Inspection of Hydropower Projects

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It is vital to note that cohesive inspections, require expertise in technical, environmental and social dimensions of hydropower development.

The training setup reflects the process and thinking mode for conducting sound inspections. All inspections and monitoring are project specific and thus require the delineation of specific targeted areas for inspections and follow-up.

INSPECTION describes an activity where we inspect something in order to determine the status of that item. We inspect structures and environment in order to find to what degree they fulfill our expectations and criteria. We also inspect in order to see if there have been deviations from the accepted plans or changes from previous records. It is important to bear in mind that in a HPP-project there are many situations where a technical solution – or faulty design- may lead to environmental consequences or safety concerns. It is therefore important to understand the technology and design as well.

When visiting a new project site- for the first time – an open minded approach is necessary, in order to absorb information, get to know the site, and to note things that one is curious about.
It is important to follow a procedure and note down first impressions as soon as possible, because these are based on instincts and natural reactions, and not influenced or overshadowed by the load of impressions and verbal information that will follow later. On a second inspection, and subsequent visits, one is already familiar with the site and can go straight to areas of concern, as well as being open for eventual new problem issues.

For each Project it is important to observe and establish:

The type of project (risk consequence level) – risk category of a project.
Stage at which a project is: preconstruction /construction /operation

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The background documents which your inspection will be based on? (ESMP, SDP, RAP)
What records, monitoring and reporting, there are on technical-environmental-social aspects?
What safety issues are relevant? Which risks are to be avoided/minimized (especially based on observations-first impressions)?
Are inspectors/public/workers warned of unsafe areas in this project? (e.g., verbal information/ signs / information boards / pamphlets)

Inspection needs to employ a range of methods including reviewing and analyzing: visual observations; photos; checklists; building notebook-records; meeting notes-minutes; daily logs; plans (excavation, boring, blasting, waste management, safety, etc.); interviews with stakeholders (where necessary directly impacted communities); monitoring consultants; detailed reviews of all records; routines for safety, among others.

Note that the inspection of the monitoring of social aspects require an inspector competent in social and cultural themes A good understanding of the local situation which may be obtained from the ESIA,ESMP and RAP and time should be allocated to preparing for this inspection. This is particularly complex when resettlement is an unavoidable impact of a project. The range of indicators and their relevance are key aspects that need evaluation, as indicators may require adjustment to render them as measurable to fit changing local stakeholder perceptions, expectations and social environment.

Following is a working thematic checklist. The purpose of this list to present potential areas of inspection associated with hydropower projects. As each HPP has specific technical, environmental and social characteristics the inspectors have to prepare a project-specific checklist. This list is not exhaustive and aspects/themes should be added as necessary.

Abbreviations:
HPP – hydropower project
ESIA – environmental and social impact assessment
ESMP – environmental and social management plan
SDP – social development plan
RAP – resettlement action plan

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Technical, Environmental and Social Aspects of Hydropower Projects

Safety and monitoring aspects (note that this is a working list and is not exhaustive)

Date:_____

Inspectors:_____ Site personnel participating *):_____

List of persons interviewed/met and dates*): _____(this can be put at the end of the Table below or in an annex)

List of key documents reviewed*): _____(this can be put at the end of the Table below or in an annex)

*) team manager. Participants listed in enclosures

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No	Aspect	Observation / Report reviewed Benchmark?	Status Low/med/high risk	Comment
	Project Information: Arrangement plans, overviews. Details as assumed/required (submitted or requested).			
	Project Phase:			
	Project time schedule: (on track, delayed, completed?)			
1	**Area conditions, site environment (general status)**	**Observation / Report reviewed** Benchmark?	**Status** Low/med/high risk	**Comment**
	i. Public roads			
	ii. Public areas			
	iii. Housing			
	iv. Farms and land			
	v. Local activities			
	vi. Hunting			
	vii. Fishing			
	viii.			
1.1	**Administrative issues (general)**			
	i. Land			
	ii. Employment			
	iii. Health & treatment			
	iv. Emergency plans			
	v. Social issues			
	i. Records, all sites			
	vi.			

