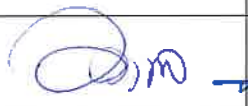
NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

January 2021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EXECUTIVE SUMMARY

The preparation of ISO 14001:2015 documentation is in progress; mandatory and non-mandatory (but commonly used) documents are gathered and being prepared by the relevant parties. The mandatory documents are expected to be ready for the ISO14001 Internal Audit by the end of March 2021 after the Internal Audit training by SGS (Lao) Sole Co., Ltd.

During January 2021, EMO received one Detail Work Program (DWP) and Site Specific Environmental and Social Monitoring and Management Plan (SS-ESMMP) for review and approval.

On 20 January 2021, the Environment Management Unit (EMU) of Bolikhan District resumed the monthly site visits by focusing on the progress of environmental activities and on the status of decommissioned and rehabilitated sites before handing over to the GOL within Q1 of 2021. A total of 30 out of the 32 sites to be handed over were accepted by EMU, but EMU requested that due to the low percentage of vegetation cover, additional counter measures should be implemented for the remaining two sites of HM Hydro's Labour Camp No.2 (LILAMA10 Camp) and the Phouhomxay Village's Irrigation Canal Rock and Spoil Disposal. The two contractors responsible for those sites have been instructed to implement additional measures.

NNP1PC has received technical proposals for improvement and modification work of NNP1 wastewater treatment systems (WWTS). The proposals are being evaluated, and the selection of the contractor is expected to be completed within February 2021 with expected start of work in Q1 2021. A 7 months (January to August 2021) Consultancy Service Contract was signed with the Wastewater Treatment Expert to assist with supervision of the construction work and assessment of the performance of the treatment plants during commissioning.

During the month, Dissolved Oxygen (DO) levels at the surface of the main reservoir were generally between 2 and 8 mg/L which was lower than in December 2020. In the re-regulation reservoir, the DO levels were below 5 mg/L.

During January 2021, the discharge from the re-regulation dam mainly went through the turbine and occasionally combined with discharge through the gate. The DO levels, except during the gate discharge on 13 January 2021, were less than 6 mg/L at the stations in Nam Ngiep immediately downstream of the Re-regulation Dam and thus were non-compliant with the GOL Standard. No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC is still in the process of collecting information to assist in developing measures to improve the DO levels downstream.

In January 2021, a total of 18.7 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 1.1 m^3 compared with December 2020. A total of 12.5 m^3 of solid waste from Phouhomxay, Thaheua and Hat Gniun Villages was disposed of at Houay Soup Landfill. No recycle waste trade activities in the Community Waste Bank during the reporting period. However, a 170.5 kg of damaged cardboard was segregated and disposed of at Houay Soup Landfill.

A handover ceremony of two aluminium boats to Xaysomboun WRPO took place on 14 January 2021 at the NNP1 Dam Site and the patrolling of the reservoir in Xaysomboun Province was commenced during 14-22 January 2021. The reservoir patrolling of Bolikhamxay WRPO will resume in February 2021.

Biodiversity offset related activities under the components of law enforcement and conservation linked livelihood continued in January 2021.

The fish catch monitoring for December 2020 in Nam Ngiep watershed was dominated by *Channa striata*, *Clarias batrachus* and *Tor sinensis* and species groups of Hampala and Poropuntius that are classified as Least Concern (LC) according to the IUCN Red List, except *Tor sinensis* is classified as Vulnerable species (VU).

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

The preparation of ISO 14001:2015 documentation is in progress; mandatory and non-mandatory (but commonly used) documents are gathered and being prepared by the relevant parties. The mandatory documents are expected to be ready for the ISO14001 Internal Audit by the end of March 2021 after the Internal Audit training by SGS (Lao) Sole Co., Ltd.

TABLE 1-1: ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN

Item	ISO14001:2015 Work Plan	Year 2020		Year 2021			
		Q3	Q4	Q1	Q2	Q3	Q4
1	Continue to prepare EMS documents (8 Standard Operating Procedures are completed)						
2	**NNP1PC Environmental Policy announcement**						
3	NNP1PC ISO Committee establishment						
4	Training relevant staff on: - Requirement and Interpretation of ISO14001:2015 - Organization Context and Risk Management for ISO14001 - ISO14001:2015 Document Information - ISO14001:2015 Internal Audit						
5	Implement the EMS procedures and processes						
6	ISO14001:2015 Internal Audit						
7	Implement the corrective actions and preventive actions according to the Internal Audit						
8	Management Review by NNP1PC Management						
9	ISO 14001:2015 Assessment and Certification Audit – **1st Stage** (***remote audit*** on the documentation review)						
10	Implement the corrective actions and preventive actions according to the 1st Stage Audit						
11	ISO 14001:2015 Assessment and Certification Audit – **2nd Stage** (***on-site audit***)						
12	Implement the corrective actions and preventive actions according to the 2nd Stage Audit						
13	**Certify of ISO14001:2015 upon successful completion of the audit**						

1.2 COMPLIANCE MANAGEMENT

In January 2021, EMO received one DWP and SS-ESMMP for review and approval. The status is presented in ***Table 1-2.***

TABLE 1-2: SS-ESMMP AND DOCUMENT REVIEW STATUS IN JANUARY 2021

Title	Date Received	Status
DWP and SS-ESMMP for Construction of Suspension Bridge in 2UR	04 January 2021 (3rd submission)	No objection with no further comments on 08 January 2021 for the SS-ESMMP part. *(DWP is pending approval by NNP1PC-TD and ESD INFRA)*

There was one Observations of Non-Compliance issued during January 2021. The status of compliance reports (Observation of Non-Compliance or ONC, Non-Compliance Report or NCR) issued by NNP1PC is summarized in ***Table 1-3*** and the status of the ONCs and NCRs that are unsolved exceeding deadlines are presented in ***Table 1-4.***

TABLE 1-3: SUMMARY OF ONCS AND NCRS

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from December 2020	3	2	0	0
Newly Opened in January 2021	1	0	0	0
Total in November 2020	**4**	**2**	**0**	**0**
Resolved in January 2021	2	0	0	0
Carried over to February 2021	2	**2**	0	0
Unsolved Exceeding Deadlines	**1**	**2**	**0**	**0**

TABLE 1-4: SUMMARY OF THE ONCS AND NCRS THAT ARE UNSOLVED EXCEEDING DEADLINES

Document Number / Date of Issue	Subject Description	Current Status at the end of January 2021
ONC_AM-0003 / 28 Feb 2020	Issued to ADM to improve the second wetland pond similarly to the first wetland pond. (Based on the LTA's recommendation made during the mission in August 2019 to improve the OSOV's WWTS)	The technical proposals for improvement and modification work of NNP1 wastewater treatment systems (WWTS) are under evaluation and the selection of the contractor is expected to be completed within February 2021 with start of work expected in Q1 2021. A 7 months (January to August 2021) Consultancy Service Contract was signed with the Wastewater Treatment Expert to assist with supervision of the construction work and assessment of the performance of the treatment plants during commissioning.

Document Number / Date of Issue	Subject Description	Current Status at the end of January 2021
NNP1-ESD-EMO-NCR-VSP-0001 / 13 Jul 2020 **(NCR Level 1)**	Non-Compliance with site rehabilitation at the Spoil Disposal Area for the construction of the irrigation canal	During the monthly site visit, the Environment Management Unit (EMU) of Bolikhan District requested the Project to take additional counter measures due to the low percentage of vegetation cover before handing over to GOL. During a joint site inspection with the Contractor on 22 January 2021, EMO instructed the Contractor to take corrective actions by increasing the topsoil coverage in accordance with GOL-EMU's comments. ***The NCR1 will be closed after the Contractor has completed adding the topsoil which is expected by early February 2021***
NNP1-ESD-EMO-NCR-HM-0007 / 06 Apr 2020 **(NCR Level 1)**	Non-Compliance with the site revegetation requirements at HM Hydro's Labour Camp No.2 (LILAMA10 Camp).	during the monthly site visit, the Environment Management Unit (EMU) of Bolikhan District requested the Project to take additional counter measures due to the low percentage of vegetation cover before handing over to GOL. The Contractor has been instructed to implement the required corrective actions. ***The NCR1 will be closed after the Contractor has completed adding topsoil, which is expected before the wet season of 2021***

1.2.1 Site Inspection by Environment Management Unit (EMU)

On 20 January 2021, the EMU of Bolikhan District resumed the monthly site visits by focusing on the progress of environmental activities and also the status of decommissioned and rehabilitated sites before handing over to the GOL within Q1 of 2021. A total of 30 out of the total 32 sites were accepted by EMU, but EMU requested that due to the low percentage of vegetation cover, additional counter measures should be implemented for the remaining two sites of HM Hydro's Labour Camp No.2 (LILAMA10 Camp) and the Phouhomxay Village's Irrigation Canal Rock and Spoil Disposal.

Two main topics were also discussed during the EMU visit:

(i) The Houay Soup landfill operation and the community involvement on the community solid waste management in 2021 including the plan for handing over of all responsibilities for Houay Soup Landfill management to the local authority in 2022.
(ii) The process for handing over of the decommissioned and rehabilitated sites to GOL.

EMO expects to receive the EMU site visit report and comments by early February 2021.

FIGURE 1-1: PHOTOS OF GOL-EMU MISSION

SITE INSPECTION AT THE RCC PLANT	SITE INSPECTION AT THE HOUAY SOUP LANDFILL
	

1.2.2 Site Decommissioning and Rehabilitation

A total of 32 revegetation sites were continually monitored in January 2021. The respective responsible contractors of the HM Hydro's Labour Camp No.2 (LILAMA10 Camp) and the Phouhomxay Village's Irrigation Canal Rock and Spoil Disposal were requested to implement additional counter measures due to the low percentage of vegetation cover.

