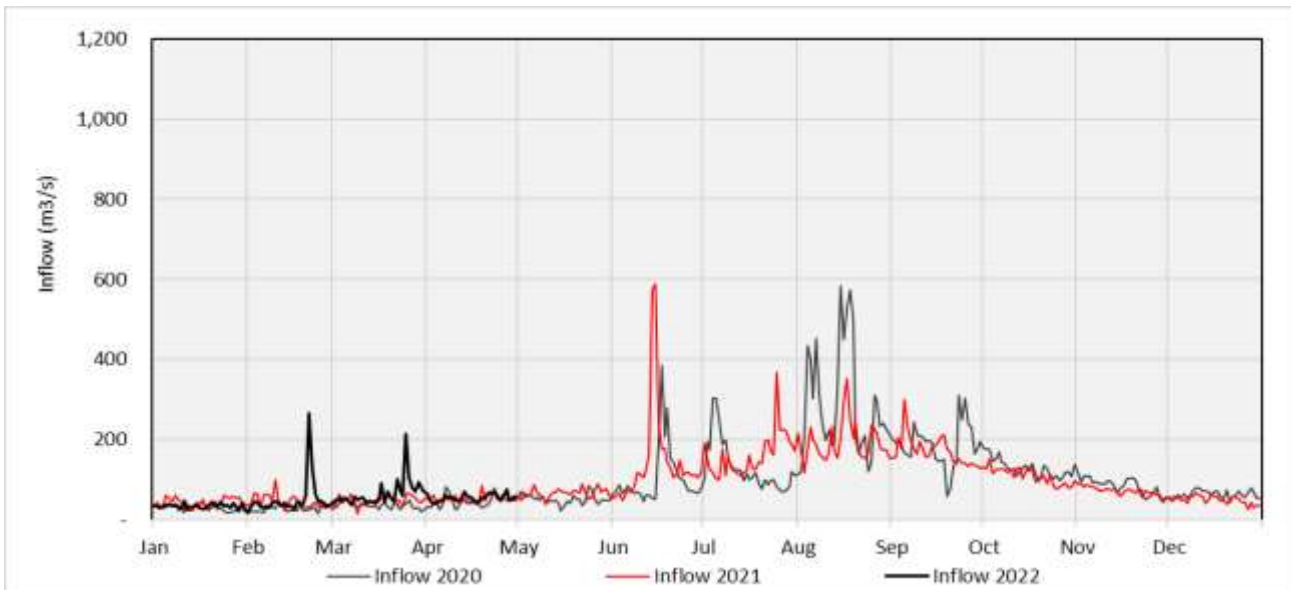
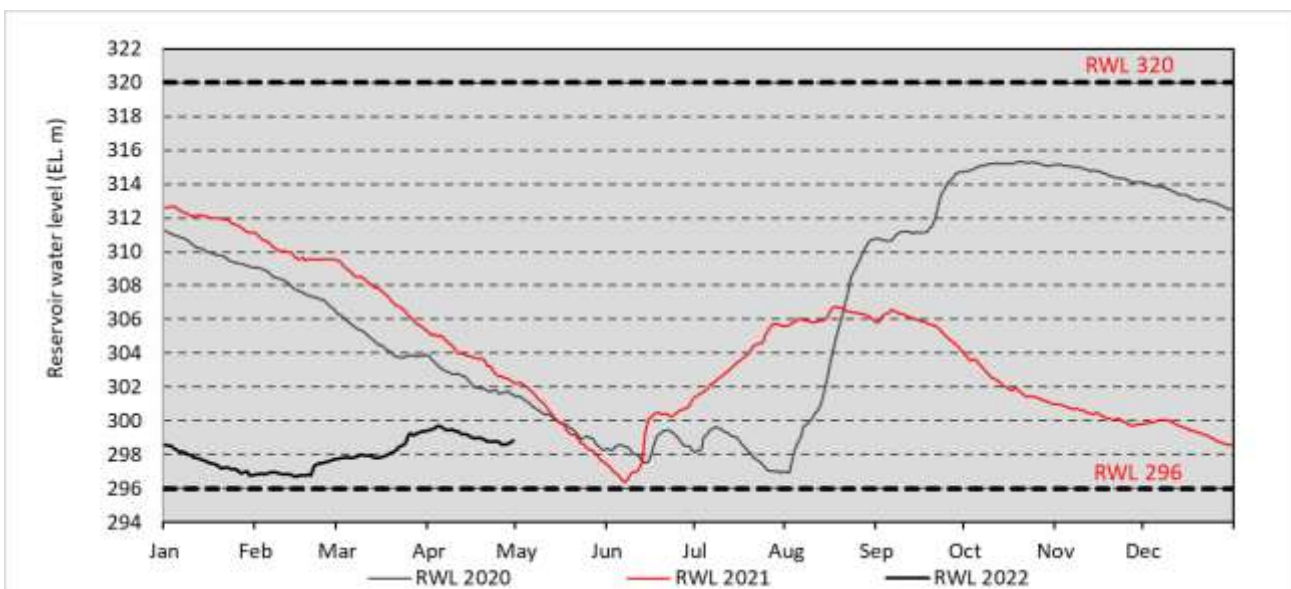
1.4.1 Main Reservoir – Water Level, Inflow and Discharge

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in **Figure 1-6** and **Figure 1-7** presents the values recorded since January 2020.

During April 2022, the mean inflow to the main reservoir was 55 m³/s. The minimum and maximum inflows were 41 m³/s (on 03 April 2022) and 76 m³/s (on 27 April 2022) respectively.

From 01 to 30 April 2022, the water level in the main reservoir decreased from El. 299.71 m asl to El. 298.61 m asl.

In April 2022, the hourly turbine discharges from the Main Powerhouse varied between 57 m³/s and 231 m³/s usually interrupted by night-time periods with no discharge.

FIGURE 1-6: INFLOW TO THE MAIN RESERVOIR DURING JANUARY 2020 TO APRIL 2022**FIGURE 1-7: WATER LEVEL FOR THE MAIN RESERVOIR DURING JANUARY 2020 TO APRIL 2022**

