Hydropower Sustainability Assessment Protocol Supplement – Draft1 Final – 26th April 2010

About this Document

This document is provided as an example of how a supplement could be developed to accompany the Hydropower Sustainability Assessment Protocol.

This document is provided for consideration by members of the Hydropower Sustainability Assessment Forum at Forum Meeting 9.

Proposed Approach

The following content is illustrative only, drawn from the guidance notes in the Draft Hydropower Sustainability Assessment Protocol August 2009 without any further research at this stage. A preliminary draft version was circulated to Forum members during the period between Forum Meetings 8 and 9, and the content has not changed since that version.

The proposed approach with a supplement is to provide useful information on many of the key issues and themes that arise in the Protocol, with the following guidelines:

- Simple presentation, alphabetical order approach, one that would lend itself to a web-based platform in the future.
- Provision of information about that issue, key issues and risks, guidance on avoidance or management approaches, references to any important international standards or guidelines for further information.
- For high profile and cross-cutting issues, provide information on why and how they are relevant across many Protocol topics.
- Avoidance of the words “should” or “must”, but rather language such as “projects progress most smoothly where the following measures are undertaken…”, “important considerations include…”, etc.

Important Forum Discussion and Decision Points

Views that have been expressed on this proposed supplement include:

- It is critical to have such a supplement, as education is an important function of the Protocol, and the Forum members’ contribution to this should be captured.
- Some frustration has been expressed that issues felt to be of high importance to some Forum members have been relegated to a supplement.
- Timing. Some recommend to retain this as a follow up activity given that it still needs a lot of work. Others propose that even if it is not able to be developed any further it is worth taking as far as the Forum can get it, as a record of inputs and information collected during the Forum process. There is still considerable potential to pull in information that has been tabled through the Forum process, and this draft essentially provides a proposed framework for this.
- Questions about how content will be reviewed and approved. Within the timeframe of the Forum process, it is not possible to review and discuss the contents of this document, because the core priorities are the assessment documents.
- Questions about the status and relationship to the core Protocol documents. By definition the supplement is meant to contain information that is not critical to assigning scores.
- Questions about whether such a supplement is also included in the documents that are

candidates for adoption and endorsement at the end of the Forum process.

- General disfavour with the name. Names that have been proposed include:
    - Protocol Educational Supplement
    - Protocol Additional Information
    - Protocol Technical Supplement
    - Protocol Technical Guide
    - Protocol Sourcebook
    - Protocol Guidance Document

Proposed List of Contents

The following issues are included in this draft supplement, in alphabetical order. For some of these important content issues, at this point in time they are listed but no information provided.

Assessment
Benefits
Biodiversity
Catchment Management
Climate Change
Communication
Complaints Mechanisms
Compliance
Conformance with Plans
Construction Impacts
Consultation
Corporate Governance
Corruption
Cultural Heritage
Downstream Flow Regimes
Effectiveness
Erosion and Sedimentation
Financial Analysis
Gender
Human Rights
Indigenous Peoples
Integrated Water Resource Management
Invasive Species
Legacy Issues
Livelihoods
Management
Multi-Purpose Hydro
Procurement
Project Affected Communities
Public Health
Reservoir Management
River Basin Planning
Social Impact Assessment
Stakeholder Support
Transboundary Agreements
Transparency
Water Quality

Example Content using Text drawn from the Draft Protocol Aug 09

Assessment. The assessment process underpins the understanding of the issue, the arrangements for management, and the ability to evaluate effectiveness. Important considerations include:

- Identification of baseline condition. This includes evaluation of issues relevant to that aspect, geographic coverage with respect to the project's area of influence, methodologies, type and length of data set, and type of analysis.
- Clarity of definition of the role and responsibility of the proponent and accountability of other parties (e.g. government).
- Identification of legal and other requirements.
- Identification of potential positive and negative impacts related to project implementation and operations.
- Risk assessment of potential impacts. This includes likelihood and consequences of particular impacts occurring, and addressing of uncertainties for example by extending data sets, forecasting/modeling, and parallel studies.

- Opportunity assessment to determine if improvements could be made to the existing condition.
- Evaluation of scenarios, including alternative project siting and design options, and alternative management and mitigation measures.
- Allocation of resources to the assessment process. This includes qualifications/expertise of those involved, utilization of local knowledge as appropriate, scale of resource commitment, and continuity (for example project preparation may take 5-10 years).

Examples of evidence for the quality of the management process could include: assessment reports; risk and uncertainty analyses; scenario analyses; and expert advice.

Benefits. Regional development can be leveraged by the following aspects:

- capacity building, training and specific clauses for local employment opportunities
- additional infrastructure (e.g. bridges, access roads, boat ramps)
- additional services (improved health and education services thanks to electrification)
- supporting other water usages such as irrigation, navigation, flood/drought control, integrated water resource management, aquaculture, leisure industry (i.e. outfitters, camping), increased water availability for industrial and municipal water supply, ground water protection.