The latest status and evaluation the percentage of vegetation cover as of January 2021 are shown in ***Table 1-5.***

TABLE 1-5: EVALUATION THE PERCENTAGE OF VEGETATION COVER AS OF JANUARY 2021

No	Site Name	Status of Decommissioning & Re-vegetation	Vegetation cover evaluation Percentage
			January-2021
01	TCM & GFE Camp	Completed	90%
02	Spoil Disposal Area 7	Completed	98%
03	Spoil Disposal Area 9	Completed	75%
04	Spoil Disposal Area 10	Completed	95%
05	Borrow Pit P1	No need	95%
06	Borrow Pit P1A	No need	80%

No	Site Name	Status of Decommissioning & Re-vegetation	Vegetation cover evaluation Percentage January-2021
07	TCM Mobile Crusher	Completed	90%
08	Dike Borrow Areas	No need	75%
09	SECC camp	Completed	90%
10	KENBER Camp	Completed	95%
11	LiLaMa10 Camp	Completed	40%
12	Obayashi Camp	Completed	90%
13	Right Tunnelling Camp	Completed	90%
14	Songda5 Camp N#1	Completed	98%
15	Songda5 Camp N#2	Completed	95%
16	Sino Hydro Camp	Completed	95%
17	V&K Concrete Sole Camp	Completed	70%
18	Zhefu Camp	Completed	75%
19	Spoil Disposal Area 1	Completed	90%
20	Spoil Disposal Area 2 & main dam workshop	Completed	75%
21	Spoil Disposal Area 6	Completed	75%
22	Spoil Disposal Area 8	No need	60%
23	Re-regulation dam workshop	Completed	85%
24	Main Quarry	Completed	70%
25	Aggregate Plant Yard	Completed	85%
26	CVC Plant	Completed	70%
27	IHI Field shop and contractor camp	Completed	85%
28	RCC Plant	Completed	70%
29	Songda5 Batching Plant & Stock yard	Completed	95%
30	Sino and Song Da's Magazine Area	Completed	80%
31	Sand Stock Yard	No need	60%
32	Irrigation Canal Spoil Disposal Area *Phouhomxay Village*	No need	10%

1.3 ENVIRONMENTAL QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD_5), 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/

1.3.1 Effluent Discharge from Camps and Construction Sites

Detailed monitoring results are provided in the ***Annex B*** of this Report. The effluent camp monitoring results in January 2021 indicated non-compliances for some parameters in OSOV2 (EF13) and the Main Powerhouse (EF19).

The status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities are summarized in ***Table 1-7.***

TABLE 1-6: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT WWTSS IN JANUARY 2021

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Full compliance	The selection of a qualified Contractor is under process to improve the WWTSs in OSOV1 and the Main Dam as well as modify the WWTS in OSOV2.
OSOV2	EF13	Non-compliance for Total Phosphorus, Ammonia Nitrogen and Total Nitrogen	
Main Powerhouse	EF19	Non-compliance for Total Phosphorus (first fortnightly sampling), Ammonia Nitrogen and Total Nitrogen	

1.3.2 Ambient Surface Water Quality Monitoring

The ambient surface 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]).

In addition, weekly depth profile monitoring (pH, DO, conductivity, TDS and temperature) has been undertaken since 18 September 2018 for stations located in the Re-regulation and main reservoirs. The locations of the monitoring stations are shown in ***Figure 1-2.***

The monitoring results for key parameters (DO, TSS and BOD_5) during January 2021 are presented in ***Table 1-7, Table 1-8*** *and* ***Table 1-9.*** The full set of data for January 2021 is attached in ***Annex A***. In addition, the results for DO are presented as line graphs in ***Figure 1-3***.

Main Reservoir

From 01 to 31 January 2021, the water level in the main reservoir decreased from El. 312.55 m asl to El. 311.10 m asl.

At R05, the station closest to the main dam, as the water temperatures dropped over the course of the first 3 weeks of January 2021, the thermocline deepened to a depth of about 35 m and the DO levels in the upper 30 m dropped from about 5 mg/L to just below 2 mg/L - likely due to a gradually increasing mixing of upper DO rich(er) water with DO deficient water in the lower layers enabled by the deepening of the thermocline.

At R04, the DO levels in the upper 30 m varied between 3 mg/L and 5.5 mg/L. Below 30 m, the DO levels gradually fell to below 1 mg/L.

The DO levels at R03 were recorded between 4.5 mg/L and 6.5 mg/L in the upper 25 m, and at deeper levels, the DO concentrations were generally between 3 mg/L and 4 mg/L with occasional concentrations below 1 mg/L.

At R02, the DO levels were generally between 3.1 mg/L and 6.3 mg/L in the entire water column.

At R01, the DO levels were generally between 5.6 mg/L and 10.5 mg/L in the entire water column.

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 BOD_5 measurements at R03, R04 and R05 in the epilimnion were less than 1.2 mg/L, but in the hypolimnion, BOD_5 was recorded 1.0 mg/L, 2.4 mg/L and 3.2 mg/L respectively.

Re-regulation Reservoir

In January 2021, the turbine discharges from the main powerhouse varied between 64 and 235 m^3/s usually interrupted by night-time periods with no discharge.

The DO measurements at R06 and R07 representing turbine discharges from the main dam generally had DO concentrations below 5 mg/L in the entire water column.

The BOD_5 concentrations in R06 and R07 were about 3 mg/L.

Downstream

During January 2021, the discharge from the re-regulation dam mainly went through the turbine and occasionally combined with discharge through the gate. The DO levels, except during the gate discharge on 13 January 2021, were less than 6 mg/L at the stations in Nam Ngiep immediately downstream of the Re-regulation Dam and thus were non-compliant with the GOL Standard. No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC is still in the process of collecting information to assist in developing measures to improve the DO levels downstream.

The BOD_5 in the downstream station (NNG05) was less than 1 mg/L and complied with the national surface water quality standard.

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

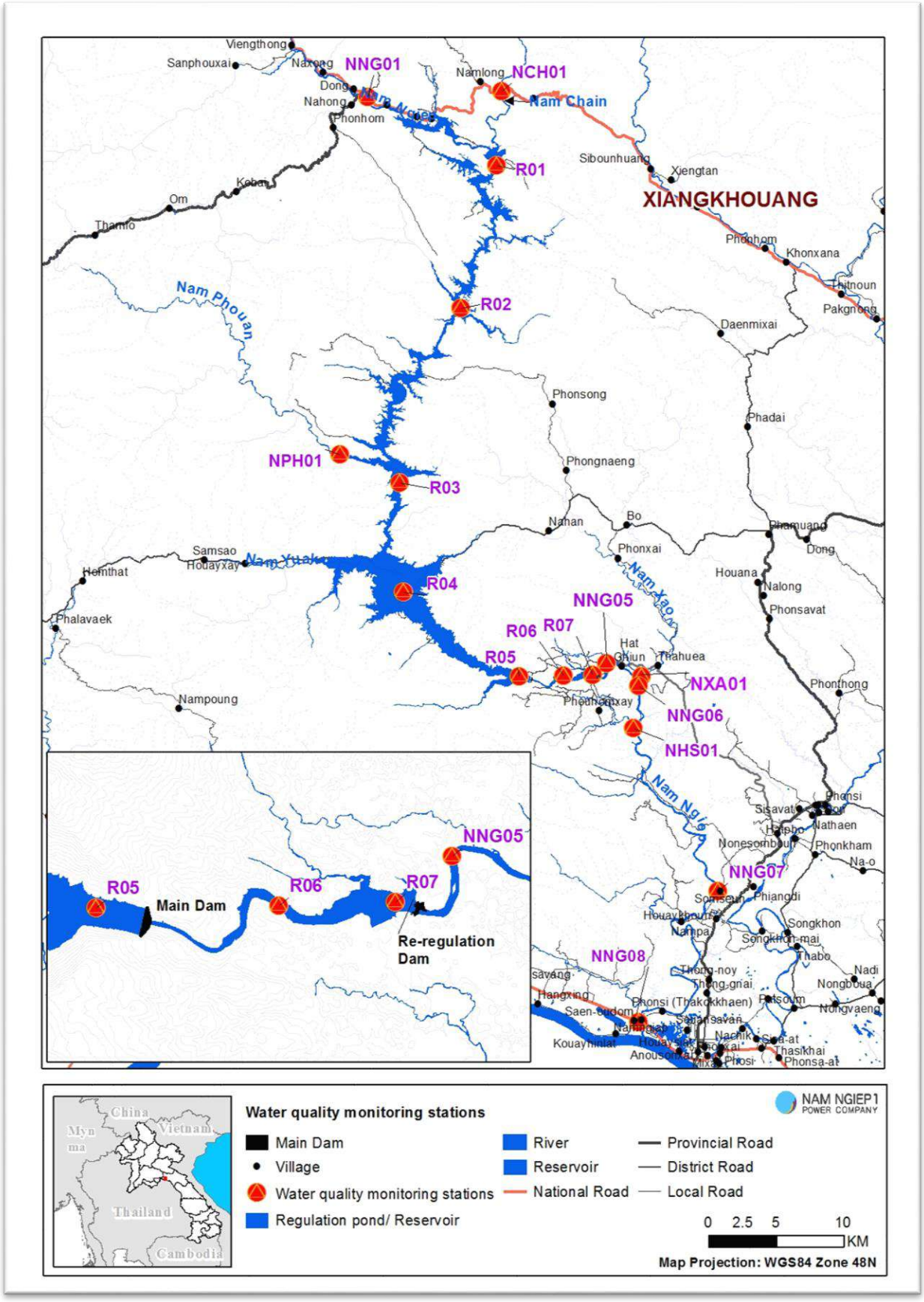


FIGURE 1-3: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO JANUARY 2021

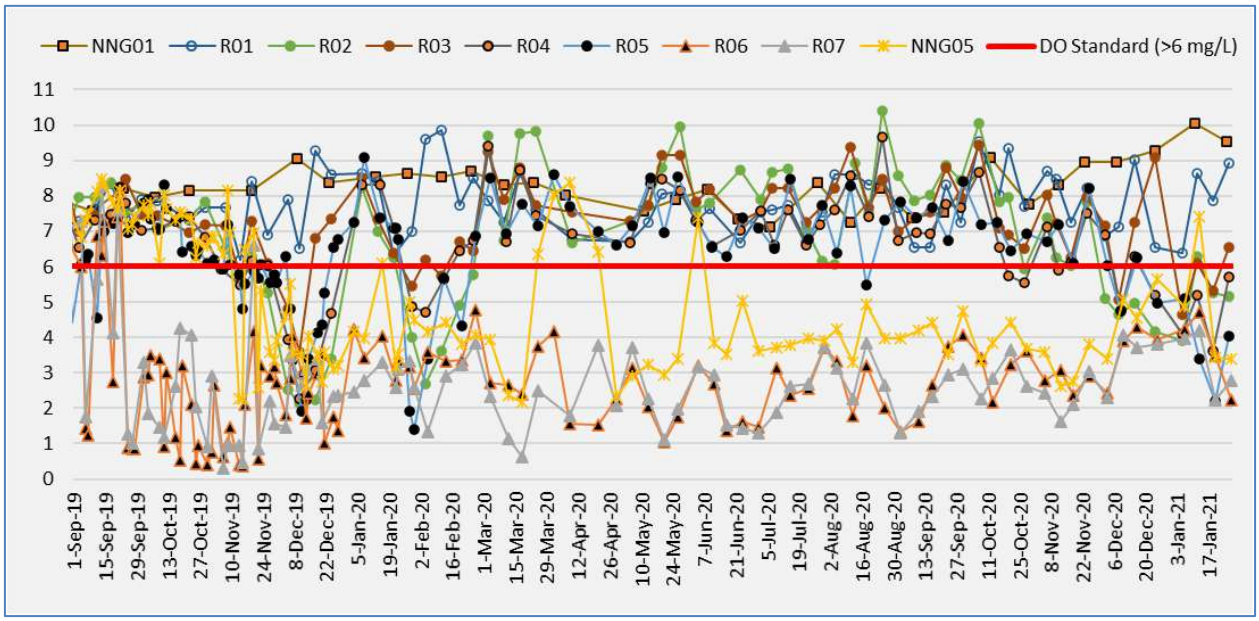


TABLE 1-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
5-Jan-21		6.4	3.9	4.65	4.1									6.87		
6-Jan-21						5.11	4.22	3.96	4.88	5.37	6.45	6.95			7.85	8.08
11-Jan-21	10.06												10.06			
12-Jan-21		8.63	6.29	6.11	5.18									11.24		
13-Jan-21						3.4	4.72	4.19	7.4	7.14	7.24	7.26			7.56	8.09
19-Jan-21		7.86	5.26	5.32	3.61									9.08		
20-Jan-21						2.21	3.48	2.23	3.43	5.26	7.58	7.94			7.41	7.7
25-Jan-21	9.52												10.54			
26-Jan-21		8.93	5.16	6.54	5.71	4.05								8.63		
27-Jan-21							2.23	2.77	3.39	4.05	6.42	7.09			6.32	6.84