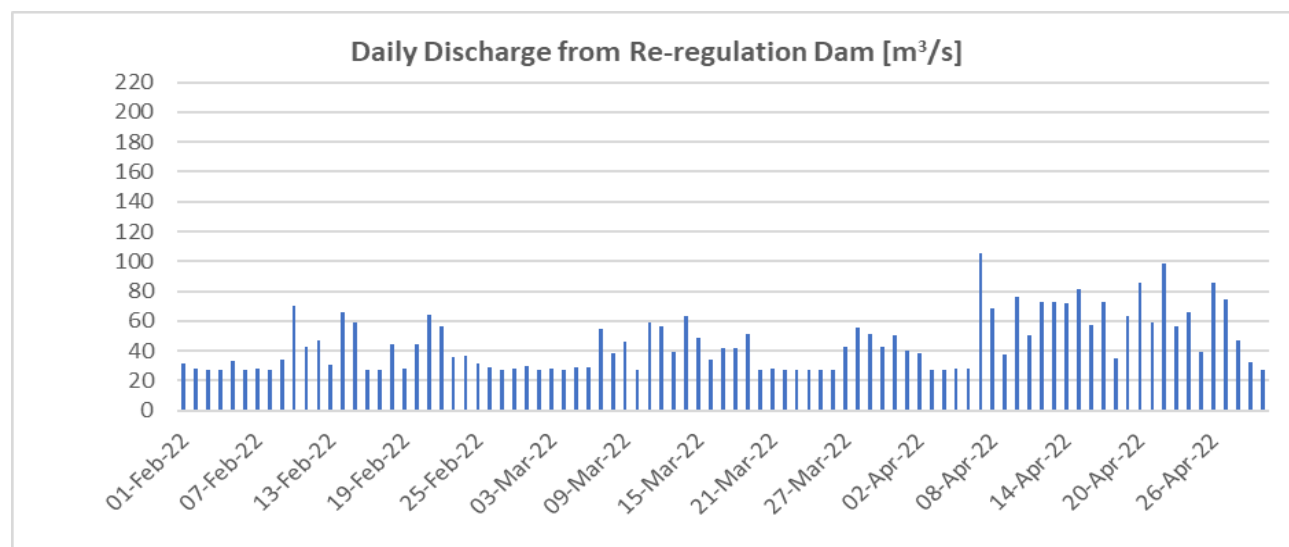
1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during January to April 2022 is presented in **Figure 1-8**.

During April 2022, the mean daily discharge from the Re-regulation Dam was about 57 m³/s with hourly gate discharge varied between 27 m³/s and 205 m³/s, and no hourly turbine discharge. The hourly discharge was kept above the minimum flow requirement of 27 m³/s at all times.

The changes in the discharge from the Re-regulation Dam were informed in advance to the RMU and to the heads of the downstream villages, who then announced the changes to the communities over the village speaker systems.

FIGURE 1-8: DAILY DISCHARGE MONITORING AT THE RE-REGULATION DAM IN FEBRUARY TO APRIL 2022



1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In April 2022, EMO carried out only one boat mission to monitor the water depth in the Nam Ngiep downstream of the Re-regulation Dam. A total of 19 sites have been identified with potential shallow water depths and during the boat mission, the thalweg water depth was less than 0.5 m at four sites (distance between 1.5 and 5.6 km from the Re-regulation Dam) but the team did not have any difficulties with boat navigation during the discharge about 27 m³/s on 26 April 2022.

NNP1PC TD and EMO will conduct a joint survey during low discharge (about 27 m³/s) in May 2022 to determine the need for minor excavations in the thalweg riverbed to ensure compliance with the water depth requirement of at least 0.5 m.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In April 2022, a total of 11 m³ of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 6.4 m³ compared with March 2022.

On 11 April 2022, the contract with the local waste management contractor expired, however, the contractor verbally agreed to continue waste collection and operation of the project landfill until 15 April 2022 with no additional charge. A one-year extension of the service contract with the same contractor was executed on 25 April 2022.

The Contractor continued the regular waste collection from the NNP1PC's operation sites and operated the project landfill for three days per week. The work included waste segregation and disposal, waste cover and compaction, grass cutting and repairing of perimeter fences.

FIGURE 1-9: WASTE MANAGEMENT ACTIVITIES AT NNP1 LANDFILL DURING APRIL 2022

The total amount of recyclable waste selling and collection this month is summarized in **Table 1-10**.

TABLE 1-10: AMOUNTS OF RECYCLABLE WASTE SOLD AND COLLECTION IN APRIL 2022

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by April 2022
1	Plastic bottles	kg	80	0
2	Aluminium can	kg	5	0
3	Paper/Cardboard	kg	130	0
4	Glass	kg	83	0
5	Scrap Metal	Kg	200	0
Total		kg	298	200

In April 2022, the access to OSOV1 continued to be restricted and the villagers collected 473 kg food wastes from the OSOV1 canteen for feeding their animals.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in April 2022 are shown in **Table 1-11** and **Table 1-12**.

TABLE 1-11: RECORD OF HAZARDOUS MATERIAL INVENTORY

No.	Type of Hazardous Material	Unit	Total in April 2022 (A)	Used (B)	Remaining at the end of April 2022 (A – B)
1	Diesel	Litre	5,587	3,365	2,222
2	Gasoline	Litre	950	303	647
3	Lubricant (Turbine oil)	Litre	12,315	0	12,315
4	Colour Paint	Litre	242	0	242
5	Thinner	Litre	7	0	7
6	Grease Oil	Litre	785	0	785
7	Gear Oil	Litre	216	0	216
8	Chlorine Liquid	Litre	81	40	41
9	Chlorine Powder	kg	65	0	65
10	SIKA	Litre	7	0	7

TABLE 1-12: RECORD OF HAZARDOUS WASTE INVENTORY

No.	Hazardous Waste Type	Unit	Total in April 2022 (A)	Disposed (B)	Remaining at the end of April 2022 (A - B)
1	Used Oil (Hydraulic + Engine)	Litre	312.3	0	312.3
2	Used oil mixed with water	Litre	3,600	3600	0
3	Empty used oil drum/container (drum 200L)	Unit	3	0	3
4	Contaminated soil, sawdust and textile material	m ³	5.48	5	0.48
5	Used tyre	Drum	16	0	16
6	Empty used chemical drum/container (drum 20L)	Unit	19	13	6
7	Lead acid batteries	Unit	9	0	9
8	Empty paint and spray cans	Unit	168	0	168
9	Halogen/fluorescent bulbs	kg	276	0	276
10	Empty cartridge (Ink)	Unit	166	0	166
11	Clinic Waste	Kg	9	0	9

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community Recycling Programme

Due to the continuation of COVID-19 measures, many local recycling businesses and vendors have not yet resumed their recyclable waste trading in the community area. No recycle waste trade activities in the community recycle waste bank in April 2022.

1.6.2 Community Solid Waste Management

In April 2022, a total of 22.9 m³ of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, a decrease of 1.4 m³ compared with March 2022.

On 12 April 2022, the contract with the local waste management contractor expired and the communities' solid waste management and the Houay Soup Landfill operation was under processing to handing over to the local authorities (Bolikhan EMU). However, the Contractor verbally agreed to continue waste collection and operation of the Houay Soup landfill until 15 April 2022 with no additional charge. As part of the service contract, the Contractor conducted regular waste collection from the three villages and operated the Houay Soup Landfill for two days per week. The work included waste collection, segregation and disposal, waste cover and compaction, grass cutting and repairing the perimeter fences and landfill internal access road.

FIGURE 1-10: WASTE MANAGEMENT ACTIVITIES DURING APRIL 2022



2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP)

2.1.1.1 Xaysomboun Watershed and Reservoir Protection Office (WRPO)

Xaysomboun WRPO with the technical assistant from Biodiversity Service Provider (BSP) - Wildlife Conservation Society (WCS) discussed the patrolling results including the SMART data analysis at the end of April 2022.

