

Enhancing Development Benefits to Local Communities from Hydropower Projects A Literature Review

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A Literature Review

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Table of Contents

Foreword.....	ii
Acknowledgements.....	iii
Summary.....	iv
Glossary	v
1. Introduction.....	1
<i>Brief History of Hydropower Development and Sustainability Considerations</i>	1
<i>Current Context</i>	2
<i>Scope of Assignment</i>	3
<i>Structure of this Report</i>	4
2. Literature Review.....	5
<i>Overview</i>	5
<i>Approach and Methodology</i>	5
<i>Past and Current Contribution of Hydropower to Development</i>	7
<i>Constraints to Enhancing Development Benefits in Hydropower Projects</i>	33
<i>Gaps in the Literature</i>	35
Conclusion.....	37
Bibliography	38
Annex 1: Literature Review Summary	44
Annex 2: Summary of Issues Addressed in Literature	74
Annex 3: Pro-Forma of the Literature Review Summary Sheet	82

Boxes and Tables

Box 1: Constraints in Enhancing Development Benefits	33
Table 2.1: Égré et al (2008)'s Criteria to Evaluate Benefit Sharing Mechanisms	12
Table 2.2: Community Investment Program Activities for Hydropower Projects identified by IADB's 2006 CIP Report	18
Table 2.3: Summary of Carbon Market Standards	29
Table 2.4: World Bank Community Development Carbon Fund (CDCF) Hydropower Projects	31

Foreword

Primary beneficiaries of dams tend to live far away from the dam sites while other groups of people in the project-affected area may sustain most of the negative impacts of dams. Prior to the 1970s, many hydropower projects focused on supplying electricity to growing economies and presumed that benefits would ‘trickle down’ to local communities through market mechanisms. Evidence demonstrated that this assumption was very far from reality and environmental and social considerations were included in the design, construction and operation of hydropower projects since the 1980s. However, the environmental and social considerations mainly focused in mitigating adverse impacts instead of distributing in an equitable way the benefits and costs of these projects.

New paradigms to share the benefits of hydropower projects emerged in the 1990s and several monetary and non-monetary mechanisms have been applied in different projects across the world. Additionally, the focus of projects increasingly widens from hydropower generation to include multiple purposes such as integrated water, land, and resources management, the benefits arising from such projects can comprise a broader range of products and services. Within the context of multiple purposes projects, one of the most fundamental challenges is the need to articulate and equitably distribute both monetary and non-monetary benefits across multiple sectors, groups, and geographies: i.e., to the share of benefits.

After a hiatus of roughly a decade, and much debate as per its legacy and contribution to poverty and development, the World Bank is scaling up its investment in hydropower. Poverty eradication and the Millennium Development Goals cannot be achieved without providing developing countries with the needed infrastructures among which hydropower is a basic component in several different parts of the developing world. Hydropower also plays a key role in climate adaptation as a renewable source of energy which can contribute to the reduction of GHG and to adaptation to changes from the foreseen increase in variability in hydrology. Furthermore, from the lessons learned of the past decade or so, hydropower is increasingly recognized as providing multiple opportunities to significantly enhance community, regional and transboundary development if planned, designed and implemented in a sustainable manner.

Within this context, the World Bank began a three-year pilot initiative to develop a framework for enhancing development benefits to local communities in hydropower projects. The World Bank intends to design and test a framework of enhancing development benefits that can be applied to hydropower projects and that can be tailored, at the same time, to the particular circumstances and characteristics of individual projects. This initiative on enhancing development benefits to local communities in hydropower projects consists of the following key components: (i) a *Literature Review* documenting past and current experiences; (ii) *Global Case Studies* that will examine the different mechanisms for benefit sharing, the institutional and capacity aspects, and the outcomes in order to identify innovations and good practices for benefit sharing; and (iii) a *Guidance Note-Tool Kit* that will highlight factors contributing to benefit sharing mechanism.

As an initial activity of the World Bank initiative on enhancing development benefits to local communities in hydropower projects, this document presents a review of the available literature documenting mechanisms for benefit sharing in hydropower projects. This Review will help identify gaps in the literature addressing directly or indirectly benefit development issues in hydropower projects as lessons and experiences in benefit sharing have not been documented in a systematically manner thus far.

Acknowledgements

The literature review and preliminary analytical frameworks were produced in relatively short time frames and would not have been possible without the close working efforts and support from the World Bank team, comprising Navin Rai and Daryl Fields as the task team managers, and Elena Correa and Peter Leonard who provided sector expertise. The documents also benefited from contributions made by international experts who attended an expert meeting followed by a wider technical workshop with World Bank operational staff. Our thanks for their helpful practical insights go to: Claudia Lucia Alvarez Tobon, Walter Arensberg, Ana Maria Arias Loaiza, Joji Carino, Rumjhum Chatterjee, Bhaskar Chatterjee, Réal Courcelles, Lawrence Haas, Robert Lanari, Donal O'Leary, Denis Roux, Claudius Thomas, Asger Christensen, Salman Salman, Maria C.J. Cruz, and Yumi Sera.

Summary

The World Bank has undertaken a three-year initiative to develop an operational framework for enhancing development benefits to local communities in Bank-financed hydropower projects. This report documents, reviews and analyses past and current approaches for sharing and enhancing development benefits¹ in hydropower projects, with a focus on local communities. The key findings from this literature review on what is known and not known can be summarized as follows:

Making Benefits-Sharing Operational: While the concept of benefits-sharing is often referred to, authors have found it difficult to express what it means in reality. There is a lack of documentation and analytical work to make the concept as useful as it should be for practitioners. This has led many authors to focus more concretely on the conditions required to facilitate benefit sharing, and the mechanisms most appropriate for achieving it. More documentation on how to operationalize benefit sharing and how it achieves positive, quality results is needed.

Benefits-Sharing Mechanisms: There is systematic classification and documented examples on mechanisms for transferring monetary benefits, which tend to have a more developed country focus. However, there is little systematic information on mechanisms for transferring non-monetary benefits except for community investment programs.

Legislation: Generally legislation on benefit sharing is regarded as an enabler or necessary pre-condition. There are multiple examples from both developed and developing countries where laws or policies provide frameworks and rules for the sharing of monetary benefits. In most cases, they are fairly recent and the literature describes relatively well how they work, but with scarce information on monitoring or evaluation of the benefit sharing results from a stakeholder or beneficiary point of view.

Additionality: Benefit sharing mobilizes additional resources above and beyond what is required for traditional compensation and mitigation budgets. In particular, large projects can produce significant economic rent that provides real opportunities for enhancing development benefits to local communities.

Involuntary Resettlement as a Development Opportunity: Seen through a benefit enhancement lens, resettlement can provide a development opportunity to improve the conditions of displaced persons, especially in developing countries and remote areas. A wide range of both monetary and non-monetary benefit sharing mechanisms to communities can be implemented that reach beyond mitigation and compensation to enhance incomes and livelihoods of people adversely affected.

Monitoring and Evaluation: While monitoring and evaluation of benefits and transfer mechanisms may be taking place at the project level to meet country or donor requirements or for corporate responsibility reporting, it is scarcely documented, dependent on management interests, and generally not systematic. It is not clear what is being monitored or how the information is being used. This renders difficult comparing efficiencies and effectiveness of benefit sharing mechanisms among hydropower investment projects. Better documented and accessible monitoring and evaluation of schemes would greatly contribute to increasing operational knowledge of benefit sharing mechanisms.

¹ The term 'benefits-sharing' in this document refers to a systematic effort to enhance development benefits, particularly to local communities. For the purposes of this document, "benefits-sharing" will be broadly defined across the range of possible types of benefits, and used interchangeably with "enhancing development benefits".

Glossary

ADB	Asian Development Bank
CBTI	Community Based Tourism Initiative
CDCF	Community Development Carbon Fund
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CIP	Community Investment Program
CO ₂	Carbon dioxide
CRA	Cooperative Regional Assessments
DDP	Dams and Development Project
ERPA	Emissions Reductions Purchase Agreement
ERU	Emission Reduction Units
GDP	Gross Domestic Product
GEF	Global Environment Facility
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HEP	Hydroelectric Power
IADB	Inter-American Development Bank
IBRD	International Bank for Reconstruction and Development
IHA	International Hydropower Association
IISD	International Institute for Sustainable Development
IUCN	International Union for the Conservation of Nature
JI	Joint Implementation
KP	Kyoto Protocol
MW	Megawatt
NGO	Nongovernmental organization
PAPs	Project Affected Persons
PDD	Project Design Document
tCO ₂ e	Tonnes of carbon dioxide equivalent
TWh	Terawatt hour
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VER	Voluntary/Verified Emission Reduction
WCD	World Commission on Dams
WWF	World Wildlife Fund

1. Introduction

BRIEF HISTORY OF HYDROPOWER DEVELOPMENT AND SUSTAINABILITY CONSIDERATIONS

Records of using flowing water to provide mechanical power date back to Roman times. The technique continued to develop and by the late 18th and early 19th centuries, the majority of industrial developments were driven by water mills. In the latter part of the 19th century, the generation and transmission of electricity became a practical possibility and improved turbines made hydroelectric power (HEP²) a prime source of energy generation. The first hydropower projects were commissioned in the last two decades of the 19th century.

From the early 1900s up to the 1970s, HEP was a major driver of development worldwide, wherever there was an adequate water resource. Power plants were built, owned and operated by both private and public utilities, by government agencies and companies. Regardless of their stage of development, countries perceived hydropower development in terms of using their own natural resources to meet growing industrial and domestic demands for electricity, energy security and self-sufficiency.

Towards the end of this period, the multi-lateral financing agencies began to support the development of hydropower and funded some major projects in developing countries with mixed success. There were significant technical and economic achievements in terms of energy generation, mostly by national public agencies, but by the mid-1980s, hydropower projects had gained a reputation for substantial cost and schedule overruns.³ In addition, it had become apparent that an increasing number of HEPs had shortcomings, mainly in terms of addressing environmental and social issues, such as:

- Excessive numbers of people displaced with neither provision of adequate resettlement nor livelihoods and income restoration programs.
- Unexpected adverse environmental effects such as choking of reservoirs by water hyacinth or the introduction of bilharzia.
- Poor performance due to silt accumulation in reservoirs or inadequate hydrological assessment.

