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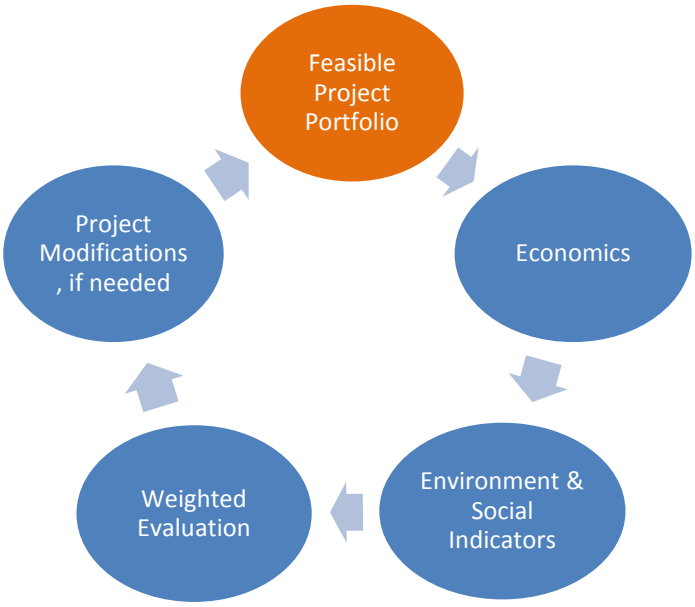
MRC Initiative for Sustainable Hydropower (ISH)

GUIDELINES FOR THE EVALUATION OF HYDROPOWER AND MULTI-PURPOSE PROJECT PORTFOLIOS

ANNEX 2

GUIDANCE ON NON-MONETIZED SOCIAL AND ENVIRONMENTAL INDICATORS



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MRC Initiative on Sustainable Hydropower (ISH)

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Produced for	MRC Member Countries
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** **NOTES:**

1. This Working Version has been reviewed by MRC member countries at Regional and National Meetings through 2014 and 2015. However, there is a need for ongoing and further discussion between MRC member countries on several aspects including the methods proposed for the multi-criteria analysis.
2. The economic valuation methods proposed here are based on international practice and research in the Mekong Region. The application of these methods by suitably qualified practitioners will require discussion with MRC member countries to ensure the valuation methods are suitable for the context of that particular application.

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Disclaimer

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While the development of the Guidelines is undertaken in a collaborative process involving the MRC Secretariat, National Mekong Committees of the four countries as well as civil society, private sector and other stakeholders, this document was prepared by the ISH02 Consultant Team to assist the Secretariat, and the views, conclusions, and recommendations contained in the document are not to be taken to represent the views of the MRC. Any and all of the MRC views, conclusions, and recommendations will be set forth solely in the MRC reports.

Further information on the MRC Initiative on Sustainable Hydropower (ISH) can be found on the MRC website: http://www.mrcmekong.org/ish/ish.htm.

Abbreviations and Acronyms

ADB	Asian Development Bank
BDP	MRC's Basin Development Plan (approved January 2011)
DM	Decision Maker(s)
EGDP	Ethnic Group Development Plan
EIA	Environmental Impact Assessment
EP	Environment Programme (of the MRC)
FP	Fisheries Programme (of the MRC)
HPST	Hydropower Planning Support Tool
IEA	International Energy Agency
IHA	International Hydropower Association
IKMP	Information and Knowledge Management Programme (of the MRC)
IP	Indigenous Peoples
ISH	Initiative for Sustainable Hydropower (MRC)
IWRM	Integrated Water Resource Management
KSA	Knowledge, Skills and Abilities
LMB	Lower Mekong Basin
M&I	Municipal and Industrial
MIGA	Multilateral Investment Guarantee Agency (of the World Bank)
MONRE	Ministry of Natural Resources and Environment
MP	Multipurpose (hydropower dams)
MRC	Mekong River Commission
MRCS	Mekong River Commission Secretariat
NGO	Non-governmental Organization
NMC	National Mekong Committee
NMCS	National Mekong Committee Secretariats
NUL	National University of Laos
PDR	People's Democratic Republic
PPA	Power Purchasing Agreement
PTNA	Participatory Training Needs Analysis
RAP	Resettlement Action Plan
RSAT	Rapid Sustainability Assessment Tool
SCB	Social Costs & Benefits
SEA	Strategic Impact Assessment
SIA	Social Impact Assessment
SIMVA	Social Impact Monitoring and Vulnerability Assessment
TNA	Training Needs Assessment
ToR	Terms of Reference
UN	United Nations
VF	Village Facilitators
WCD	World Commission on Dams
WWF	World Wide Fund for Nature

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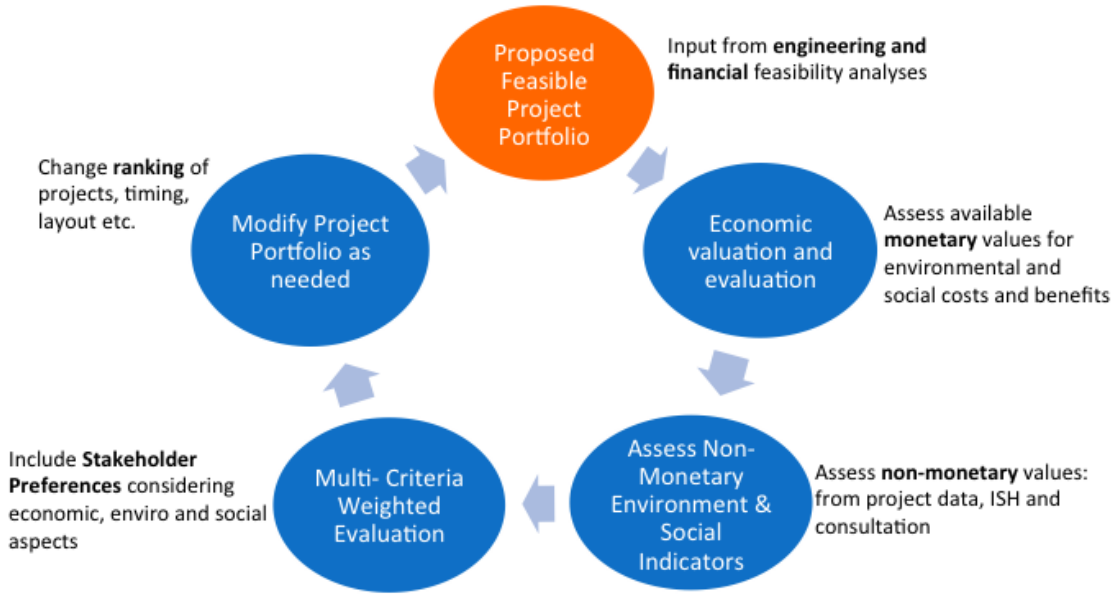
1 Overview of the Guidelines

The MRC's Initiative for Sustainable Hydropower (ISH) seeks to propose sustainable hydropower considerations which can be integrated into the planning and regulatory frameworks of member countries. The purpose and need for the Guidelines for the Evaluation of Hydropower and Multi-Purpose Project Portfolios (The Guidelines) developed under the ISH02 Project can be summarized as:

- *Current ways of planning hydropower schemes need to adequately take into account their wider social, economic and environmental implications. The key to integration of all costs and benefits into the national strategic planning approach is to identify credible values for these costs and benefits and then to "internalize" them into the normal economic analysis used to compare hydropower and multi-purpose options.*
- *Multi-purpose uses of dams need to be considered at the outset of project and basin planning.*

The Guidelines propose a portfolio planning process with associated tools for valuation and evaluation of hydropower and multipurpose dam project portfolios. Their objective is to assist Member Countries in their basin planning and energy/hydropower planning frameworks. The figure below illustrates the essential components of ISH02 Guidelines concept.

Figure 1 The Portfolio Planning Concept



It is important to note that "portfolio planning" here is taken in its broadest sense. This means that any set of projects that meet a planned purpose could constitute the portfolio of projects for evaluation with the Guidelines. For example, a portfolio might include:

- all planned hydropower projects in a country:
- all planned hydropower projects in the Mekong:
- all planned hydropower projects in a sub-basin of the Mekong: or
- a suite of alternatives for a single site or a single cascade of dams on a river

The idea behind the Guidelines is that including, quantifying and valuing as many of the costs and benefits in an agreed upon and standardized way that promotes sustainability would add value to the decision-making process. **The Guidelines will not provide "the" answer for decision makers. Rather they represent a tool that informs stakeholders and decision-makers enabling improved decisions.** The Guidelines – consistent with the approach recommended by the World Commission on Dams (2000) – then are ultimately a multi-criteria decision support tool supported by sound financial and economic analysis.

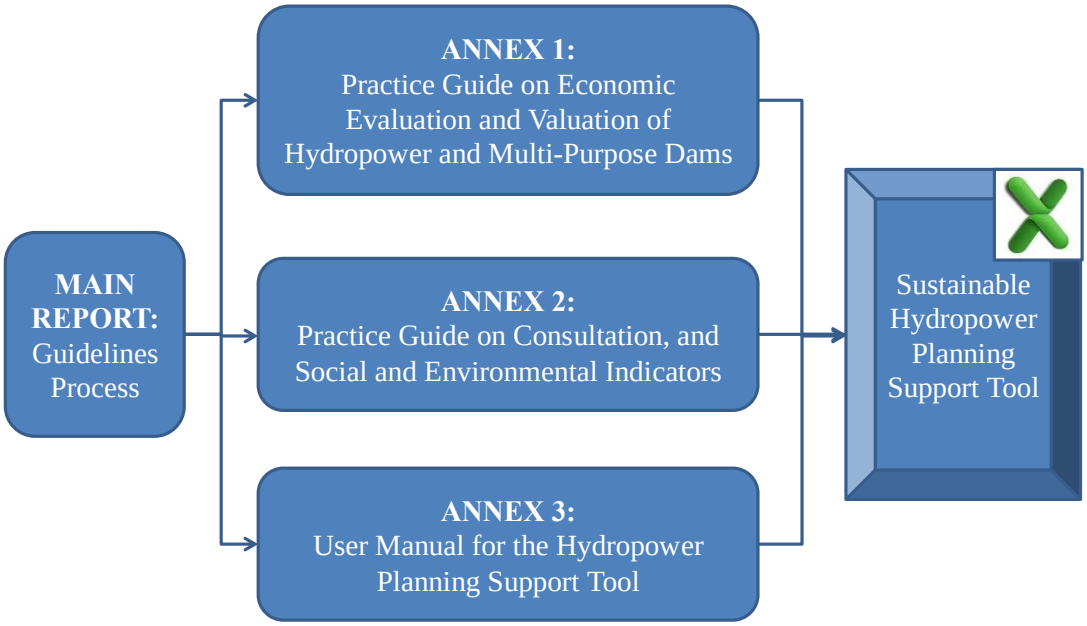
The development of the guidelines was completed in the context of the realities faced by the various stakeholders. In other words, the detailed Guidelines will be most useful if they are adapted to account for national planning methods and regulatory requirements, as well as effective consultation with all stakeholders.