Xaysomboun WRPO planned to conduct the training on Participatory Land Use Planning (PLUP) and LUP improvement for Phonhom Village from the first week of April 2022 but it was postponed because the members responsible for the activity contracted COVID-19.

The Xaysomboun Provincial Governor approved the restructure of Xaysomboun Watershed and Reservoir Protection Office Committee (WRPC) and Watershed and Reservoir Protection Office (WRPO) on 29 March 2022 and the internal meeting among Xaysomboun WRPC and WRPO was organized on 8 April 2022. Xaysomboun WRPO will share the minutes of meeting (MOM) to NNP1PC after it is signed by the Chairman of the meeting. Xaysomboun WRPO also informed that a new Head of Xaysomboun Provincial Agriculture and Forestry Office (PAFO) has been appointed and they will have further internal discussion about the AIP implementation including the pending progress of particular the appointment of staffs for WRPO sub-office operation and patrolling program, the establishment of two land-based ranger stations in the Totally Protected Zone (TPZ) and two reservoir checkpoints, as well as actions related with reservoir and fishery management.

2.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO organized the discussion with BSP-WCS to plan for their forest and reservoir patrolling in 2022. However, they could not progress with any activities because they have not received the fund for implementing the activities under the approved AIP2022 from DOF-MAF until end of April 2022 due to the GOL's internal process and their documentation works for the fund disbursement. NNP1 EMO followed up with DOF-MAF and noted that there is long document processing time from DOF-MAF and Ministry of Finance (MoF) office and the process was also delayed during the Lao New Year holidays in the middle of April 2022.

2.1.1.3 NNP1PC EMO

Implementation of the agriculture extension service plan for improving home gardening and Kai Noi rice production by growing vegetable in greenhouse and organic rice farming in Thathom District started on 6 April 2022. Village meetings to present the activities and to select households for a farming demonstration plot were organized at Phonhom and Nahong Village on 6 and 7 April 2022 respectively.

A field visit by the trainers who are professors from Faculty of Agriculture to Phonhom and Nahong Village, Thathom District and Phoungou and Houayxai Village in Hom District, Bolikhamxay Province to collect necessary information for planning and designing the training course for the farmers/villagers was organized on 4-8 April 2022. Challenges and issues related to farming (cattle,

pineapple and orange) were informed and discussed between farmers/villagers and the professors during the field visit. The training program was scheduled to start at the end of April 2022.

The training for organic greenhouse gardening and Kai Noi rice production at Nahong and Phonhom Village of Thathom District was organized on 26 and 27 April 2022 respectively. The training at Nahong Village was participated by four rice farmers including three selected farmers for farming demonstration plot. The training organized at Phonhom Village was participated by 11 farmers including three selected farmers for farming demonstration plot and three selected farmers for greenhouse garden. Noted that many farmers could not participate in the training because they are busy with harvesting their off-season rice and growing casava. The trained farmers have learned methods and techniques to produce different natural-based fertilizers for fertilizing the soil and the crops as well as producing organic pesticide for pest control. At the end of the training, all the selected farmers for organic farming demonstration produced natural-based fertilizers and organic pesticides including 1,200 kg of bio-compost fertilizer, 45 litres of bio-extract for enhancing crop growth, 10 litres of bio-extract for enhancing yield and 55 litres of plant herb pesticides. The training and demonstration will be continued in the middle of May 2022.

After consultation meetings in March 2022, Hom District Agriculture and Forestry Office (DAFO) has prepared and submitted the document for establishing the cattle and orange production groups to the relevant offices for their review prior to submission and approval by Hom District Governor. The document is still being reviewed until end of April 2022. EMO team also had discussions with Thathom DAFO on the plan for establishing the local producer groups at Nahong and Phonhom Village. They confirmed that a kick-off meeting on group establishment can be organized in late May 2022.

Figure 2-1. REPRESENTATIVE PHOTOS DURING FIELD VISIT BY TRAINERS FROM FACULTY OF AGRICULTURE OF BOLIKHAMXAY PROVINCE ON 4-8 APRIL 2022







	
<p>Discussion with farmers/villagers at Phoungou Village of Hom District</p>	<p>Discussion with farmers/villagers at Houayxai Village of Hom District</p>
	
<p>Site visit at orange plantation in Phoungou Village of Hom District</p>	<p>Site visit at Napier grass cultivation in Phoungou Village of Hom District</p>

Figure 2-2. REPRESENTATIVE PHOTOS DURING VILLAGE MEETING ON IMPLEMENTATION OF AGRICULTURE EXTENSION SERVICE AT PHONHOM AND NAHONG VILLAGE IN THATHOM DISTRICT ON 6 APRIL 2022

	
<p>Meeting in Nahong Village of Thathom District</p>	<p>Meeting in Phonhom Village of Thathom District</p>

Figure 2-3. REPRESENTATIVE PHOTOS DURING ORGANIC FARMING TRAINING IN NAHONG AND PHONHOM VILLAGE OF THATHOM DISTRICT ON 26 AND 27 APRIL 2022

	
<p>Deliver materials to farmers at Nahong Village of Thathom District</p>	<p>Preparing bio-compost fertilizer at Nahong Village of Thathom District</p>
	
<p>Preparing bio-extract at Phonhom Village of Thathom District</p>	<p>Preparing bio-extract at Nahong Village of Thathom District</p>
	
<p>Selected plot for building greenhouse garden at Phonhom Village of Tathom District</p>	

2.1.2 Preparation of Annual Implementation Plan (AIP) 2022

2.1.2.1 Xaysomboun WRPO

Xaysomboun WRPO submitted the budget plan of their AIP2022 to EMO on 30 March 2022. The plan is being reviewed by EMO team and is expected to be further discussed after a meeting on improving the institutional arrangements for the Watershed and Reservoir Protection Committee (WRPC) and WRPO was organized in April 2022.

2.1.2.2 Bolikhamxay WRPO

The funds to cover the implementation of activities during Q1 and Q2 2022 under the approved AIP2022 for Bolikhamxay WRPO was transferred by NNP1PC to DOF-MAF account at central level on 15 March 2022 but they have not received the fund until end of April 2022 due to the GOL's internal process and their documentation works for the fund disbursement.

2.2 BIODIVERSITY OFFSET MANAGEMENT

2.2.1 Implementation of BOMP Annual Implementation Plan (AIP)

The progress on the implementation of key activities by Component in April 2022 are described below:

a. Component 1 - Spatial Planning and Regulation

The Biodiversity Offset Management Unit (BOMU) continued the process to obtain the official approval of NC-NX Totally Protected Zone (TPZ) boundary from District authorities of Viengthong and Xaychamphone. NNP1-EMO provided assistance to NC-NX BOMU in finalizing the map of NC-NX and its TPZ boundaries. The updated map was circulated among EMO, NC-NX BOMU and BSP-WCS on 27 April 2022 and NC-NX BOMU will confirm the final version and continue with the process to obtain the official approval from the Bolikhamxay Provincial and District management offices.

b. Component 2 – Law Enforcement

There was no patrolling in April 2022 because the AIP2022 that includes the budget to continue the patrolling working from April 2022 will not be finalized by NC-NX BOMU until the discussion of final draft of FMM is organized. Some of the patrol team members were assigned to the patrol sub-stations to safeguard the facility and make observations nearby the sub-station.