By the mid-1990s, the multi-lateral financing agencies had either withdrawn or reduced their involvement in hydropower investment projects both as a result of these difficulties and due to the ready availability of fossil fuels at relatively low prices, which made alternative forms of energy generation more economic, at least in the short term. Furthermore, among other contributing factors, political influences at that time tended to favor private funding with the associated preference for low risk and low cost developments with a relatively short life span.

In parallel with these social, political and financial influences, environmentalists perceived HEP as being damaging to the environment; this position was strengthened by the widespread dissemination of data of mixed quality on greenhouse gas (GHG) production of reservoirs.

² In this report the term hydropower (HEP) covers hydroelectric power and hydel power generation.

³ HEPs financed by the World Bank between 1985 and 1986 exceeded cost estimates by an average of 27 percent and took on average 28 percent longer to construct than anticipated.

Others questioned why local communities were being burdened with a disproportionate amount of the negative impacts of some large HEP projects whereas the benefits, primarily in the form of electricity and profits, were mostly accruing to the central state or stakeholders who were not directly affected in the project area of influence. Foreseen macro-benefits were not necessarily trickling down to the local community level and, furthermore, in many cases, the populations most affected were poor rural or vulnerable groups - such as Indigenous Peoples - living in remote natural resource rich areas.

Despite the events of recent years, hydropower provides close to 20 percent of the world's installed generation capacity and is by far the largest contributor of renewable energy. Countries as disparate as Brazil, Lesotho and Norway rely almost entirely on hydropower for their energy needs. Opponents of HEP schemes have reservations about its shortcomings, but there is a widening recognition that hydropower, if done correctly by maximizing the inherent advantages of a particular site and involving the relevant stakeholders appropriately, is a sustainable source of energy that can play an important role in meeting energy and community development needs.

CURRENT CONTEXT

The conditions for the development of hydropower as a sustainable means of generation are more favorable than they have been for many years. Furthermore, the ability of HEP to provide electricity has never been questioned and since about 2005 there has been a resurgence of interest in hydropower development, driven by a number of political, financial, environmental and social influences. Hydropower covers a huge range of sizes and types of projects, from small micro-hydro units generating a few kilowatts to major mega-projects with capacities in excess of 20,000 MW. Projects may or may not include dams and reservoirs and the size of a project in power capacity terms (megawatts) is not necessarily linked to the size of the dam or reservoir.⁴ Some projects have a multitude of primary functions which may include water supply, irrigation or flood control, and power generation is not always the primary driver.⁵

Political considerations now gaining prominence include the fluctuations and long-term rise of the price of fossil fuels, a growing awareness of the need to address climate change effects and an emphasis on greater sustainability in development of all kinds. At its best, when well planned and appropriately implemented, HEP addresses these concerns. In the present context, in comparison to fossil fuel generation, hydropower is becoming relatively less expensive. This effect is particularly marked for countries with limited fossil fuel resources.

With regard to climate change, HEP has among the lowest GHG emissions per unit of electricity generated for all modes of energy generation, producing limited amounts of CO₂ in comparison to heavy oil and coal. Recent research has enabled GHG emissions to be estimated and monitored with greater

⁴ While there is no consensus on the delineation between small hydro and large hydro, 25 to 30 MW has been the upper limit on small hydro to date although a limit of 10 MW is starting to become more generally accepted.

⁵ Australia's Snowy Mountains HEP is an example of a HEP development where non-energy benefits were the project driver. This project sought to divert water across a mountain range to irrigate farming land. When the project was started in 1949, water in Australia was considered to be a "free good" and hence it would have been difficult to charge farmers for use of the water transferred by this scheme. Thus, the project was developed as a multi-purpose HEP rather than as an irrigation scheme.

confidence than previously. HEP is considered an environmentally sustainable form of energy generation if it is properly planned and implemented.

Environmental safeguards provide guidance and requirements for HEPs' environmental performance. The first environmental protection legislation was enacted in 1970 in the United States. The 1980s and 1990s were associated with the development of safeguards to ensure that projects met criteria which avoided and mitigated the social and environmental problems encountered previously. These were embodied in policies and guidelines introduced by both the World Bank and the regional Development Banks (e.g. Asian Development Bank, African Development Bank, Inter-American Development Bank).

HEP financing is adapting to new challenges. Prior to 1990, provision of electricity was often the responsibility of the public sector, or closely regulated private utilities. There has been significant development in financing models that use both private and public funding (sometimes known as Public Private Partnerships). These models allow for a wide range of risks to be shared between different parties, with each risk being taken by the party most able to bear it. Multi-lateral agencies and commercial banks have now become more receptive to this type of funding than previously. Whatever the model, public support in some form or other is often necessary for financing HEP.

The World Commission on Dams (WCD) formed in 1998 to examine the issues associated with dam design and construction and subsequently published a framework for decision-making (Dams and Development: A New Framework for Decision-Making by the World Commission on Dams Report 2000, hereafter referred to as the WCD Report). The debate and controversy over the results of the WCD have fostered different initiatives that have sought to develop good practices and practical guidelines building on the core principles of the WCD Report.

The hydropower industry, insofar as it can be considered as a whole, has increasingly recognized that a more proactive approach is required to address the issues related to environmental and social sustainability. Among the industry initiatives worthy of mention, the International Hydropower Association (IHA), which was formed in 1995 to promote and disseminate good practice and enhance global knowledge of hydropower, has developed a set of Sustainability Guidelines and a Sustainability Assessment Protocol as tools for assessing sustainability.

SCOPE OF ASSIGNMENT

The World Bank began a three-year pilot initiative to develop a framework for enhancing development benefits to local communities in hydropower projects. There has been a wide array of approaches in the past two decades that all have in common the objective of designing and implementing means and mechanisms to ensure local communities a more equitable share of project benefits. The World Bank intends to design and test a framework of enhancing development benefits that can be applied to hydropower projects and that can be tailored, at the same time, to the particular circumstances and characteristics of individual projects. This initiative is based on the hypothesis that hydropower projects planned in environmentally and socially sustainable manner can provide a large range of development benefits to local communities.

As one of the initial activities of the three-year initiative on enhancing development benefits to local communities, this Literature Review documents and analyzes past and current state-of-the-art approaches and mechanisms for enhancing development benefits in hydropower projects to local communities. This Review will provide a basis for an analytical framework in reviewing lessons learned and good practices of development benefit mechanisms in hydropower projects that will serve as a platform for the elaboration of guidelines for enhancing development benefits to local communities.

The Literature Review will not go into the many economic and social outcomes which are well documented and recognized in their own set of literature, for example in discussions on electricity as a facilitator and prerequisite for achieving the Millennium Development Goals. It should be noted that the depth of the review was limited to readily available literature due to time and resource constraints. Much of the experiences on benefits- sharing in hydropower have not been the object of extensive publications other than project documentation, which is often not readily available. The case studies review planned for the next step of this initiative seeks to fill this significant gap on recent practices.

STRUCTURE OF THIS REPORT

Chapter 1 provides an introductory background to the Literature Review briefly explaining the current context of hydropower projects, the scope of the assignment and the structure of this report. Chapter 2 offers the core of the intellectual discussion by describing the approach and methodology utilized for the Literature Review, by describing the existing literature on benefit sharing in hydropower projects, by stating the constraints in enhancing development benefits and the existent gap in the literature. Finally, Chapter 3 offers the main conclusions on the outcome of the literature review on enhancing development benefits to local communities.

2. Literature Review

OVERVIEW

This Section presents the findings of the literature review with the objective of identifying past, current and potential ways of directly or indirectly addressing development benefits to local communities issues in hydropower development. The literature review aims to answer the following questions:

- What are the past and current contributions to local community and regional development that hydropower projects offer in different types of settings?
- What are the constraints and barriers to enhancing direct and indirect development benefits in hydropower projects?

The literature review explores and synthesizes development benefit enhancement issues structured around the following five general themes:

- Community development.
- Economics and revenue management.
- Environmental protection and enhancement, including hydrological management.
- GHG reduction.
- Innovation in HEP project development and technical engineering practices.

The focus of the literature review is on development benefits to local communities and their constituent stakeholders. However, consideration is also given to how the literature addresses macro benefits at the national and regional scale given the closely intertwined relationships between local, regional and nationwide benefits.

This Section first provides an outline of the approach and methodology adopted for identification, categorization and review of the literature. An overview of past and current contributions of hydropower to development follows with the findings of the review, which are structured around the ways in which the literature addresses the two key questions posed above. Literature on constraints and barriers is then reviewed, followed by existing case study information. Gaps in the literature are identified. The following Section summarizes key findings from the literature review and provides some concluding remarks on how the literature review results provided input to the development of the draft analytical framework presented in Volume 2.

APPROACH AND METHODOLOGY

Literature was reviewed by a multi-disciplinary project team comprising specialist sub-teams according to the five themes presented above. Literature was identified through the following steps:

- Consultation with the World Bank on core benefit sharing literature.
- Internal consultation within a multi-disciplinary team of specialists.
- Interviews with industry specialists from the IHA, Oxfam and the Swedish government funded project manager looking at benefits for transboundary water projects.

- Key hydropower journals.
- Use of internet search engines.
- Review of citations within literature (as part of an iterative, ongoing process of literature identification).

The reference information and summaries of the key issues of each article reviewed were logged in a master summary matrix which was regularly circulated within the team in order to avoid duplication of review efforts and to share cross-cutting information among specialist sub-teams. Appendix A provides an abstract and the key issues for each piece of literature reviewed. See Appendix B for a summary of the issues, namely economic, social and environmental benefits, monetary and non-monetary transfer mechanisms, and equity/distribution also for each piece of literature reviewed.

The sources of literature originate from a range of disciplines and include academic journal articles or book chapters; industry articles and conference papers or presentations; non-governmental advocacy papers and think pieces; media reports; international financial institution and private lending bank reports, and national and local government policies and reports.