TABLE 1-8: 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
11-Jan-21	<5												<5			
12-Jan-21 Hypolimnion		<5		<5	<5									<5		
12-Jan-21				<5	<5											
13-Jan-21						<5	9.36	<5	<5	<5	<5	<5			<5	<5
13-Jan-21 Hypolimnion						<5										

TABLE 1-9: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD_5 (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
11-Jan-21	<1												<1			
12-Jan-21		1.21		<1	<1									<1		
12-Jan-21 Hypolimnion				<1	2.37											
13-Jan-21						1.95	3.96	3.33								
13-Jan-21 Hypolimnion						3.15										

1.3.3 Groundwater Quality Monitoring

During January 2021, community groundwater quality analyses were carried out for six wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village. The community groundwater samples were taken from household's water tap.

The results indicate that two newly installed wells in Phouhomxay Village, one well in Somsuen Village and one well in Nam Pa Village comply fully with the groundwater quality standards.

Faecal Coliform and *E.coli* Bacteria are still present in the wells of Pou and Thong Noy Villages. 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. The groundwater quality monitoring results are presented in ***Table 1-10.***

TABLE 1-10: GROUNDWATER QUALITY MONITORING RESULTS IN SOMSUEN, NAM PA, THONGNOY AND POU VILLAGES

Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	Nampa Village	Thongnoy Village	Pou Village
	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
	Guideline						
pH	6.5 - 9.2	7.43	7.18	6.87	6.79	7.3	7.68
Sat. DO (%)		35.3	28.7	81.5	94.9	68.1	90.9
DO (mg/L)		2.81	28.7	6.91	7.78	5.59	7.76
Conductivity (µS/cm)		277	278	269	292	281	13.87
Temperature (°C)		25.6	25.4	22.6	24.4	23.4	21.7
Turbidity (NTU)	<20	2.15	2.45	1.77	2.22	2.37	1.61
Fecal coliform (MPN/100mL)	0	0	0	0	0	130	4.5
E.coli bacteria (MPN/100mL)	0	0	0	0	0	4.5	4.5

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Although the two new groundwater boreholes *(GPHX01 and GPHX02 – **Table 1-10**)* were connected to the existing water supply tanks commencing on 21 October 2020 (and as mentioned in Section **Error! Reference source not found.**, these groundwater samples complied with the G OL Drinking Water Standards for all parameters), in January 2021, the surface water from Houay Soup Stream is still used occasionally as alternative water supply source for Phouhomxay Village.

The results of the water quality analyses are presented in ***Table 1-11***.

Faecal Coliform and *E.coli* exceeded the standards in the water supply of Thaheua Village (WTHH02), Hat Gnuin Village (WHGN02) and Phouhomxay Village (WPHX02 – Primary School Water Tap and WPHX03 – Household Water Tap). 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. 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 were encouraged to boil water before drinking.

TABLE 1-11: RESULTS OF THE GRAVITY FED WATER SUPPLY QUALITY MONITORING

	Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
	Station	WTHH02	WHGN02	WPHX02	WPHX03
Parameter (Unit)	Guideline				
pH	6.5 - 8.6	7.87	7.71	7.13	7.65
Sat. DO (%)		114	103.3	88.2	76.8
DO (mg/L)		9.73	8.82	7.29	6.29
Conductivity (µS/cm)	<1,000	36.7	55.7	119	118
Temperature (°C)	<35	22.2	22.2	23.6	24
Turbidity (NTU)	<10	3.2	2.4	2.35	2.56
Faecal Coliform (MPN/100 mL)	0	70	7.8	130	170
E.coli Bacteria (MPN/100 mL)	0	33	7.8	14	22

1.3.5 Landfill Leachate Monitoring

During January 2021, landfill leachate monitoring was not conducted at NNP1 Project Landfill and Houay Soup Solid Waste Landfill due to the ponds were dry.

1.4 DISCHARGE MONITORING

1.4.1 Main Reservoir – Water Level, Inflow and Discharge

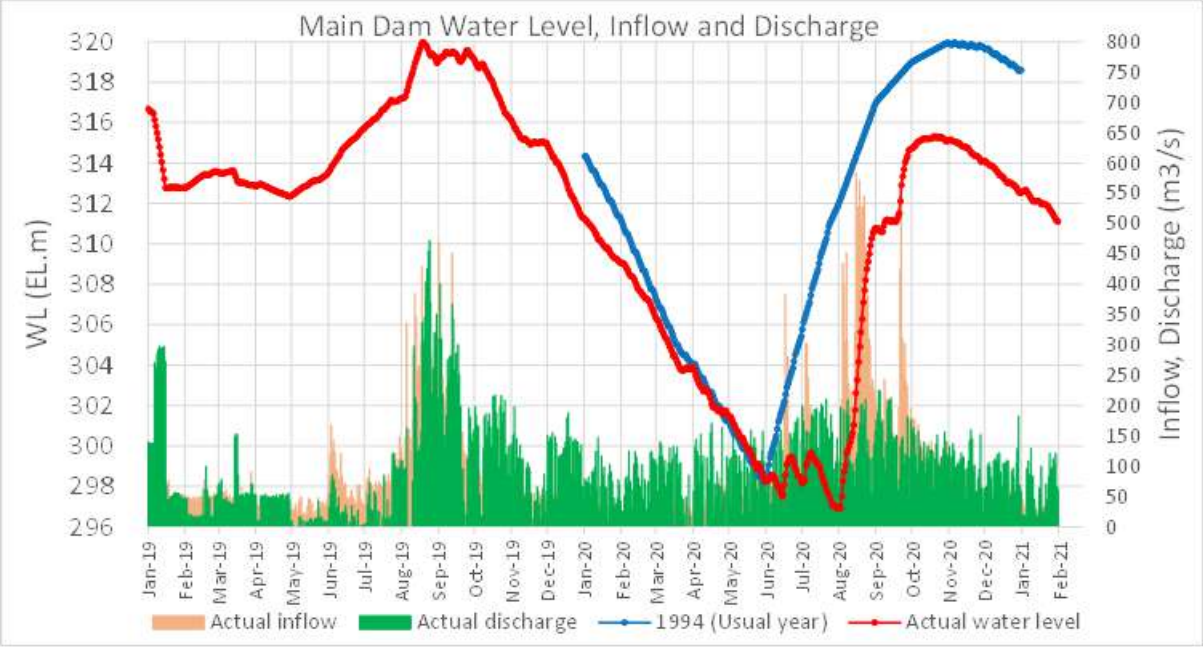
The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in ***Figure 1-4*** presents the values recorded since 01 January 2019.

During January 2021, the mean inflow to the main reservoir was 43 m^3/s. The minimum and maximum inflows were 22 (on 13 January 2021) and 62 m^3/s (on 07 January 2021) respectively.

From 01 to 31 January 2021, the water level of the main reservoir slightly decreased by 1.45 m from El. 312.55 m asl to El. 311.10 m asl.

In January 2021, the turbine discharges from the Main Powerhouse varied between 64 and 235 m^3/s usually interrupted by night-time periods with no discharge.

FIGURE 1-4: WATER LEVEL, INFLOW AND DISCHARGE FOR THE MAIN RESERVOIR



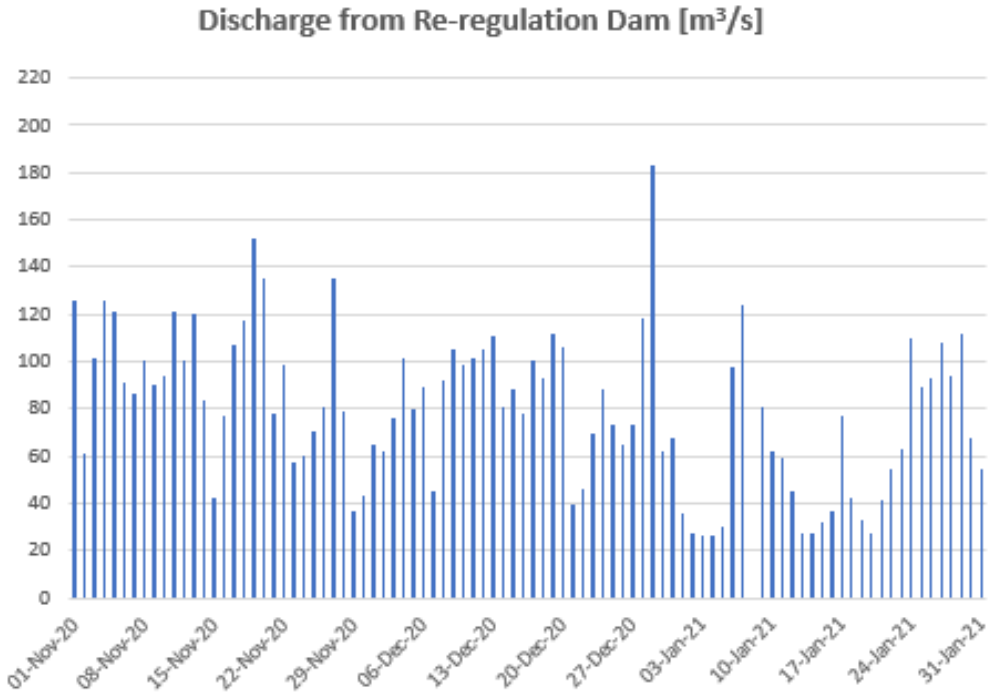
1.4.2 Re-regulation Reservoir – Discharge

The discharge monitoring data for the re-regulation dam during November 2020 to January 2021 is presented in ***Figure 1-5*****.**

During January 2021, the mean discharge from the Re-regulation Dam was about 59 m^3/s with turbine discharges varying between 48 m^3/s and 161 m^3/s, combined with gate discharge varying between 27 m^3/s and 214 m^3/s. The discharge was kept above the minimum flow requirement of 27 m^3/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 1-5: DISCHARGE MONITORING AT THE RE-REGULATION DAM IN NOVEMBER 2020 TO JANUARY 2021



1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In January 2021, EMO carried out four boat missions 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 only one of the sites (on 13 January 2021 with the lowest discharge rate of 27 m^3/s) was recorded having a water depth less than 0.5 m.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In January 2021, a total of 18.7 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 1.1 m^3 compared with December 2020.