The results of patrolling activity in March 2022 are as follows:

Team	Patrolling Area/distance	Observations/Actions Taken
1	TPZ highest priority area including Houay Phai, Nam San and southern Nam San Mountain ridges. (16 days covering a distance of 66 km on forest patrolling)	The team heard a gunshot at Nam San.
2	TPZ highest priority area including Nam Sone, Nam Chouan, Nam Xi, Houayxai Noi and mountain ridges.	The team did not encounter any threats during the patrolling.

Team	Patrolling Area/distance	Observations/Actions Taken
	(16 days covering a distance of 126.5 km on forest patrolling)	
3	Nam Houg TPZ high priority area including Nam Tan, Nam Sik, Houay Vangmoun, Houay Kanang, Houay San, Houay Pahok, Houay Nongsaen and Houay Kaengkouang. (16 days covering a distance of 85.29 km distance on forest patrolling)	The team found and destroyed one hunting camp at Nam Sik, one hunting camp at Houay Vangmoun, and one hunting camp at Houay Kanang. The team also detected and destroyed 120 active large spring snares at the upstream of Houay Kaengkouang.
4	Nam Ma TPZ high priority area including Nam Ma, Nam Sa Nga and mountain ridges. (16 days covering a distance of 95 km on forest patrolling)	The team encountered and destroyed a fresh fishing camp at Nam Ma (outside TPZ or TPZ high priority area) and two old fishing camps at Nam Ma (inside TPZ high priority area).

FIGURE 2-4: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN MARCH 2022

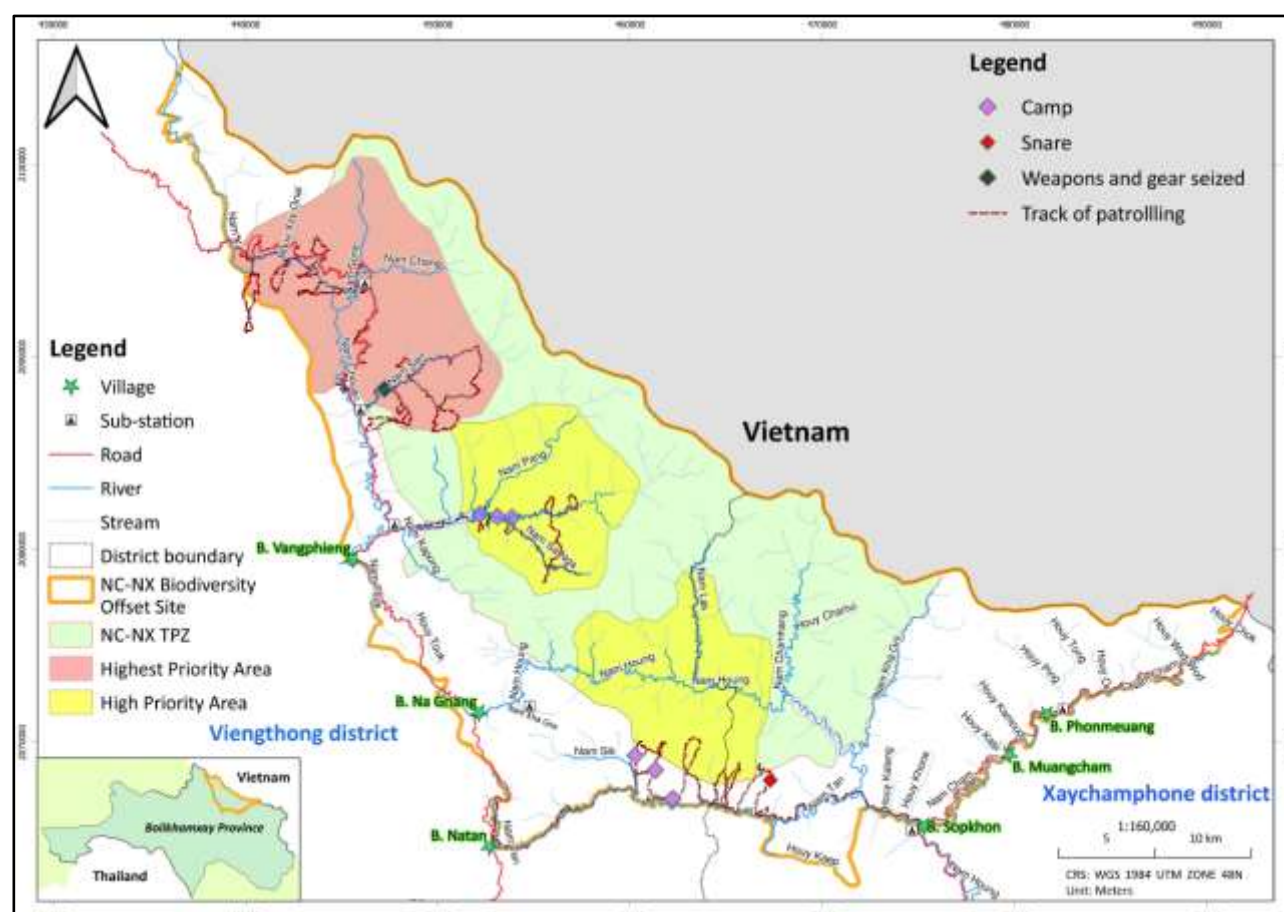


FIGURE 2-5: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN MARCH 2022

	
<p>Hunting camp found and destroyed by Team 3 close to Nam Sik</p>	<p>Fishing camp detected and destroyed by team 4 at Nam Ma (inside the TPZ high priority area)</p>

c. Component 3 – Conservation Outreach

BSP-WCS continues to further improve the draft Nam Chouan-Nam Xang (NC-NX) outreach strategy. The radio-broadcast outreach will continue to be implemented until July 2022.

d. Component 4 – Conservation linked livelihood development

The activity under the approved Community Development Plan (CDP) was scheduled in May 2022.

BSP-WCS continued improving the Lao version of the draft Community Conservation Agreement (CCA) for BOMU review and comments.

EMO, BOMU, and BSP-WCS conducted snare removal assessment at the end of April 2022.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2022

The draft AIP 2022 was submitted to ADB and IAP on 23 February 2022. IAP and ADB provided comments with no objection on 7 and 18 March 2022 respectively. However, BOMU confirmed that FMM should be finalized first before concluding the AIP2022. The discussion on final draft FMM was postponed to May 2022 following the recommendation from DOF-MAF because they only received the final comments from Xaysomboun WRPO at the end of April 2022 and official responses from NNP1PC needs to be issued first before the meeting is organized.

2.3 FISHERY MONITORING

The fishery monitoring is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey of the month by covering the upstream, upper reservoir, lower reservoir, downstream and Mekong areas.

Fish species dominated the fish catch by weight in March 2022 as listed in **Table 2-1**. All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species¹, except *Sikukia gudgeri* is classified as Data Deficient species (DD).