The range of literature was continually reviewed and verified by the Core Management Team to ensure that it reflected:

- Maintenance of core focus: enhancing development benefits of hydropower projects, particularly for local communities.
- Breadth: covering a range of types, sizes, settings and locations of HEP projects including: reservoir, run-of-river, cascade development, and pumped storage hydro dams; large down to small, micro and pico hydropower; developed, developing, and emerging market country settings, including remote and densely populated developed areas, and new green-field sites, upgrading and rehabilitation activities.
- Depth: including a range of conceptual analysis, practical experience supported by single and comparative case study examples and speculation on innovation.
- Quality: peer reviewed if from an academic or industry journal source, or from a reputable organization if otherwise.

Where the range of literature was found to be inadequate with regards to the scope identified above, new literature was sought and reviewed when available.

Standard literature review summary sheets were completed by each reviewer for every article reviewed (see Appendix C for the pro-forma of the Literature Review summary sheet used to collect data) and these were coded by the Core Management Team in order to identify trends in the literature and draw out common and disparate strands of conceptual thinking and practical experience.

All of the articles reviewed and the completed literature review summary sheets were stored centrally on an intranet accessible to the project team with hyperlinks to these documents provided in the literature review summary matrix for quick reference. The summary review sheets were continually referred to in order to provide relevant input for the development of the draft analytical framework.

PAST AND CURRENT CONTRIBUTION OF HYDROPOWER TO DEVELOPMENT

The concept of benefits in relation to HEP has been continually evolving. Initially the main focus was on employment and infrastructure for GDP growth; this was followed by a risk and resettlement focus whereby mitigation and compensation were the main approaches used to address social and environmental impacts of HEP. More recently the focus is increasingly on a benefits enhancement and sharing approach that seeks to optimize and provide more equitable distribution of benefits. This may be achieved through a wide range of means and mechanisms such as targeting entitlements of local stakeholders or multi-purpose uses integrated into the project cycle so sustainable development outcomes are enhanced. More “good hydro projects” are needed (Collier, 2005) that share the benefits of the water and not just the physical resource itself (Jagerskog and Lundqvist, 2006).

The most direct and obvious benefit of hydropower is electricity provision; dams generate 19 percent of the world’s electricity and provide water to 30-40 percent of irrigated land worldwide (WCD Report, 2000). The WCD Report gave some prominence to the concept of “benefit sharing” with the central argument that stakeholders must move away from competing for water resources in order to find ways to share them equitably and sustainably. The WCD Report proposed seven key recommendations in its strategic framework; one of which centered upon recognizing entitlements and sharing benefits. This recommendation endorsed the contention that entitlements that improve livelihoods and quality of life should be enshrined in law, and that Project Affected Persons (PAPs) should be considered to be among the key stakeholders of dam projects.

Moving on from the World Commission on Dams

Subsequent to the publishing of the WCD Report, several international efforts were undertaken to convert the WCD’s core principles and strategic framework findings into acceptable guidelines or compilations of good practice for practitioners. Three notable efforts among them – by the United Nations Environment Programme (UNEP), the Asian Development Bank (ADB), and the IHA – are described briefly below. Specific examples or points drawn from these sources are cited as appropriate throughout this report.

UNEP Dams and Development Project (DDP)

The DDP aimed to improve decision-making, planning and management of dams and their alternatives, building upon the core principles and strategic framework of the WCD Report. The DDP initiative focused in particular on strengthening policy and legal and regulatory frameworks to ensure that environmental and social issues are duly accounted for in order to attain sustainable outcomes. Of particular interest to the topic of enhancing and sharing benefits is the work done under Phase 2 of the DDP, which has resulted in publication of a Compendium of Relevant Practices for Improved Decision-Making on Dams and Their Alternatives.

The Compendium brings together a series of international examples to inform policy makers, managers and practitioners about the state of current practice in the field of dams, documenting examples of good practice while encouraging replication, adaptation of good practice and innovation. The DDP thus adopted a knowledge sharing approach rather than a critical analysis approach, favoring the concept of “good examples of relevant practices.” The focus was on sharing and disseminating good practice

through a compendium of examples. Benefit sharing for hydropower and dams – our subject of specific interest among the work of the DDP – was approached through monetary and non-monetary benefits.

Monetary benefit sharing mechanisms involve sharing part of the monetary flows generated by dam operation with affected communities. Such mechanisms have been in use for years but represent part of a relatively new approach in the past decade. The main types of monetary benefit sharing mechanisms considered by the DDP were revenue sharing, development funds, equity sharing or full ownership, taxes paid to regional or local authorities and preferential electricity rates. The review of literature and case studies indicates that fundamental elements for successful monetary benefit sharing schemes are: (a) existence of an economic rent and overcoming financial constraints; (b) reconciling the goals of stakeholders; (c) ensuring the efficiency of redistribution of benefits; (d) ensuring the involvement of local communities; and (e) ensuring the accountability of agencies entrusted with the redistribution of benefits.

Regarding monetary benefit sharing mechanisms, legislation on revenue transfers or development funds that should include mechanisms to effectively ensure that those affected by dams actually benefit from transfer payments are discussed.

Less attention is given to non-monetary benefits, though the main elements are covered. Transfer mechanisms for non-monetary benefits are reviewed for ten dam projects. Of these, eight had livelihood restoration and enhancement strategies linked to agriculture, two used community development and the provision of roads, schools and health services and one used basin catchment activities to enhance environmental protection.

Establishing partnership agreements between developers and local communities is considered to be among the most innovative forms of monetary benefit sharing. These partnerships are hailed as a win-win form of benefit sharing, contributing greatly to project acceptance by local communities by recognizing the entitlement of affected people to a share of the economic rents generated by a dam and their right to participate in the management of local water resources.

ADB Dams and Development e-paper

Accessible only online through the ADB's website (www.adb.org/water/topics/dams) is a rich and diverse source of information, guidance, and related weblinks that provide key information and discussion on the planning and implementation of dam projects. Prepared by ADB in 2005 with the assistance of Jeremy Bird, this e-paper provides structured and easy access to a wide range of papers, case studies, and websites that deal with many topics linked to the planning and implementation of hydropower and dam projects.

IHA Sustainability Guidelines

In response to the WCD Report and ensuing debates, the IHA has developed a set of Sustainability Guidelines that attempts to provide a framework for good practice for hydropower projects. In order to support these guidelines, a Sustainability Assessment Protocol has also been developed as a tool for assessing sustainability performance of planned or existing projects. While these documents do provide guidance on the assessment of the social impacts of projects, including at the community level, they do not specifically address benefit sharing approaches or mechanisms to enhance community benefits.

In March 2008, the IHA launched a Hydropower Sustainability Assessment Forum which seeks to expand guidance and sharing of good practice as well as furthering the IHA's Sustainability Assessment Protocol

application through wider application and updates. Although IHA is mainly an industry association, forum members include developed and developing country representatives, as well as stakeholders from NGOs, the hydropower industry and the international financial sector. Members meet every two months to discuss issues that should potentially be included within the Protocol. Should the Forum discuss the concept of benefit sharing, it is likely that use of benefit sharing mechanisms will become part of the assessment protocol in the future given the importance attributed to community development in the IHA guidelines.

Economic Rents as the Main Source of Benefits

Water and environmental resources may provide economic rents in HEP projects. Low-cost (infra-marginal) hydropower projects will also earn rents even in a hydropower dominated system to the extent their lifecycle costs undercut the prevailing wholesale price. In these cases, the price at which power is sold will determine how the rent is divided between sellers and buyers (off-takers). Fixed price arrangements may allow the seller to capture some of the rent, to the extent that lifecycle costs are less than the market price for electricity. The off-taker will normally capture the upside for economic rents arising from fossil fuel price increases and additional carbon penalties.

An area where there is little coverage in the literature relates to the hedge value that hydropower provides against fossil fuel and carbon prices. Simon Awerbuch and Martin Berger (2003) apply a mean-variance portfolio approach, which is a well-known element of modern finance theory, to the process of evaluating generating technologies and portfolios. This theory helps to show that the value of hydropower's hedge against fossil fuel and carbon prices provides the off-taker with an additional value beyond any savings in average expected energy purchase costs. The implication of this is that hydropower should be developed beyond the point where its lifecycle costs just match those for alternative fossil generation, even with the expected carbon price and environmental/social externalities factored in. In principle, it would be possible to estimate the value of the hydropower hedge and then allocate a portion of it to affected parties. No examples were found in the literature to date of estimates of this hedge value, however, let alone any discussion of how to capture this value from the off-taker.

M. Rothman (2000), in his paper on "Measuring and Apportioning Rents from Hydroelectric Power Developments," defines what the concept of economic rent is and how this concept can be applied to HEP developments. The paper draws on the concept of differential rent, that is where the marginal cost is less than the output price, and scarcity rent, which together are the two main sources of economic rents, and discusses how to measure these rents. Hydroelectric rents for Canada, Norway, Sweden and Hawaii are given, as is an example of how rent may be captured through royalties. The paper uses the Nam Theun 2 project in Laos to illustrate both the tax and royalty structures imposed on the developer.

In 2002, Dominique Égré, Vincent Roquet and Carine Durocher were commissioned by the World Bank to carry out a desk study on "Benefit Sharing from Dam Projects." They focused on economic rent as a source for applying monetary benefit sharing mechanisms. The report brings attention to benefit sharing opportunities that can alleviate the adverse impacts on displaced peoples, downstream users, taxpayers and the natural environment through direct monetary redistribution of project related revenues. It conceptualizes benefit sharing mechanisms as going beyond resettlement and rehabilitation programs as well as environmental and social mitigation or compensation measures.

Égré et al (2002) focus on the following main types of mechanisms for monetary benefits:⁶

- Redistribution of part of the dam's revenue to local or regional authorities in the form of royalties tied to power generation or water charges.
- Establishment of development funds financed from power sales.
- Part or full ownership of the project by PAPs (equity sharing).
- Levy of property taxes by local authorities.
- Granting preferential electricity rates and fees for other water related services to local companies and PAPs.