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1.2	Safety Plans and Awareness	Observation / Report reviewed Benchmark?	Status Low/med/high risk	Comment
1.21	Safety Action Plans			Note that some plans may be combined
	i. Emergency preparedness and response			
	ii. Floods and life safety			
	iii. Life and Fire safety			
	iv. Evacuation plans			
	v. Dam safety plans			
	vi. Health emergency action plan			
	vii. Traffic safety plan			
	viii. Transport Plan			
	ix. Community Health and Safety			
	x. Occupational Health and Safety			
1.22	Community and public roads			
	i. General condition of roads			
	ii. Roads and Signs			
	iii. Waste, oils and hazardous material and signs			
	iv. Information provision			
	v. Access to public/domestic animals			
	vi. Ecosystem services impacted and maintained (road related)			
	vii.			
1.23	Labor /workers/ Camps			

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	ii. Frequency of information /awareness			
	iii. Health provisions			
	iv. Personal protective material			
	v. Camp (observations, waste management, water etc.)			
	vi. Labor – age group (child labor avoidance)			
1.3	**Technical installations & services (temporary)**	**Observation / Report reviewed** Benchmark?	**Status** Low/med/high risk	**Comment**
	i. Concrete batching plant			
	ii. Aggregate storage and handling			
	iii. Storage areas, materials			
	iv. Storage areas, equipment			
	v. Workshops			
	vi. Garages, repair grounds			
	i. Site offices			
	ii. Site dwellings			
	iii. Workers camps			
	iv. Social clubs			
	v. Rest rooms / ablution areas			
	vi. Temporary shops			Those allowed by project and those opened by camp followers.
	vii. Water treatment			
	viii. Waste water treatment			

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2	Site topography, geotechnical and geological conditions	Observation / Report reviewed Benchmark?	Status Low/med/high risk	Comment
2.1	**Slope stability / erosion**			
2.11	Roads			
	i. Access roads			
	ii. Upgraded roads			
	iii. Main road to project (within project impact area)			
	iv. Culverts and drainage pipes			
	v. Bridges, and load capacity			
	vi. Temporary roads			
	vii. Access tunnels, and dimensions (load clearance)			
	viii. Road inclination (weights)			
	ix. other			
2.12	Dam site			
	i. Right bank upstream			
	ii. Left bank upstream			
	iii. Right bank downstream			
	iv. Left bank downstream			
	v. Other			
2.13	Reservoir area			
	i. Forest & bush clearing			
	ii. Slopes right side			
	iii. Slopes left side			
	iv. Landslides			
	v. Tributaries & side streams			

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	vi. other			
	vii.			
2.14	Borrow areas			
	i. Forest & bush clearing			
	ii. Soil removal (& storing)			
	iii. Gravel			
	iv. Quarry area			
	v. Rock quality			
	vi. Other			
2.15	River banks (downstream)			
	i. Stability			
	ii. Deposits			
	iii. Waste material			
2.16	River bed			
	i. Stability			
	ii. Deposits			
	iii. Waste material			
	iv. Erosion			
2.17	Safety Plans			
	i. Flood waves/ landslides			
	ii. Accidents			

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3	Technical installations & services (permanent)	Observation / Report reviewed Benchmark?	Status Low/med/high risk	Comment
3.1	**Power plant**			
	i. Dams and weirs			Example of aspects: Cracks, subsidence/bulging; Weathering, leakage: Spillway condition, erosion: Diversion conduit/tunnel
	ii. Intake structures			
	iii. Environmental flow measurement			
	iv. Flood discharge capacity			
	v. Gates			
	vi. Power station			
	vii. Transformer area			
	viii. Ventilation			
	ix. Fire fighting equipment			
	x. Safe rooms with equipment			
	xi. Medical emergency units/equipment			
	xii. Emergency exits			
	xiii. Illuminated signs			
	xiv. Safety handles on doors			
	xv. Locked areas for unauthorized personnel			
	xvi. Drainage systems			
	xvii. Oil spill handling			
	xviii.			