Through project benefit sharing there is the potential to improve livelihoods of communities within the project area of influence, and through benefit sharing strategies it can be demonstrated that the project adds value to those communities. Benefit sharing mechanisms are distinct from one-off compensation payments or resettlement support. Examples of benefit sharing mechanisms include:

- equitable access to electricity services – project affected communities are among the first to be able to access the benefits of electricity services from the project, subject to contextual constraints (e.g. power safety, preference);
- non-monetary entitlements to enhance resource access – project affected communities receive enhanced local access to natural resources;
- revenue sharing – project affected communities share the direct monetary benefits of hydropower according to a formula and approach defined in regulations; this goes beyond a one-time compensation payment or short-term resettlement support; and trust funds.

Biodiversity. Biodiversity and invasive species considerations relate to both flora and fauna. The area of consideration would include the catchment, reservoir and downstream areas as well as any project construction areas and associated infrastructure. Assessment components include:

- terrestrial and aquatic species and their life cycle developments and associated habitat, movement and feeding needs (for aquatic species, habitat needs include water depth, substrate and channel characteristics, temperature, water quality, current velocities, etc);
- interactions amongst the different species and populations within those species, and the pressures that would be put on these by the land use changes brought about by project development and operation;
- threatened or at risk species and their survival requirements;
- migratory species, both aquatic and terrestrial and with respect to both upstream and downstream migration - the habitat connectivity requirements of these species, the cues (e.g. flow, temperature, water quality) that trigger migration; and
- critical habitat areas.

Various management approaches to address biodiversity issues include:

- Alternative siting and design to minimize biodiversity and invasive species risks.

- To protect or enhance biodiversity: catchment protection, creation of reserves, habitat conservation, species management plans, translocations, habitat rehabilitation, new habitat creation, managed flow releases.
- To address passage of aquatic species: fish ladders, fish elevators, catch and release programs, fish hatcheries, re-stocking programs, mechanisms for diversion away from turbines for downstream passage, assisted cues (water chemistry, operational conditions), and choice of turbine design.

Catchment Management. Catchment management measures include but are not limited to forming or joining a catchment management committee, creation of protected areas, creating rights of access to land and water resources for particular community groups, developing educational facilities, working with catchment residents to address land use practices, project revenue investment programs for the catchment, capacity building programs such as management opportunities for locals e.g. with respect to managing reserves, tourist facilities, side industries, projects, etc. Catchment management planning may best be designed and implemented where it is integrated with broader regional objectives.

Catchment management committees, or similar services that provide this role, can be effective structures that promote consultation and understanding of issues, long-term stakeholder engagement, monitoring and adaptive management of the catchment. Financing for catchment management committees and their programs is an important consideration

Climate Change. Xxx.

Communication. There are different dimensions to communications. Relevant considerations include those that relate to advocacy, project development, corporate communications, and internal communication.

Some elements of communications management can be integrated into consultation management plans. Responsibilities for project communications will be context specific and may be spread across different organizations; communications protocols may be developed to manage this.

Complaints Mechanisms. Considerations in relation to the quality of complaints or grievance mechanisms include the degree to which they are developed in a participatory manner, use appropriate languages, are available and accessible, and the responses are timely and direct.

Compliance. Compliance with relevant legal requirements and other publicly stated commitments on the part of the developer / owner / operator is important for any project to demonstrate. Regulatory approval requirements for a project are country or jurisdiction specific, and may require approval / licenses for: project design, including dam, powerhouse, transmission lines, substations; power purchase agreement; Environmental / Social Impact Assessments and management plans for all project components; planning permits; water licence; land tenure change approvals; operating licence; Resettlement Action Plan; and permits for various project components such as for disposal of wastes, use of roads by heavy vehicles, etc. Commitments may include, for example, a commitment to adhere to international standards, declarations or conventions on particular issues.

Compliance is a gradational concept. Important considerations include compliance with relevant legal requirements and other public commitments made by the developer/owner/operator; and number, level, significance, persistence and ease of remedy of non-compliances. A major non-compliance, for example, is one that could incur litigation, prosecution, fines, penalties, or is very difficult to remedy.

Examples of evidence for the level of compliance or non-compliance include: a register of relevant legal requirements and other public commitments; records showing compliance with legal requirements and other commitments; audit reports; evidence of regulatory breaches, prosecutions, fines; interviews with regulators; and evidence of community concerns.

Conformance with Plans. Conformance with plans is focussed on the degree to and quality with which the developer / owner / operator is implementing its plans and planned arrangements. Management measures to address an issue may not always be formalised into management plans, but may be documented planned arrangements, for example based on agreements for forward actions made at meetings. This differs from level of compliance in that it is not restricted to legal requirements and public commitments of the developer / owner / operator, but is looking at the quality of internal business systems and plans. Important considerations include the level of conformance with relevant management plans and other associated documents; and the number, level, significance, persistence and ease of remedy of non-conformances.

Conformance with plans is a gradational concept. A major non-conformance is that it could incur a substantial consequence (e.g. with respect to severity, extent or duration), or is very difficult to remedy.