TABLE 2-1: FISH SPECIES DOMINATING THE FISH CATCH IN MARCH 2022

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Barbonymus gonionotus</i> , <i>Hypsibarbus malcomi</i> , <i>Hypsibarbus vernayi</i> , <i>Hypsibarbus wetmorei</i>	ປາປາກ	163	LC
<i>Sikukia gudgeri</i> , <i>Amblyrhynchichthys truncatus</i>	ປາຂາວຊາຍ	138.5	DD, LC
<i>Oreochromis niloticus</i>	ປານິນ	109.2	LC
<i>Poropuntius normani</i> , <i>Poropuntius laoensis</i> , <i>Poropuntius carinatus</i>	ປາຈາດ	98.2	LC
<i>Channa striata</i>	ປາຄໍ້	95	LC

The recorded catch of Threatened species (IUCN Red List classification) in March 2022 are presented in **Table 2-2**. The list includes three species that are classified as Vulnerable species (VU).

TABLE 2-2: THREATENED SPECIES OF MARCH 2022 FISH CATCH

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Cirrhinus cirrhosus</i>	ປາແກງ/ປານວນຈັນ	0.2	VU
<i>Scaphognathops bandanensis</i>	ປາວຽນໄຟ/ປາປ້ຽນ	15.1	VU
<i>Tor sinensis</i>	ປາແດງ	7.1	VU

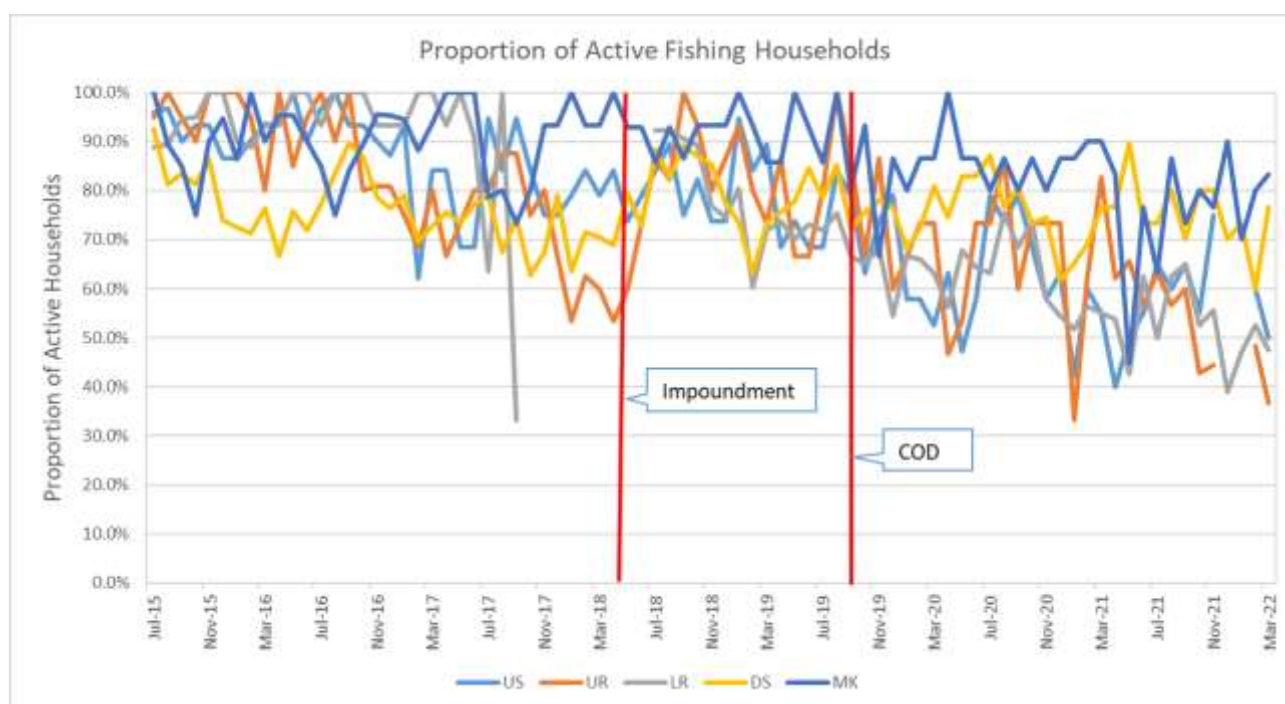
Species abundance and occurrence is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey in March 2022. The catch is divided in three areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in March 2022 for above dam, below dam and Mekong area are presented in **Table 2-3**.

¹ The IUCN Red List of Threatened Species is the world's most comprehensive inventory and classification of threatened species. The Red List classifies species into nine groups: Extinct (EX), Extinct in the wild (EW), Critically endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least concern (LC), Data deficient (DD), and Not Evaluated (NE). The term "Threatened" includes Critically Endangered, Endangered, and Vulnerable.

TABLE 2-3: MAIN BIODIVERSITY INDICATORS FOR MARCH 2022

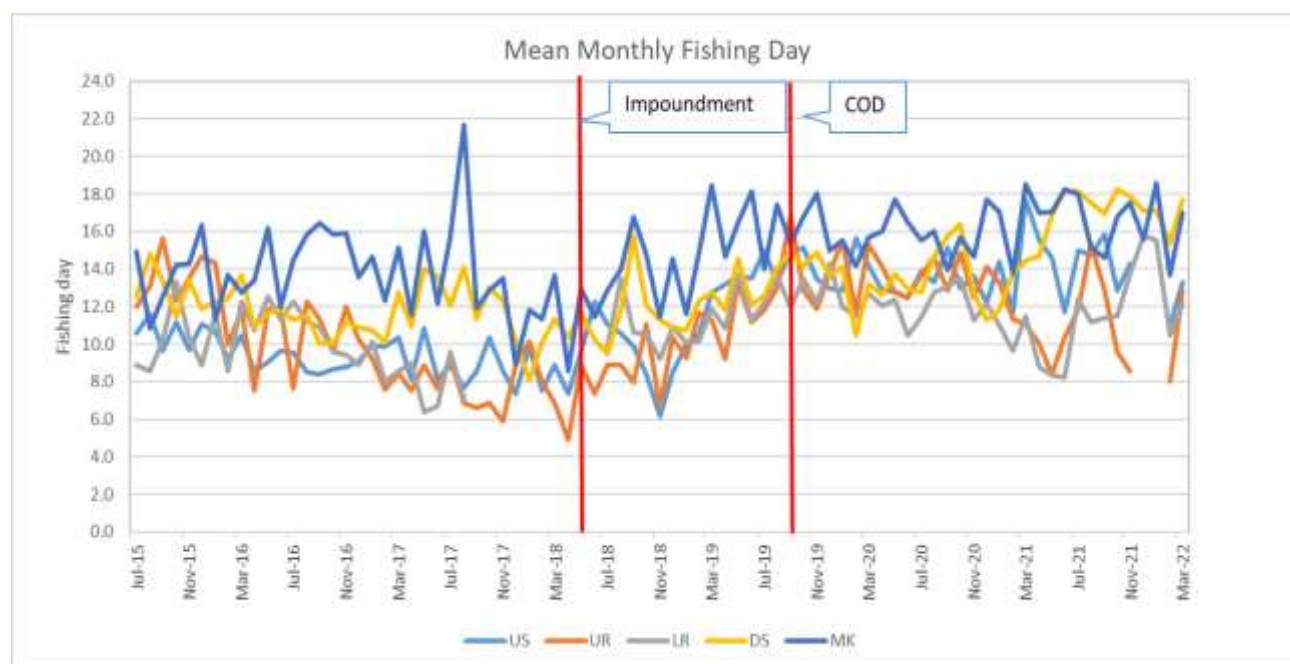
Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	36	37	30
Single species	28	23	18
Species groups	8	14	12
Top 15 species (% total catch weight)	88.02%	84.60%	96.42%
Proportion for species groups	30.04%	68.29%	51.13%
Diversity index (Shannon)	2.7786	2.6063	2.3747