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3.2	**Service units**			
	i. Water treatment plants			
	ii. Sewage treatment plants			
	iii. waste treatment plants			
	iv. Storage areas			
	v. Workshops			
3.3	**Social clubs**			
3.4	**Housing**			
3.5	**Gate houses and security**			
3.6	**Car parks**			
4	**Materials, Water & Waste Management**	**Observation / Report reviewed** Benchmark?	**Status** Low/med/high risk	**Comment**
4.1	**General**			
	i. Location stored (temporary)			
	ii. Location of storage(before processing)			
	iii. Access protected			
	iv. Handling plan for material			
	v. Soil management			
	vi. Safety plan – workers			
	vii. Safety plan - public			
	viii. Records kept			

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4.2	**Oils**			
	i. Location stored			
	ii. Location of deposit for used material			
	iii. Access protected			
	iv. Handling plan for material			
	v. Soil contamination and management			
	vi. Safety plan – work force			
	vii. Safety plan - public			
	viii. Personal protection			
	ix. Records kept			
4.3	**Hazardous material**			
	i. Location stored			
	ii. Location of deposit for used material			
	iii. Access protected			
	iv. Signboards / posters			
	v. Handling plan for material /transport			
	vi. Soil contamination and management			
	vii. Safety plan – work force			
	viii. Safety plan - public			
	ix. Personal protection			
	x. Records kept			
4.4	**Water Quality**			

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	i. Upstream (during construction in reservoir during operation)			
	ii. Downstream			
	iii. Waste in river system from settlement discharges/dumping			
	iv. Ecosystem Services			
	v. Monitoring regime used			
	vi. Location planned/sampled			
	vii. Records kept and status			
	viii. Protection for workers			
4.5	**Waste Water management**			
	i. collection			
	ii. treatment			
	iii. monitoring			
	iv. records kept and status			
	v. safety plan			
4.6	**Noise Quality**			
	i. Monitoring regime used			
	ii. Location planned/sampled			
	iii. Records kept and status			
	iv. Protection for workers			
	v. Safety plan / personal protection			
4.7	**Air Quality**			
	i. Monitoring regime used			
	ii. Location planned/sampled			
	iii. Records kept and status			

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	iv. Protection for workers			
	v. Safety plan / personal protection			
	vi. Emissions (climate)			
5	**Biodiversity (general observations only)**	**Observation / Report reviewed** Benchmark?	**Status** Low/med/high risk	**Comment**
5.1	i. General measures taken			
	ii. Awareness Plan of conservation species -			
	iii. Exploitation (signs of wood and hunting, often related to labor)			
5.2	i. Special species concerns (conservation) plants			
	ii. Conservations off-sets			
	iii. Re-vegetation success and biodiversity conservation			
	iv. Ecosystem services			
5.3	i. Special species concerns (conservation) - wildlife			
	ii. Conservations off-sets (impacts)			
	iii. Re-vegetation success and biodiversity conservation for wildlife and birds			
	iv. Ecosystem services			
5.4	i. Special species concerns (conservation) – fish and other aquatic			
	ii. Conservations aspects related to water stretches (impacts on fish)			
	iii. Fish ladder needs and their functionality			

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	iv. Fisheries and local fishing			
	v. Bank and river-side vegetation – status – ecosystem services (water related)			
	vi. Ecosystem services			
6	**Social-economic and cultural**	Requires significant time allocation to inspect the monitoring.		Needs to be based on potential and actual impacts of project. In ESIA, ESMP and RAP
6.1	**Communication**			In ESMP and RAP (resettlement action plan)
	i. Communication – conducted and how? and for what?			
	ii. Communication process – involved all stakeholders			
6.2	***Livelihood restoration and well being***			Sustainability and maintenance as key aims
	i. Livelihood indicators which maintain or improve baseline levels (look at sustainability)	5-years		Numerous indicators – based on baseline and mitigation needs. Key for resettled communities in particular.
	ii. Services – mitigation			
	iii. Health – indicators followed			
	iv. Education – number going to school and reachability (access)			
	v. Mobility and Access			
6.3	***Cross-linked aspects***			
	i. Gender inclusion			
	ii. Cultural recognition and maintenance – including identity			

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	iii. Public sentiment and linkages to project – communication and trust aspects			
	iv. Social development plans			May be several – both specific to resettlement communities and in-direct impacted communities.
	v. Retrenchment			
	vi. Rights to information and relevant human rights aspects			
	vii.			
7	**Climate Change**	**Various mitigation and monitoring aspects – specific to project**		**ESIA evaluation of potential impacts**
7.1				Risk studies - floods
7.2				Methane
7.3				Carbon Sequestration

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