The authors believe that revenue sharing mechanisms are most effectively developed through collaborative planning between local and regional authorities and the project proponent, or pre-defined in national benefit sharing legislation, and that a percentage of the revenues should be transferred back to regional/local stakeholders, specifying the proceeds' destination.

In addition to power sales, development funds can be financed by water charges or government and provide seed money to foster economic development in the project affected area. Usually the objective, structure and duration of the fund are decided by the local and regional authorities in coordination with the project proponent or it may be defined in the legislation.

Equity sharing or full ownership mechanisms allow for local or regional authorities to partly or fully own a dam project. This entails sharing the risk of the venture but also its profits. It may also provide a degree of control over the design and operation of the project.

Taxes paid to local or regional authorities can come either through direct taxation on a dam's property value or another basis. The tax generally applies to the level of power generated; this means it is a fixed charge on a producer with a direct impact on profits. Taxes may also be defined in state legislation, sometimes as a percentage of sales or net income, making the latter similar to a revenue sharing mechanism.

The design and outcome of the mechanisms discussed vary in terms of community participation and involvement in their development and efficiency in the use of benefits. Ultimately, the authors believe that mechanisms need to be developed that are fair and equitable in their results.

Key questions that should be addressed before project design and implementation are related to economic considerations, ethical considerations, role of government, compensation of environmental and social costs and development considerations. For example, under economics, the authors ask: "Who owns the economic rent of the exploitation of the natural resource and how is it being captured?" Royalties, fees and competitive auctions are discussed, and examples of measuring economic rents of hydropower projects are provided.

⁶ The report does not touch on non-monetary benefits, which would include, for example, the allocation of fishing rights in a newly-created reservoir, access to improved infrastructure or priority hiring of PAPs on construction works or in operations activities.

With regard to ethical considerations, the rationale for fair redistribution of benefits of dams to locally affected people is presented, along with benefit sharing to ensure that local populations can claim part ownership of the economic rents generated by the dam. To be fully considered as being development outcome oriented, the authors believe that a given project must be equitable to both present and future affected generations. When evaluating the need for and degree of benefit sharing for development, existing infrastructure and services in the project area must be taken into consideration; generally, more remote areas have greater needs for benefit sharing mechanisms, especially in developing countries where basic infrastructure may be lacking.

Égré et al (2002) propose that rather than trying to overcompensate for non-quantifiable costs through compensation by increasing this to account for all future losses, projects should share the benefits from the profits generated over the long term. In this manner, the project could provide a compensation package based on quantifiable losses and give back profits to cover additional losses.

The authors recommend that dam projects be planned through a regional economic development plan, taking into account all resource potential in the region as well as opportunities created by the reservoir and the access roads built for the construction of the dam and ancillary facilities. This can include reservoir fisheries, irrigated agriculture, access to new markets, or improved navigation. Part of the funding to implement these projects could be channeled from the profits generated by the dam to local and regional communities.

Key questions to consider when evaluating benefit sharing mechanisms are posed. Guidance for reaching an agreement is provided, with key points related to timing, stakeholder involvement, use of an impact benefits agreement and leveraging facilitation. Both the mechanism evaluation and agreement guidance are further refined in the authors' 2008 article, reviewed below.

Égré's 2007 Benefit Sharing Issues Report for UNEP provides a comprehensive overview of these issues. It contains a survey of experience to date and focuses primarily on policy frameworks, drawing on project examples where schemes have been deployed. The author reviews experiences in both developed and developing countries where legislation has been adopted for monetary benefit sharing. In most cases they had only been recently implemented; their performance and outcomes had only been partially evaluated, and rarely involved taking into account stakeholder views.

Égré, Roquet and Durocher build on their previous work by looking at benefit sharing as a means of supplementing compensation to address impoverishment risks in the article "Benefits Sharing to Supplement Compensation in Resource Extractive Activities: The Case of Dams," recently published as part of the compendium book titled, *Can Compensation Prevent Impoverishment? Reforming Resettlement through Investments and Benefit-Sharing*, edited by Michael M. Cernea and Hari Mohan Mathur and published by Oxford University Press.

Their article takes the resettlement proposition that "establishing project-related mechanisms for equitable sharing of benefits can provide resources necessary for complementing sheer compensation with incremental investments financing"⁷ and subjects it to empirical examination in light of the practice

⁷ Michael M. Cernea in "For a New Economics of Resettlement: A Social Critique of the Compensation Principles" in Michael M. Cernea and Ravi Kanbur (eds.), *An Exchange on the Compensation Principle in Resettlement*, WP 202 33, Department of Applied Economics, Ithaca: Cornell University.

and experience of a number of large scale recent dam projects from both developed and developing countries.

As in 2002 and 2007, the authors focus on mechanisms that ensure a direct monetary redistribution of a share of project revenues to populations adversely affected by projects. Non-monetary benefits are not covered in the 2008 paper. The authors identify this as a subject of further, complementary analysis.

Égré et al (2008) present economic, ethical and development arguments for supporting benefit sharing with PAPs. The economic rationale is that dam projects generate significant rents which can be shared by dam owners with PAPs. To support this, the authors review the theory of economic rents, ownership of the rents and measuring rents from dam projects. Their argument focuses on the premise that those sacrificing their access to or use of natural resources in project affected areas should receive part of the monetary benefits which otherwise accrue to populations and enterprises far away from the project site. The need for fair redistribution of benefits from dams to PAPs, the use of benefit sharing to enhance local project acceptability and increasing recognition of entitlements for PAP communities are discussed. The role of the state in setting national development priorities, for example by requiring benefit sharing to be highest in remote areas lacking in access to infrastructure and services, is reviewed. The authors also consider that the use of benefit enhancement in addition to compensation of environmental and social impacts is also important, since they state that compensation and mitigation guidelines generally tend to not capture the full social costs of impacts. Cernea’s impoverishment risk theory⁸ is used to argue that impoverishment as a by-product of a dam project is intolerable on economic and ethical grounds. To counter impoverishment, benefits can be channeled especially to PAP communities as part of a development plan. The authors use the economic rationale, ethical and development considerations as well as administrative considerations to develop criteria to evaluate the benefit sharing mechanisms that are presented in the table below.

Table 2.1: Égré et al (2008)’s Criteria to Evaluate Benefit Sharing Mechanisms

Categories	Criteria
Economic rationale	1. Existence of an economic rent (prerequisite).
Ethical considerations	2. Benefits shared commensurate with the entitlements and needs of each category of PAPs. 3. Involvement of PAPs in use of benefits.
Development considerations	4. Involvement of the state in defining benefit sharing mechanism. 5. Contribution of benefit sharing mechanism to development on a sustainable basis on project affected area.
Administration considerations	6. Efficiency of transfer mechanism. 7. Accountability of implementing agencies

As previously, Égré et al (2008) suggest that a package of monetary and non-monetary benefits should take the form of an Impact Benefit Agreement, to be negotiated and signed by PAPs prior to feasibility and environmental and social impact assessments. They also propose that indicators related to economic

⁸ Impoverishment risks identified by Cernea in “Impoverishment Risks and Reconstruction: A Model for Population Displacement and Resettlement” in Michael M. Cernea and Christopher McDowell (eds), *Risks and Reconstruction: Experiences of Resettlers and Refugees*, Washington, D.C.: World Bank include: landlessness, joblessness, homelessness, marginalization, increased morbidity and mortality, education losses, food insecurity, loss of common property and social disarticulation.

rents, PAP perception, PAP standard of living, and local institutional capacity should be used at the options assessment or pre-feasibility stage for assessing the likelihood of reaching a benefit sharing agreement.

The article concludes that benefit sharing practices have been introduced in some countries and approaches have proven to be feasible in some important dam projects, providing tangible positive results. The authors conclude that their most important finding is that benefit sharing mobilizes resources additional to compensation budgets. Yet the authors also note that lack of information on benefit sharing for policy makers and development practitioners is an issue, despite its relevance and practical functionality.

Trembath (2008), in his paper entitled “Beyond Compensation: Sharing of Rents Arising from Hydropower Projects,” has developed the economic rents distribution argument further. He draws on experience from a number of large dam projects across the world to show the contribution that hydropower can make to local and regional development. One such project is the Shuikou Dam project in the Province of Fujian in China, cited as a good example of a project in which resettlement was planned as a development opportunity. In this project, the poorest villages have dramatically increased their income, overcoming through resettlement a 38 percent income lag behind the provincial average.

Trembath underscores the importance of maximizing and sharing economic rents as a mechanism to maximize the development benefits of hydropower:

Economic rent is the surplus return (earnings or profit) that some factors of production generate when they vary in quality and are limited in supply. Hydropower resources fall into this category. Rent is a unique form of return in that it will not be dissipated by free market competition and will continue to accrue to whoever holds the right to exploit those resources (p. 380).

The author examines the actual cases of rents captured by various governments (Canada, Laos) and looks at innovative practices of explicit and implicit rent sharing with affected communities, which have emerged in countries pioneering this approach. He builds on the work of Égré et al (2008) and Milewski et al (1999) to examine four basic types of evolving arrangements for rent sharing: (a) “resettlement assistance,” for example village development funds and committees in Laos; (b) “tax sharing,” for example agreements to devote a percentage of levied taxes made possible by project created businesses in China; (c) “royalty sharing,” for example distribution of a percentage of royalties to affected communities across the region (catchment basin) in Brazil; and (d) “equity sharing with power producers,” for example, “true development partnerships” (going beyond purely financial arrangements) between provincial power and indigenous leaders in Canada.

Trembath’s main tentative conclusions on the rent sharing models are that there is an increasing tendency for sharing rents with PAPs and this is yielding positive developmental outcomes. Although formulas for doing this vary and it is too early to come to definitive conclusions as to best methods, the author considers that the most effective mechanisms are those that explicitly provide rents as a share of revenue, profits, or cash flow from the power plant, while noting that, “Conceptually, royalty sharing is the preferred method of rent sharing.”