Examples of evidence for level of conformance or non-conformance with plans include records showing conformance with planned arrangements; records demonstrating achievement of objectives and targets; audit reports; and evidence of incorporation of opportunities for improvement, preventive action, and/or corrective action.

Construction Impacts. Potential construction-related issues include:

- road safety; noise; chemical, oil and fuel spills; site run-off and drainage issues; siltation; water quality; erosion and sediment liberation due to earthmoving, clearing, quarrying and road-making; long-term scars on the landscape due to vegetation and earth removal or disturbance; materials sourcing; waste management; long-term site contamination risks; disturbance of animal and plant communities; introduced species; air quality especially dust; and water diversion issues.
- social issues can be associated with the above impacts, but can also arise in their own right. Loss of community cohesion and values may be at risk with the introduction of migratory workforces, and competition for local resources. Noise and dust may also be issues where the development is close to human habitation, and health issues have been known to arise when local communities are exposed to outside influences.

The construction phase, with its high level of intensity, large local workforce and influence on the local economy, can take a number of years, and the cessation of this phase can cause its own social and economic impacts.

Consultation. Effective consultation is a fundamental requirement for ensuring positive and sustainable outcomes for both the project and the stakeholders affected by it. Important considerations include:

- Identification of issues and associated affected stakeholders. This includes stakeholder mapping and engagement guided by the consideration of rights, risks and responsibilities.
- Formulation of the consultation plan. This includes consultation objectives and targets over an appropriate time period.
- Appropriateness and transparency of the engagement processes. This includes freedom to participate, assistance to stakeholders, timing, location, accessibility of information, and feedback procedures,
- Allocation of resources for consultation. This includes appropriateness, scale, continuity and capability.
- Consultation developed with informed participation of affected peoples, respectful of rights, culturally sensitive, and gives appropriate attention to gender, minorities, level of literacy, and others who might require particular assistance.
- Integration of the consultation plan, processes and outcomes with other relevant plans and arrangements.
- Issues raised in the consultation considered in the decision-making.

- Grievance and dispute resolution processes. This includes grievance mechanisms in appropriate languages, and evaluating if they were developed with affected stakeholder participation.
- Monitoring, evaluation, review, and continual improvement of the consultation plan.

Forms of assistance may include, for example, translation of documents, interpreters, forms of communication, assistance to attend meetings, personal visits, and/or physical infrastructure installations.

Examples of evidence for the quality of the consultation process could include: stakeholder maps; the consultation plan / program including engagement strategies; records of meetings, surveys, web information, written materials, media information and various forms of engagement; grievance and dispute resolution procedures; consultation analysis reports; consultation response reports; and interviews with stakeholders.

Corporate Governance. Commonly accepted principles of corporate governance include the following elements:

- rights and equitable treatment of shareholders - the developer should respect the rights of shareholders and help shareholders to exercise those rights;
- interests of other stakeholders – the project developer should recognize their legal and other obligations to stakeholders;
- role and responsibilities of the developer – the project developer's Board needs a range of skills and understanding to be able to deal with various business issues and have the ability to review and challenge management performance;
- integrity and ethical behavior – ethical and responsible decision-making is not only important for public relations, but it is also a necessary element in risk management and avoiding lawsuits;
- disclosure and transparency – relates to basic facts and figures as well as the mechanisms and processes; and management of risks.

Corruption. Public sector corruption risks include, at the different project stages:

- Project Preparation – limited options considered, short-cutting of assessment / preparation requirements, non-transparent approvals;
- Project Implementation and Operation – a blind eye to licence and permit violations

Project corruption risks include, at the different project stages:

- Project Preparation – biased studies, technical specifications biased to a particular technology, over- or under-design, poor EIA, limited options considered, non-transparent selections;
- Contracting / Bid Evaluation - non-transparent prequalification, confusing tender documents, non-transparent or non-objective selection procedures, bid clarifications not shared with other bidders, award decisions not made public, or not justified, deception and collusion, agents' fees;
- Project Implementation - concealing sub-standard work, agreeing to unwarranted contract variations, creating artificial claims, biased project supervision, bribery to avoid project delay penalties, corruption in resettlement and compensation, a blind eye to construction environment violations;
- Project Operation - commitments not kept, under-funding of environment and social mitigation obligations (no money plea), corruption in O&M procurements, insurance fraud on equipment and performance guarantees.

A business code of ethics or code of conduct should specify the business commitments to disclosure of political and philanthropic contributions, rejection of facilitation payments, and clear guidelines for giving and receiving gifts, hospitality and expenses.

Cultural Heritage. This aspect relates only to physical cultural heritage. Non-physical cultural heritage such as traditions, festivals and rituals can also be impacted through hydropower project impacts to local communities and should be assessed as part of the social impact assessment aspect.

Assessment includes understanding of local, national, regional and international legislation, policies, agreements and conventions relating to protection of cultural heritage. Use of indigenous and local knowledge and expertise are important considerations in relation to cultural heritage assessment and management.

