



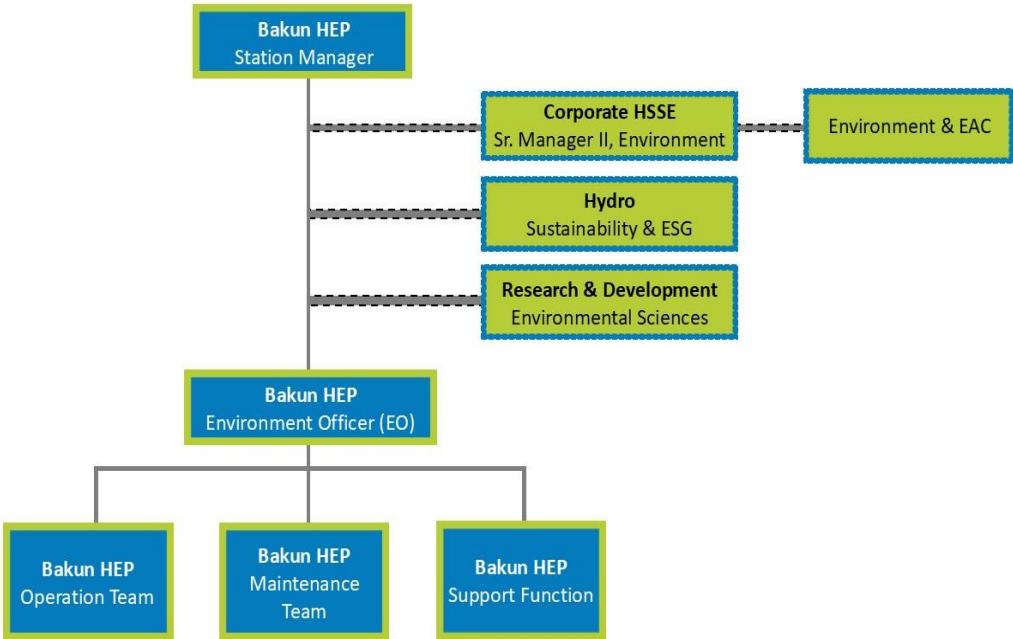
**Bakun HEP Environmental Management Plan  
Executive Summary**

Introduction

The Environmental Management Plan (EMP) for the Bakun Hydroelectric Plant outlines strategies to minimize environmental impacts during operation. It converts EIA-approved pollution prevention measures into actionable steps, ensures consistent implementation by allocating resources and responsibilities, and is updated as needed.



1. Organizational Structure and Roles and Responsibilities for Bakun HEP



The Station Manager oversees operation, maintenance, HSSE management, station support, and project execution during the operation and maintenance stage. Key personnel manage, perform, and verify work affecting quality.