Figure 2-6 shows the proportion of total number of households actively fishing by fishing zone including upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK). It ranges between 36% and 83% of active fishing households for all fishing zones in March 2022.

FIGURE 2-6: PROPORTION OF TOTAL NUMBER OF HOUSEHOLDS ACTIVELY FISHING BY FISHING ZONE FROM JULY 2015 TO MARCH 2022

Note: Proportion of Active Fishing Households = (Active Fishing Households/Total Interviewed Households) x 100%

Figure 2-7 shows the average (mean) of monthly fishing day from July 2015 to March 2022 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

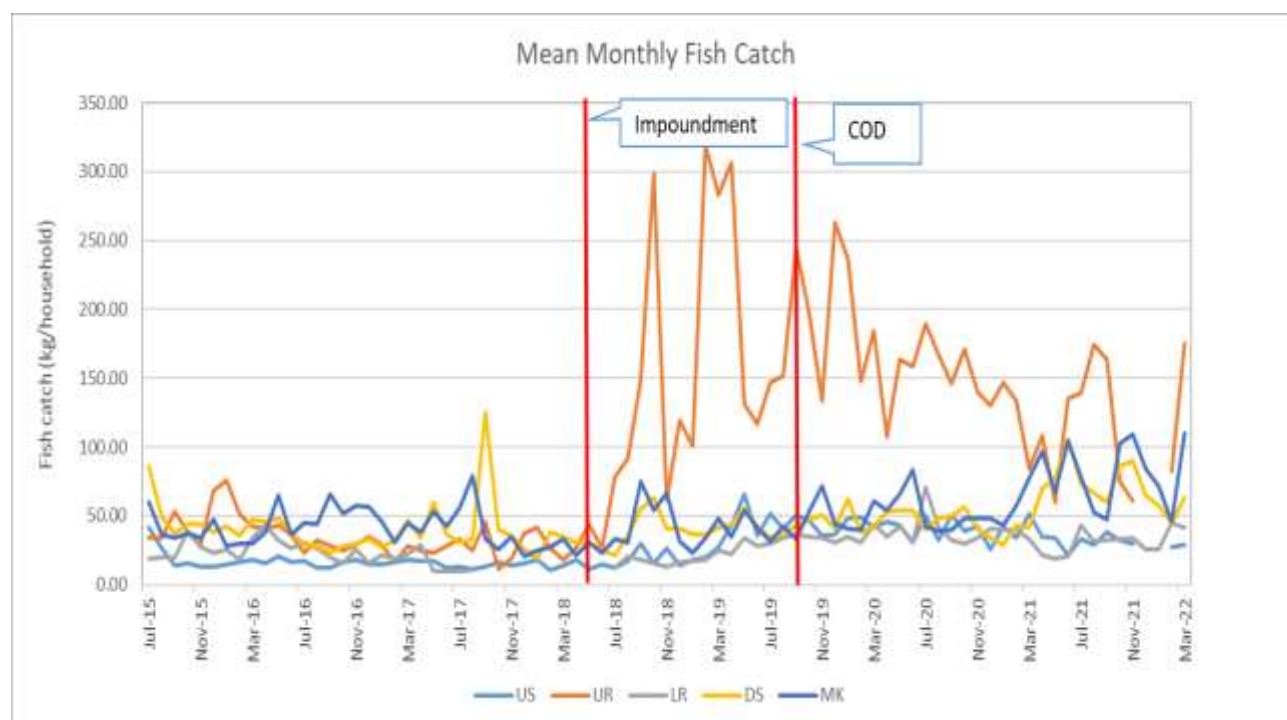
FIGURE 2-7: MEAN OF MONTHLY FISHING DAY FROM JULY 2015 TO MARCH 2022

The mean monthly number of fishing day for the month of March from 2016 to 2022 for the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in **Table 2-4**.

TABLE 2-4: MEAN REPORTED NUMBER OF FISHING DAYS BY FISHING ZONE FOR THE MONTH OF MARCH FROM 2016 TO 2022

Fishing Zone	March 2016 (day)	March 2017 (day)	March 2018 (day)	March 2019 (day)	March 2020 (day)	March 2021 (day)	March 2022 (day))
Upstream	10.47	10.33	8.86	12.76	14.17	17.71	13.29
Upper reservoir	11.81	8.45	6.89	11.27	15.30	11.07	12.88
Lower reservoir	12.26	8.54	0.00	11.88	12.67	11.47	12.12
Downstream	13.65	12.73	11.32	12.75	13.17	14.44	17.71
Mekong	12.76	15.13	13.65	18.45	15.67	18.53	17.01

The mean monthly household fish catch from July 2015 to March 2022 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in **Figure 2-8**.