A diversity of management approaches could include protection, conservation, restoration, documentation and record-keeping. Protection, conservation and restoration could be *in situ* or relocated.

Downstream Flow Regimes. Environmental flows refers to the patterns of flow of water in a river or lake that sustains healthy ecosystems and the goods and services that humans derive from them.

The downstream baseline condition encompasses hydrology, ecological systems, habitats and services, and socio-economic uses and values throughout the zone of influence of the power station. The river hydrology is closely inter-related with these other considerations. Altered flow regimes create a host of potential effects, depending on the specific context and degree of change - fish cues for migration, connectivity of habitat and quality of habitat refuges, habitat area available for macroinvertebrates and fish, changes to habitat quality through altered riparian zones, increased erosion or sedimentation, and delivery of organic materials and nutrients. Altered flow regimes from natural patterns can disadvantage native species to the advantage of introduced species. The retention of flood flows in the reservoir can affect the natural productivity and stability of riparian zones, floodplains and deltas. In estuarine systems, altered flows can change the extent of salt-water intrusion due to changed freshwater inflow patterns to the estuary. The ecosystem impacts from altered flow regimes can lead to or are accompanied by impacts on the local communities and economies. Loss of silt and nutrient delivery to floodplains can have major implications for agriculture, as can loss of water in diverted river systems, and impacts to fishery productivity can significantly affect local economies. Local and indigenous knowledge can be of high value in obtaining an understanding of the relation between flow and other conditions, uses and values of the river.

From a hydropower project operational perspective, managed flow regimes for downstream river flows to achieve environmental or social objectives might comprise maintenance of a range of maximum and minimum base flows in the low flow seasons and higher flows in the high flow seasons, limits on draw-down or ramp-up rates, and/or periodic flushing flows. The characteristics of the project design influence the mechanics of how these flows may be released. With early understanding of environmental flow requirements, the power station can be designed to deliver these flows in a manner that least constrains hydropower generation opportunities. For example, minimum flows could be released from a valve by which no power is generated, or through a turbine running at an inefficient load, but more optimally they could be released through a dedicated turbine scaled so that the minimum flow is at the turbine's efficient load.

The articulation of flow-related objectives identifies specific targets for environmental, social and economic values to be optimized. These are unique to the project situation and context. In some cases it might even be agreed through a consultative process that a stream segment does not warrant an environmental flow, whereas in other streams flow regimes close to natural may be sought. Where there are plans for the river basin in which the project is located that provide for protection or conservation management of certain tributaries and river reaches, environmental flows in project affected reaches may be of less importance.

An important consideration is the degree to which environmental flows provide a fit of flow requirements between all objectives in relation to threshold levels of sustainability.

Threshold levels of sustainability refers to those objectives that require a specific minimum or maximum flow level to remain viable.

Effectiveness. Level of effectiveness is focussed on the effectiveness of the implementation of management plans in terms of on-ground outcomes. Impacts are considered within the framework of desired outcomes as reflected in management objectives. The focus is on the degree to which the aspect intent has been met with respect to agreed performance measures. Important considerations include:

- Degree to which negative impacts have been avoided, minimised, mitigated, and managed and/or compensated.
- Degree to which positive impacts have been achieved and optimised.
- Degree to which baseline condition enhanced.
- Absolute / quantitative performance indicators on an issue-by-issue basis.
- Evaluation of effectiveness taking into account the extent of developer / owner / operator influence and responsibility on an issue-by-issue basis.

Examples of evidence include: monitoring and condition reports; statistical data; predictive analyses; third party reviews; and expert reviews.

Erosion and Sedimentation. Erosion and sedimentation issues for hydropower projects can relate to:

- Catchment sediment yields - sediment accumulation can reduce the effective water storage area of hydropower reservoirs over time.
- Reservoir - erosion issues can occur depending on the lake level operating regime, the retention of stabilizing vegetation, the control of recreational activities on the lake, and other factors such as wind-induced wave action or rapid drawn-downs.
- Downstream river systems - trapping of the river's natural sediment load within the storage deprives sediments to the downstream river system. Where diversions out of river systems have occurred, downstream channels can become blocked up with sediments, allowing vegetative species can encroach on the river channel, which can exacerbate the impacts of floods. Downstream of power stations, reduced sediment loads and often higher than natural base flows can lead to erosion of the existing channel sediments and consequent destabilization of riparian vegetation through a range of mechanisms, e.g. rapidly fluctuating discharges, rapid water level draw-downs, or continuous discharges at a single flow. Erosion and sedimentation cause fundamental changes to habitat, and so have implications for biodiversity in the reservoir and downstream river systems. Dependent on the location and extent of influence of the project, coastal and deltaic erosion issues could also arise.