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No.	Role	Responsibilities
1	Station Manager	<p>The Station Manager is ultimately responsible for the achievement of the set objectives and targets in the organisation. He will exercise active and aggressive leadership in environmental management. However, he may delegate his responsibility of the implementation and the operation of environmental management system to Manager (Operation) and his subordinate personnel. The responsibilities of Station Manager, among others are:</p> <ul style="list-style-type: none"> <li>• Will take an overall responsibility for Project's Environmental, Occupational Safety and Health (EOSH) requirements and for the achievement of objectives as per environmental policy and commitments.</li> <li>• Assure that the environmental management system (EMS) and EMP are implemented throughout the operation and maintenance phase of the Project.</li> <li>• Assure that suitably competent HSSE personnel are assigned to the Project.</li> <li>• Assure that sufficient resources, manpower and material are allocated for all EOSH requirements.</li> <li>• Ensure that all relevant EOSH requirements are well known and implemented by the Project personnel, and that all delegations of responsibility and authority concerning EOSH are fully understood and appreciated.</li> <li>• Monitor the performance of EOSH to ensure effectiveness.</li> <li>• To ensure that the operation of plant is conducted safely and in accordance with statutory and environmental requirement.</li> </ul>
2	Operation Manager & Maintenance Manager	<p>The Operation Manager and Maintenance Manager shall report to the Station Manager. Operation Manager and Maintenance Manager will:</p> <ul style="list-style-type: none"> <li>• Ensure the EOSH and EMS performance and accountability of subordinates.</li> <li>• Assure that Project personnel take ownership of the EOSH management manual.</li> <li>• Periodically appraise the effectiveness of the EOSH management manual and ensure that any necessary changes are made.</li> <li>• Ensure that Contractor's and Subcontractor's capacity is adequate to cover sound and safe methods of environmental policy.</li> <li>• Delegate a clear responsibility for EOSH protection to all, including Subcontractor, through liaison, planning and coordination.</li> <li>• Provide full support to and cooperate with the HSSE Department during site inspections or incident investigations.</li> <li>• Ensure compliance with statutory regulations by confirming that all Project registers and incident investigation reports are updated and available at all times.</li> <li>• Monitor the performance of the EOSH management manual, certifies that work is continuing in accordance with the EMP, ensure that all activities related to the operation and maintenance works of the Project are completed in accordance with the environmental requirements.</li> </ul>
3	HSSE Department – Senior Manager II (Environment)	<p>HSSE Department - Senior Manager II (Environment) is the first line of reporting operation progress to the General Manager, HSE and Station Manager. HSSE Department - Senior Manager II (Environment) is assisted by one (1) Environmental Officer who is responsible for the various operation and maintenance components of the Bakun HEP. Specific tasks that a HSSE Department - Senior Manager II (Environment) is responsible for are:</p> <ul style="list-style-type: none"> <li>• Guide and advise the Station Manager in planning and implementing the EOSH / EMS program.</li> <li>• Ensure that all environmentally related facilities are operated to meet EOSH / EMS requirements.</li> <li>• Participate in the investigation of environmental incidents, accidents and near misses.</li> </ul>
4	Environmental Officer (EO)	<ul style="list-style-type: none"> <li>• Planning for implementation of the EMS and EMP taking into account the DEIA report recommendations.</li> <li>• Co-ordinate implementation of the environmental management programs to ensure compliance with the approved DEIA report and its approval conditions.</li> <li>• Inspect the work areas to identify environmental hazards and abatement measures.</li> <li>• Conduct regular site inspections and audits in the area of competence to ensure that staff are aware of and comply with the EOSH requirements including waste management.</li> <li>• Verify that inspection and audit follow up actions are fully taken in a timely manner.</li> <li>• Intervene and promote corrective actions in case of unsafe acts and conditions.</li> <li>• Assist and advise the Power Plant on the Waste Management Program.</li> <li>• Co-ordinate environmental incident investigations and report findings to HSSE Department - Senior Manager (Environment) and Station Manager.</li> <li>• Coach supervisors to operate over all environmental awareness and performance.</li> <li>• Suggest changes to the operation EMP to account for changes in the Project / scope of work and changes in regulatory or Project policies.</li> <li>• Assess environmental protection compliance and report findings to HSSE Department - Senior Manager (Environment) and Station Manager.</li> <li>• Carry out monitoring or ensure that the monitoring is carried out by competent personnel / organization as directed by the Operation EMP.</li> <li>• Ensure all workers are aware of any changes to the operation EMP, EMS and revised procedures.</li> <li>• Provides advice and assistance to the HSSE Department - Senior Manager (Environment) and Station Manager to help ensure operations are conducted in an environmentally sound manner.</li> </ul>
5	All employees in Bakun HEP - Bakun HEP Support Functions	<ul style="list-style-type: none"> <li>• Must know, understand, and comply with the EOSH and EMS requirements as applicable to the work they perform.</li> <li>• Correcting any unsafe work practices within the scope of the work operations and reporting any unsafe work actions or conditions</li> <li>• Suspending works if conditions present an immediate danger to life, limb, or property and reporting such conditions immediately.</li> </ul>

	<ul style="list-style-type: none"> <li>- Maintenance Team</li> <li>- Operation Team</li> </ul>	<ul style="list-style-type: none"> <li>• Use the correct materials, tools, equipment, and methods for the work they are carrying out.</li> <li>• Must advise their immediate Supervisor whenever they are unsure of the instructions for a task or where they are concerned about the safety status of any task.</li> <li>• Be familiar with emergency procedures.</li> </ul>
6	Support Function (HQ) <ul style="list-style-type: none"> <li>- SEB R&amp;D</li> <li>- SEB HSE (Environment &amp; EIA Division)</li> <li>- Hydro</li> </ul>	<ul style="list-style-type: none"> <li>• Assist in the implementation of the EMP and EMS taking into account the EIA report recommendations based on area of expertise.</li> <li>• Assist in the implementation of the environmental management programs to ensure compliance with the approved EIA report and its approval conditions based on area of expertise.</li> <li>• Suggest changes to the operation EMP to account for changes in the Project / scope of work and changes in regulatory or Project policies based on area of expertise.</li> <li>• Carry out monitoring under own management plan based on area of expertise and submitting the report to Bakun HEP Team- Station Manager as directed by the Operation EMP whenever related.</li> <li>• Provides advice and assistance based on area of expertise to the Bakun HEP Team - Station Manager and EO to help ensure operations are conducted in an environmentally sound manner.</li> </ul>