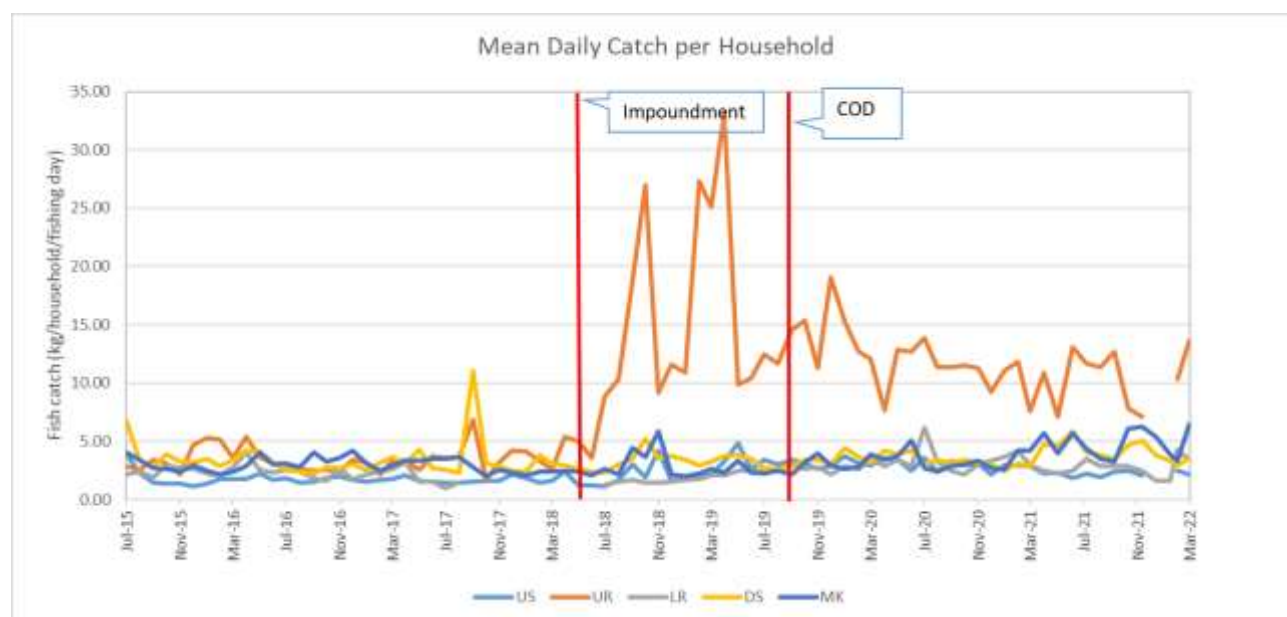
FIGURE 2-8: MEAN MONTHLY HOUSEHOLD FISH CATCH FROM JULY 2015 TO MARCH 2022

The mean household fish catch for the month of March from 2016 to 2022 in the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in **Table 2-5**.

TABLE 2-5: MEAN MONTHLY HOUSEHOLD FISH CATCH FOR THE MONTH OF MARCH FROM 2016 TO 2022

Fishing Zone	March 2016 (kg)	March 2017 (kg)	March 2018 (kg)	March 2019 (kg)	March 2020 (kg)	March 2021 (kg)	March 2022 (kg)
Upstream	18.20	18.05	14.17	27.17	41.63	51.45	28.65
Upper reservoir	42.54	28.02	17.81	282.74	184.63	84.20	175.41
Lower reservoir	34.37	22.55	0.00	24.80	44.25	33.60	41.14
Downstream	47.07	46.91	34.84	41.23	42.11	41.30	63.52
Mekong	30.17	44.62	33.14	48.27	60.67	77.68	110.29

The mean daily fish catch per household from July 2015 to March 2022 are displayed in **Figure 2-9** and the mean fish catch per household per fishing day for the month of March from 2016 to 2022 are shown in **Table 2-6**.

FIGURE 2-9: MEAN DAILY FISH CATCH PER HOUSEHOLD FROM JULY 2015 TO MARCH 2022**TABLE 2-6: MEAN DAILY FISH CATCH PER HOUSEHOLD FOR THE MONTH OF MARCH FROM 2016 TO 2022**

Fishing Zone	March 2016 (kg)	March 2017 (kg)	March 2018 (kg)	March 2019 (kg)	March 2020 (kg)	March 2021 (kg)	March 2022 (kg)
Upstream	1.74	1.75	1.60	2.13	2.94	2.90	2.16
Upper reservoir	3.60	3.31	2.59	25.08	12.07	7.61	13.62
Lower reservoir	2.80	2.64	0.00	2.09	3.49	2.93	3.39
Downstream	3.45	3.68	3.08	3.23	3.20	2.86	3.59
Mekong	2.36	2.95	2.43	2.62	3.87	4.19	6.49

The survey results in March 2022 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitat for the upper reservoir, lower reservoir and Mekong zones are the reservoir, tributaries and streams, and Mekong respectively. The proportion of fishing habitats in March 2022 are displayed in **Table 2-7**.

TABLE 2-7: PROPORTION OF THE CATCH REPORTED BY MAIN HABITATS (%) IN MARCH 2022

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.00%	20.92%	91.73%
Nam Ngiep	59.2%	8.8%	0.00%	53.35%	1.12%
Nam Xan	0.0%	0.0%	0.00%	0.00%	0.00%

Habitats	US	UR	LR	DS	MK
Reservoir	0.0%	88.1%	18.81%	0.00%	0.00%
Tributary and stream	40.8%	3.1%	81.19%	23.76%	0.00%
Wetland	0.0%	0.0%	0.00%	1.52%	7.15%
Others	0.0%	0.0%	0.00%	0.45%	0.00%

Total reported fish and OAA (other aquatic animals) catch (proportion of OAA) for the same 7-day period from July 2015 to March 2022 are presented in **Figure 2-10** and the proportion of OAA catch for the month of March from 2016 to 2022 are shown in **Table 2-8**.

FIGURE 2-10: PROPORTION OF OAA TO THE TOTAL REPORTED NUMBER OF FISH AND OAA FOR A 7-DAY PERIOD BY FISHING ZONE FROM JULY 2015 TO MARCH 2022

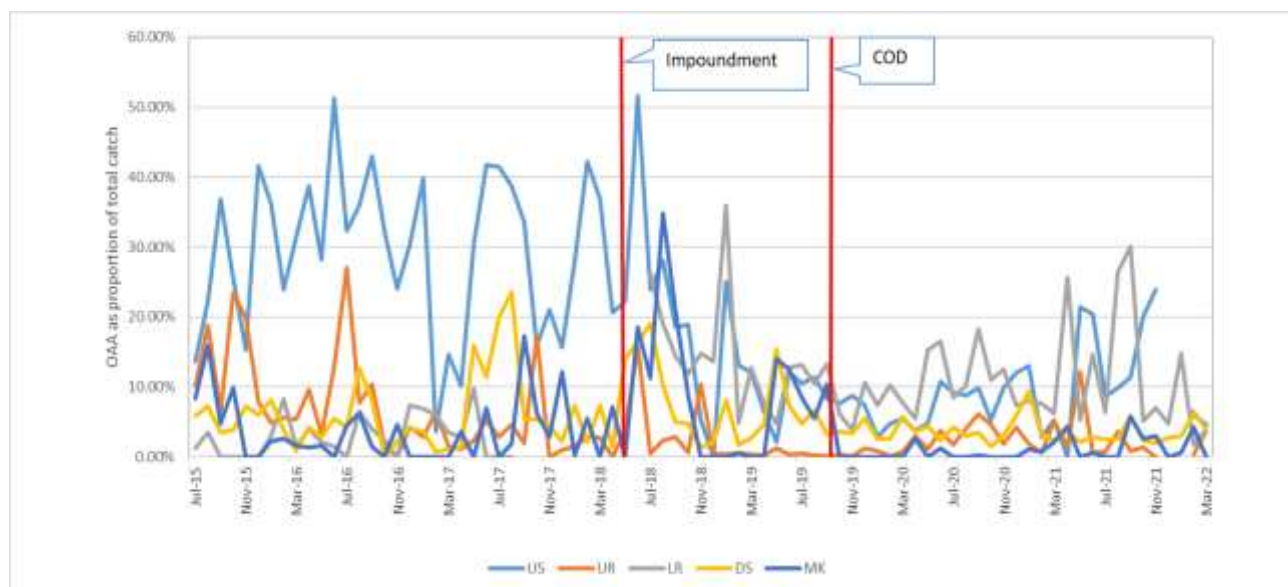


TABLE 2-8: PROPORTION OF OAA TO THE TOTAL REPORTED NUMBER OF FISH AND OAA FOR THE MONTH OF MARCH FROM 2016 TO 2022

Fishing Zone	March 2016	March 2017	March 2018	March 2019	March 2020	March 2021	March 2022
Upstream	31.41%	14.66%	36.98%	11.98%	5.43%	5.19%	4.57%
Upper reservoir	5.38%	1.42%	2.69%	0.28%	0.74%	5.08%	3.68%
Lower reservoir	1.46%	3.52%	0.00%	12.80%	7.77%	6.29%	3.81%
Downstream	0.78%	1.13%	7.37%	2.72%	5.72%	2.37%	3.96%
Mekong	1.53%	0.00%	0.00%	0.00%	0.00%	2.07%	0.00%

3. EXTERNAL MISSIONS AND VISITS

There was no external mission and visit during the month of reporting.