Various management approaches to address erosion and sedimentation issues include:

- alternative siting and design to minimize erosion and sedimentation risks.
- to address reservoir sediment accumulation: at the catchment level, cooperation with local communities and regulatory authorities to improve catchment management practices; specific catchment controls on road construction, mining, agriculture or other land uses; catchment vegetative cover protected through reservation; catchment terracing; upstream check structures; catchment reforestation can be employed in the catchment. Within the reservoir, sediment by-pass systems for floodwaters; gated structures for sediment flushing; sediment trapping and filtration systems; direct dredging.
- to address shoreline erosion in reservoirs: water management measures (e.g. ramp-down rules, constraints on time spent at particular operating levels, operating to maintain the stabilising characteristics of existing or planted vegetation); direct intervention techniques (e.g. rip-rap, bank protection works, planting stabilising vegetation).
- to address shoreline erosion in downstream river systems: water management and direct intervention approaches listed above; utilization of re-regulation storages to dampen

rapidly fluctuating flow releases from power stations and attenuate the downstream flows.

- to address sediment accumulation in downstream river systems: careful removal of sediment retaining weed species, such as willows, and replanting with more appropriate species; sediment flushing of the river channel itself through controlled releases if shown to be effective.

Financial Analysis. Financial modeling at the most minimum has as inputs the project costs and revenue streams, and as outputs the financial returns. It can be used to examine the implications of various market conditions, trends and risks on the financial viability of the project, and may even include low likelihood stress scenarios (including Debt Service Coverage Ratio). It can also be used to test the implications of various financing arrangements.

Considerations relating to project costs include equipment, supplies, labour, tax, land/water resource rights, and social and environmental issue mitigation and management costs. Associated risks may include inflation, supply chain disruptions, contractual arrangements, life of resource concessions, project delays, and uncertainties in relation to social and environmental issues and mitigation/management requirements. Opportunities relate to cost-savings, for example which may arise due to siting and design choices. The assessment may include independent review (legal opinion) of contractual arrangements.

Considerations relating to revenue streams include understanding of the electricity market, the investment drivers for new market entrants e.g. access to carbon finance, and the Power Purchase Agreement. Associated risks may include long-term viability of the market; stability of the regulatory environment; security of revenue lines e.g. with respect to transmission, other competitors, or industry trends; and security of the project inflows. Opportunities relate to electricity sales strategies (trading, base vs peak load delivery, ancillary services), and non-energy services such as irrigation, water supply, flood control and navigation. The assessment may include independent review (legal opinion) of contractual arrangements.

Availability of equity for construction sufficient to support risks of cost overruns could be indicated by, for example, the debt-equity ratio, financial ratings, credit guarantees or the financial strength of the sponsor (taking into consideration the feasibility of recourse to the sponsor). This may also include analysis of the Internal Rate of Return and the Net Present Value of the project. Debt Service Coverage Ratio measures the proponent's ability to produce enough cash to cover its debt.

Gender. Xxx.

Human Rights. Xxx.

Hydrological Resource. Important considerations in relation to the quality of the hydrological analysis include:

- all available data has been analysed using appropriate statistical indicators (e.g. precipitation, temperature, evaporation, flow rates, flood flows on a range of time steps such as daily, monthly, seasonal, annual);
- data includes actual field measurements over at least 3 years capturing seasonality and spatial variability over the project catchment area;
- the quality of the data has been assessed and factored into the analysis;
- modelling has been utilized to extend data sets and enable forecasting based on different scenarios and assumptions;
- there is some understanding of the levels of uncertainty in the data; and
- analysis is updated taking into account emerging information.

Simulation and optimisation models allow an understanding of the interaction of inflows with other considerations, and can also be used to evaluate opportunities to improve efficiency in

the system(s). In systems where a project is in a cascade, models can ensure efficiency in water utilisation. Where hydro interacts with other generation sources (e.g. thermal, nuclear, wind), the use of such models can minimise the use of other more costly generation and can be used to better manage and operate the other generation sources in the system.

Demands on water use could include other water resource project developments, development of water-reliant land uses e.g. agriculture or industrial, population growth, and likely requirements for environmental flow releases to the downstream environment.

Power system opportunities and constraints will relate to patterns of demand for energy (e.g. base vs. peak load), influence of power prices and competition, and transmission issues.

Indigenous Peoples. The definition used in this Protocol is as defined as per IFC Performance Standard 7 (30 April 2006)[a], and refers to "a distinct social and cultural group possessing the following characteristics in varying degrees:

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- customary cultural, economic, social or political institutions that are separate from those of the dominant society or culture;
- an indigenous language, often different from the official language of the country or region".
- Indigenous peoples groups would need to be defined as meaningful for the project, and may relate to villages, family groups or households.

Indigenous peoples rights are articulated in International Labour Organisation ILO 169[b], and in the UN Declaration on Rights of Indigenous Peoples (13 September 2007)[c]. Indigenous peoples' rights may be individual and/or collective rights and belong concurrently to individuals and groups. Rights may address the tangible (land, water and resources) and/or the intangible (traditional knowledge understandings and practices, spirituality and artistic teachings and representations of these). While national and international instruments recognise the rights of indigenous peoples, the content of these rights is generally determined by the laws and customs governing the relationship of an Indigenous group to their traditional country, region and to other groups with whom they have contact.