Another important conclusion of Trembath's work is that there is a growing perception that rent sharing should benefit the region in a broader sense than just the local community. One approach is to develop rules for rent sharing among different levels of government depending on project size. This arrangement should specify upstream and downstream stakeholders, an approach in line with the Dublin Principles,⁹ which provide for integrated resource management. Such an approach is particularly relevant to large projects with vast catchment areas. Finally, Trembath concludes that from the projects he has reviewed, it is clear that only a small share of the total rent is locally distributed. However, the author considers that well used, such amounts are sufficient to significantly contribute to local and regional development.

Haas and Tung (2007) propose a formula and standard procedures to remit a share of the revenue (i.e., a royalty) generated by a hydropower project into a project-specific revenue sharing fund, and to internalize this cost in the retail electricity tariff. The aim of the fund is to offer a menu of local development measures preferred by beneficiaries, administered through a grant application program. They recommend appointing a benefit sharing council with appropriate local representation to manage the Fund and to make other recommendations on non-monetary forms of benefit sharing to extend to the project's host community. They propose a collaborative framework which sets out transparent eligibility criteria, grant selection and award procedures and all the local administrative arrangements in order to ensure public confidence is maintained.

Upadhyaya (2006a) reviews inequities and injustices in hydropower projects in the compensation of affected parties and allocation of benefits to local communities, drawing upon project experiences in Brazil, China, Colombia, Costa Rica, India, Nepal and the United States. A main finding is that there is a need for guidance on fair distribution of royalties that should also include different rules for mega-hydropower projects where wider distribution of benefits is possible. Upadhyaya (2006b) also recognizes the importance of a royalty share being allocated for upstream watersheds (to ensure provision of environmental services) and for downstream areas, which are at present often excluded.

Moving Beyond Compensation and Mitigation to Benefit Sharing

Alongside authors - mainly economists - who have considered the issue of benefit enhancement and sharing predominantly from an economic perspective, a parallel school of thought has been evolving since the 1980s among development practitioners more concerned with impact assessment and sustainable outcomes. Whereas the dominant approach historically generally considers mechanisms that yield monetary benefits to stakeholders, over the past decade or more, a parallel approach has increasingly evolved which involves non-monetary mechanisms that often complement monetary ones. For the purposes of this study the latter approach is referred to as a "sustainable development approach" based on the greater importance given to the non-monetary social and environmental benefits that accrue from maximized rents.

⁹ The Dublin Principles aim to promote changes in the concepts and practices considered fundamental to improved water resources management. They were formulated through an international consultative process culminating in the International Conference on Water and the Environment in Dublin, 1992. Subsequently, they contributed significantly to Agenda 21 recommendations (Chapter 18 on freshwater resources) adopted at the United Nations Conference on Environment and Development in Rio de Janeiro, 1992. Since then these principles have found universal support among the international community as the underpinning principles of Integrated Water Resources Management. The four Dublin Principles are: Principle No. 1 - Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment. Principle No. 2 - Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels. Principle No. 3 - Women play a central part in the provision, management and safeguarding of water. Principle No. 4 - Water has an economic value in all its competing uses and should be recognized as an economic good.

It is important to recognize that although they have come from different starting points, there is much convergence of the different schools of thought. Economists on the whole usually recognize the importance of environmental and social and equity issues as evidenced by the literature summarized in the previous section. In turn, environmentalists and sociologists overall acknowledge the more tangible monetary benefits that dominate economics. That said, while the literature has addressed the mechanisms for enhancing and sharing monetary benefits in a fairly comprehensive and systematic way, the literature on non-monetary benefits is less developed, more dispersed, and usually addressed as a supplemental corollary to discussions of monetary benefits. The remainder of this section highlights examples of descriptions, analysis and commentary on non-monetary benefits.

A Current Example of Benefit Sharing and Project Enhancement

A current attempt to consider non-monetary benefits, equitable redistribution, and empowerment of local communities is represented in recent work conducted by the Electricity Regulatory Authority of Vietnam to prepare and test guidelines to introduce benefit sharing mechanisms in their hydropower projects. Reporting on this work at the end of 2007, Lawrence Haas, Dang Vu Tang, and their colleagues (Haas, Tung and IES, 2007) explain that academic researchers and development practitioners have begun to refine the commonly practiced definition of benefit sharing. Their approach goes beyond the conventional top-down allocation of economic rents:

The notion of benefit sharing goes beyond one-time compensation payment and short-term resettlement support for displaced people. It treats both displaced people and communities that host the hydropower project in their locality as legitimate partners in the project and first among its beneficiaries (p.8).

The study report presents a menu of benefit sharing or redistributive mechanisms for practical application in the form of a set of guidelines and draft regulatory decree for Vietnam. The guidelines categorize benefit sharing mechanisms under three areas:

- Equitable sharing of electricity access and services (for example mechanisms such as mandatory electrification of resettled areas).
- Entitlements for enhancing resource access (for example mechanisms such as grass roots People's Committees with policy making power).
- Revenue sharing (for example mechanisms such as central reserve funds to facilitate financial transfers).

The Vietnam benefit sharing report notes, as many previous studies have, that livelihood restoration is often the weakest part of resettlement planning; most attention is often placed on direct cash compensation. In order to address this in the Son La Hydropower Project,¹⁰ the ADB has established a technical assistance fund to build local capacity for livelihood restoration activities. The fund was used to increase the capacity of both resettlement authorities and PAPs. Capacity building and training focused on three major areas:

¹⁰ The Son La Hydropower Project is part of a Master Plan for the Hydropower Development Cascades on the Da River. It is the largest hydropower station planned for the country, and involves resettlement of over 20,000 families from ten different ethnic groups. Construction of the US\$3.2 billion project started on December 2, 2005 and is expected to be completed by 2015. Resettlement to a pilot site began in 2003, and resettlement is currently still in progress.

- Training government staff to use Geographic Information Systems to assess potential resettlement sites, how to assess soil types and availability of natural resources and how to plan and implement livelihood activities.
- Training PAPs on harvest improvement.
- Training PAPs on livestock management.

The Enabling Conditions

What are the enabling conditions for channeling benefits to local communities? This topic is addressed by Mokorosi and van der Zaag in a set of detailed articles published in 2007. Drawing upon experience in southern Africa's Orange Senqu River Basin, they observe that benefits are rarely equitably shared. When local PAPs receive benefits, these are generally only indirect or secondary benefits, such as community services, access to construction jobs, or skills training, whereas non-local and non-affected stakeholders, for example off-takers and urban citizens, receive the direct or primary benefits, such as urban water supply, electricity provision and cash royalties. To remedy this situation, and make benefit sharing a practical reality for local communities, the authors identify three enabling conditions to facilitate the effective application of specific mechanisms:

- National legislation must support the concept of local PAPs being the primary beneficiaries.
- Mechanisms must be defined at the outset of the project planning stage.
- Local authorities must have sufficient capacity.

Mokorosi and van der Zaag assert that the political environment, as reflected in the national legal and institutional framework, plays a major role in protecting or marginalizing PAPs. Therefore, their rights and entitlements must be protected in national legislation. The authors suggest that one of the key mechanisms for translating monetary benefits into sustainable development outcomes for local communities is the use of community investment programs (CIPs).

Community Investment Programs

In 2006, the Inter-American Development Bank (IADB, 2006) published an overview of public sector investments for private sector consideration in hydropower and other major infrastructure projects. The report sets a clear definition for distinguishing between conventional compensation and the benefits that would qualify under a CIP:

“These ... must be considered as ideas and activities that go “above and beyond” a company’s obligation to fully mitigate any negative environmental or social impact that they cause and comply with all in-country regulations related to the environment, social protection, health and safety, and worker’s rights. For example, a toll road concession might entail a requirement in which certain users are provided with discounted road-use fees. Even though these users might be members of a local community, compliance with the requirement would not in itself be considered as a community investment program. On the other hand, if no such requirement existed – and the company developed its own program to discount road fees for a local community – then it would be considered a community investment.”

Thus, CIPs should go above and beyond compliance with regulatory requirements and provide a way for companies to expand their beneficial impact on local communities. In order to do this, CIPs should be designed to meet the needs and demands of each community; this involves developing long-term

sustainable relationships with the communities in which they operate. CIPs are based on principles of transparency, inclusiveness and fair and equitable distribution of benefits and should consider the needs of present and future generations. Some authors, such as Trembath (2008), categorize the use of CIPs as one form of resettlement assistance.

The IADB report suggests a comprehensive list of generic community programs related to education, health, poverty reduction, children and youth, environment, community empowerment and development, cultural and historical heritage, Indigenous Peoples and emergency response. It lists support programs and community activities that should be considered specifically in regards to hydropower generation, transmission and distribution and water resource management; these are presented in Table 2.2. These lists provide helpful menus of the range of opportunities to deliver both monetary and non-monetary benefits to local communities.

Table 2.2: Community Investment Program Activities for Hydropower Projects identified by IADB's 2006 CIP Report

Hydropower Generation	Hydro Transmission & Distribution	Water Resource Management
<p>Development in fisheries, tourism, recreational, and other uses of the reservoir.</p> <p>Research and educational efforts related to fisheries, fauna, and flora in the reservoir.</p> <p>Ecological research programs, such as meteorological stations, microclimate monitoring, geological, and archeological research programs.</p> <p>Educational programs on business and residential energy efficiency.</p> <p>Educational programs on reduction of GHG emissions</p> <p>Local health programs, such as hygiene, public health, HIV/AIDS, disease-carrying vectors.</p>	<p>Provide free or reduced rates for special users, including schools, libraries, and community centers in impoverished communities.</p> <p>Sponsor educational programs for schoolchildren and local community organizations to prevent accidents involving contact with electric lines and electrical substations, and tower climbing (e.g., to retrieve kites).</p> <p>Sponsor energy conservation programs.</p> <p>Distribute low-energy-consumption light bulbs in low-income communities.</p> <p>Provide special rates and assistance on connection for disadvantaged residential customers.</p> <p>Provide technical and financial assistance to community centers, libraries, sport fields, and schools for lighting systems, electrical transformers, and other equipment.</p> <p>Sponsor community awareness programs on the health and safety risks related to electromagnetic radiation near high-voltage lines.</p>	<p>Promote water conservation and reuse programs.</p> <p>Provide access to potable water for disadvantaged persons not connected to water systems.</p> <p>Sponsor programs for watershed protection and management.</p> <p>Support water quality monitoring in lakes, streams, and rivers.</p> <p>Provide special rates and assistance to disadvantaged residential customers.</p> <p>Sponsor research and educational activities related to potable water supply.</p> <p>Sponsor research on environment-friendly water supply and wastewater treatment.</p> <p>Sponsor water quality programs involving local schoolchildren and youth.</p> <p>Promote reuse of effluents to conserve water resources.</p> <p>Support reuse of sludge to fertilize marginal soils or non-food agricultural fields (e.g., flowers).</p> <p>Provide assistance to install rural, waste-water treatment systems.</p> <p>Support watershed and water resource cleanup and remediation programs.</p> <p>Promote environmental education programs for schoolchildren and community groups.</p>

Writing for the ADB, Jason Rush (Rush, 2007) describes the current experience of applying CIPs to the Nam Theun 2 Project in the Peoples Democratic Republic of Laos. These CIPs are being applied both to those communities being resettled from the reservoir area, and to upstream and downstream communities.