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### 3. Summary of Environmental Impacts Management and Monitoring Programme

Project Activities/ Aspects	Regulatory Requirements	Environmental Issues/ Potential Impacts	Mitigation Measures <sup>1</sup>	Monitoring Requirements	Timing & Monitoring Frequency	Responsibility	Reports
<b>Reservoir Water Quality</b>	NWQS Class IIB	Deterioration of water quality in the reservoir affected by or affecting the operation	<ul style="list-style-type: none"> <li>BMPs, as described in the Bakun HEP - EIA - Appendix 6: EMP during operation phase shall be implemented.</li> <li>Water quality monitoring shall be carried out at reservoir.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring at identified water quality locations/ sampling points at reservoir</li> <li>To include monitoring of stratified water quality at the intake.</li> </ul>	Half yearly	Environment Bakun HEP & Environment Monitoring Team HQ	Water quality monitoring report
				<ul style="list-style-type: none"> <li>Real time water quality continuous monitoring station (CMS) at reservoir</li> </ul>	Real time		Real-time report via website
				<ul style="list-style-type: none"> <li>Monitor, interpret and evaluate of real-time CMS results.</li> </ul>	Daily monitoring and data recording	Environment Monitoring Team HQ	Real-time report via website
	N/A		<ul style="list-style-type: none"> <li>Collection of floating debris</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection of the accumulation status of floating debris</li> </ul>	Zone based	Dam Safety Team Bakun HEP	Monthly report
<b>Downstream Water Quality</b>	NWQS Class IIB	Deterioration of water quality in the downstream water affected by or affecting the operation	<ul style="list-style-type: none"> <li>To draw top 10m oxygenated by installing water training log.</li> <li>Water quality monitoring shall be carried out at downstream.</li> </ul>	<ul style="list-style-type: none"> <li>Real time water quality continuous monitoring station (CMS) at downstream</li> </ul>	Real time	Environment Bakun HEP & Environment Monitoring Team HQ	Real-time report via website
				<ul style="list-style-type: none"> <li>Monitor, interpret and evaluate of real-time CMS results.</li> </ul>	Daily monitoring and data recording	Environment Monitoring Team HQ	Real-time report via website
<b>Effluent Quality Management</b>	Environmental Quality (Industrial Effluent) Regulations 2009	Degradation of water quality due to oily effluent discharge from oil interceptors	<ul style="list-style-type: none"> <li>Routine inspection shall be conducted at oil interceptors</li> </ul>	<ul style="list-style-type: none"> <li>Monitor the wastewater flow condition of the oil interceptors by visual inspection.</li> <li>Check the oil scum level in the oil interceptors.</li> <li>Check the condition of oil interceptors.</li> </ul>	Daily monitoring and data recording	Environment Bakun HEP and Operation & Maintenance Team	SEACE application
<b>Sewage Quality Management</b>	Environmental Quality (Sewage) Regulations 2009	Degradation of water quality due to sewage discharge from sewage treatment plant (STP)	<ul style="list-style-type: none"> <li>Routine inspection shall be conducted at STP</li> </ul>	<ul style="list-style-type: none"> <li>Monitor the sewage flow condition of the STP by visual inspection.</li> <li>Check sludge level in the septic tanks and desludge periodically.</li> <li>Check the physical condition of STP.</li> </ul>	Daily monitoring and data recording	Environment Bakun HEP, Operation Team, CMS & BFI	SEACE application
<b>Scheduled Waste Management</b>	EQA (SW) Reg 2005	Improper management of scheduled waste which may cause water or land pollution	<ul style="list-style-type: none"> <li>Personnel direct handling of scheduled waste handling shall attend the CePSWAM course.</li> <li>Awareness or induction training shall be provided to workers who may indirectly handling or generate scheduled waste.</li> <li>Periodic monitor and maintenance of the scheduled waste facility</li> </ul>	<ul style="list-style-type: none"> <li>Weekly Workplace Inspection</li> <li>Bi-weekly: SEACE</li> <li>Monthly: ESWIS</li> <li>Monthly: SW Building and Emergency Response Kit inspection</li> </ul>	Weekly, Monthly & Quarterly	Environment Bakun HEP (CePSWAM)	ESWIS & SEACE application
<b>Domestic Waste Management</b>	Local Authority Ordinance	Improper waste management / disposal which may lead environmental pollution	<ul style="list-style-type: none"> <li>MoU with local council to send the waste to Sg. Asap landfill</li> <li>Implement Zero Waste Program</li> <li>No open burning at site</li> </ul>	<ul style="list-style-type: none"> <li>Record the estimated quantity of waste generated for recycling and composting.</li> <li>Record estimated quantity of waste dumped at Sg. Asap Landfill</li> </ul>	Weekly	BFI	Monthly report