During January 2021, the local Waste Collection Contractor continued the routine operation and maintenance activities of both landfills which included waste separation, waste covering and waste inventory, and clean-up of scattered waste. In addition, the Contractor has also continued assisting on segregation of recyclable waste and clean-up in the community waste bank.

No recyclable waste was sold this month. The cumulative amounts are presented in ***Table 1-12.***

TABLE 1-12: AMOUNTS OF RECYCLABLE WASTE SOLD

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by January 2021
1	Plastic Bottle	kg	0	**127**
2	Aluminium	kg	0	**178.3**
3	Paper/Cardboard	kg	0	**82**
4	Glass	kg	0	**112**
Total		**kg**	**0**	**499.3**

The villagers from Phouhomxay Village collected a total of 510 kg of food waste from the OSOV1 canteen for animal feed in January 2021, an increase of 28 kg compared with December 2020.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous material and hazardous waste stored on site in January 2021 are shown in ***Table 1-13*** and ***Table 1-14*****.**

TABLE 1-13: RECORD OF HAZARDOUS MATERIAL INVENTORY

No.	Type of Hazardous Material	Unit	Total in January 2021 (A)	Used (B)	Remaining (A – B)
1	Diesel	Litre	8,400	4,810	**3,590**
2	Gasoline	Litre	1,428	539	**889**
3	Lubricant (Turbine oil)	Litre	7,210	0	**7,210**
4	Colour Paint	Litre	266	0	**266**
5	Thinner	Litre	12	0	**12**
6	Grease Oil	Litre	725	0	**725**
7	Gear Oil	Litre	220	0	**220**
8	Chlorine Liquid	Litre	100	20	**80**
9	Chlorine Powder	Kg	65	0	**65**
10	SIKA	Litre	7	0	**7**

TABLE 1-14: RECORD OF HAZARDOUS WASTE INVENTORY

No.	Hazardous Waste Type	Unit	Total in January 2021 (A)	Disposed (B)	Remaining (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	392.3	0	392.3
2	Empty 200L drum of used oil	Unit	3	0	3
3	Contaminated soil, sawdust and textile material	m^3	0.46	0	0.46
4	Used tires	Piece	17	3	14
5	Empty 20L chemical drum	Drum	6	0	6

No.	Hazardous Waste Type	Unit	Total in January 2021 (A)	Disposed (B)	Remaining (A - B)
6	Lead battery	Unit	7	0	7
7	Empty paint and spray cans	Can	138	0	138
8	Halogen/fluorescent bulbs	Unit	264	10	254
9	Empty cartridge (Ink)	Unit	176	0	176
10	Clinic Waste	Kg	8.4	0	8.4

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community Recycling Programme

In January 2021, there was no trading of recyclable waste at the community waste bank. Due to the continuation of COVID-19 measures, many local recycling businesses and vendors have stopped coming on site to trade recyclable waste. In addition, there were also less trading activities in the project site and nearby communities due to reduced amounts of recyclable waste after the completion of project construction and decommissioning of the contractors' camps.

A total of 170.3 kg out of 296.5 kg cardboard stored in the community waste bank had become unsellable and were disposed of at Houay Soup Landfill. Therefore, the total amount of recyclable waste in the waste bank is 2,519 kg.

TABLE 1-15: TYPES AND AMOUNTS OF RECYCLABLE WASTE TRADED AT THE COMMUNITY RECYCLE WASTE BANK

Types of Waste	Unit	Remaining in December 2020	Additional in January 2021	Sold/ dispose	Remaining in January 2021
Glass bottles	kg	2,358	0	0	**2,358**
Paper/ cardboard	kg	296.5	0	170.5	**126**
Plastic bottles	kg	35	0	0	**35**
Aluminium cans	kg	0	0	0	**0**
Scrap metal	kg	0	0	0	**0**
Total	**kg**	**2,689.5**	**0**	**170.5**	**2,519**

1.6.2 Community Solid Waste Management

In January 2021, approximately 12.5 m^3 of solid waste was collected from Phouhomxay Village and the host villages for disposal at the Houay Soup Landfill, a decrease of 2.1 m^3 compared with December 2020.

FIGURE 1-6: WASTE MANAGEMENT ACTIVITIES DURING JANUARY 2021

SOLID WASTE COLLECTION IN PHOUHOMXAY VILLAGE'S SCHOOL (RESETTLEMENT VILLAGE)	***WASTE DISPOSAL AT HOUAY SOUP LANDFILL***
	
DAILY WASTE COVERING AT HOUAY SOUP LANDFILL	***DAILY RECYCLE WASTE SEGREGATION AT NNP1 LANDFILL***
	

2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP) 2020

A handover ceremony for two aluminium boats of Xaysomboun WRPO was organized on 14 January 2021 at NNP1 Main Dam Site. The boats were handed over by NNP1PC ESD management and received by the Head of Xaysomboun WRPO with participation of representatives from NNP1PC-EMO and GOL agencies. NNP1PC EMO Team also delivered the two boat trailers in which one trailer is kept at Ban Houay Xay of Hom District and another trailer is kept at Ban Pou of Thathom District.

Xaysomboun WRPO commenced the reservoir patrolling during 15 to 22 January 2021 with the participation of BSP technical team as an observer. The results were entered into the SMART database with the technical support from BSP.

NNP1PC SMO Infrastructure and EMO Watershed teams reviewed the detailed design and Bill of Quantity (BoQ) of the sub-office of Xaysomboun WRPO which will be established at Ban Houay Xay of Hom District under the approved AIP2020.

NNP1PC EMO team organized the discussion with Hom and Thathom District authority during 27 to 29 January 2021 to finalize their activities under component 5 of NNP1 WMP - Reservoir Management. The detailed activities will be incorporated into the draft of Xaysomboun AIP2021.

Bolikhamxay WRPO has been preparing a report on the forest patrolling that was carried out between 21 and 30 December 2020. The reservoir patrolling is scheduled to resume in February 2021.

NNP1PC EMO team handed over the SMART system equipment to Bolikhamxay WRPO on 15 January 2021 and installed the new reservoir warning sign near Houay Sao of Hom District on 19 January 2021.

BSP organized a discussion with Xaysomboun and Bolikhamxay WRPO on 07 and 15 January 2021 respectively about the law enforcement and patrolling strategy, monthly patrolling planning, and SMART implementation. BSP also provided technical assistance to document the results of reservoir and patrolling activities between 2019 and 2020 into the SMART system and the analysis and further updates will be communicated during the monthly meetings with WRPOs.

A meeting with NNP1 watershed and biodiversity committees including DOF-MAF on the issues related with GOL financial policy was organized on 25 January 2021. The meeting was chaired by Head of the Section of DOF-MAF and participated by representatives from DOF-MAF, Xaysomboun and Bolikhamxay WRPO, Bolikhamxay NC-NX BOMU, and NNP1PC EMO. An official minute of meeting is being prepared by DOF-MAF and discussed with NNP1PC EMO Team.

Figure 2-1: (a) Hand-over ceremony of the two boats of Xaysomboun WRPO at NNP1PC Main Dam site on 14 January 2021 and (b) hard-over SMART equipment to Bolikhamxay WRPO on 15 January 2021

2.1.2 Preparation of Annual Implementation Plan (AIP) 2021

Bolikhamxay WRPO confirmed to submit the improved draft AIP2021 in February 2021 after elaborating on the comments from the meeting on 25 January 2021.

NNP1PC EMO have reviewed the draft of Xaysomboun WRPO which was submitted on 23 December 2020. The draft will be further improved based on NNP1PC EMO comments, the comments during the meeting on 25 January 2021, and further inputs from Hom and Thathom districts related to the reservoir management activities.

It is noted that both Xaysomboun and Bolikhamxay WRPO still have sufficient budget from the remaining of AIP2019 and AIP2020 to continue the patrolling and enforcement activities until their respective AIP2021 are approved.

2.2 BIODIVERSITY OFFSET MANAGEMENT

2.2.1 Engagement of Biodiversity Service Provider (BSP)

The MOU between NNP1PC, ADB and WCS was signed by ADB and WCS in January 2021.

NNP1PC-EMO team and BSP continued to make progress on the preparation of a Law Enforcement Strategy (LES) document for NC-NX offset site, the overall biological monitoring program for NNP1 watershed and NC-NX offset site, community outreach program, and the conservation linked livelihood.

2.2.2 Implementation of BOMP Annual Implementation Plan (AIP) 2019 and 2020

The progress on the implementation of key activities by Component in January 2021 are described below:

a. Component 1 - Spatial Planning and Regulation

At the end of January, Bolikhamxay NC-NX BOMU finalized the plan for the TPZ boundary demarcation in the remaining village, Ban Vangphieng of Viengthong District. The activity will be executed in February 2021.

b. Component 2 – Law Enforcement

The four patrol teams continued the patrolling between 07 and 27 January 2021 with the focus on TPZ Highest priority area including Nam Chang, Nam Sone, Nam Chouan, Nam Xi and tributaries of Nam Xi, Nam San and the mountain ridges; as well as within Xaychamphone District including Nam Lak, Nam Kasae, Nam Kha Gni, Nam Chantui, Houy Kup and Houy Sopkhone. The results of patrolling in January 2021 will be presented and discussed in February 2021 Monthly Report.