"The economic, social and legal status [of indigenous peoples] often limits their capacity to defend their interests in, and rights to, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. They are particularly vulnerable if their lands and resources are transformed, encroached upon by outsiders, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also be under threat. These characteristics expose indigenous peoples to different types of risks and severity of impacts, including loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and disease" (IFC Performance Standard 7 (30 April 2006)[a]).

Integrated Water Resource Management (IWRM). Xxx.

Invasive Species. Invasive species risks include:

- Weeds, algal blooms;
- Proliferation of certain terrestrial or aquatic fauna with no natural predators;
- Proliferation of insect-related issues such as mosquitos;
- Facilitated passage of invasive species into uninfested waterways through water transfers around the hydro system;
- Associated public health issues.

Various management approaches to address invasive species include (as appropriate) reservoir vegetation clearing prior to filling; physical barriers to pest species passage; pollution control; physical removal or containment; chemical treatment; reservoir water residence times; and managed flow releases.

Legacy Issues. Legacy issues are unmitigated impacts of previous projects.

Livelihoods. Xxx.

Management. The quality of management planning and implementation are a key measure of present and likely future sustainability performance. Important considerations include:

- Integration of the assessment process as the basis for development of planned arrangements.
- Formulation of plans or planned arrangements. Plans outline measures to manage (avoid, minimise, mitigate, compensate) risks and enhance opportunities, including the establishment of achievable objectives and targets.
- Implementation of the planned arrangements. This includes utilising appropriate and effective methodologies.
- Allocation of resources. This includes qualifications/expertise of those involved; utilization of local capacity as appropriate; scale of resource commitment; continuity of resources through project preparation, implementation and operation; and contingency planning.
- Clarity of roles, responsibilities and accountabilities.
- Effective strategies for identifying and managing change.
- Checking and evaluation, including monitoring, auditing, and management review.
- Continual improvement and adaptive management, including management of nonconformities, corrective and preventive actions, and any necessary plan revision.

Management measures to address an issue may not always be formalised into management plans, but may be documented planned arrangements, for example based on agreements for forward actions made at meetings.

A management system is the framework of processes and procedures used to ensure that an organisation can fulfill all tasks required to achieve its objectives. In the case of some aspects, management of that aspect may be incorporated into a higher level management system (e.g. management of Water Quality within the Environmental Management System).

Examples of evidence for the quality of the management process could include: management plans; change management process; monitoring and management reviews; and audit reports.

Multi-Purpose Hydro. Xxx.

Procurement. Major supply needs relate to economic, financial, technical, environmental and social consultancies; contractors for project construction works; and supply of major goods and complex control equipment for project construction.

Supply chain risks relate to inability to meet the contract provisions with respect to cost, time, quality, specifications, and corruption.

Procurement management measures may encompass the following range of considerations:

- Prequalification process to screen potential bidders.
- Bidding process – e.g. open competitive bidding (reasons stated if not the case); transparent and equitably available information about tender opportunities; bidding documentation states selection criteria, evaluation and award decision process; bidders have sufficient time for bid preparation and for pre-qualification requirements when these apply.

- Awarding of contracts – e.g. transparency on the award decision and its justification; opportunity for aggrieved competitors to challenge award decisions.
- Contract specifications – e.g. clarity on terms and conditions of the contract, management of variations, penalty clauses, contract implementation, role of intermediaries and agents, dispute-settlement mechanisms and procedures.
- Management responsibilities – e.g. responsibility for demand assessment, preparation, selection, contracting, supervision and control of a project assigned to separate bodies; safeguards such as committees at decision-making points and rotation of staff in sensitive positions; well trained and adequately remunerated staff responsible for procurement.
- Monitoring – e.g. internal and external control and auditing bodies; independent audits; publicly accessible reports; high level monitoring of contract 'change' orders that alter the price or description of work beyond a cumulative threshold; triggers for additional control activities if there are unreasonable delays in project execution; participation of civil society organisations promoted as independent monitors of both the tender and execution of projects.
- Anti-corruption measures – e.g. ensuring contracts are above a low threshold, requiring the contracting authority and its employees to commit to a strict anti-corruption policy, development of a project integrity pact, providing mechanisms to report corruption and protect whistleblowers; confidentiality limited to legally protected information.

Screening criteria might encompass at a minimum quality, reputation, cost, and contractor prior performance on meeting contractual obligations to time, cost and specifications. Screening based on sustainability criteria would also encompass social, environmental, ethics, human rights, health and safety performance, and take into account giving preference and support to local suppliers where they meet other criteria. Screening to address anti-corruption would specify that companies tendering must have a code of conduct addressing anti-corruption.

Project Affected Communities. Project affected communities are interacting populations of various kinds of individuals living in the region that is affected by the hydropower project preparation, implementation and/or operation. These may be within the catchment, reservoir area, downstream, or in the periphery where project-associated activities occur, and also can include those living outside of the project affected area who are economically displaced by the project.