In addition to providing new homes to 1,216 affected people, the project is providing schools, health units, training programs, and plots of land for farming to each affected family. Additional agricultural and pasture lands are being provided to the communities. Year round access to clean, potable water for local communities has already been shown to have significantly improved health, by reducing the incidence of water borne diseases including malaria, with notable improvements in infant mortality and

health. The project has also put aside a separate fund supporting the preservation of 4,000 square kilometers of forest as a permanently protected wilderness reserve to protect elephants and other wildlife. In addition to covering the direct costs of resettlement, the project developer and its financial backers, including both the ADB and the World Bank, are providing US\$16 million to offset livelihood losses such as the anticipated loss in fish catch for downstream communities, and US\$31 million to protect wildlife habitat mainly upstream.

Overall, Nam Theun can be considered as providing an example still in the making that illustrates the opportunity to use dam-induced resettlement as a catalyst for development, providing social and environmental benefits to local communities in the immediate vicinity of the dam and reservoir as well as in the larger basin and nationally.

Overview of Outcomes of Benefit Sharing

The most obvious and direct benefits of HEP projects to society are the provision of electricity, provision of water supply, creation of construction jobs, and the provision of replacement housing and community infrastructure for PAPs. HEP projects can also provide a wide range of other types of benefits that go beyond strict compliance with compensation and mitigation approaches.

It is fairly common for HEP projects to consider community development initiatives concerning issues of health, poverty, economic development and gender. This section presents a survey of development outcomes associated with HEP. It intends to provide examples of development outcomes and although one particular project may be used as reference, the premise is that such benefits or development outcomes have also occurred in other similar projects.

Community Benefits of Rural Electrification

The benefit of HEP derived electricity is primarily received by urban communities who are connected to the national grid and who are not directly affected by HEP projects. Especially in developing countries it is not unusual for HEP projects to be situated in areas where local communities, often comprised of indigenous or vulnerable people, do not have electricity infrastructure or cannot afford the costs of connection to their homes and hence do not participate in the benefits associated with secure affordable electricity supply. The World Bank (2008) has produced an assessment of the costs and benefits that affect the welfare impact of rural electrification. It provides a review of the domestic, community and productive uses of rural electrification and discusses, among other issues, the benefits related to lighting and television, health, time use, education, production as well as the overall benefits related to having access to electricity.

HEP development can facilitate rural electrification that otherwise would not have taken place. One such example is documented by Tshering and Tamang (2007) which looks at the benefits of rural electrification enabled by HEP development in Bhutan, where in 2007 approximately only 40 percent of the total population and 30 percent of rural people had access to electricity. In communities adjacent to the HEP projects, artificial lighting has particularly improved the quality of life of students and housewives, contributing in the latter case to women's development. Once electricity service was made available to their homes, it usually enhanced rural income activities and provided more productive time under better light. Rice cookers and water boilers facilitated kitchen work and overall exposure to health hazards from smoke created by fuel wood was reduced. Rural community infrastructure and social services were dramatically improved, especially the quality of services of basic health units and the telephone network.

A micro hydropower example documented by the United Nations Development Programme/Global Environment Facility (UNDP/GEF, 2003) is the 18kW Tungu-Kabiri Community Micro Hydro Power Project in Kenya implemented by a local NGO in partnership with the community. This project yielded a range of direct and spin-off social benefits for the local community, for example: a health clinic is now able to use electricity to refrigerate medicines; lighting instead of kerosene burners is used, thereby reducing the risk of respiratory and eye problems; lighting in houses at night is enabling children to study; women and children do not have to collect as much firewood so they have more time; and there are improved local opportunities for use by neighboring villagers such as a new social hall and community development office, as well as other service shops with an energy supply.

The key mechanism for attaining these benefits was grass roots capacity building. Just like empowerment of individuals, institutional capacity building is considered a mechanism to maximize a whole range of specific benefits. The Tungu-Kabiri project built the capacity of the local community to construct, maintain and repair the electrical system. It also established their capacity to manage and operate a power scheme. The implementing NGO is still providing advice and support as the community decides upon tariffs for the use of power and rent for the use of stalls in the micro-enterprise centre.

Another example of a small scale HEP project providing a wide range of social benefits to local communities can be found in Tibet (GTZ, 2004). This GTZ funded project involved the rehabilitation of projects in three rural communities. The community leases the mini hydropower plant to one of the villagers who was trained and advised by GTZ. Long-term operation is assured with the revenue from the electricity charges. Reserves are put to pay for repairs and grid expansions. The first surpluses were used to connect the neighboring community to the grid, along with isolated farms and two large irrigation systems. Billing of power supply is according to consumption and in a manner that is comprehensible to all stakeholders including consumers. According to GTZ, this private sector operator concept was successfully replicated by the Office for Water Resources Management in the whole of Tibet.

The project objectives included development measures and the project aimed to promote development outcomes. The primary objective was to increase employment through provision of electricity, helping to set the stage for local development. The spin-off benefits included loans being made available for farmers and craftsmen to buy small machines such as grain mills, oil presses, planing machines or welding equipment. The loans also enabled households to invest in electrical appliances such as refrigerators, electric mixers, spinning machines and carpet shears, which in turn gave them economic empowerment and the ability to initiate or consolidate sustainable businesses. Additional socio-economic benefits came in the form of tourism, as an electric water pump for the guesthouse was provided and the restaurant was able to open in the evening thanks to new lighting; locally manufactured turbines, generators, switching and control devices were used, thus boosting the local economy.

Water Supply and Related Benefits

Water issues are addressed in a wide range of hydropower articles and case studies in a general manner, with a focus on positive and negative impacts of hydropower schemes and less detail on how water issue benefits have been, or could be, enhanced (Shah and Kumar, 2008; the WCD Pakistan Case Study). Best practice for addressing water-related issues related to hydropower projects; such as downstream water supply, improving integrated water resources management, water pricing and watershed management is generally confined to specialized articles on these subjects, and not often included in hydropower or multi-purpose dam-specific articles and case study material. Useful sources include the International

Union for Conservation of Nature (IUCN) “Pay” publication; Irrigation water pricing, the gap between theory and practice,” written for the Comprehensive Assessment of Water for Agriculture, Global Water Partnerships’ Technical Background Paper No. 4 on Integrated Water Resources Management, and selected parts of the study “Water for Food, Water for Life.”

The benefits and transfer mechanisms for the major water issues, namely water supply, flood and drought control, watershed management, water rights, and environmental flows related to hydropower schemes are summarily discussed below.

Hydropower projects often involve the provision of irrigation and domestic water supply downstream, but as inherent parts of multi-purpose schemes, are not often seen as real “benefits.” Dam schemes have had a huge positive impact on world food security over the last few decades. About 30-40 percent of irrigated land worldwide relies on dams, and about 40 percent of food is produced on such land (UNEP, 2007). The contentious issue for multi-purpose dams used primarily for hydropower is that water is released at different times than is often required for irrigation purposes. The dam’s operation therefore needs to be optimized so that power can be generated while also providing water for irrigation downstream. Conversely, it is also important that irrigation be managed in such a way that water storage is used effectively and not wasted. Some of the methods to improve the performance and productivity of irrigation systems are outlined in Chapter 5 of the WCD report.¹¹

In more remote areas and even some urban areas in developing countries, women mostly spend time and scarce money to collect and purchase water. The provision of better water supply can provide benefits by freeing individuals from this onerous task and providing them more time for other productive pursuits. Additionally the quality of the water supply may be better as it may be more easily monitored. In terms of domestic water supply, enhancements can also be made by using demand side management techniques: metering and tariff structures, for example, will greatly increase efficiency (UNEP, 2007).

A main benefit of dams is flood control, which often is inherently integrated in project objectives and design. The effect of a dam and reservoir on a river’s flood hydrology is a function of dam design and reservoir characteristics as well as the nature of the influent flood. The extent to which dams attenuate floods effectively can be reduced if the dam is to serve other purposes, which depend upon an abundant supply of water being stored behind it at certain times of year. “A Review of the Role of Dams and Flood Management” (Hawker, 2000), details case studies where dams are used for flood control across the world and outlines lessons learned and policy measures based on the case study findings. One useful suggestion is that operating rules should be enshrined in entitlement licenses, with a system of fines for non-compliance that negate the potential economic gain associated with breaching such rules (e.g., gaining extra hydropower revenue by encroaching into flood storage). However, it must be recognized that de facto in many or most cases, flood control is a dam site constraint – as well as a project benefit – that is taken into account during project cost planning as well as covered by operation regulations.

Dams can also be used to secure domestic water supplies through drought periods. In India, for example, the National Water Policy earmarks water from irrigation reservoirs for drinking water supply during droughts (Shah and Kumar, 2008).

¹¹ World Commission on Dams Report (2000), “Dams and Development”, Chapter 5, “Options for Water and Energy Resources Development.”