Project Activities/ Aspects	Regulatory Requirements	Environmental Issues/ Potential Impacts	Mitigation Measures <sup>1</sup>	Monitoring Requirements	Timing & Monitoring Frequency	Responsibility	Reports
<b>Biodiversity Management (Wildlife)</b>	Wildlife Ordinance, National Park Ordinance	- Extinction of indigenous species - Overhunting /Overfishing/ Over harvesting. - Illegal poaching	- Awareness with SFC, installation of signages & poster at public jetty, Bakun main guard post	- BioMot application for reporting wildlife sighting.	Quarterly	Environment Bakun HEP, R&D	Biodiversity Monitoring and Assessment Report (R&D)
<b>Noise Management</b>	EQA 1974, Guidelines for Environmental Noise Limits and Control Third Edition	- Noise equivalent level to not exceeds 60 dBA during the day and 55 dBA during the night	- Noise level monitoring shall be carried out at boundary.	- Monitoring at identified boundary noise monitoring locations	Bi-annually	Environment Bakun HEP, Environment Monitoring Team	Boundary Noise Monitoring Report
<b>Air Quality</b>	N/A	H <sub>2</sub> S release during spilling	- Reduce frequency of controlled release through reservoir operation management	- Weekly water level projection monitoring - Yearly H <sub>2</sub> S monitoring report (for operation and asset control purposes)	- Monthly, during normal operation - Weekly (during controlled release)	Plant Performance Bakun HEP	Hydro Reservoir Water Level (RWL) Projection Summary Report  Annual H <sub>2</sub> S Monitoring Report
<b>Air Quality</b>	EQA 1974, NREO 1993	Open Burning	- Awareness through staff engagement and signage installation at various location within Bakun HEP compound	- Weekly HSSE walkabout	Weekly	Environment Bakun HEP	SEACE Application
<b>Erosion &amp; Sediment (Upstream)</b>	N/A	Landslide	- Apply best management practices (eg. install geomat) at the affected area to minimise the impact.	- Reservoir rim visual inspection for early detection	Monthly	Dam Safety Bakun HEP	Reservoir Rim Visual Inspection Report
					Bi-annually	Dam Safety Unit from Sarawak Energy headquarters, Batang Ai HEP, Murum HEP and Bakun HEP team	Reservoir Rim Visual Inspection Report
<b>Greenhouse Gas Emissions</b>	N/A	Release of GHG of high GWP (SF <sub>6</sub> ) into the atmosphere from powerhouse and switchyard	- Apply best management practices to minimize the GHG emission	- Visual monitoring of SF <sub>6</sub> tanks pressure gauge conditions from leakages/ damages, issuance of Permit-to-work	Bi-annually	Electrical Maintenance, Bakun HEP	Monitoring Report from EMS
	EQA 1974	Smoke emissions from diesel engine vehicles		- Conduct dark smoke-test for diesel engine vehicles	Yearly	Fleet Management	Reports from Fleet Management

#### 4. Reporting

List of reporting on Environmental Performance to the Management Team.

No.	Report	Content	Prepared By	Submitted To
1.	Quarterly Environmental Performance Report	Compilation of environmental performance <ul style="list-style-type: none"> <li>Findings / Issue</li> <li>Corrective action to be taken, if any.</li> <li>Consultation with external stakeholders (authority, upstream community, logging company)</li> </ul>	Bakun Environment Team	<ul style="list-style-type: none"> <li>Environment Division</li> <li>Bakun EOSH Committee</li> <li>Bakun ESG Committee</li> </ul>
2.	Internal Integrated Management System (IMS) audit findings	Audit Report	IMSA	Bakun Management Team
3.	Internal Integrated Management System (IMS) audit findings	Audit Report	External	Bakun Management Team

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## 5. Management Review

List of Escalation Meeting on Bakun HEP Environmental Performance.