The results of patrolling activity in December 2020 are as follows:

Team	Patrolling Area/distance	Observations/Actions Taken
1	Nam Houng TPZ high priority area including Nam Houng, Nam Kha Gna, Nam Tan, Houy Vangmoun, Houy Kanang, Houy San and Houy Pahok (16 days covering a distance of 56 km of forest patrol and 54 km of road patrol)	The team collected and destroyed a total of 51 active snares which are assumed to be set by the local villagers/hunters from Ban Natan. These include one large wire snare at Houy San, 10 large wire snares at Houy Pahok, and 40 large wire snares at Houy Vangmoun. The team also heard a gun fire in Nam Tan area.
2	TPZ highest priority including Nam San, Nam Chang and Nam Sone (16 days covering a distance of 74 km on forest patrolling and 18 km on road patrolling)	The team did not encounter any threats during patrolling.
3	Nam Ma TPZ high priority area including Nam Ma, Nam Pang, Nam Mong, Nam Phai and Houy Phaphard (16 days covering a distance of 90 km on forest patrolling)	The team found and destroyed one small fresh fishing camp at Nam Pang.

Team	Patrolling Area/distance	Observations/Actions Taken
4	Xaychamphone District including Nam Cham Hang, Nam Kha Gni, Houy Lampang, Houy Kamoud, Houy Ping, Houy Tong, Houy Or and Houy Mouang (16 days covering a distance of 71 km on forest patrolling and 40 km on road patrolling)	- Collected and destroyed a total of 51 snares comprises of three large wire snares at Houy Mouang and 48 large wire snares close to Nam Houng. - Found and destroyed one fishing camp at Nam Kha Gni. - Located illegally cut timber at Houy Kamoud that includes timber with the estimated volume of 0.5 cubic meter, 31 pieces of purlin, and three logs. The team assumed that the cut timber belongs to the villagers of Ban Meungcham. - Located illegally cut timber consisting of 25 pieces of purlin at Houy Mouang that are assumed to belong to villagers of Ban Phonemeung. - The team have reported the cases to Xaychamphone DAFO for further investigation and action.

Figure 2-2: Map of Threats Recorded by Patrolling Teams in December 2020

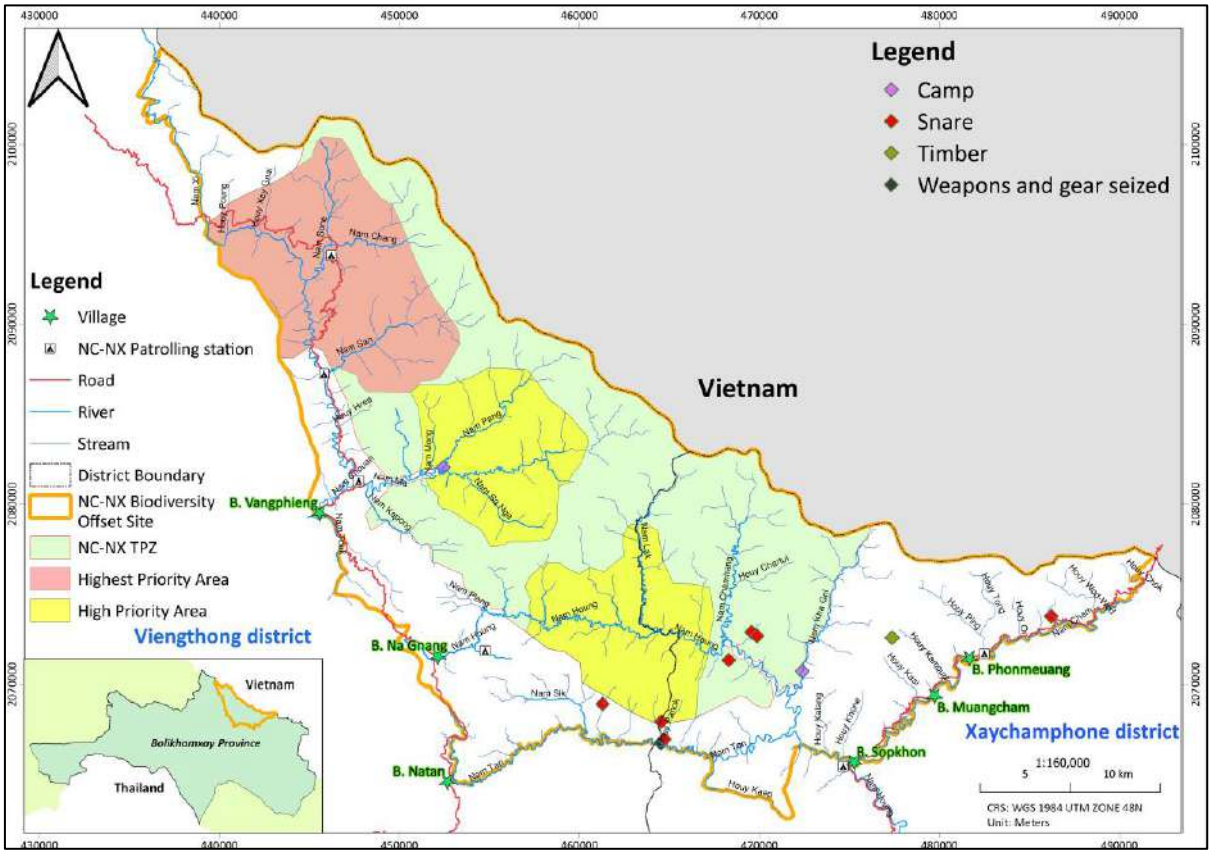


Figure 2-3: Wire snares found by team 1 at Houy Vangmoun	*Figure 2-4: Fishing camp found and destroyed by Team 3 at Nam Pang*
	
Figure 2-5: Illegal cut timber found by Team 4 at Houay Kamoud	*Figure 2-6: Wire snares found by team 4 at Nam Houng northern of Xaychamphone District*
	

c. Component 3 – Conservation Outreach

The results of pre-assessment survey as part as the development of community outreach strategy were presented by BSP Team to NNP1PC EMO on 29 January 2021. It will be further communicated with Bolikhamxay NC-NX BOMU during the monthly meeting in February 2021.

d. Component 4 – Conservation linked livelihood development

The improved final plan was re-submitted to ADB and IAP on 30 December 2020. ADB Social Team provided additional comments on 20 January 2021 while there was no feedback from ADB Environmental Team and IAP until end of January 2021. The final lao version is expected to be finalized and submitted to Bolikhamxay NC-NX BOMU after ADB and IAP review in February 2021. The activities are incorporated into the BOM AIP2021.

In January 2021, Bolikhamxay NC-NX BOMU was still discussing the Snare Removal Plan with NNP1PC EMO and BSP.

e. Component 6 – Biological Monitoring

BSP team is still improving the monitoring matrix elaborating the comments and recommendations from IAP and ADB during the virtual mission between 09-10 December 2020.

NC-NX BOMU, NNP1PC-EMO, and BSP team installed a total of 100 camera traps at 56 target locations within NC-NX offset site during 27 October to 27 November 2020. The team started retrieving the camera traps on 19 January 2021 and expect to complete this activity in the second week of February 2021.

2.2.3 Preparation of Annual Implementation Plan (AIP) 2021

Bolikhamxay NC-NX BOMU submitted the improved draft plan to NNP1PC EMO on 27 January 2021. The draft plan in English is being further reviewed and translated by NNP1PC EMO.

3. FLOATING DEBRIS REMOVAL

NNP1PC EMO completed the removal of temporary log-boom from the main reservoir on 22 January 2021.

Figure 3-1: Removal of temporary log-boom from the NNP1 main reservoir

4. FISHERY MONITORING

Two species groups and three species dominated the fish catch by weight in December 2020 as listed in **Table 4-1.** All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Tor sinensis* is classified as Vulnerable species (VU).

Table 4-1*: *Fish Species dominating the Fish Catch in December 2020

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Hampala dispar, Hampala macrolepidota	ปาสูด	200.9	LC
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	104.7	LC
Channa striata	ปาถ่ำ	95	LC
Clarias batrachus	ปาดุก	50.2	LC
Tor sinensis	ปาแดง	47.8	VU

The recorded catch of Threatened and Near Threatened species (IUCN Red List classification) in December 2020 is presented in ***Table 4-2.*** The list includes three species that are classified as Vulnerable species (VU) and two Near Threatened species (NT).

Table 4-2*: *Threatened Species of December 2020 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Cyprinus carpio	ปาไน	12.7	VU
Neolissochilus stracheyi	ปาสอง	3.6	NT
Onychostoma gerlachi	ปาคิง	4.4	NT
Scaphognathops bandanensis	ปาอวนไฟ/ปาป่วน	10.4	VU
Tor sinensis	ปาแดง	47.8	VU

The total recorded monthly fish catch for the downstream and upstream fishing households and the Mekong control group involved in the monitoring programme from July 2015 to December 2020 is presented in ***Figure 4-1.*** Note that the upstream fish catch excludes the fish catch from the fishing households in Zone 2LR because these households were resettled during Q4-2017.