1.1 Structure and Content of the Guidelines

The Guidelines consist of the documents and tools as illustrated in Figure 2. The components of the guidelines are as follows:

- **The Guidelines Process document (this Main Report):** Provide the "process" for implementing the Guidelines including all the instructions and step-by-step activities.
- **Guidance on Economic Evaluation and Valuation for Hydropower and Multi-Purpose Dams (Annex 1 to the Main Report):** Provides a process for the monetization of technical, engineering, environmental and social characteristics of the dams being assessed. It is understood that not all impacts can be expressed in monetary terms.
- **Guidance on Valuation of Non-Monetary Indicators for Hydropower and Multi-Purpose Dams (Annex 2 to the Main Report)**: Provides a recommended approach for selecting, scoring and weighting of a set of social and environmental indicators that represent impacts that are not valued in monetary terms; and also provides guidance on consultation and participation processes to elicit these values from stakeholders and stakeholder representatives. (**This document)**
- **The Hydropower Planning Support Tool (HPST): User's Manual (Annex 3 to the Main Report):** The HPST User Manual provides guidance on how to enter and upload data into the HPST, how to customize applications of the HPST to particular circumstances (the type of analysis as per above); and explains the results that the HPST provides.
- **Sustainable Hydropower Portfolio Planning Support Tool.** 'The HPST consists of two spreadsheets. The HPST Project Data Workbook is where project data is entered and refined according to protocols in the User Manual. The project data is then uploaded into the HPST Basin Workbook. This workbook takes the project data, the default parameters, and stakeholder weightings and generates a series of outputs. Outputs of this model include prioritization of projects, total net present value of all (or some) of the dams being assessed in financial and economic terms, normalized scores and ranking of projects on social and environmental criteria, and ranking of projects using a risk-weighted benefit-cost ratio. A set of standard modifications and customization to the Basin Workbook can be made by users and stakeholders following guidance provided in the HPST User Manual. Additional customization is possible by modifying the underlying algorithms and formulae in the workbook.

Figure 2 Guidelines for Hydropower and Multi-Purpose Planning



The Guidelines were applied to a case study to test the processes, procedures, guidance and materials in the LMB country context. Based on the case study experience and lessons learned a final draft Guidelines were produced for ISH and the member countries.

2 Non-Monetized Social and Environmental Indicators

2.1 Introduction

Table 1 presents a synopsis of the approach to valuation taken in the HPST. The table[1] lists each impact and whether it is accounted for in financial or economic terms, and whether it is then valued through the environmental or social criteria. While the intent was to avoid overlap, given the multi-functionality of some of the environmental and social indicators, the table shows it is not possible to avoid overlap. Every effort however, was made to minimize the extent of the overlap in order to avoid unnecessary double counting of an impact in the multi-criteria analysis.

As can be seen in the table and discussed in Annex 1 and the main report, there are a number of significant social, environmental and macroeconomic impacts that will not "reasonably and practically" valued in monetary terms. These impacts, however, must be assessed and integrated into the evaluation process for portfolio planning. They will be either quantified (for example, physical units of habitat lost) or qualitatively assessed (inundation of burial grounds). The end point of this assessment is a set of simplified and appropriate indicators for the impacts that are additional to those valued in economic terms. Ideally these could be reduced to a scaled rating of these impacts, such as a single normalized score on a 0 to 1 scale for the different types of impacts (social, environmental, macroeconomic). This Annex presents the approach taken to identify the indicators that are used in the HPST.

Implicit in group efforts to select, score and weight these indicators is some form of consultative and/or participatory method that enables stakeholders or their representatives to jointly assess these impacts so that they can be brought into the decision-making process. Annex 2 therefore provides considerations and recommendations on how a time and resource effective, yet inclusive stakeholder approach may be developed as part of the Guidelines Process.

[1] This table is further explained in Annex 1

Table 1 Chart of Impacts and Approach taken to Valuation

Category			Impact	Included in Monetary Valuation?		Included in non-Monetary Indicators?	
				Financial	Economic	Environmental	Social
DIRECT IMPACTS			Dam & hydropower construction				
			Multipurpose construction				
			Resettlement & development assistance				
			Environmental mitigation				
			Hydroelectric power				
			Irrigated agriculture				
			Water supply				
			Flood control				
			Navigation				
			Fisheries - reservoir				
EXTERNAL IMPACTS	"Local"	Human Population	Culture				
			Health				
			Infrastructure				
			Displacement and dislocation				
		Inundated Lands	Developed land				
			Forestland				
			Wetlands				
	Downstream	Causal Factors	Flow regime				
			Sediment transport				
			Nutrient transport				
			Fish passage				
		Fisheries	Aquaculture				
			Marine				
			River / Lake		flow and passage		
		Agriculture	Riverbank gardens				
			Recession/rain-fed (Tonle Sap)		nutrients only		
			Paddy (Delta)		nutrients only		
			Riparian & aquatic vegetation				
		Other	Bedload: sand & gravel				
	Other Ecosystem Services		Biodiversity				
			GHG emissions				
			Bioprospecting				
			Tourism & recreation				
			Watershed protection				

Key to Inclusion of Impacts in HPST	
Monetary Valuation	
Fully integrated	
Limited inclusion	
Not included	
Not applicable	
Non-Monetary Valuation	
Indicator included	
Indicator not included	

2.2 Non-Monetized Social Indicators

2.2.1 The Issue

As shown in Table 1 above, there are several important social impacts which are not included (or only partially included) in the Guidelines approach and the HPST. These include issues such as health, cultural values, and the impacts of dislocation that are often not addressed in resettlement programs. The non-monetized indicators developed for the Guidelines are selected based on literature searches, the pilot study, and stakeholder consultations. It is emphasized that the most effective and professionally correct method for obtaining the information needed to assign values to the indicators is through consultation carried out at the local level, that is, with those stakeholders most directly affected by the projects being evaluated. This Annex presents a recommended procedure for accomplishing this in Section 4.

2.2.2 Literature Review –LMB and International

There have been many LMB studies since the late 1990s[2] undertaken on the impacts of specific hydropower projects, many from a position of concern to traditional livelihoods, allocation of benefits and maintenance of ecosystems, but what is also needed is to specifically address basin wide issues, complement existing research and assessment tools and the International Hydropower Association (IHA) protocol, and provide a broader basis for dialogue. This is the objective of the MRC's 2010 Rapid Basin-wide Hydropower Sustainability Assessment (RSAT) tool (MRC 2013). This tool helps to conduct dialogue among basin stakeholders on hydropower sustainability issues including site selection, designs and operations as well as management of social and environmental impacts. It embodies the principles of sustainable development of hydropower encapsulated in previous work by the WCD and the IHA hydropower sustainability assessment protocol (HSAP). RSAT Topic 5 deals with socio-cultural values and non-material uses of natural resources as well as the protection of livelihoods and natural resource access rights and entitlements of the basin population and may be a valuable basin-wide guide for good practice.

Primary beneficiaries of dams tend to live far from these sites while other groups of people in the project-affected area tend to sustain most of the negative impacts of dams. Since the 1980s social considerations were included in the design, construction and operation of hydropower projects but these tended to focus on mitigating adverse impacts instead of equitable distribution of costs and benefits of these projects. In the late 1990s notions of benefit sharing and multipurpose functions emerged, along with monetary and non-monetary mechanisms now used in various projects around the world. Multilateral bank involvement started to increase investment in hydropower in the turn of the last century with the argument being that hydropower is necessary infrastructure in developing economies and especially in relation to debates on GHG emissions. In this way hydropower, learning important lessons from poorly planned projects in the past, is seen as providing new multiple opportunities to strengthen communities, regional and transboundary development – but only if planned, designed and implemented in a sustainable manner (WB 2009)[3] . The important point for multilateral funding is to ensure least negative impacts on local resource-users abiding in the vicinity of reservoirs and minimising the number of people needing to be relocated and, where this must take place, ensuring adequate and sustained livelihood and income restoration programs (ADB 2009; WB 2013).[4]

The late 1980s saw the introduction of social (and environmental) safeguards to ensure that projects met criteria which avoided and mitigated the social dilemmas encountered earlier, as embodied in World Bank and the regional development banks as mentioned earlier. The WCD, formed in 1998, was tasked with examining issues connected to design and construction of hydropower and in 2000 published a framework for decision-making. Discussions around this important report have tended to foster various initiatives for discussing good practice and practical guidelines. In regard to the discussion on human dimensions of hydropower, this relates to national

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[2] Some of these concerning shared benefits have been summarised in a report for the World Bank by Mott MacDonald in 2009, "Enhancing development benefits to local communities from hydropower projects: A literature review".