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

TABLE A-1: RESULTS OF MAIN RESERVOIR, RE-REGULATION RESERVOIR AND SURFACE WATER (NAM NGIEP RIVER, NAM PHOUAN, NAM CHIANE AND NAM XAO) QUALITY MONITORING

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream	Tributaries Downstream		
			Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH 01	NXA01
1-Apr-22	pH	5.0 - 9.0	7.23											7.24				
23-Apr-22	pH	5.0 - 9.0		6.63	6.69	7.24									6.87			
24-Apr-22	pH	5.0 - 9.0					6.88	6.79	6.79	6.7								
25-Apr-22	pH	5.0 - 9.0									6.87	7	6.83	6.88		6.09	7.05	
1-Apr-22	Sat. DO (%)		92.9											88.7				
23-Apr-22	Sat. DO (%)			96.7	92.3	100									96.6			
24-Apr-22	Sat. DO (%)						97.3	94.5	55.3	66.9								
25-Apr-22	Sat. DO (%)										91.1	87.2	87.2	86.9		78.3	82.2	
1-Apr-22	DO (mg/L)	>6.0	7.62											7.61				
23-Apr-22	DO (mg/L)	>6.0		7.64	7.15	7.81									7.95			
24-Apr-22	DO (mg/L)	>6.0					7.52	7.35	4.24	5.09								
25-Apr-22	DO (mg/L)	>6.0									7.6	7.22	7.08	6.79		6.02	6.63	
1-Apr-22	Conductivity (µs/cm)		110											36				
23-Apr-22	Conductivity (µs/cm)			91	85	76									126			
24-Apr-22	Conductivity (µs/cm)						71	69	78	78								
25-Apr-22	Conductivity (µs/cm)										79	81	79	80		168	42	
1-Apr-22	Temperature (°C)		25.38											23.03				
23-Apr-22	Temperature (°C)			26.97	28.64	28.14									25.03			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream	Tributaries Downstream		
			Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH 01	NXA01
24-Apr-22	Temperature (°C)					28.58	28.32	29.17	29.85									
25-Apr-22	Temperature (°C)									24.81	24.73	25.88	28.1			29.24	26.45	
1-Apr-22	Turbidity (NTU)		8.19											13				
23-Apr-22	Turbidity (NTU)			13	1.73	1.63									10.4			
24-Apr-22	Turbidity (NTU)					1.46	1.42	1.98	2.28									
25-Apr-22	Turbidity (NTU)									1.47	1.47	2.39	8.69			5.89	3.47	
1-Apr-22	TSS (mg/L)		6.43											7.4				
23-Apr-22	TSS (mg/L)			17.33		<5									9.14			
24-Apr-22	TSS (mg/L)					<5	<5	<5	<5									
25-Apr-22	TSS (mg/L)									<5	<5	<5	7.77			5.46	<5	
1-Apr-22	BOD ₅ (mg/L)	<1.5	<1											<1				
23-Apr-22	BOD ₅ (mg/L)	<1.5		<1		<1									<1			
24-Apr-22	BOD ₅ (mg/L)	<1.5				<1	<1	<1	1.19									
25-Apr-22	BOD ₅ (mg/L)	<1.5								<1	<1	<1	<1			<1	<1	
1-Apr-22	Faecal coliform (MPN/100 mL)	<1,000	540											110				
23-Apr-22	Faecal coliform (MPN/100 mL)	<1,000													33			
24-Apr-22	Faecal coliform (MPN/100 mL)	<1,000						14	27									
25-Apr-22	Faecal coliform (MPN/100 mL)	<1,000								14	170	170	920			920	540	
1-Apr-22	Total Coliform (MPN/100 mL)	<5,000	1,600											1,600				

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream	Tributaries Downstream		
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH 01	NXA01	NHS01
23-Apr-22	Total Coliform (MPN/100 mL)	<5,000													27			
24-Apr-22	Total Coliform (MPN/100 mL)	<5,000						14	11									
25-Apr-22	Total Coliform (MPN/100 mL)	<5,000								7	14	26	540			70	49	
23-Apr-22	Turbidity (NTU)-bottom				2.01													
24-Apr-22	Turbidity (NTU)-bottom					0.46	0.44											
23-Apr-22	TSS (mg/L)-bottom				<5													
24-Apr-22	TSS (mg/L)-bottom					<5	5											
23-Apr-22	BOD ₅ (mg/L)-bottom				<1													
24-Apr-22	BOD ₅ (mg/L)-bottom					7.71	7.32											

TABLE A-2: RESULTS OF CAMP EFFLUENTS IN APRIL 2022

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	02-Apr-22	26-Apr-22	01-Apr-22	26-Apr-22	02-Apr-22	26-Apr-22
Parameters (Unit)	Guideline						
pH	6.0 - 9.0	7.29	6.5	7.68	6.97	7.83	7.22
Sat. DO (%)		72.9	82.5	73.4	19.2	75.3	54.6
DO (mg/L)		5.81	6.35	5.81	1.56	5.85	4.3
Conductivity (µs/cm)		320	382	533	525	879	882
Temperature (°C)		26.89	28.89	27.15	26.21	28.27	27.5
Turbidity (NTU)		0.65	0.07	12	8.98	8.8	3.2
TSS (mg/L)	<50	0.6	0.1	18.93	9	9.5	1.3
BOD ₅ (mg/L)	<30	<6	<6	7.26	15.6	7.62	<6
COD (mg/L)	<125	Pending	Pending	Pending	Pending	Pending	Pending
NH ₃ -N (mg/L)	<10.0	Pending	Pending	Pending	Pending	Pending	Pending
Total Nitrogen (mg/L)	<10.0	Pending	Pending	Pending	Pending	Pending	Pending
Total Phosphorus (mg/L)	<2	Pending	Pending	Pending	Pending	Pending	Pending
Oil & Grease (mg/L)	<10.0	Pending	Pending	Pending	Pending	Pending	Pending
Total coliform (MPN/100 mL)	<400	5,400	350	22	110	0	49
Faecal Coliform (MPN/100 mL)	<400	1,600	350	0	110	0	49
Residual Chlorine (mg/L)	<1.0			0.77	0.60	0.49	0.12