Figure 4-1*: *Total Monthly Fish Catch July 2015 – December 2020

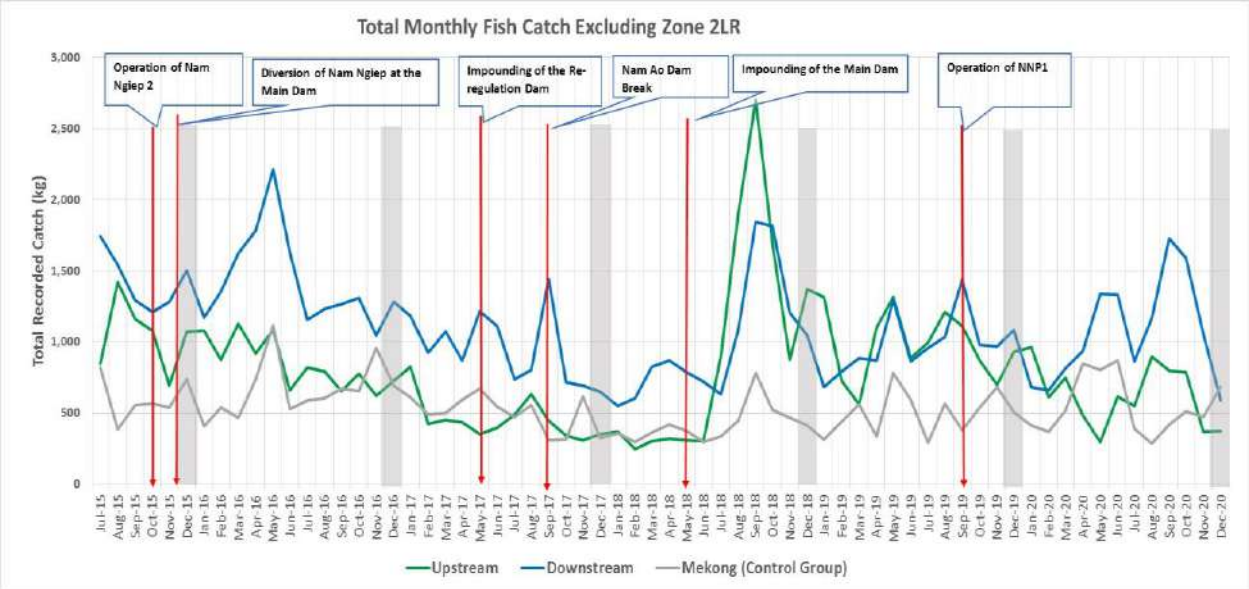
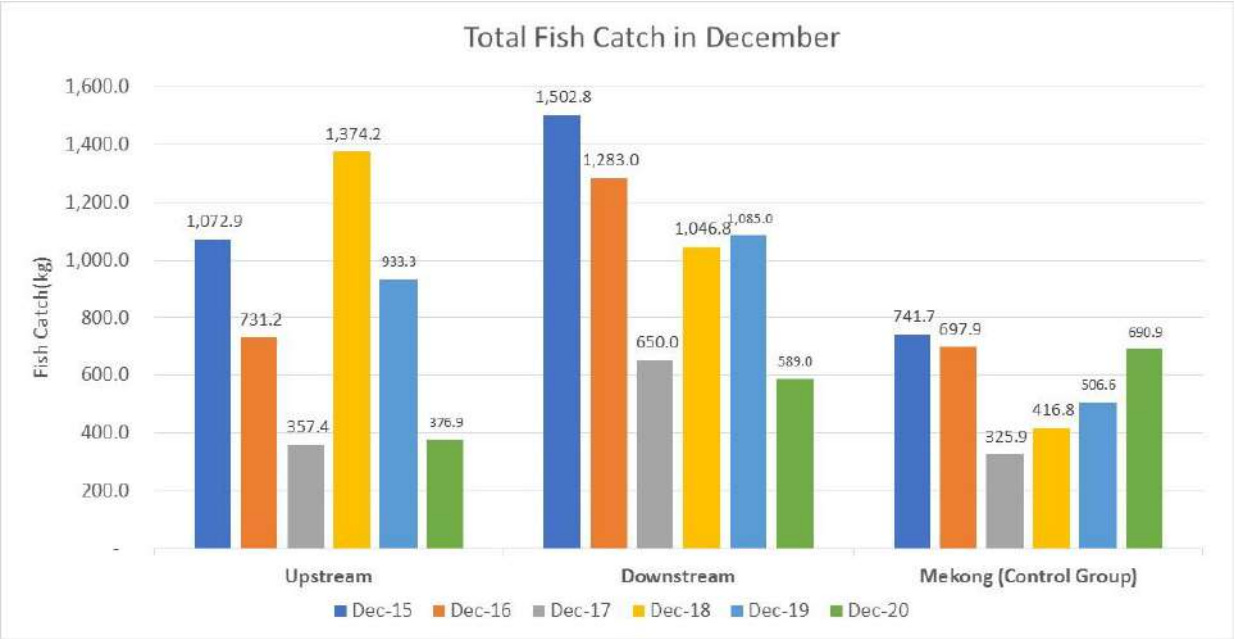


Table 4-3 and **Figure 4-2** show the total recorded fish catch for the month of December from 2015 to 2020 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group. The total fish catch data represents the total fish supply provided by the involved fishing households.

Table 4-3*: *Total Fish Catch by Upstream (Excluding Zone 2LR), Downstream and Mekong Control Group Fishing Households for the month of December from 2015 to 2020

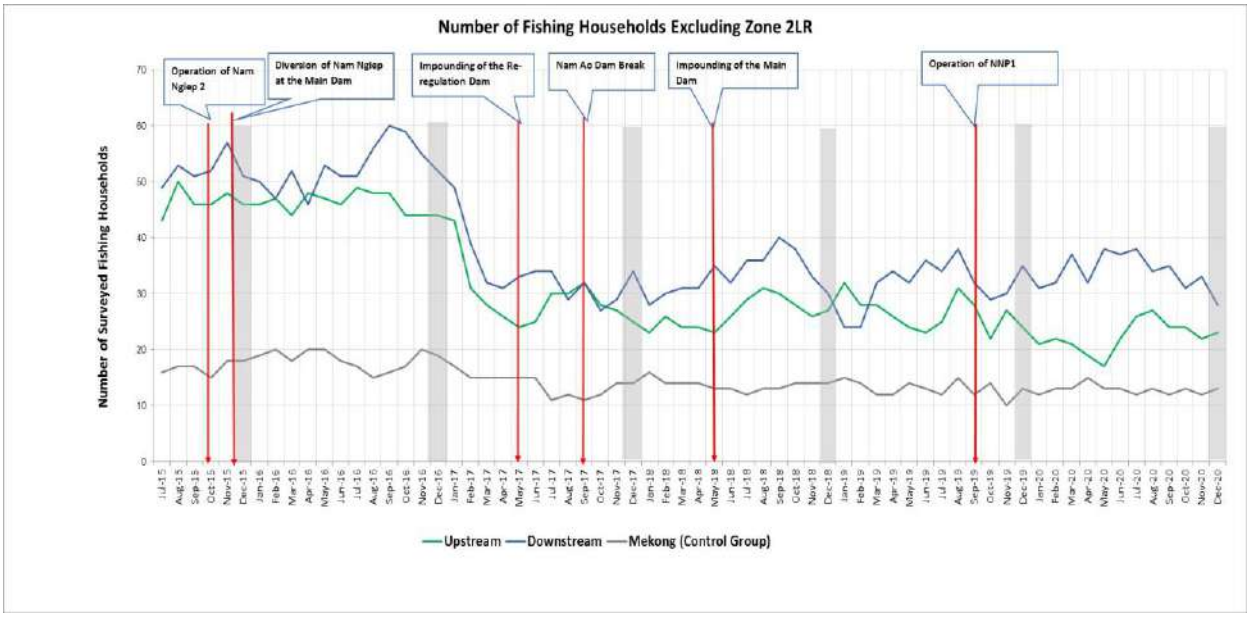
Fishing Zone	December 2015 (kg)	December 2016 (kg)	December 2017 (kg)	December 2018 (kg)	December 2019 (kg)	December 2020 (kg)
Upstream	1,072.9	731.2	357.4	1,374.2	933.3	376.9
Downstream	1,502.8	1,283.0	650.0	1,046.8	1,085.0	589.0
Mekong Control Group	741.7	697.9	325.9	416.8	506.6	690.9

Figure 4-2*: *Total Fish Catch by Upstream (Excluding Zone 2LR), Downstream and Mekong Control Group Fishing Households for the month of December from 2015 to 2020



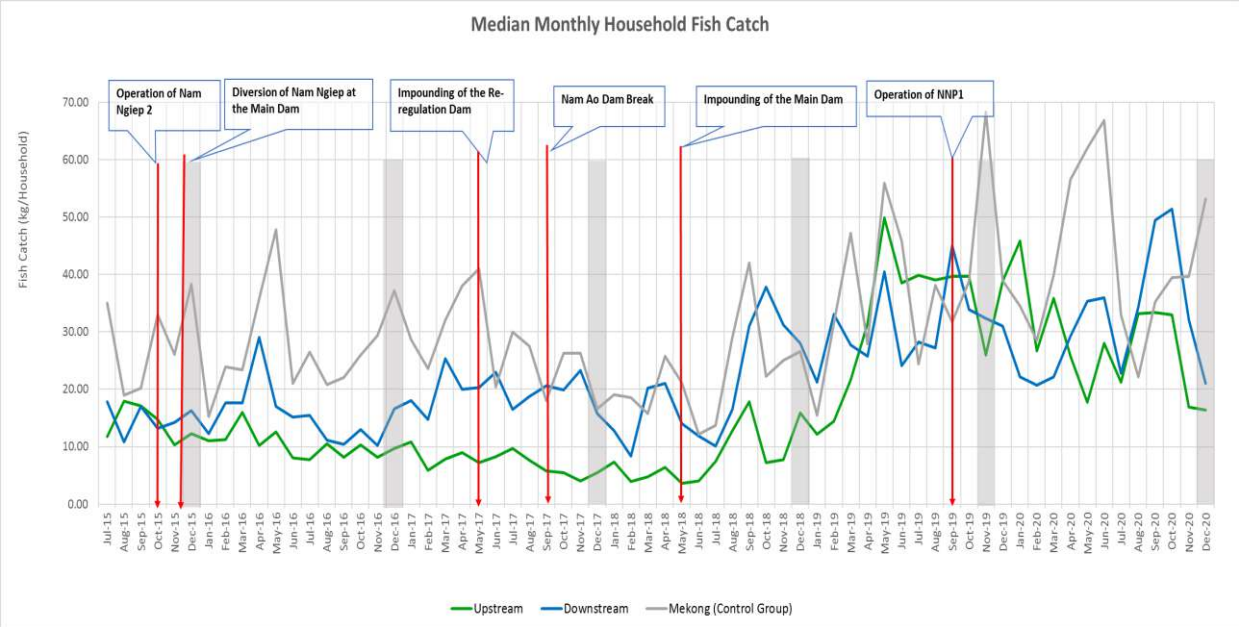
The numbers of fishing households involved in the fish catch monitoring programme are displayed in **Figure 4-3.**

Figure 4-3*: *Number of Fishing Households Involved in the Fish Catch Monitoring Programme



The median monthly household fish catch from July 2015 to December 2020 for the upstream (excluding Zone 2LR) and downstream communities, and the Mekong control group are presented in **Figure 4-4.**

Figure 4-4*: *Median Monthly Household Fish Catch without Zone 2LR



The median household fish catch for the month of December from 2015 to 2020 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group are displayed in **Table 4-4.**

Table 4-4*: *Median Monthly Household Fish Catch in the Upstream and Downstream Communities Excluding Zone 2LR for the month of December from 2015 to 2020

Fishing Zone	December 2015 (kg)	December 2016 (kg)	December 2017 (kg)	December 2018 (kg)	December 2019 (kg)	December 2020 (kg)
Upstream	12.3	9.7	5.5	15.9	38.9	16.4
Downstream	16.3	16.7	15.8	28.1	31.0	21.0
Mekong Control Group	38.3	37.2	16.6	26.6	39.0	53.1

The median daily fish catch per household are displayed in **Table 4-5**, and the median fish catch per household per fishing day for the month of December from 2015 to 2020 are shown in ***Table 4-5.***