[3] "Directions in Hydropower", The World Bank, 2009: http://siteresources.worldbank.org/INTWAT/Resources/Directions_in_Hydropower_FINAL.pdf

[4] ADB 2009, *Safeguard Policy Statement*, safety requirements 2 "involuntary resettlement"; The World Bank Operational Policy 4.12, "involuntary resettlement", revised 2013.

and international efforts to reduce poverty, meet MDGs, particularly improve local health care, educational opportunities, reduce the burden on women's work, & etc., and identify culturally appropriate livelihood alternatives for the various ethno-linguistic groups residing in these often politically and ecologically sensitive areas.

The literature discussion on benefits has been evolving over the past decade looking at employment and infrastructure to stimulate growth, then a risk and resettlement focus with mitigation and compensation the main interests for reducing social impacts[5]. *Benefit sharing* is a more recent consideration for more equitable distribution of financial returns/ benefits[6]. This was in line with new partnership/stakeholder approaches in poverty reduction[7]. An economic argument is that benefit sharing creates significant rents which can be shared by dam owners with project affected communities[8]. Notwithstanding national interests, the moral, economic and ethical argument suggests that those sacrificing their access or use of natural resources at impact sites should receive part of the monetary benefits which would normally accrue to interests further away from the site. The use of benefit enhancement together with compensation of social impacts is important as compensation and mitigation guidelines do not always accurately reflect the full social costs of impacts. In the past decade or so monetary and non-monetary benefits have been considered, though the latter seems to be less well covered in the literature.

The WCD Report (2000) gave some importance to benefit sharing and proposed seven recommendations in its strategic framework including the recognition of entitlements and sharing of benefits among all stakeholders. Further indicating that project affected communities are to be considered in planning as among the principal stakeholders. The WCD Report led to international interest in incorporating the core principles and strategic framework into acceptable guidelines or recommendations for good industry practice. This included UNEP, ADB and the IHA. The IHA, mentioned earlier, is an industry association and in response to the WCD report developed a Sustainability Assessment Protocol for good practice in 2008-2010. The Protocol is the result of work undertaken by the Hydropower Sustainability Assessment Forum. This is a multi-stakeholder body which has representatives from social and environmental NGOs (Oxfam, The Nature Conservancy, Transparency International, WWF); governments (China, Germany, Iceland, Norway, Zambia); commercial and development banks (Equator Principles Financial Institutions Group, The

[5] See Michael Cernea 2000, "Risks, safeguards and reconstruction: A model for population displacement and resettlement", In Michael Cernea and Christopher McDowell (eds.), *Risks and Reconstruction: Experiences of Resettlers and Refugees*, Washington D.C.: The World Bank, pp 11–55; and 2004, "social impacts and social risks in hydropower programs: Pre-emptive planning and counter-risk measures", keynote address Social Aspects of Hydropower Development, UN Symposium on Hydropower and Sustainable development, Beijing, China.

[6] See Jagerskog A., and J. Lundqvist, 2006 "Benefit sharing in International River Basins", Stockholm International Water Institute (SIWI); Janka Rokob 2013, "The Concept of Benefit Sharing and its Application to the Hydropower Sector of Laos", unpublished Masters' thesis, Geographisches Institut der Ruprecht--Karls-Universität, Heidelberg, and Daniel Gibson and Helen Carlsson Rex 2010, (Background paper) *Lao PDR Development Report 2009 on Natural Resource Management for Sustainable Development: Social Impact Mitigation from Hydropower and Mining in Lao PDR: Examining Potential for Benefit-Sharing Approaches,* The World Bank.

[7] See Lawrence Haas, Vu Tung 2007, "Benefits sharing mechanisms for people adversely affected by power generation projects in Vietnam", Manila, ADB.

[8] See Dominique Egre, Vincent Roquet and Carine Durocher 2008, "Benefits sharing to supplement compensation in resource extractive industries: The case of dams", in Michael Cernea and Hari Mohan Mathur (eds.), *Can Compensation Prevent Impoverishment? Reforming Resettlement through investments and benefit-sharing*, Oxford University Press.

World Bank); and the hydropower sector, which is represented by IHA[9]. IHA Protocol Topics 13-18 include project affected communities and livelihoods, resettlement, indigenous peoples, labour and working conditions, cultural heritage, and public health.

There have been many reports which indicate that livelihood restoration is frequently the weakest part of resettlement planning and the easiest means of dealing with this for the private sector is through cash payouts to project affected communities. In 2005 the ADB for instance had a provision for technical assistance to build local capacity for livelihood restoration activities on the Son La Hydropower project[10]. This covered training of government personnel on use of GIS for assessing resettlement sites, assessing soil types, the availability of natural resources and how to plan and implement livelihood activities; and training for project affected communities on improving food production and management. A prevailing concern rarely raised in the literature is how much of the monetary benefits should be shared; defining the extent and scope of stakeholders, risks and returns (the Equator Principles 2013 have come into planning considerations as a credit risk management framework for determining, assessing and managing social and environmental risks in project finance transactions – ensuring due diligence), monitoring and evaluation of benefit sharing, etc., and finally to what extent private developers are prepared to participate in these equity programs.

A number of reports indicate the growing importance of non-monetary benefits such as community investment programs (CIPs) at project affected sites, upstream and downstream[11]. The literature indicates taking a more holistic and integrated approach to river basin planning, though having a baseline and the skills, tools, guidelines and operating framework in which to work effectively needs time and participative learning approaches, the important social aspects of development. [12]

2.2.3 Social Criteria to be Considered and Selected Social Assessment Indicators

Available databases normally list projects with information on number of persons displaced. These are easily measurable statistics. However this data does not disaggregate to a level suitable to understand the extent of vulnerability by ethnicity, the constituency and complexity of ethnic groups displaced, and the particular needs of the respective ethic minority groups themselves. The BDP "Assessment of Basin Wide Development Scenarios" (MRC, 2011) commenced with a list of social indicators for poverty, and the relation of poverty to planning, while the earlier 2005 IBFM report

[9] Hydropower Sustainability Assessment Protocol, http://www.hydrosustainability.org/

[10] See ADB document "39387-012: Strengthening Institutional Capacity of Local Stakeholders for Implementation of Son La Livelihood and Resettlement Plan".

[11] The case of NT2 is held as a good example, see Jason Rush 2007, "Lao PDR Hydro Project Improves Families' standard of living, health", ADB. Aviva Imhof and Shannon Lawrence raise concerns about NT2's effectiveness on the long term sustainability of its livelihood programs (see 2005 "An Analysis of Nam Theun 2 Compliance with World Commission on Dams Strategic Priorities", International Rivers Network and Environmental Defence). See also David McDowell, Thayer Scudder, Lee M. Talbot 2013, "Twentieth Report of the International Environmental and Social Panel of Experts", The World Bank).

[12] See for instance Michael Haney and Judith Plummer 2008, "taking a holistic approach to planning and developing hydropower", PPIAF, The World Bank; and an early paper by Michael Cernea 1997, "hydropower dams and social impacts: A sociological perspective", Paper 16, Social Assessment Series, The World Bank.

"social impact of flow regimes in the LMB"[13] lists socio-economic indicators and the direct drivers of these, including:

- Abundance of fish for household use
- Abundance of non-fish river food for household use
- Abundance of river plants for household use
- Area under river-bank gardening
- Area under shrimp farming
- Water level in wells in dry season (↑= moves up; ↓ = moves down)
- Abundance of sand for construction
- Distance to carry water
- Extent of treatment to produce potable water
- Occurrence of river-linked diseases
- Level of nutrient-related health
- River resources available for selling
- Passage for boats in dry season
- Potential to create income from recreation and ecotourism activities
- Threat to cultural and religious values

The MRC SEA (ICEM, 2010) for hydropower on the Mekong Mainstream, "social systems assessment baseline working paper" 2010 noted a concern that with social component there was no existing (at the time) social information database that supports a strategic environment assessment and few resources to draw upon for identified social topics. The report adopted instead a case study approach for the six (out of eleven) "without Mekong mainstream dams" scenarios.

The MRC's SIMVA draft report (MRC, 2011) is an attempt to look at social conditions and vulnerability in the LMB related to changes in environment and availability of aquatic resources. However there is a limited disaggregation of data by ethnicity, limited use of qualitative tools, and the selection of sites to the far south may not capture the extent of ethnic diversity, especially further north of Champasak Province. Thus indicators selected as viable for the south may not, *ipso facto*, apply to social and cultural configurations in the northern part of the LMB. But information like the SIMVA is useful start for inclusion in basin wide planning purposes.

2.2.4 Social Indicators —Prioritization

It is suggested that indicators be kept simple to use and based on a High, Medium, or Low style of assessment. In much the same way vulnerability levels may be defined by these values. The sectoral indicators chosen are: food security, vulnerability; health/wellbeing, and cultural heritage values.

At a *minimum* we need to have indicators which cover:

- Social displacement and resettlement

[13] Wickramanayake, Ebel and Kanokporn Deeburee 2005, *Social Impact of Flow Regimes in the Lower Mekong Basin*, MRC, Water Utilization Program / Environment Program, Integrated Basin Flow Management Specialist Report.

- Livelihood changes (among affected communities at project sites, defined field upstream and downstream)
- Health and nutrition (among affected communities at project sites, defined field upstream and downstream)
- Communication skills in national language (women, older people, traditionally mobile ethnic minority groups (e.g. numerically small family groups of Mon-Khmer/Vietic hunter-gatherers)

Monetized social indicators may also include incomes (comparative household/ village) and expenditures. Importantly, social indicators may need to have a baseline of the project affected communities (PACs) and in order to identify specific vulnerability levels. SIA are critical as part of project requirements but in many instances may be neglected as part of EIAs, or disregarded completely.

A matrix of outcomes, performance indicators, and targets is shown in Table 2. These were tested and refined during the pilot project stage.