There are many different ways to view communities, and these will need to be defined in meaningful ways for the project. They may include, by way of example, urban dwellers, rural dwellers, indigenous peoples, ethnic minorities, people of a common profession, livelihood activity type or religion, disabled, elderly, illiterate, women, men, children, etc. Particular attention needs to be paid to community groups that might be considered vulnerable with respect to the degree to which they are marginalized or impoverished, and their capacity and means to absorb change.

Public Health. Public health assessment considerations for a hydropower project include:

- risks due to introduction of the construction workforce (e.g. HIV, Aids);
- risks of vector borne diseases (e.g. malaria, schistosomiasis);
- communicable and non-communicable diseases, malnutrition, psychological disorders, social well-being;
- maternal and child health;
- public health system capacities;
- relevant national regulations;
- accessibility to health services (financial, technical, cultural) with special regard to gender and ethnicity;
- access to and use of traditional medicines;

- possible loss or contamination of traditional resources (plants) and access to traditional fisheries;
- increased heath risks for resettled individuals which may relate to stress;
- anaerobic decay processes in large reservoirs can increase levels of contaminants such as mercury in fish through bio-accumulation; and health needs, issues and risks for different community groups.

Examples of creation of public health opportunities include:

- Improved health services through provision of electricity, water supply, and sanitation;
- directly developing or upgrading public health facilities in the project affected area;
- provision of equipment (medical and non-medical, including buildings and vehicles);
- training and/or capacity building for public health servants;
- health education for project-affected communities;
- disease prevention education and awareness campaigns, monitoring of vectors and disease outbreaks, vector control, and clinical treatment of disease cases;
- practical measures such as control of floating aquatic weeds near populated areas to reduce mosquito-borne disease risks, and mechanical or chemical treatment of shallow reservoir areas to reduce proliferation of insects that carry waterborne diseases.

Integration of local and indigenous knowledge into assessment and management planning for public health is an important consideration. Management measures include:

- efficient and ready access to medical supplies and immunisations for outbreaks;
- educational awareness schemes and disease prevention trainings;
- clear warnings and instructions in relevant languages on potentially hazardous materials;
- regular testing of water quality at multiple sites.

Reservoir Management. Important considerations relevant to the reservoir area at different stages of the project life cycle include:

- Project preparation – evaluation of the potential for production of greenhouse gases with feedback into siting and design options.
- Project implementation, prior to reservoir filling - clearing of vegetation, management of contaminated sites and cultural heritage that will be flooded.
- Project implementation, during reservoir filling - water quality, wildlife management, safety, community impacts, land/slope stability, timing of reservoir filling in relation to resettlement or other management activities.
- Project operations - optimising power generation, integrating multiple uses, commercial uses, rights of access, safety, flood management, aesthetics, public health, invasive species.

Relatively high risks of greenhouse gas emissions would be in cases where there are high reservoir water retention times, high carbon and nutrient loading, high water temperatures, and relatively high shoreline length compared to reservoir surface area (e.g. shoreline is very convoluted with many inlets).

Reservoir filling needs to be mindful of other reservoir management activities such as resettlement activities, cleaning up contaminated sites, and relocating cultural heritage items.

Measures include variations in project siting (e.g. as affects reservoir bathymetry, carbon and nutrient loading), variations in project design (e.g. high level or variable level outlet), clearing of reservoir vegetation, management of reservoir water retention times, etc.

Potential multiple use benefits include water offtakes for irrigation or town water supply, fishing, boating, swimming, other recreation activities, aquaculture and tourism.

Resettlement. Important considerations for the socio-economic baseline include:

- data collected early in the project preparation stage, with a cut-off date clearly communicated (to avoid inflows of those interested in compensation benefits);
- data analysed to enable a good understanding of community groups, with particular attention to gender and vulnerable social groups;
- data analysed with respect to living standards and livelihood measures. Living standards measures could include many dimensions of household well-being such as consumption, income, savings, employment, health, education, nutrition, and housing. Livelihood refers to the capabilities, assets (stores, resources, claims and access) and activities required for a means of living;
- gender-disaggregated data to help understand womens' roles in productive and reproductive livelihood activities;
- independent review.

Emphasis is on the analysis of options for avoidance and minimization, and their interlinkages with options for project siting and design.

Considerations relevant to the resettlement assessment and management process include:

- exploring all viable alternative project designs, including the "no-project" alternative;
- giving preference to land-based resettlement strategies, especially for displaced persons whose livelihoods are land-based; i.e. land-for-land)
- provision of compensation and other relocation assistance prior to displacement, and transitional support;
- provision of compensation and rehabilitation even in the absence of a formal land or resource title; and granting of security of tenure.

Components of a Resettlement Action Plan could include:

- identification of project impacts and affected population – mapping, census, inventory of affected assets, socioeconomic studies, analysis of surveys and studies, consultation with affected people concerning assistance benefits and development opportunities;
- legal framework;
- compensation framework – compensation, eligibility for assistance, responsibility and schedule for compensation payments;
- resettlement assistance and livelihood - selection and preparation of the resettlement site, influx management, relocation schedule and assistance, replacement of services and enterprises, livelihood restoration, treatment of cultural property, special assistance for women and vulnerable groups;
- budget and implementation schedule;
- organizational responsibilities;
- consultation and participation - information exchange, promoting participation;
- grievance redress mechanisms;
- monitoring and evaluation - performance monitoring, impact monitoring, completion audit (source: IFC Handbook on Preparing a Resettlement Action Plan, April 2002[b])

River Basin Planning.