FIGURE 4-5: MEDIAN DAILY FISH CATCH PER HOUSEHOLD

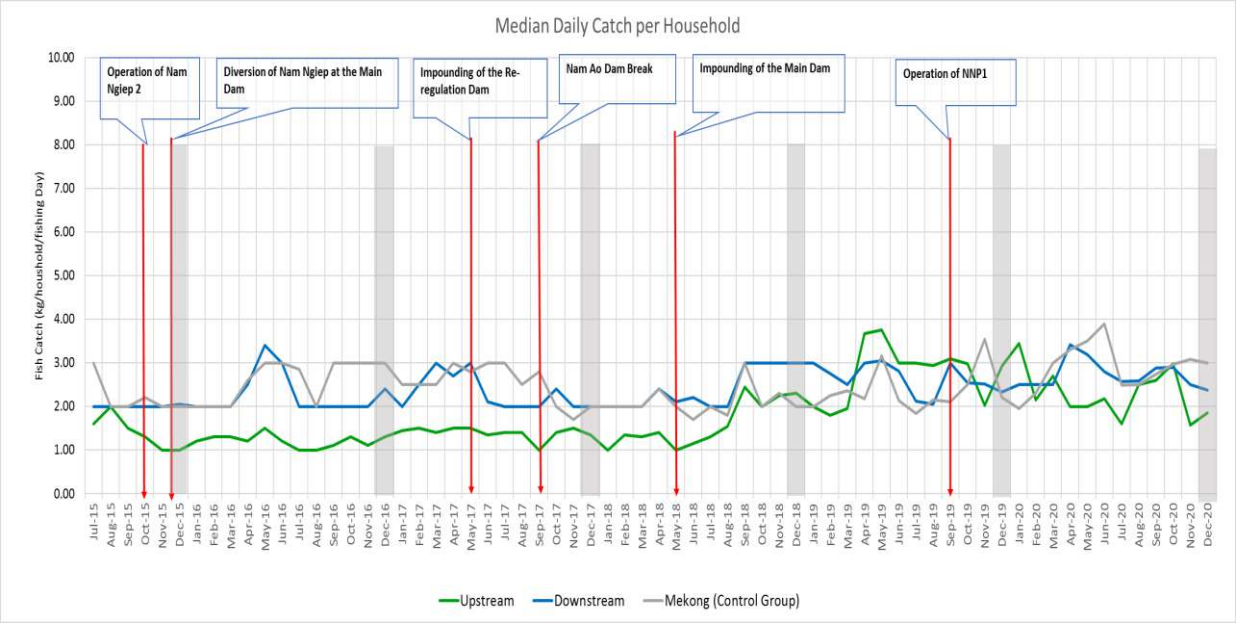


Table 4-5: Median Daily Fish Catch per Household for the month of December from 2015 to 2020

Fishing Zone	December 2015 (kg)	December 2016 (kg)	December 2017 (kg)	December 2018 (kg)	December 2019 (kg)	December 2020 (kg)
Upstream	1.00	1.30	1.35	2.30	2.93	1.85
Downstream	2.05	2.40	2.00	3.00	2.33	2.38
Mekong Control Group	2.00	3.00	2.00	2.00	2.20	3.00

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

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

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
5-Jan-21	pH	5.0 - 9.0		6.89	6.81	6.75	6.62							
6-Jan-21	pH	5.0 - 9.0						6.86	6.9	6.96	6.93	6.78	6.82	6.78
11-Jan-21	pH	5.0 - 9.0	7.39											
12-Jan-21	pH	5.0 - 9.0		7.21	7.1	6.92	6.88							
13-Jan-21	pH	5.0 - 9.0						6.65	6.77	6.81	6.96	7.16	7.01	6.84
19-Jan-21	pH	5.0 - 9.0		7.1	6.78	6.85	6.73							
20-Jan-21	pH	5.0 - 9.0						6.64	6.77	6.82	6.77	6.99	7.1	7.14
25-Jan-21	pH	5.0 - 9.0	7.97											
26-Jan-21	pH	5.0 - 9.0		6.55	6.88	6.71	6.6	6.78						
27-Jan-21	pH	5.0 - 9.0							6.93	6.78	6.78	6.92	7.16	6.89
5-Jan-21	Sat. DO (%)			73.7	46.2	53.2	48.4							
6-Jan-21	Sat. DO (%)							60.4	49.1	47.2	58.1	62.7	76.8	83.4
11-Jan-21	Sat. DO (%)		109.7											
12-Jan-21	Sat. DO (%)			98.6	73.9	71.9	60.8							
13-Jan-21	Sat. DO (%)							39.8	54.9	48.4	85.5	81.7	83.1	83.7
19-Jan-21	Sat. DO (%)			90.5	61.7	62.3	42.2							
20-Jan-21	Sat. DO (%)							25.8	40.5	25.8	39.7	61.1	85.8	92.2
25-Jan-21	Sat. DO (%)		113.6											
26-Jan-21	Sat. DO (%)			107.1	60.9	77.2	67.2	48.8						
27-Jan-21	Sat. DO (%)								25.8	33	39.6	47.6	76.8	85.6
5-Jan-21	DO (mg/L)	>6.0		6.4	3.9	4.65	4.1							
6-Jan-21	DO (mg/L)	>6.0						5.11	4.22	3.96	4.88	5.37	6.45	6.95
11-Jan-21	DO (mg/L)	>6.0	10.06											
12-Jan-21	DO (mg/L)	>6.0		8.63	6.29	6.11	5.18							
13-Jan-21	DO (mg/L)	>6.0						3.4	4.72	4.19	7.4	7.14	7.24	7.26
19-Jan-21	DO (mg/L)	>6.0		7.86	5.26	5.32	3.61							
20-Jan-21	DO (mg/L)	>6.0						2.21	3.48	2.23	3.43	5.26	7.58	7.94
25-Jan-21	DO (mg/L)	>6.0	9.52											
26-Jan-21	DO (mg/L)	>6.0		8.93	5.16	6.54	5.71	4.05						
27-Jan-21	DO (mg/L)	>6.0							2.23	2.77	3.39	4.05	6.42	7.09
5-Jan-21	Conductivity (µs/cm)			79	75	68	64							

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
6-Jan-21	Conductivity (µs/cm)							63	76	71	71	79	72	71
11-Jan-21	Conductivity (µs/cm)		78											
12-Jan-21	Conductivity (µs/cm)			81	75	65	66							
13-Jan-21	Conductivity (µs/cm)							67	77	75	76	79	74	75
19-Jan-21	Conductivity (µs/cm)			76	75	66	67							
20-Jan-21	Conductivity (µs/cm)							69	73	74	74	74	75	75
25-Jan-21	Conductivity (µs/cm)		60.9											
26-Jan-21	Conductivity (µs/cm)			76	74	67	67	69						
27-Jan-21	Conductivity (µs/cm)								74	72	71	72	72	72
5-Jan-21	Temperature (°C)			22.85	23.99	22.05	23.79							
6-Jan-21	Temperature (°C)							23.75	23.56	23.79	23.94	23.1	24.08	24.31
11-Jan-21	Temperature (°C)		18.1											
12-Jan-21	Temperature (°C)			21.87	23.34	23.55	23.34							
13-Jan-21	Temperature (°C)							23.24	23.27	22.6	22.7	22.05	22.14	22.52
19-Jan-21	Temperature (°C)			22.89	23.38	23.32	23.12							
20-Jan-21	Temperature (°C)							22.88	22.94	22.93	23	22.92	23.08	23.12
25-Jan-21	Temperature (°C)		22.1											
26-Jan-21	Temperature (°C)			24.13	23.77	23.6	23.55	24.52						
27-Jan-21	Temperature (°C)								23.02	23.81	23.18	23.44	24.4	24.88
5-Jan-21	Turbidity (NTU)			2.7	1.4	1.6	1.77							
6-Jan-21	Turbidity (NTU)							1.51	2.3	2.43	2.7	3.04	3.83	8.23
11-Jan-21	Turbidity (NTU)		2.99											
12-Jan-21	Turbidity (NTU)			2.6	1.47	1.64	2.51							
13-Jan-21	Turbidity (NTU)							2.2	3.75	3.53	4.29	3.94	3.11	3.5
19-Jan-21	Turbidity (NTU)			2.59	1.75	1.9	3.31							
20-Jan-21	Turbidity (NTU)							4.22	4.55	8.79	8.17	8.38	6.26	5.77
25-Jan-21	Turbidity (NTU)		2.79											

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
26-Jan-21	Turbidity (NTU)			2.51	1.44	1.27	1.84	2.66						
27-Jan-21	Turbidity (NTU)								6.65	10.23	6.41	11.86	5.43	5.25
11-Jan-21	TSS (mg/L)		<5											
12-Jan-21	TSS (mg/L)			<5		<5	<5							
13-Jan-21	TSS (mg/L)							<5	9.36	<5	<5	<5	<5	<5
11-Jan-21	BOD_5 (mg/L)	<1.5	<1											
12-Jan-21	BOD_5 (mg/L)	<1.5		1.21		<1	<1							
13-Jan-21	BOD_5 (mg/L)	<1.5						1.95	3.96	3.33				
11-Jan-21	COD (mg/L)	<5.0	15.1											
12-Jan-21	COD (mg/L)	<5.0												
13-Jan-21	COD (mg/L)	<5.0							7.6	7.1	6	5.4	6.7	8.3
11-Jan-21	NH_3-N (mg/L)	<0.2	<0.2											
12-Jan-21	NH_3-N (mg/L)	<0.2		<0.2		<0.2	<0.2							
13-Jan-21	NH_3-N (mg/L)	<0.2						<0.2						
11-Jan-21	NO_3-N (mg/L)	<5.0	<0.02											
12-Jan-21	NO_3-N (mg/L)	<5.0		<0.02		<0.02	<0.02							
13-Jan-21	NO_3-N (mg/L)	<5.0						<0.02						
11-Jan-21	Faecal coliform (MPN/100 mL)	<1,000	430											
12-Jan-21	Faecal coliform (MPN/100 mL)	<1,000		4		0	0							
13-Jan-21	Faecal coliform (MPN/100 mL)	<1,000						0	0	0	8	11	8	11
11-Jan-21	Total Coliform (MPN/100 mL)	<5,000	1,600											
12-Jan-21	Total Coliform (MPN/100 mL)	<5,000		540		2	8							
13-Jan-21	Total Coliform (MPN/100 mL)	<5,000						13	79	23	23	130	49	49
11-Jan-21	TKN (mg/L)		<1.5											
12-Jan-21	TKN (mg/L)			<1.5		<1.5	<1.5							
13-Jan-21	TKN (mg/L)							<1.5						
11-Jan-21	TOC (mg/L)		0.72											
12-Jan-21	TOC (mg/L)													