Table 2 Outcomes, Performance Indicators and Targets for Planning

Criteria	Desired generic outcomes (PACs)	Outcome indicators in measuring performance	Baseline	Indicator of impacts	Source of Data
Food Security/ sustainable livelihoods	Maintain and enhance employment and livelihoods	○ HH income from agricultural and other sources ○ Number of local people employed on project/ related activities	○ Average agricultural and other incomes and natural resources beside outside remittances (define amount) ○ Existing employment % (non-subsistence)	○ N = improvement guaranteed ○ L = high likelihood of improvement ○ M = some potential for improvement ○ H= no likelihood of improvement ○ 10-20% increase incomes/HH ○ (percentage) local people employed on projects	○ National and District statistics ○ SIA, SMP, RAP ○ Experience from similar HPP in similar location ○ Affected persons' representatives
	Improved access to agricultural land, markets and services	○ Access to suitable land/forest for food production ○ Number of villages with all-weather road access to other villages and markets	○ Current access to river and land resources ○ Forest area currently used by communities for swiddens & NTFPs ○ Current average productive agricultural land/HH ○ (define number of affected villages)	○ Affected villages and resettlement villages have all weather road access ○ Common land maintained in PAC villages ○ Poor quartile have access to extension services	○ SIA, SMP, RAP ○ GIS and project road infrastructure ○ Affected persons' representatives
Health/ wellbeing &education	Improved health and safety	○ Access to adequate health care services or local clinics within <10km	○ Number of health centers/ clinics at project sites and wider zones of influence	○ Improved access to clinics for 80% of PACs ○ Reduced incidence of water-borne diseases, mental health problems, dam accidents, STIs, & alcoholism	○ SIA, SMP, RAP ○ Health clinics & district hospitals ○ GIS and project road infrastructure ○ Affected persons' representatives

Criteria	Desired generic outcomes (PACs)	Outcome indicators in measuring performance	Baseline	Indicator of impacts	Source of Data
	Improved access to potable water and sanitation	○ Number of HHs with direct domestic water supply and sanitation	○ Current condition	○ 100% of resettlement/ PAC houses	○ SIA, SMP, RAP ○ Affected persons' representatives
	Improved access to education	○ Number of children attending primary school in the project impact area	○ Current Stats	○ (Defined number) ○ 100% schools receiving equipment support from the project/government	○ National, district stats. ○ SIA, SMP, RAP ○ Affected persons' representatives
Ensure wellbeing of vulnerable ethnic minority groups	**Risk to identified vulnerable groups is reduced.**	○ Vulnerability Index (which shows among identified project affected ethnic minority groups targeting priorities)	○ prevalence of ethnic minorities/IPs, gender, single-headed households, or households with disabled members ○ show extent of cultural reliance on natural resources & customary coping strategies (this defines level of vulnerability) ○ language/functional literacy rates; ability to communicate effectively in the national vernacular	N= PAC not vulnerable L= low level of vulnerability M= Medium level of vulnerability H=PAC highly vulnerable	○ (disaggregated data needed) ○ National, district stats. ○ SIA, SMP, RAP ○ Affected persons' representatives

Criteria	Desired generic outcomes (PACs)	Outcome indicators in measuring performance	Baseline	Indicator of impacts	Source of Data
Cultural Heritage values	**Preserve material and non-material cultural assets**.	○ Cultural assets retained among various ethnic minority groups in project affected areas	○ Material cultural assets: temples, sacred sites, religious artefacts; community forests, traditional burial grounds, animistic and Buddhist ritual sacra and images, etc. ○ Non-material cultural assets: religious songs, stories and mythology, ritual *mnemonics*; religious knowledge relating to local places, etc.	N= No cultural assets present L=low likelihood of cultural assets present M=medium likelihood of cultural assets present H=Very significant cultural asset values in project affected area.	○ National, district stats. ○ SIA, SMP, RAP ○ Cultural heritage assessment ○ Affected persons' representatives

2.2.5 Non-Monetized Social Indicators Used in the HPST

The literature search, analysis, pilot project assessment, and consultations led to the selection for use in the HPST of the non-monetized social indicators that follow:

- Lost Land/MW – addresses food security and livelihoods
- Displaced Persons/MW -- this covers the impacts of displacement and dislocation (resettlement costs are already included in the economic and financial assessments)
- Ethnic Minorities Affected -- this addresses the wellbeing of vulnerable ethnic minority groups
- Cultural/Sacred Values – includes the preservations of material and non-material cultural assets. This issue is not included in the economic evaluation.

2.3 Non-Monetized Environmental Indicators

2.3.1 The Issue

This part of Annex 2 presents the recommended approach to obtaining the values of the non-monetized environmental indicators followed by a discussion of how these particular indicators were selected for the Guidelines. As shown in Table 1 above, the economic analysis proposed in the Guidelines and the HPST does not attempt to monetize a number of important environmental impacts, such as riparian and aquatic vegetation, fish habitats, and perhaps most importantly, biodiversity. In order to include these in the HPST it was necessary to identify several non-monetized environmental indicators. It is impractical and potentially misleading to attempt to model all conceivable environmental parameters as part of the hydropower development decision support approach. At best, such an attempt may give an incomplete picture of the environmental issues surrounding economic development. At worst, much effort will be expended for very little useful benefit, since the data and knowledge required to model the intricate interrelationships between the environment and hydropower development process are simply not available in many areas of the lower Mekong basin. Therefore, there is a need to define acceptable and useful indicators which will provide the decision makers with enough information to consider the environmental impact of their actions together with economic, financial, and social aspects. These environmental indicators must be reliable, acceptable to decision makers, practical, and reasonably comprehensive. Further, although some indicators can be valued in monetary terms and included in an economic analysis others must be considered in non-monetized terms, but still included in the overall assessment.

Table 3 shows examples of criteria and indicators for environmental indicators that are not already considered in the economic analysis and which are developed for use in the HPST. They are designed to address in particular potential impacts to ecological and biodiversity issues, since these are not covered in the economic evaluation.

Table 3 Example of Non-Monetized Environmental Indicators

Criteria	Desired generic outcomes	Outcome indicators in measuring performance	Baseline	Indicator of negative impact	Source of Data
Status of river channel habitats	Maintain existing river channel habitats	○ Short or no Length of River Left Dry (the shorter the better) ○ No peaking operations	○ Existing conditions	○ Long Length of River Affected (Km) ○ Large Reservoir Surface Area (Km^2) ○ Peaking operations	○ MRC database ○ Feasibility studies ○ ESIA ○ Experience from similar HPP in similar location
Status of flagship species	Maintain or enhance status of critical species in the basin	○ Small Reservoir Surface Area ○ Short or no Length of River Left Dry ○ Few or no Critical Natural Habitats Affected ○ Few or no Fish Species and Endemism Affected	○ Existing conditions ○ Projected conditions from basin or regional studies	○ Large Reservoir Surface Area (Km2) ○ Long Length of River Affected (Km) ○ Fish Diversity/ Endemism (many species affected) ○ Presence of Ecologically Sensitive Areas (from ISH01)	○ MRC database ○ Feasibility studies ○ ISH01 results ○ ESIAs, SEAs ○ Experience from similar HPP in similar location
Status of key environmental hot spots	Maintain or enhance status of key environmental hot-spots in the basin	○ Few or no Critical Natural Habitats Affected ○ Few or no Fish Species and Endemism Affected ○ Small or no effect on environmental hot-spots	○ Existing conditions ○ Projected conditions from basin or regional studies	○ Effect on Ecologically Sensitive Areas: (High, Medium, Low, None)	○ ISH01 results ○ ESIAs, SEAs ○ Experience from similar HPP in similar location ○ MRC database ○ Local government environmental agencies ○ Environmental NGOs (IUCN, etc.)

Criteria	Desired generic outcomes	Outcome indicators in measuring performance	Baseline	Indicator of negative impact	Source of Data
Overall status of biodiversity within mainstream corridor	Maintain or enhance biodiversity in the basin	○ Few or no Critical Natural Habitats Affected ○ Few or no Fish Species and Endemism Affected ○ Small or no effect on environmental hot-spots ○ Small Reservoir Surface Area	○ Existing conditions ○ Projected conditions from basin or regional studies	○ Effect on Ecologically Sensitive Areas: (High, Medium, Low, None)	○ ISH01 results ○ ESIAs, SEAs ○ Experience from similar HPP in similar location ○ Local government environmental agencies ○ Environmental NGOs (IUCN, etc.)

2.3.2 Literature Review (LMB and International)

Numerous studies dealing with hydropower planning in the region and elsewhere have attempted to score environmental impacts using indicators for the purpose of prioritizing dam developments. For example:

The **MRC's Hydropower Project Database**, with the objective to collect key information from hydroelectric projects in Lao PDR, Cambodia, Vietnam and Thailand. The information is used for two purposes: (1) To make a cursory assessment of the value of the projects in terms of their power production and its social and environmental impacts, and (2) to formulate and analyze development scenarios using MRC models of the Mekong river basin. The Environmental Impact Scorecard contains four indicators of environmental impacts that are to be assessed for each project. These are (1) Hourly Flow Regime, (2) Seasonal Flow Regime, (3) Ecosystems, and (4) Micro-climate. The assessment is based on a score from -3 (very negative) to +3 (very positive) for a project's impact as reflected by the indicators. The criteria for the ratings are sometimes quantitative and at other times subjective. For example, impacts on Hourly Flow Regime are characterized as follows (only negative ratings can be associated with this indicator):

-3 Hourly variation in downstream flow during the dry season and under normal (i.e., no flood) conditions is increased/decreased by more than 50%.

-2 Hourly variation in downstream flow during the dry season and under normal (i.e., no flood) conditions is increased/decreased by between 25% and 50%.

-1 Hourly variation in downstream flow during the dry season and under normal (i.e., no flood) conditions is increased/decreased by not more than 25%.

0 There will be no measurable change in hourly flow variation downstream.

It is presumed that this type of information would be available from project studies.

Conversely, scores for "Ecosystem" use the score criteria defined above to identify the impact on the ecosystem in a much more subjective or qualitative manner, such as:

- Negative or positive impact of the project on the diversity of flora and fauna in the region including the effect on commercial fish species
- Negative or positive impact of the project on the downstream river morphology including stability of the delta
- Negative or positive impact of the project on water quality including salinity, temperature and oxygen content.