Social Impact Assessment. The International Association of Impact Assessment identifies social impacts as changes to one or more of the following:

- people's way of life – that is, how they live, work, play and interact with one another on a day-to-day basis;
- their culture – that is, their shared beliefs, customs, values and language or dialect;
- their community – its cohesion, stability, character, services and facilities;
- their political systems – the extent to which people are able to participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose;

- their environment – the quality of the air and water people use; the availability and quality of the food they eat; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation, their physical safety, and their access to and control over resources;
- their health and wellbeing – health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity;
- their personal and property rights – particularly whether people are economically affected, or experience personal disadvantage which may include a violation of their civil liberties; and
- their fears and aspirations – their perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.

Important considerations for a social baseline include:

- assessment of issues for both project implementation and operation;
- use of local and indigenous knowledge;
- data collected early in the project preparation stage;
- data collected for the project catchment, all construction sites, downstream areas and project associated infrastructure (e.g. roads, transmissions lines, housing);
- data analysed to enable a good understanding of community groups, with particular attention to gender and vulnerable social groups;
- data analysed to show trends.

Stakeholder Support. Support of stakeholders for the project or components of the project of most interest to them is an important sustainability consideration. Important considerations include the level of support of stakeholder groups directly affected by a particular issue for the assessment, management, consultation and outcomes relevant to that issue, and associated review and improvement. Also important is the level of success in resolving disputes.

The highest form of stakeholder support is free, prior and informed consent. Consent in the Protocol is defined as signed agreements with community leaders or representative bodies who have been authorised by the affected communities which they represent, through an independent and self-determined decision-making process undertaken with sufficient time and in accordance with cultural traditions, customs and practices.

Examples of evidence of stakeholder support could include: agreements / contracts with stakeholders; interviews with various stakeholder groups; minutes of stakeholder meetings; media and website surveys; results of surveys and polls; public disclosure of complaints and actions undertaken; independent and regular monitoring and transparent reporting of stakeholder views; and independent assessments.

Transboundary Agreements. Transboundary agreements refers to agreements made based on good faith amongst riparian states about how shared water resources will be utilized and optimized by the parties involved, and the processes that will be followed to sustain these understandings.

Transparency. Xxx.

Water Quality. Water quality issues for hydropower projects differ significantly at the construction and operation stages.

At the construction stage, water quality issues can relate to turbidity, run-off, and pollutants from construction activity.

At the operation stage, water quality issues can relate to reduced oxygenation, temperature, stratification potential, pollutant inflow, nutrient capture, algal bloom potential and the release of toxicants from inundated sediments. The residence time of water within a reservoir is a

major influence on the scale of these changes, along with bathymetry, climate and catchment activities. Considerations for assessment include the following risks:

- Flooding of biomass, especially forests, results in underwater decay which can result in de-oxygenated water.
- In deep lakes that tend to stratify, colder de-oxygenated water at depths in the lake can release metals from the sediments e.g. methylmercury.
- Deep intakes can result in deoxygenated and hydrogen sulphide rich releases out of the power station tailrace into the downstream river system.
- High hydropower dams can have problems with gas supersaturation resulting in fish deaths.
- Eutrophication and algal blooms can arise in relation to nutrient inputs, temperature and water residence time.
- Water temperatures in the discharged water can differ significantly from ambient temperatures, and can also fluctuate over short time scales depending on operating patterns. Biological impacts can ensue, as temperature has a major influence on biological health and can be instrumental in providing migrational cues for some species.
- Turbidity can occur due to erosion of riverbanks, incoming sediments, and re-suspension of bottom sediments in shallow lakes.
- Activities within the catchment beyond the direct control of the proponent can cause water quality problems.

Various management approaches to address water quality issues include:

- Alternative siting and design to minimize water quality risks.
- To avoid release of cold anoxic waters from deep reservoirs: selective or multi-level offtakes; seasonal management of lake levels; air injection facilities and aerating turbines.
- To avoid downstream gas supersaturation: stilling basins, spillway design, structures that favour degassing, and management of air injection.
- To address consumption of oxygen in reservoirs: vegetation clearing prior to inundation to limit organic decomposition in the reservoir; reducing water residence time through operating patterns; in shallow lakes, baffles to direct circulation and ensure adequate water flow-through and mixing.
- To address reservoir sediment resuspension and erosion: planting of appropriately selected macrophyte communities (aquatic vegetation); in shallow lakes baffles to inhibit wind-induced resuspension, and/or raising minimum operating levels in the reservoir.
- To address water pollution inflows to the reservoir: catchment management measures; collection/treatment of pollutant-laden inflows; water pollution control measures such as sewage treatment plants or control of industrial emissions.