Watershed management can improve power generation potential by extending the ability to generate dry-season power and by delaying reservoir siltation. In addition, watershed management can be used as a tool to improve livelihoods within communities upstream of the reservoir. Two of the articles reviewed were hydropower case studies with a focus on improving the health of upstream catchments. A Venezuelan case study (IADB) briefly outlined the Integrated Watershed Management Plan set up in 2003 to support sustainable use of the watershed to maintain hydropower potential using the following mechanisms: water and soil conservation, revision and improvement of the relevant legislation, environmental education, implementation of research studies, and monitoring and enforcement. A second case study from the Philippines (Watershed Management Department of the Philippines) outlined practices currently in place to effectively manage forestry and agricultural activities of watersheds and improve livelihoods. It included reforestation, vegetative erosion control measures, agro-forestry, and non-timber forest management to rehabilitate and stabilize sparsely vegetated and critically degraded areas of watersheds. Livelihood training, seedling and animal dispersion, formation of people's organizations and technical assistance are amongst the enhancement measures that were used to improve livelihoods. Other mechanisms included the enforcement of forestry laws and military assistance in the apprehension and confiscation of illegally gathered forest products.

A hydroelectric scheme may also affect water rights, usually by re-determining how and when water is distributed downstream. No literature reviewed to date was found directly linking the issue of water rights to the instigation of a particular hydropower scheme. However, there exist a number of articles that outline best practice for integrated water resources management. These include Global Water Partnership's "Integrated Water Resources Management" Technical Background Paper 5 and IUCN's "Pay" publication 3, which offers practical advice on how to establish fair payment schemes for users of watershed services, such as irrigation and domestic water supply.

The establishment and empowerment of water user associations often occurs as part of the water re-distribution process that takes place in conjunction with the implementation of a large hydropower/dam scheme, and goes hand in hand with the determination of water needs and rights. Water user associations may have a positive influence; as communities increase their participation in managing water resources, service delivery and cost recovery often improve.

Environmental flows also provide benefits to the ecology of river basins that can be measured in terms of ecological services that support human activities. Although there has been tremendous progress in determining environmental flow requirements to maintain or enhance river basin ecology, in a survey to identify water management practitioners' perceptions of environmental flows, Moore (2004) found that one of the key constraints to assessing environmental flows is the lack of data and suitably qualified scientists and technical support in developing countries. The provision of scientific expertise and results of data collected as part of the environmental and social impact assessments can provide an important enhancement benefit to local research programs and stakeholders. This is particularly the case if opportunities are provided for local stakeholders to be involved in the data collection and study process.

Employment, Training and Other Opportunities

Provision of employment is often cited as one of the primary social benefits of HEP projects; however, it must be recognized that most of the employment is often construction related and therefore temporary. The literature recognizes that one should not overstate the contribution of HEP employment creation.

Diduck et al (2007) have observed that the EUR620 million 520 MW Tapovan-Vishnugad project HEP project in Uttarakhand, India will create many jobs and the promise of paid employment was welcomed by the people. However, many of the paying positions will go to workers from outside the region and the vast majority of jobs for locals would be confined to the construction period and thus would often not necessarily contribute per se to long-term economic growth and development. Given the area's poverty and the lack of employment, the promise of employment during construction was a powerful attractor for many but, at the same time, the loss of productive land, especially when combined with the environmental impacts of the project, threatened to destabilize their traditional agriculture-based economy. This example emphasizes the need for local worker preference policies and additional support to local agricultural economies. The challenge to maximize employment benefits is to create new jobs skills that will serve afterwards for other employment or income generation opportunities. In order to do so, planning enshrined in agreements should be reached at the options assessment or pre-feasibility stage. These should include measures such as hiring of PAPs on planning surveys, construction works and in operation activities (Roquet and Associates, 2002).

HEP development can also provide training services that may be useful for the immediate but also future employment opportunities, as was the case in Tibet, in which a specific mechanism to enhance benefits and developmental outcomes was the provision of training for electricians, cooks and tourist guides as well as courses on welding, woodworking and carpet weaving (GTZ, 2004).

Not all employment generation is a direct benefit related to construction of the HEP; livelihoods can also be indirectly enhanced through spin-offs and related socio-economic development such as tourism. An example of tourism benefits can be seen in the 14 GW Itaipu HEP project on the border of Paraguay and Brazil, which supplied 93 percent of the energy consumed by the former and 20 percent of that consumed by the latter as of 2005. The Itaipu site has become a major tourism attraction. The project created the "Bela Vista Sanctuary" for displaced animals, which included an eco-museum, and the Museum of Guarani Land, which retraces the ten thousand years of Guarani life and culture in Paraguay. The dam also provides a light show and the Tatí Yupí Sanctuary, which is an environmental protection unit created and maintained by Itaipu in Paraguay that is open to visitors. There is a local zoo where Itaipu preserves the wealth of animal life found on the Paraguayan side of the Paraná River, and a nursery where seedlings are grown for the reforestation of woods and forests degraded by human activity. As well as creating jobs, these initiatives attract tourists who spend money in the local communities.

Simpson (2006) notes that conceptually, there appears to be two similar but opposing schools of thought on how to maximize social benefits to local people through tourism: the newer community based tourism initiative (CBTI) approach, versus the predominant community management approach. The difference between the CBTI approach and other initiatives is that a defining principle of CBTI is the transfer of benefits to a community regardless of location, instigation, size, level of wealth, involvement, ownership and control. The more established approach involves community ownership, management and control, whereas the CBTI approach does not always need to involve the community in any rights, tenure or control of the project in order to achieve distribution of benefits. The CBTI focus is on securing partnerships with all stakeholders - communities, business, government and civil society - to bring the appropriate mix of skills and resources required for optimum benefits. Community participation, control or level of ownership should occur mainly to ensure delivery of the appropriate proportion and type of benefits to the relevant community (as a whole, not just a predefined section of society). The CBTI approach aims to engender localized and regional development. For the purpose of integrating tourism

into hydropower development, it could be argued that the benefits of tourism should be considered in both forms – community based and non-community based initiatives – depending on what best suits the specific site/community and meets the investments purpose.

Involuntary Resettlement

There is general agreement among resettlement practitioners that resettlement can be planned and implemented to provide development outcomes that improve the standard of living of PAPs and provide overall benefits. The World Bank OP 4.12 encourages this approach. Unfortunately, many projects only intend to restore previous standards of living, seeing resettlement action planning as no more than a mitigation tool focused on compensation. In fact, a growing amount of evidence shows that even restoration of living standards is difficult to achieve in many cases. There are several examples of using resettlement as a development opportunity in different projects. In addition to providing new homes, they also provided schools, health units, training programs, socio-economic income generating activities and community organization.

Transboundary Benefits

In their pioneering 2002 article, “Beyond the River: The Benefits of Cooperation on International Rivers” (Sadoff and Grey, 2002), David Grey and Claudia Sadoff, both senior staff at the World Bank, made the case that national riparians need to be able to perceive not just the water resource itself, but the range of benefits that can be derived from cooperation rather than conflict over the river’s use. These potential benefits are defined in a four-part typology:

- To the river: cooperation enables better management of ecosystems, providing the environmental benefits that underpin all other benefits.
- From the river: cooperative management and development of shared rivers can yield direct economic benefits, notably increased food and energy production, and flood and drought management.
- Because of the river: tensions between co-riparian states will always be present, if underlying, but cooperation will decrease costs related to political benefits, including reduction of tensions.
- Beyond the river: international rivers can catalyze indirect economic benefits, through broader regional cooperation and integration.

The extent and relative importance of each of these will vary greatly among basins, reflecting political, geographic, economic and cultural circumstances. In some cases, the scale of benefits may not justify the costs of cooperative action; in others, the sum of benefits can be very high. Identifying and understanding the range of often inter-related benefits derived from the cooperative management and development of international rivers is central both to better management of rivers, and to relations among the nations that share them.

Sadoff and Grey’s 2005 article “Cooperation on International Rivers: A Continuum for Securing and Sharing Benefits” builds on the earlier typology to provide a menu of options and choices to help riparians perceive the opportunities of cooperation. Both simple sharing of water rights and sharing of the four types of benefits involve negotiations to achieve what each riparian will consider “fair shares.” Various payment/compensation options are reviewed with the aim that perceived inequities in the distribution of gains does not prevent cooperation. A “Cooperation Continuum,” moving from unilateral

action through coordination to collaboration and joint action, provides a framework for applying the four types of benefits.

A significant new tool for supporting these efforts to promote cooperation is introduced: Cooperative Regional Assessments (CRAs). CRAs may be comprised of:

- *Transboundary Analysis* (“without borders”) of the range of potential benefits of cooperation, providing a basin-wide view of the best possible river management and development opportunities.
- *Distributive Analysis* (“with borders”) of the relative share of benefits and costs for each riparian nation under alternative management and development scenarios (to ensure that a program designed to maximize net gains for the basin as a whole will also provide acceptable gains for each country individually), and exploration of the options for sharing the costs and benefits of cooperation more equitably.
- *Institutional Analysis* of the possible modes of cooperation necessary to generate the greatest net benefits, taking account of the costs of cooperation.

CRAs should be designed for the specific circumstances of the river basin. They should provide a practical approach to bring together a range of stakeholders, share information to expand perceptions and explore alternatives to reach common understanding and consensus.

The authors purport that cooperation for improved river basin management is recognized to be a costly, time consuming, iterative process. But it is this process of analysis-negotiation-implementation, repeated in all of its complications over time, which leads to cooperation, optimization of benefits from the river basin resources, and satisfactory sharing of those benefits and sustainable development for the riparian neighbors.

Transboundary Water Cooperation

In a 270-page study (Phillips, Daoudy, McCaffrey, Ojendal and Turton, 2006) prepared for the Swedish Ministry of Foreign Affairs, a team of five international consultants and academics analyses the potential of cooperation on international transboundary waters as a tool for preventing conflict and for encouraging the broader sharing of benefits by co-riparians. The work refers to and explicitly builds on Sadoff and Grey (2002). Three river basins – the Jordan, the Kagera and the Mekong – are assessed in detail, applying the “Inter-SEDE model” (security, economic development and environment), which consists essentially of a matrix with these three broad categories of issues.