The **Se Kong - Se San and Nam Theun River Basins Hydropower Study Initial Environmental Examination**[14] proposed that the proportion of the total annual run-off affected by a scheme can be taken as the most useful overall indicator of the importance of a scheme in contributing to

[14] Sir William Halcrow and Partners Ltd., UK, in Association with EPDC International, Japan & MK Centennial, USA, May 2010

cumulative impacts. No criteria are presented with respect to the magnitude of the scheme's effect on annual run-off that would be considered a significant impact.

The **Power System Development Plan for Lao PDR**[15] attempts to incorporate all environmental and social impacts in the economic through valuation. There is no stakeholder input in the process, and no acknowledgement of social or environmental impacts that cannot be monetized. For the purposes of the present study, the PSDP is useful due to the detailed information available for the economic study, but does not help with regard to the development of indicators for non-monetized issues.

In their report "**Good Dams and Bad Dams: Environmental Criteria for Site Selection of Hydropower Projects"** the World Bank concludes[16] that the most effective environmental mitigation measure is good site selection. While focusing on physical and biological environmental considerations, the paper also notes:

- impacts due to displacement and the need for participatory decision making with resettlers and hosts, and for income restoration assistance in contributing to successful resettlement
- the importance of determining of downstream releases in, among other factors, managing disease vectors and maintaining downstream human uses.
- the role of access roads in facilitating major land use changes (positive and negative), and hence the need for locating them in the least environmentally and socially damaging corridors

Ledec and Quintero argue that the selection of a site largely defines the environmental and social impact of hydroelectric projects. Assessing the potential environmental impact of alternative sites through a series of quantitative indicators and even before ESIAs begin facilitates strategic planning. A multi-criteria framework for choosing sites can rule out those sites that will have very high adverse environmental and social effects. It would make it possible to screen projects before doing ESIAs, thus potentially saving developers and government agencies the costs of carrying out and evaluating ESIAs at unsuitable sites. It would also make it possible to compare and rank alternative projects and sites at different locations, which would not normally happen in the standard ESIA process. Poor sites for hydropower projects include sites that require large areas to be flooded, where dam and reservoir construction would require significant resettlement, that would affect critical natural habitats or sites of high cultural significance; where the project would affect rivers with a naturally high diversity of native species and where some aquatic species that would be affected are found only in the project area; and where the project is likely to cause water quality to deteriorate. Another critically important set of indicators measures the extent of any downstream impact, such as the length of river left mostly dry due to water diversion and the number of tributaries downstream of the dam (Ledec and Quintero, 2003).

The paper introduces 13 quantitative, easily calculated indicators of potential environmental impact from dams. "These indicators have high predictive value for likely adverse environmental (and related social) impacts. The first nine indicators (A–I) use information that is normally easy to obtain

[15] Maunsell Limited in association with Lahmeyer GmbH, PO Box 4241, Auckland, New Zealand, August 2004

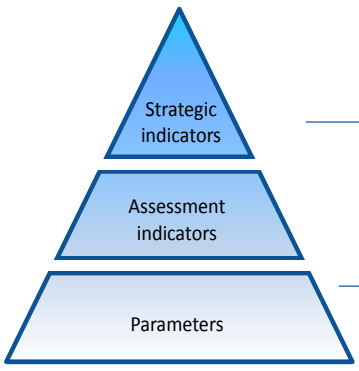
[16] Latin America and Caribbean Region -- Sustainable Development Working Paper 16, "Good Dams and Bad Dams: Environmental Criteria for Site Selection of Hydroelectric Projects", November 2003, by George Ledec and Juan David Quintero

from basic dam planning data, even without a separate environmental study. The other four indicators (J–M) are also very important in the environmental comparison of alternative dam sites, but involve data that may require further environmental (or resettlement) study to obtain.

A. Reservoir Surface Area (the smaller the better)
B. Water Retention Time in Reservoir (the shorter the better)
C. Biomass Flooded (the less the better: avoid inundation of forests)
D. Length of River Impounded (the shorter the better)
E. Length of River Left Dry (the shorter the better)
F. Number of Downriver Tributaries (the more the better)
G. Likelihood of Reservoir Stratification (the less the better)
H. Useful Reservoir Life (the longer the better)
I. Access Roads through Forests (the shorter the better)
J. Persons Requiring Resettlement (the fewer the better)
K. Critical Natural Habitats Affected (the shorter the better)
L. Fish Species Diversity and Endemism (the shorter the better)
M. Cultural Property Affected (the less the better)

The MRC's **Basin Development Plan** is in the process of developing a series of environmental (and other) indicators that are useful at various planning levels, as illustrated in Figure 3. For the purposes of the ISH02 process, the "Assessment Indicators" are those most useful for providing stakeholders with assessments of projects or groups of projects. It should be noted that the BDP indicators are generally for the mainstream and relate to the MRC mandate. National planning generally takes place tributaries where information may not be as readily available. The same principles discussed in the Guidelines apply but the planner should be cognizant of the specific application. The latest BDP environmental indicators have already been reviewed by the ISH11 team so should be the first place to go, assuming the data is available. The "BDP" Environmental Indicators currently being considered are as shown in Table 4.

Figure 3 BDP Indicator Structure



Information Users	*Role of the Information Users*	*Forms of information input and output*
Decision-Makers – Government Agency Heads, Ministers, Joint Council Members, Business Heads	*Receive recommendations and make decisions*	**Inputs** – Management papers for decision-making **Outputs** – Agreements, decisions, policies
Assessors and Planners – Consultants, Managers, Government Agency Staff	*Convert technical inputs into management reports for decision-makers*	**Inputs** – Technical reports, map-based condition info **Outputs** – Management papers for decision-making
Technical Users – Monitoring Teams, Monitoring, Database Managers, Modellers, Analysts	*Provide technical inputs to assessors and planners*	**Inputs** - Spreadsheets, databases, historical reports **Outputs** – Technical reports

Table 4 BDP "Assessment" Indicators

Water flow conditions in mainstream	Maintenance of dry season flows - Compliance with PMFM
	Maintenance of flood season peak flows - Compliance with PMFM
	Maintenance of Tonle Sap reverse flows - Compliance with PMFM
	Timing of onset of wet season flows
Water quality conditions in mainstream	Maintenance of mainstream water quality - Compliance with PWQ
	Maintenance of mainstream sediment processes
	Area of salinity intrusion in delta within threshold level of salinity
Status of environmental assets	Area of wetlands (forest, marshes, inundated grasslands)
	Area of wetlands around Tonle Sap
	Status of river channel conditions and habitats
	River bank erosion risk
	Status of aquatic biodiversity
	Overall status of biodiversity within mainstream corridor

2.3.3 Selected Criteria and Related Indicators

The BDP indicators are in some respects similar to the Ledec and Quintero indicators previously discussed. However, an issue that is not often discussed is the relative independence of the indicators from one another. In an evaluation process that relies to a certain extent on the cumulative effects of numerous indicators to provide a replicable and credible "bottom line" assessment, it is important to ensure that the basic message of each indicator is not duplicated by another indicator. This could result in a bias in the assessment by giving greater weight to one impact aspect by representing it in many indicators. One approach that has been used to account for this, compare seemingly different indicators, and select a smaller number of reasonably independent indicators is the "Strengths of Relationships Matrix" approach (Balloffet, 1984). When applied to the 13 BDP environmental assessment indicators and the 11 Ledec and Quintero indicators this results in the selection of four indicators that are representative and cover the major concerns, as indicated in Table 5.

Table 5 Strength of Relationships Matrix for the BDP Environmental Assessment Indicators compared to the Ledec and Quintero indicators

BDP Assessment Indicators >>> Ledec & Quintero Indicators V V	Maintenance of dry season flows - Compliance with PMFM	Maintenance of flood season peak flows - Compliance with PMFM	Maintenance of Tonle Sap reverse flows - Compliance with PMFM	Timing of onset of wet season flows	Maintenance of mainstream water quality - Compliance with PWQ	Maintenance of mainstream sediment processes	Area of salinity intrusion in delta within threshold level of salinity	Area of wetlands (forest, marshes, inundated grasslands)	Area of wetlands around Tonle Sap	Status of river channel conditions and habitats	River bank erosion risk	Status of aquatic biodiversity	Overall status of biodiversity within mainstream corridor	Sum	Rank
A. Reservoir Surface Area	0.5	0.5	0.7	0.3	0.5	0.3	0.3	0.5	0.3	0.7	0.1	0.5	0.5	5.7	3
B. Water Retention Time in Reservoir	0.7	0.7	0.5	0.3	0.3	0.0	0.3	0.1	0.3	0.0	0.0	0.5	0.3	4.0	6
C. Biomass Flooded	0.0	0.0	0.0	0.3	0.0	1.0	0.3	0.7	0.3	0.5	0.0	0.5	0.5	4.1	5
D. Length of River Impounded	0.3	0.3	0.3	0.0	0.0	0.3	0.0	1.0	0.0	0.5	0.3	0.3	0.5	3.8	7
E. Length of River Left Dry	1.0	0.0	0.5	0.7	0.3	0.0	0.0	1.0	0.0	0.5	0.0	0.7	0.5	5.2	4
F. Number of Downriver Tributaries	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.5	0.0	0.7	0.7	2.4	9
G. Likelihood of Reservoir Stratification	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.3	0.0	0.7	0.5	2.9	8
H. Useful Reservoir Life	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.3	0.0	0.0	0.5	1.5	11
I. Access Roads through Forests	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.0	0.0	0.0	1.0	2.3	10
K. Critical Natural Habitats Affected	0.3	0.0	0.3	0.3	0.3	1.0	0.5	0.5	0.5	1.0	0.0	0.0	1.0	5.7	2
L. Fish Species Diversity and Endemism	0.3	0.3	0.3	0.5	0.3	0.5	0.3	0.5	0.3	1.0	0.0	1.0	1.0	6.3	1
Sum	3.1	1.8	2.6	3.2	1.8	3.1	1.7	6.3	1.7	6.3	0.4	4.9	7.0		
Rank	7	10	8	5	9	6	11	2	11	2	13	4	1		

Relationship	Definition
0	*Independent*. Two indicators essentially independent (provide different information to planner)
0.3	*Weak importance of one indicator over another*.
0.5	*Strong Importance of one indicator o*ver the other.
0.7	*Demonstrated importance of one indicator over another*.
1	*Absolute dependence*. One indicator provides essentially the same information as the other

The matrix shows those indicators with higher values as providing the most information about the issues covered by those indicators and others as well.