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
13-Jan-21	TOC (mg/L)								1.4	1.66	1.42	1.61	1.57	1.57
12-Jan-21	Phytoplankton Biomass (g dry wt/m³)			4		0..0	0.8							
13-Jan-21	Phytoplankton Biomass (g dry wt/m³)							1						
11-Jan-21	Total Phosphorus (mg/L)		<0.01											
12-Jan-21	Total Phosphorus (mg/L)			<0.01		<0.01	<0.01							
13-Jan-21	Total Phosphorus (mg/L)							<0.01						
11-Jan-21	Total Dissolved Phosphorus (mg/L)		<0.01											
12-Jan-21	Total Dissolved Phosphorus (mg/L)			<0.01		<0.01	<0.01							
13-Jan-21	Total Dissolved Phosphorus (mg/L)							<0.01						
12-Jan-21	Hydrogen Sulfide (mg/L)			<0.02		<0.02	<0.02							
13-Jan-21	Hydrogen Sulfide (mg/L)							<0.02						
12-Jan-21	Turbidity (NTU)-Hypolimnion					2.32	3.32							
13-Jan-21	Turbidity (NTU)-Hypolimnion							4.68						
12-Jan-21	TSS (mg/L)-Hypolimnion					<5	<5							
13-Jan-21	TSS (mg/L)-Hypolimnion							<5						
12-Jan-21	BOD_5 (mg/L)-Hypolimnion					<1	2.37							
13-Jan-21	BOD_5 (mg/L)-Hypolimnion							3.15						
12-Jan-21	Total Coliform (MPN/100 mL)-Hypolimnion					0	0							
13-Jan-21	Total Coliform (MPN/100 mL)-Hypolimnion							23						

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
12-Jan-21	Faecal coliform (MPN/100 mL)-Hypolimnion					0	0							
13-Jan-21	Faecal coliform (MPN/100 mL)-Hypolimnion							2						
12-Jan-21	NH_3-N (mg/L)-Hypolimnion					<0.2	<0.2							
13-Jan-21	NH_3-N (mg/L)-Hypolimnion							<0.2						
12-Jan-21	NO_3-N (mg/L)-Hypolimnion					<0.02	<0.02							
13-Jan-21	NO_3-N (mg/L)-Hypolimnion							<0.02						
12-Jan-21	TKN (mg/L) -Hypolimnion					<1.5	<1.5							
13-Jan-21	TKN (mg/L) -Hypolimnion							<1.5						
12-Jan-21	Total Dissolved Phosphorus (mg/L)-Hypolimnion					<0.01	<0.01							
13-Jan-21	Total Dissolved Phosphorus (mg/L)-Hypolimnion							<0.01						
12-Jan-21	Total Phosphorus (mg/L)-Hypolimnion					<0.01	<0.01							
13-Jan-21	Total Phosphorus (mg/L)-Hypolimnion							<0.01						
12-Jan-21	Hydrogen Sulfide (mg/L)-Hypolimnion					<0.02	<0.02							
13-Jan-21	Hydrogen Sulfide (mg/L)-Hypolimnion							0.02						
12-Jan-21	Phytoplankton Biomass (g dry wt/m^3)-Hypolimnion					1.2	2							
13-Jan-21	Phytoplankton Biomass (g dry wt/m^3)-Hypolimnion							11						

TABLE A-2: RESULTS OF SURFACE WATER QUALITY MONITORING IN NAM CHIAN, NAM PHOUAN, NAM XAO AND NAM HOUAY SOUP

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
5-Jan-21	pH	5.0 - 9.0		6.4		
6-Jan-21	pH	5.0 - 9.0			6.98	6.67
11-Jan-21	pH	5.0 - 9.0	8.41			
12-Jan-21	pH	5.0 - 9.0		7.05		
13-Jan-21	pH	5.0 - 9.0			7.35	6.85
19-Jan-21	pH	5.0 - 9.0		6.9		
20-Jan-21	pH	5.0 - 9.0			7.2	7.12
25-Jan-21	pH	5.0 - 9.0	7.68			
26-Jan-21	pH	5.0 - 9.0		6.91		
27-Jan-21	pH	5.0 - 9.0			7.18	7.1
5-Jan-21	Sat. DO (%)			71.9		
6-Jan-21	Sat. DO (%)				87.9	88.8
11-Jan-21	Sat. DO (%)		107.6			
12-Jan-21	Sat. DO (%)			113.5		
13-Jan-21	Sat. DO (%)				87.4	81.2
19-Jan-21	Sat. DO (%)			96.8		
20-Jan-21	Sat. DO (%)				85.7	86.6
25-Jan-21	Sat. DO (%)		129.7			
26-Jan-21	Sat. DO (%)			94.4		
27-Jan-21	Sat. DO (%)				75.4	77.8
5-Jan-21	DO (mg/L)	>6.0		6.87		
6-Jan-21	DO (mg/L)	>6.0			7.85	8.08
11-Jan-21	DO (mg/L)	>6.0	10.06			
12-Jan-21	DO (mg/L)	>6.0		11.24		
13-Jan-21	DO (mg/L)	>6.0			7.56	8.09
19-Jan-21	DO (mg/L)	>6.0		9.08		
20-Jan-21	DO (mg/L)	>6.0			7.41	7.7
25-Jan-21	DO (mg/L)	>6.0	10.54			
26-Jan-21	DO (mg/L)	>6.0		8.63		
27-Jan-21	DO (mg/L)	>6.0			6.32	6.84
5-Jan-21	Conductivity (µs/cm)			63		
6-Jan-21	Conductivity (µs/cm)				122	42

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
11-Jan-21	Conductivity (µs/cm)		23.4			
12-Jan-21	Conductivity (µs/cm)			65		
13-Jan-21	Conductivity (µs/cm)				131	45
19-Jan-21	Conductivity (µs/cm)			40		
20-Jan-21	Conductivity (µs/cm)				96	55
25-Jan-21	Conductivity (µs/cm)		80.3			
26-Jan-21	Conductivity (µs/cm)			66		
27-Jan-21	Conductivity (µs/cm)				108	56
5-Jan-21	Temperature (°C)			18.05		
6-Jan-21	Temperature (°C)				20.68	19.97
11-Jan-21	Temperature (°C)		16.9			
12-Jan-21	Temperature (°C)			16.02		
13-Jan-21	Temperature (°C)				18.98	16.98
19-Jan-21	Temperature (°C)			18.39		
20-Jan-21	Temperature (°C)				22.56	21.24
25-Jan-21	Temperature (°C)		23.5			
26-Jan-21	Temperature (°C)			19.86		
27-Jan-21	Temperature (°C)				25	23.99
5-Jan-21	Turbidity (NTU)			1.43		
6-Jan-21	Turbidity (NTU)				3.75	3.53
11-Jan-21	Turbidity (NTU)		2.69			
12-Jan-21	Turbidity (NTU)			3.14		
13-Jan-21	Turbidity (NTU)				3.68	3.01
19-Jan-21	Turbidity (NTU)			2.22		
20-Jan-21	Turbidity (NTU)				4.73	6.54
25-Jan-21	Turbidity (NTU)		2.24			
26-Jan-21	Turbidity (NTU)			2.01		
27-Jan-21	Turbidity (NTU)				5.89	5.94
11-Jan-21	TSS (mg/L)		<5			
12-Jan-21	TSS (mg/L)			<5		
13-Jan-21	TSS (mg/L)				<5	<5
11-Jan-21	BOD_5 (mg/L)	<1.5	<1			
12-Jan-21	BOD_5 (mg/L)	<1.5		<1		
11-Jan-21	COD (mg/L)	<5.0	12.1			
12-Jan-21	COD (mg/L)	<5.0		9.5		
13-Jan-21	COD (mg/L)	<5.0			8.1	8.3

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**				
11-Jan-21	NH_3-N (mg/L)	<0.2	<0.2			
12-Jan-21	NH_3-N (mg/L)	<0.2		<0.2		
11-Jan-21	NO_3-N (mg/L)	<5.0	<0.02			
12-Jan-21	NO_3-N (mg/L)	<5.0		<0.02		
13-Jan-21	NO_3-N (mg/L)	<5.0				
11-Jan-21	Faecal coliform (MPN/100 mL)	<1,000	13			
12-Jan-21	Faecal coliform (MPN/100 mL)	<1,000		34		
13-Jan-21	Faecal coliform (MPN/100 mL)	<1,000			49	110
11-Jan-21	Total Coliform (MPN/100 mL)	<5,000	33			
12-Jan-21	Total Coliform (MPN/100 mL)	<5,000		240		
13-Jan-21	Total Coliform (MPN/100 mL)	<5,000			110	170
11-Jan-21	TKN		<1.5			
12-Jan-21	TKN			<1.5		
11-Jan-21	TOC (mg/L)		1.21			
12-Jan-21	TOC (mg/L)			0.94		
13-Jan-21	TOC (mg/L)				1.54	1.2
11-Jan-21	Total Phosphorus (mg/L)		<0.01			
12-Jan-21	Total Phosphorus (mg/L)			<0.01		
11-Jan-21	Total Dissolved Phosphorus (mg/L)		<0.01			
12-Jan-21	Total Dissolved Phosphorus (mg/L)			<0.01		

ANNEX B: RESULTS OF EFFLUENT ANALYSES

TABLE B-1: RESULTS OF CAMP EFFLUENTS IN JANUARY 2021

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	04-Jan-21	18-Jan-21	04-Jan-21	18-Jan-21	04-Jan-21	18-Jan-21
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	7.05	6.89	7.16	7.13	7.26	7.24
Sat. DO (%)		52.7	79.2	44.4	37.4	50	92.7
DO (mg/L)		4.29	6.59	3.65	3.16	3.9	7.35
Conductivity (µs/cm)		345	360	472	530	746	782
TDS (mg/L)		172.5	180	236	215	373	391
Temperature (°C)		24.4	23.4	23.9	22.6	26.8	26
Turbidity (NTU)		1.73	1.9	17.36	20.38	14.55	9.8
TSS (mg/L)	<50	<5	<5	10.6	40.2	33.3	29.2
BOD_5 (mg/L)	<30	<6	<6	<6	<6	<6	<6
COD (mg/L)	<125	<25	<25	62	70	70.8	56.8
NH_3-N (mg/L)	<10.0	<2	<2	27.2	22.2	26.7	29.3
Total Nitrogen (mg/L)	<10.0	8.11	1.02	29.6	29	30.6	35.6
Total Phosphorus (mg/L)	<2	1	1	2.23	6.18	6	1.97
Oil & Grease (mg/L)	<10.0	<1		<1		<1	
Total coliform (MPN/100 mL)	<400	130	79	0	0	0	0
Faecal Coliform (MPN/100 mL)	<400	23	14	0	0	0	0
Effluent Discharge Volume (L/mn)			4	4	2	1520	2100
Chlorination Dosing Rate (mL/mn)		n/a	n/a	38	30	380	520
Residual Chlorine (mg/L)	<1.0	n/a	n/a	0.53	1.28	0.91	0.65