2.3.4 Non-monetized Environmental Indicators for Use in the HPST

A selection of four indicators that provide the most information according to the Ledec and Quintero as well as the BDP indicators can be obtained through ranking the sum of the relationship scores. For the BDP Indicators, these are:

- Status of river channel habitats
- Status of flagship species
- Status of key environmental hot spots

- Overall status of biodiversity within mainstream corridor

The most useful Ledec and Quintero Indicators are:

- Reservoir Surface Area (the smaller the better)
- Length of River Left Dry (the shorter the better)
- Critical Natural Habitats Affected (the fewer the better)
- Fish Species and Endemism Affected (the fewer the better)

Another important indicator of downstream environmental (ecological) impacts is whether the dam is operated in peaking mode, since the large daily variations of flows will negatively impact downstream habitats unless mitigated.

The planner can use this approach to select more or fewer indicators in the analysis, keeping in mind the availability of data. These Guidelines recommend the use of the four Ledec and Quintero indicators, plus whether the dam is operated in peaking mode with no mitigation, because the information is more easily quantifiable from existing reliable information in MRC and other data bases.

Although some of the selected indicators appear also in the economic analysis (e.g., inundated area for the reservoir or presence of a fish passage), it is emphasized that the selected non-monetized indicators predict potential impacts to biodiversity, which is not considered in the economic evaluation. In other words, the same (or similar) indicator points to two different impacts: the economic value of the inundated land or fishery, and the impact to biodiversity in that area. Hence use of the same indicator in the monetized and non-monetized assessments does not result in an inappropriate overlap if biodiversity impacts are to be considered in addition to economic impacts.

2.3.5 Recommended Approach for Valuing the Environmental Indicators

This Annex provides the approach that can be used to identify the recommended non-monetized environmental indicators. A Case Study exercise was employed to test the usefulness and practicality of various indicators. Environmental data collection for the Srepok Basin Case Study included a mixture of quantitative and non-numeric values related to each hydropower facility being investigated, as follows:

- Reservoir surface area (Km^2).
- Length of river affected (upstream and downstream, if available) (Km).
- Lack or presence of an effective fish passage.
- Whether or not the hydropower facility is a peaking plant.
- Effect on Environmentally Sensitive Areas ({ESAs} expressed as none/low/ medium/ high).

Most of this information was readily available for the Srepok, and it is expected to be available to planners in other parts of the Mekong Basin. However, it is expected that the data on length of river affected downstream is not usually found in the feasibility studies or even EIAs.

Valuing the Indicators

Reservoir surface area (Km^2)

Information on the reservoir surface area in Km^2 is normally available from preliminary feasibility studies or environmental impact assessments for individual dams, which can be obtained from the developers or the responsible government agency. In terms of potential impacts it is usually preferable to use the maximum areal extent of the reservoir for this indicator, but normal water

level can be used if the maximum level area is not available. If this information is not available from these sources the following alternatives may be used:

- The MRC Data base. This computerized data base is maintained and updated regularly by the MRCS and information on particular dams can be requested.
- GIS. Digitized topographic maps for the entire Mekong basin are available, also through the MRCS. Given the location and height of the dam in question, the topographical data base can be used to determine the size of the impoundment. This approach may produce data that is not as adequate as that to be found in detailed engineering studies, but can be used at the planning level.

Length of river affected (upstream and downstream) (Km)

Upstream stream distance affected:

This datum can generally be obtained from feasibility studies or EIAs provided by the developers or the cognizant government agency. When not available in that way it can be estimated by tracing the river distance upstream from the dam to the upstream end of the reservoir. This can be done manually or by using a GIS mapping system. If GIS is used to determine the size of the reservoir it will be possible to use the same assessment to determine the upstream river length affected.

Downstream distance affected:

This information is generally difficult to obtain unless a detailed assessment has been done as part of an EIA. For the Case Study it was assumed that the general topographic conditions upstream and downstream of the dam were similar and that the slope of the stream downstream and its flows will adjust to the new long profile caused by the dam in approximately the same distance as the length of the upstream impoundment. Other flow characteristics and ecosystem changes are considerably more complex[17] and should be examined on a case-by-case basis during the feasibility and EIA stages. For dams in cascade the downstream effects will extend only to the next downstream dam if it is in close proximity.

The indicator to be used in the HPST model is the sum of the upstream and downstream distances affected.

Lack or presence of an effective fish passage

This is an important indicator given the importance of the Mekong basin to fish habitat and fisheries locally and regionally. For the purposes of the HPST, this indicator is shown as a number between 0 and 1, with 0 representing that an effective fish passage removes all constraints to fish migration, and 1 meaning that there is no fish passage and that fish migration is totally blocked. Intermediate values can be used if properly defined and documented. For example, a “0.5” might be used to

[17] A case can be made that downstream changes to flow quantity and timing extend downstream far beyond the immediate vicinity of the dam. This is the case, for example with the flow regulatory effects of the upstream dams on the Mekong, which affect its flows all the way down to the delta. When better information is not available, the distance used in the HPST is an indicator which will serve to distinguish between storage and run-of-river dams, for example, and which will indicate the most significant ecological impacts.

indicate that the fish passage is effective for most but not all fish species encountering the dam during their migration.

All the dams in the Case Study Srepok basin have been designed (and constructed) without any provision for passage of migrating fish. The indicator will allow planners and decision makers to assess these projects with and without the fish passage. It is possible, for example, that a fish passage will be retrofitted to the Lower Sesan II dam to mitigate potentially serious impacts to fish and fisheries as far downstream as Tonle Sap.

Whether or not the hydropower facility is a peaking plant

Releases of water from the dam to accommodate peaking requirements can result in downstream flow conditions that are very different from normal, especially if these flows change significantly on a daily basis. This can negatively affect aquatic habitats downstream. For the HPST model, the effect of peaking operations is represented by a number from "0" (no peaking is anticipated) to "1" (regular peaking operation). Again, an intermediate number such as "0.5" may be used to indicate that peaking operations occur only occasionally.

Effect on Environmentally Sensitive Areas (ESAs)

This subjective indicator aims to account for environmental impacts from dams on areas that are particularly vulnerable. The indicator is characterized as none/low/ medium/ high impact. For the Srepok Case Study, the impact on ESAs was not immediately available from the ISH01, so the indicators were estimated on the basis of the location of the dams and their reservoirs with respect to wildlife reserve areas, biodiversity conservation areas and national parks in both Cambodia and Vietnam. The rankings used were:

- None (N): No impacts to ESAs expected. This ranking was not used for the Case Study because the entire "3S" basin is considered ecologically sensitive.
- Low (L): Project is in the "3S" basin.
- Medium (M): Project is in or adjoins a biodiversity conservation area or wildlife reserve.
- High (H): Project is in or adjoins a national park.

In addition to the ISH01 project, information on impacts on ESAs may be obtained from strategic, regional, or sectoral impact assessments, other published reports covering the area in question, project-level EIAs, experts from universities, responsible government agencies, or the private sector.

Weighting the Indicators

Central to the procedure for considering non-monetized environmental and social indicators is the importance attributed to each indicator. This is often referred to as "weighting". Weighting must be addressed in a practical and replicable manner and integrated into the ranking, timing and selection of projects into a portfolio of sequenced projects. A key question with weighting is how to reconcile differences in desired plans that result largely from different weightings of different stakeholder groups. The Guidelines approach can assist in making the trade-offs explicit between different impacts and outcomes in the decision-making process.

The recommended process of weighting the different criteria asks stakeholders[18] to assign a non-negative value to each indicator. The total of all values for each stakeholder should equal 100 when spread across the set of social and environmental criteria (see **Table 6**). This allows all the stakeholders to express their preferences with respect to the weight that each indicator should have in the evaluation of the projects. The model adds these stakeholder preference values and normalizes the result for each indicator.

Table 6 Example of Stakeholder Weighting Process

Note: User Input in the blue highlighted cells

Each Stakeholder to Enter a non-negative Value to each criterion.

Total of all values for each stakeholder should equal 100

Stakeholder	Food Security	Vulnerable Persons	Health	Cultural	Multiplier Effects	Reservoir Surface Area	Peaking?	Length of River Left Dry	Critical Natural Areas	Fish Diversity/ Endemism	Total	Remaining
A	80	0	0	20	0	0	0	0	0	0	100	0
B	20	0	0	10	10	20	10	10	10	10	100	0
C	20	10	20	10	20	0	20	0	0	0	100	0
D	0	0	0	0	0	30	20	20	10	20	100	0
E	0	0	0	0	0	100	0	0	0	0	100	0
F											0	100
G											0	100
H											0	100
I											0	100
J											0	100
K											0	100
L											0	100
M											0	100
totals	120	10	20	40	30	150	50	30	20	30	500	
average	24	2	4	8	6	30	10	6	4	6		
normalized	0.8	0.0667	0.1333	0.2667	0.2	1	0.3333	0.2	0.1333	0.2		

[18] Stakeholders include the National planning agencies, the project developer(s), local and regional officials, representatives of affected people, non-governmental organizations, and potentially representatives from other countries in the Mekong basin that might be affected)

3 Multi-Criteria Analysis

Multi-criteria analysis (MCA) is a structured approach which identifies overall preferences among alternative options to accomplish one or more objectives. MCA allows for a variety of both monetary and nonmonetary objectives to inform policy decisions. The indicators used in the MCA process are commonly based on quantitative analysis (through scoring, ranking and weighting) of a wide range of qualitative impact categories and criteria, as has been presented in this Annex. The MCA approach is most useful in cases where a single-criterion approach (such as cost-benefit analysis) fails to address significant environmental and social impacts that cannot be assigned monetary values. MCA as applied in the Guidelines allows decision makers to include a full range of social, environmental, technical, economic, and financial criteria.[19]

An important aspect considered in the development of the Guidelines was the approach to MCA and decision making for evaluating non-quantifiable aspects (both environmental and social) leading to prioritization of potential projects or programs. In water resources planning, decision makers tend to feel comfortable with simple models when comparing non-commensurate aspects of projects, and their preference ranking for the many criteria they need to consider tends usually to be unspoken and intuitive. In environmental assessments, when the moment comes to combine all the impacts so as to make a choice among alternatives, the most common method is to simply create a matrix of alternatives versus criteria by having the analysts or other stakeholders assign values out of fuzzy sets whose members tend to be "low, medium, and high." In water resources planning, once engineering criteria are met, most attention is given to economic and financial feasibility. When environmental or social issues are considered, we are often presented the analysts' subjective assessment, and sometimes almost as an afterthought.

The challenges in the rational consideration of multiple criteria to evaluate and prioritize many potential projects is illustrated by recent work at MRC that has identified at least 37 basin development indicators, of which 13 are non-quantifiable (Wallace, 2013). Real-world problems in many areas must be solved in an interdisciplinary way, with the participation of many stakeholders, using many and non-commensurate criteria.

Multiple criteria decision-making (MCDM) has been an important research topic since the early 1970's. There are a number of methods (Zionts, 1992) which have been developed to deal with the mathematical challenges of helping rationally-behaving decision makers find preferred solutions to complex problems, such as:

- Multiple Criteria Mathematical Programming is a multi-objective problem-solving process which involves one of several mathematical programming methods (such as linear, non-linear, or dynamic programming) to find all or some non-dominated solutions.
- Multiple Criteria Discrete Alternatives (MCDA), consists of problems which are amenable to representation as a matrix where rows are alternatives and columns are objectives or

[19] A good discussion of MCA and additional information can be found at: http://unfccc.int/adaptation/nairobi_work_programme/knowledge_resources_and_publications/items/5440.php (Accessed November 2015)

criteria. The entries in the matrix are the ranking of the alternatives with respect to each criterion or objective.

- Multi-attribute Utility Theory (MAUT) is usually carried out for problems which have probabilistic outcomes by using utility functions to rank alternatives. Utility functions are developed by requiring the decision maker (DM) to choose between alternatives in a structured way. Alternative rankings are explored using sensitivity analysis.
- Negotiation Theory is a generalization of multiple criteria decision making to multiple decision makers. This area is perhaps the least advanced in terms of developing theory, algorithms, and decision support systems. At this time, negotiation theory models are limited to voting mechanisms with some kind of majority rule or with unanimity as the criteria for decision making.

Mathematical optimization methods which have been used in water resources planning also include dynamic programming and non-linear programming, with applications in problems such as reservoir operations. Often, the challenge in MCDM has been in the mathematical structuring of the problem as a rational model of reality. As models become more mathematically accessible, however, they tend to depart from the real-world influences. Ideally, Multiple Criteria Decision Support Systems (MCDSS) support the decision maker's actual behaviour rather than attempting to solve well-structured hypothetical models. As described by Korhonen [1992], these interactive MCDSS have the following three desirable features:

1. They do not (unnecessarily) restrict the DM's behaviour, but try to give as much information as necessary and to use information received from the DM's behaviour as effectively as possible, until a final, "reasonable" decision is reached.

2. They provide nice and fascinating communications facilities to the DM (= interface which is based on the use of spread sheets, colours, graphical representations, windows, helps, and a an appropriate communication language).

3. They do not force the DM to formulate the problem entirely at the beginning of the search process, but provide him/her with freedom (at least to some extent) to approach the problem in an evolutionary basis. For instance, in many decision problems, the DM may have difficulties to make a clear distinction between objectives and constraints."

The framework developed in the Guidelines for the HPST includes a computerized decision support system (a structured spreadsheet model) but also recommends and provides guidance for the intervention of human experts and affected stakeholders in the process as appropriate. The recommended consultation process is presented in the following section.

4 Consultation Processes

4.1 Guidance for Consultation

As the Guidelines process is unlikely to be able to reach the mid- to local level stakeholders in field-based assessment, the participation process proposed by the team involves two levels:

1. Consultation and participation **needed to develop the guidelines** (among stakeholders at regional and national planning levels) and implement case studies (as discussed below), and

2. Participation **proposed by the guidelines** (to be agreed with Member Countries) regarding involvement of the different institutional levels: central, provincial and local-district, in further application of the guidelines.

Discussions with Member Countries will need to be cognizant of national policy on social issues pertaining to social safeguards, vulnerability and involuntary relocation, as well as existing environmental and macroeconomic policies in place.

As an initial recommendation the team proposes a process that involves identifying stakeholder representatives to assess non-monetary values and weighting of impacts as part of the portfolio planning process and case studies.

4.1.1 MRC and Consultation

The MRC operates under the guidance of the 1995 Mekong Agreement towards collaboration on sustainable development and management of the basins water resources. In addition the Procedures define an agreed approach to particular aspects of river basin management including maintenance of flows, sharing of information, water quality and notification and consultation.

The Procedure for Notification, Prior Consultation and Agreement is intended to cover regional consultation among the member countries at a senior level around specific infrastructure projects in the basin. Consultation with stakeholders on particular tributary projects at a provincial, district and local level falls under MRC member country national policy and practice. Multi-level stakeholder discussion is considered a good practice for sustainable hydropower the planning and management, as these local areas are where much of the conflict over resource use is likely to occur. National line agencies would normally deal with this as part of their regular governance responsibilities.

4.1.2 Consultation - Literature review

In terms of planning guidance, ethnographically-informed literature may include a range of participatory information gathering processes, especially emphasising the importance of full stakeholder inclusion, public and private sector at the pre-feasibility stage, and ensuring that the basic needs and sustainable livelihood practices of vulnerable people in relation to water, land and forests should be prioritized. In general, good practice also means that there is a preparation of preliminary documentation (in some cases up to five years before actual licenses are issued and clarity on the ending of concession agreements); an early study plan development with a clear informal and formal dispute resolution process, and (in the case of countries with indigenous populations) enhanced indigenous (“tribal”) consultation (often through use of a standard Ethnic

Group Development Plan [EGDP]). The public consultation process needs to be supported by an appropriate legal framework on social, environmental, economic and regulatory aspects (important concern for dams larger than 15 megawatts).

Consultation is seen as important in the literature at all levels, especially involving lower levels of decision making and among project affected communities over issues such as resettlement and compensation[20]. This involves people moved to land already claimed by other villagers or unusable, or temporary resettlement zones with uncertainty about the future. WCD (2000) found that many grievances over failures in the consultation and compensation process still needed to be addressed and that a disproportionate burden placed on the "involuntary risk bearers". Increased consultation is needed to support displaced peoples recover from shocks, culture changes, and to pursue sustainable livelihoods, sharing in the benefits of projects as active participants and stakeholders.

Consultation process must be practical, cost-effective and non-threatening to various interests/stakeholders, and importantly, be shown to improve outputs. Protection for the most vulnerable peoples is reflected increasingly in national policies and standardisation practices as well as required by multilaterals. Indeed, a number of multilateral agencies have *various social safeguard practices* for resettlement and indigenous/vulnerable ethnic minority peoples. The most common are those of the World Bank (2005)/ MIGA (2007) and ADB (2009) but encouraged by various regional development institutions such as EIA, IDB, African Development Bank, GEF etc. In Lao PDR, the new SESO requests companies to *comply* with all Applicable Laws and Standards including Additional Standards which are the IFC Performance Standards (1-8) covering such concerns as social assessment, health, land acquisition and involuntary resettlement, Indigenous Peoples and cultural heritage.

The relationships between poverty and ethnicity or vulnerability are assessed using social information gathering techniques and, as mentioned above, ethnic group development plans[21]. This enables more effective targeting and monitoring of interventions. Baseline studies with monitoring indicators are sometimes undertaken on hydro projects which allows assessments to be made by national agencies. However, these are not consistent and sometimes lack adequate qualitative data. A rigorous case study is the ADB financed Song Bung 4 Hydropower Project which conducted an extensive Resettlement and Ethnic Minority Development Plan 2010/2012 for Electricity of Vietnam (SWECO and Mott MacDonald) and considers procedures of due diligence as required by funders. As with most remote projects, impacts on ethnic minorities is largely through land acquisition where resettlement plans are required meeting due diligence requirements, and the conditions for meeting *corporate social responsibility* (environmental, governance and social components).[22] But as much as these are the onus of private companies, relevant state agencies need to have agreements on monitoring in place at the onset of project developments.

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[20] For a case study in Vietnam see Pham Huu Ty, A.C.M Van Westen, and Annelies Zoomers 2013, "Compensation and resettlement policies after compulsory land acquisition for hydropower development in Vietnam: Policy and Practice", *Land*, vol.2, pp 678-704; see also a problem of displacement without proper consultation: Olivia Bennett and Christopher McDowell 2012, *Displaced: The Human Cost of Development and Resettlement*, Palgrave Macmillan.

[21] see for instance many projects listed under the ADB site http://www.adb.org/search?keyword=ethnic+group+plan&sa=

[22] See for instance Niki West 2013, "Corporate Social Responsibility in Mekong Hydropower Development", State of Knowledge 3, CPWF, CGIAR Vientiane.

4.1.3 Local Level Consultations – Nam Theun 2 Example

In general, unless required separately by multilateral funders, social impact assessments, which include non-monetary values and social safeguards, are included in ESIAs provided by the developer or the government.

An example of where local level public consultation has been assessed by multi-stakeholders was Nam Theun 2 (NT2): In 1998 the World Bank conducted extensive national/international consultations on the NT2. Two parallel studies were conducted at the time by both the Government of Lao PDR (feasibility and sustainability requirements) and the Nam Theun Electricity Company (social and environmental requirements). The bank at the time argued that local consultations were effectively carried out. Then in 2004, building on the first series of consultations, an assessment funded by the World Bank was undertaken to see if the consultation process had met its objectives of being "transparent, balanced, and meaningful". In a comparison on the progress made previously, the bank funded a second set of consultations involving more than 200 public consultations. The construction activities for NT2 commenced in 2005 and funding banks required a set of safeguards to be in place by that time. The actual construction of resettlement villages and relocation of villagers to new homes then took place 2006-2008 and commercial operations started in 2010.

Although the consultations and stakeholder recommendations did influence the design of the resettlement plan (on such matters as locations for resettlement, house design, village layout, livelihood models, compensation plan and design of the downstream channel), researchers participating in the second set of consultations noted that there was a trend towards promoting positive benefits of the project, rather than considering how to manage the negative impacts, which were largely ignored. Thus, as stated in the bank's interim report (see Chamberlain 2004), it was suggested that project affected communities were not provided a "balanced view" of the project if this response did not accord with developers intentions. Nevertheless, the 2004 consultations showed an improvement to the attention of working through options for the affected villagers using better information flows as reflected in the responses from the villagers. Project affected communities were starting to increasingly see themselves as active stakeholders in the process. The Nam Theun2 consultations in 2004 were considered to be relatively successful at the time and involved a multi-tiered process which could be adapted for the ISH02 guidelines as shown below:

Learning from this experience of NT2, to be able to communicate effectively and free of constraints in a two-way modality, facilitators could be identified and trained at each level: central/agency, provincial/district and at administrative village level among those project-affected communities. The more complex problem of identification (and definition) of stakeholders (or their representatives) immediately upstream and further downstream of a particular development site needs to be included in the consultation process. This strategy of multi-tiered consultations was incorporated into the NT2 project.

World Bank Social Development Notes (1998), showing the different stakeholders in the NT2

Studies Coordinated by **Government of Lao PDR**	DIRECTLY AFFECTED	INDIRECTLY AFFECTED
Analysis of alternatives	Affected communities, government, provincial officials	NGOs, private sector, EGAT, international donors (where relevant)
NNT social & environmental action plan	Affected communities (attention given to gender, ethnicity and age), provincial officials, government, BPKP, transboundary traders	Community development and environment NGOs, news media, international donors, transboundary conservation areas (ISH01), NTEC
Economic impact	Affected communities, Lao PDR, government, Thailand, EGAT	NGOSs, international donors
Studies coordinated by NTEC		
Environmental assessment and management plan	Communities (including downstream), community-based organisations, traditional authorities, government, BPKP	Community development and environmental NGOs, international donors, news media, transboundary and environmental areas, NTEC
Resettlement action plan (RAP)	Affected communities, host communities, representatives of local communities, government	Community development and environmental NGOs, international donors, news media, transboundary and environmental NGOs, NTEC

GoL= Government of Lao PDR
NTEC= Nam Theun Electricity Company
EGAT= Electricity Generating Authority of Thailand
BPKP=military logging company

Early Lessons Learned from NT2 Public Consultations

The bank noted that the "complexity and novelty" of the NT2 project made it hard to avoid having some problems though they considered **most of the consultations successful by the Government of Lao PDR, the private developer and members of the international community**. Some further lessons learned from these consultations include:

(a) Strategy
- A strategic plan is needed
- The participation process should begin early; where there are community structures for "information dissemination", these should be used to *facilitate* the consultation process, and
- Continued consultation is needed through the project development process.

(b) Methodology
- The process of consultation should clearly define the "project area" (site, and even up-steam and downstream) so that all potential impacts are included
- Clear information is need for private sponsors about monitoring requirements and evaluation criteria for the participation process, and
- Appropriate communication tools and strategies that are understandable to the target group and help ensure a process of meaningful consultation

(c) Capacity development is essential, especially:
- Strengthening the sponsors' capacity to manage complex consultation processes and to build on what they or other entities in the area are already doing
- Proper management of national workshops and the creation of breakout groups within the workshops, to enable deeper discussion of certain issues (important in facilitation/ reflection workshops)
- Supervising the project sponsors' to make sure that all consultations are occurring as desired; while at the local level it is important that supervision is carried out by a senior social scientist (anthropologist), and
- Ensuring that social scientist (anthropological) expertise is available in consultation processes.

4.1.4 Consultation versus Information Dissemination

It is often the case that governments may see "consultation" as the same as "information dissemination", as in earlier extension modalities, to the extent that lower level stakeholders are given the necessary information about what higher level institutions intend and that this is adequate. In one sense, the flow of information is important earlier on to local communities, but left by itself this closes the possibilities of negotiation as common interest partners and limits engagement and dialogue on matters of importance to lower level stakeholders. In this regard, capacity development and thematic training for identified government officials / responsible agencies should be seen as a priority, and not just for acquired listening skills, but in having a number of options or alternatives on the table for local stakeholders to consider. Indeed, establishing *best practice consultation* should be seen as a priority for hydropower development interests to avoid future conflicts between local level resource-users, government agencies, party (in the case of Lao PDR, Cambodia and Vietnam which parallels government administrative structures), civic and corporate interests.

4.1.5 Existing tools for best practice consultation

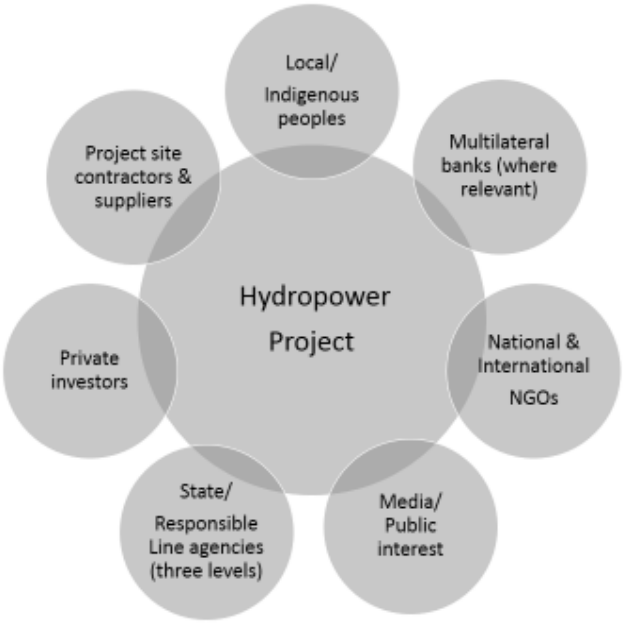
The Hydropower Sustainability Assessment tool (IHA, P-1) 2010, notes the importance of firstly identifying stakeholders and ensuring that they are involved in the issues of interest and concern to them. Furthermore, that communication and consultation processes establish a firm basis for good stakeholder relations throughout the life of the project. Similarly RSAT 2010 (with 2013 changes minus the scoring) Topic 5 notes the importance of stakeholder identification and consultation involving (a) river basin planning, (b) energy /power sector planning and regulation, (c) hydropower projects and (d) regulatory and governance. Although these do not go into detail on how to use these in practice they do provide a sound methodological framework for measuring performance and establishing consultation agreements among stakeholders. It does not unfortunately require (and cannot enforce) hydropower private sector interests to conform to a set of best practice standards or benchmarks. The Protocol notes that consultations should be guided by "the consideration of rights, risks and responsibilities", which needs to be better reflected in its scoring method[23].

The following is the recommended consultation process of the WCD Strategic Priorities and the Draft Hydropower Sustainability Assessment Protocol 2009:

a) Public acceptance essential for equitable and sustainable water and energy resource development
b) Stakeholder identification and inclusion process based on recognition of rights and assessment of risks
c) Access to information and legal and other support to all stakeholders
d) Particular attention to identification, support and informed participation of indigenous and tribal peoples, women and other vulnerable groups
e) Agreements negotiated in open and transparent process
f) Free, prior and informed consent of indigenous and tribal peoples affected by large dam projects guides decisions

[23] see International Rivers 2009, "A Critique of the IHA's Draft Hydropower Sustainability Assessment Protocol"

Figure 4 Stakeholder Segments



4.1.6 Conclusions from the Literature Review on Consultation for the Guidelines

The Guidelines recommend the following consultation approach:

1. Assess existing consultation processes within the relevant agencies in the four LMB countries.

   The problem is not that each agency does not have some kind of a consultation process in place in respect of hydropower planning and development, information and communications, but this is often ineffective at reaching lower level instrumentalities and communities for various reasons: lack of motivation, financial constraints, ambiguous roles and responsibilities among officials in various agencies (which may in any case tend to overlap).

2. Working with ISH02 national consultants, identify practical limitations and constraints to improving multi-tiered consultation processes in each LMB country for planning.

   It is clear that we still do not know enough about what actually happens on the ground, even how policy works. As well, each national LMB country has its own policy and practice in regard to hydropower projects and their own institutional culture which needs to be understood in order to make recommendations which are not simply "one-size fits all".

3. Key principles for Consultation:

   (a) *Continuous and consistent stakeholder engagement* starting at the feasibility stage, through to planning and implementation;
   (b) *Effective targeting* to capture all relevant stakeholders (which should include at least 20% women) at three administrative levels: central, provincial and district/ formal village cluster (*kumban*/*tambon*), and also directly to PACs (Project Affected Communities);

(c) *Accessibility*, stakeholders are fully informed of proposals with bilingual/ vernacular information and options in ways that they are able to understand;
(d) *Appropriate timelines*, where consultations start when development options are first being identified, not after the fact, and local stakeholders then given time to consider a response;
(e) *Transparency and accountability* in the consultation process (those individuals who are tasked to undertake consultations are supported by their line agencies), consultations taking place in an open and friendly context and feedback from stakeholders provided early on in the process;
(f) *Monitoring (and evaluation)* of the consultation process should involve the coordinating line agency, an independent practitioner/ NGO, and the private developer (in the case of a project site), with lessons learned to make these more effective in the future. The monitoring may include documenting the number of participants at a meeting, number of participating households, or community groups; the number of meetings held, where these were held and the outcome of the consultations).

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