The authors find that preferred approaches to future improvements can be determined, but each case is unique. Preferred approaches for donors and the riparian states will include:

- Positive-sum outcomes for water allocation and benefit sharing.
- Determining benefit sharing more closely and addressing benefit sharing wisely.

Factors to be considered include:

- Intra-sectoral allocative efficiencies: Many countries utilize water inefficiently, especially in agriculture.
- Inter-sectoral allocative efficiencies: Where water-stressed states rely heavily on the agricultural sector for their foreign earnings, inter-sectoral water allocations should be considered in detail.

The authors believe a greater consideration of virtual water flows would be useful and that joint water management is a desirable objective in transboundary basins. However, the form that this should take varies considerably.

Carbon Financing as a Source for Enhancing Development Benefits

There are various financial mechanisms for transferring GHG reduction benefits into financial benefits. In developing countries that have ratified the Kyoto Protocol (KP), the main mechanism is the Clean Development Mechanism (CDM). Under the CDM a project generates certified emission reductions (CERs). In countries that have ratified the KP and have an emission reduction target under it, the main mechanism is Joint Implementation (JI). Under JI, a carbon savings project generates emission reduction units (ERUs). There are also numerous non-KP compliant carbon reduction projects, which collectively make up the voluntary carbon market and generate verified emission reductions (VERs). The voluntary market has probably been in existence for more than 10 years. VERs are generated from a wider range of carbon reduction/offsetting schemes and are subject to less stringent approval and auditing methodologies than CDM and JI. However, various standards are being developed that can be used for voluntary and/or regulated market projects.

The CDM has been operational since 2005, but projects dating back to 2000 onwards were (until 2007) able to register if they could prove they had the intention of using carbon finance when the project was implemented. There are currently over 900 hydropower projects in the CDM pipeline, out of a total of around 3,500 projects. Over 600 are run-of-river projects, 60 use existing dams, and 240 involve new dam construction. If all these projects are developed they will produce a total of nearly 89.5 million tCO₂e (tones of carbon dioxide equivalent) in GHG reductions annually. In 2007 the average price for CERs was US\$13.6.¹² This would mean annual carbon finance revenue of over US\$1.2 billion for hydropower projects. The majority (over 570) of hydropower CDM projects are located in China; India hosts nearly 90 and Brazil just under 60. No other individual country hosts more than 15.

JI projects can claim credits from 2008 onwards, although JI is much less developed than the CDM; only two projects have reached the determination stage and no ERUs have yet been issued. So far one hydropower project has been rejected by the JI Supervisory Committee (JISC), due to inadequacies in the project design document (PDD). These did not relate to community benefits or disbenefits. One hydropower JI project has been approved and there are a further five hydropower projects in the JI pipeline (five in Bulgaria and one in Russia). If all are approved, these will deliver 333,000 ERUs per year to hydropower projects, totaling nearly 1.7 million ERUs up to 2012. In 2007 the average price for ERUs was US\$12.2. It would therefore mean annual carbon finance revenue of over US\$4 million for hydropower projects.

Statistics on the number of voluntary carbon market hydropower projects being developed and the revenue stream the carbon market provides are less well documented. Voluntary projects can be developed anywhere in the world, though this may be constrained if inclusion in a particular scheme or standard is sought.

There is little literature that analyses the use of carbon finance as a mechanism to enhance community benefits of hydropower projects. Literature reviewed included documentation from hydropower CDM

¹² World Bank 2008, State and Trends of the Carbon Market 2008.

and JI projects, CDM methodologies and voluntary carbon standards that can be applied to hydropower projects, country specific CDM policy, World Bank carbon finance project data, and general analysis of the CDM and sustainable development.

In terms of community benefits, the literature review highlighted two main ways in which carbon finance can enhance community benefits: through application of the carbon finance mechanisms themselves and by using the carbon revenue they generate.

Carbon Finance Mechanisms and Community Benefits

Methodologies for hydropower projects developed under the CDM require that projects demonstrate additionality. This means that they are only approved if they can justify that they bring additional GHG reductions that would not have been delivered without the use of carbon finance. In this sense they therefore bring benefits to the global community. The more GHG reductions a project brings, the more carbon finance it leverages, thus incentivizing a project developer to maximize emission reductions. In this way, if, for example, a technology to capture GHG emissions from reservoirs were developed, it might help finance its deployment.

The CDM was designed under the KP with the twin goals of reducing GHG emissions and bringing sustainable development benefits to developing countries. However, there has been criticism that many CDM projects do not adequately fulfill the sustainable development criteria, due to a lack of clear definition and widely differing approaches between host countries. Under its Development Dividend project, the International Institute for Sustainable Development (IISD) found that the general approach of host country governments is that if, on balance, a project brings a “net benefit” to the country, it gets approved. However, in some cases the simpler approval criterion of “no harmful impacts” is adopted. This suggests that little is done to enhance the community benefits that the projects may bring.

Four CDM PDDs were reviewed in detail: Xiaogushan hydropower project, China; Cote small-scale hydropower project, Costa Rica; La Vuelta and La Herradura hydropower project, Colombia; and Reconstruction of Calderas hydropower project, also Colombia. One JI PDD (Sreden Iskar Cascade HPP Portfolio project, Bulgaria) was also reviewed. Stakeholder consultation and minimization of environmental disbenefits are mandatory requirements for the PDD. Although not mandatory, some PDDs also outlined the social benefits of the projects. For example, the Sreden Iskar Cascade hydropower portfolio JI project will bring new investment and employment to an economically depressed part of Bulgaria. The Xiaogushan Hydropower CDM Project will create new employment and improve transport routes in an area of China dominated by a Tibetan minority that has an average poverty level of 94 percent. The CDM project to reconstruct the Calderas hydropower plant in Colombia is creating new jobs in a region previously held by anti-government insurgents. It has also improved safety conditions by clearing personnel mines, and rebuilt the destroyed electricity infrastructure. Another example is the Amoya River Environmental Services Project in Colombia which is currently being built. Its objective is to contribute to the reduction of greenhouse gas (GHG) emissions from the power sector in Colombia through the promotion of a 80 MW run-of-river generation facility. This project allocates twenty percent of the GHG reductions for community development projects (10 percent) and for environmental protection programs (10 percent).¹³

¹³ The Project supports an environmental program for the protection of the Paramo de Las Hermosas and a social program that will contribute to improvements in the welfare of the local community in the municipality of Chaparral.

It is difficult to prove that the benefits outlined above were created mainly because a carbon finance mechanism was used, and were not already inherent to the project. However, the literature review did highlight three ways in which the use of carbon finance mechanisms is more likely to enhance community benefits.

- By using a carbon finance mechanism under which it is mandatory that the project brings community benefits.
- By imposing investor / buyer criteria.
- By using carbon finance mechanisms to widen the scope of benefits related to a hydropower project.

These are discussed further below.

Standards that Enforce Community Benefits

World Wildlife Fund (WWF) “A Comparison of Carbon Offset Standards” (2008) and New Carbon Finance / Ecosystems Marketplace “State and Trends of the Voluntary Carbon Market” (2008) have both produced recent reports that outline the different standards under which carbon offsets can be developed. A summary of the standards currently on offer and the community benefits criteria of each is provided in Table 2.3.

Two standards in particular are noteworthy: the Gold Standard and the Social Carbon methodology. The Gold Standard acts as a quality label for CDM, JI or voluntary market carbon reduction projects. It can only be applied to projects that demonstrate clear benefits in terms of sustainable development. By attracting a premium price for the credits generated, it therefore provides an incentive to develop such benefits. Each project is assessed against indicators under the following three categories:

- Local / global environmental sustainability.
- Social sustainability and development.
- Economic and technological development.

Small low-impact hydropower CDM projects of up to 15MW may be eligible for the Gold Standard.

The Social Carbon methodology was developed to ensure high quality carbon reduction projects that value local communities by using a sustainable livelihoods approach. It has so far been predominantly applied to forestry projects in Portugal and Latin America, but it may be possible that hydropower projects could use it.

Table 2.3: Summary of Carbon Market Standards

Mechanism	Location	Description	Traded unit	Community considerations	Hydropower eligibility
CDM	Non-Annex I countries under KP (developing countries)	Regulated under KP	CER	Mandatory stakeholder consultation Negative environmental impacts must be minimized	Any, but some buyers have own criteria regarding hydropower CERs
Joint Implementation (JI)	Annex I countries under KP	Regulated under KP	ERU	Mandatory stakeholder consultation Negative environmental impacts must be minimized	Any, but some buyers have own criteria regarding hydropower ERUs
Gold Standard (GS)	Global	Enhanced standard for CDM, JI or voluntary market projects	GS CER; GS ERU; GS VER	Mandatory thorough stakeholder consultation Must bring environmental and social benefits	Low impact <15MW
Voluntary Carbon Standard (VCS)	Global	Voluntary standard for VER projects	VER	Mandatory stakeholder consultation	Any
Voluntary Emission Reduction +	Global	Based on CDM / JI process	VER+	Stakeholder consideration mandatory unless argued as unnecessary Negative environmental impacts must be minimized	Any, but large hydropower above 20MW must comply with WCD guidelines
Voluntary Carbon Offset Standard (VOS)	Global	Uses GS VER criteria or CDM criteria	VER	Same as GS VER / CDM	Any, but large hydropower above 20MW must comply with WCD guidelines
Social Carbon	Global	Methodology to ensure high quality projects that value local community	CER / ERU / VER	Methodology based on sustainable livelihoods approach	So far only used for forestry projects, not hydropower
Greenhouse Friendly	Australia	Approved offsets for use in Australia	tCO2e	None required	Any
Chicago Climate Exchange (CCX)	US	Offsets traded for member compliance	Carbon Financial Instrument (CFI)	Must avoid negative environmental and social impacts	Any
Regional Greenhouse Gas Initiative (RGGI)	RGGI regions (US)	Voluntary renewable purchases from RGGI region may be used to offset	tCO2e	None required	Any

Source: WWF 2008; New Carbon Finance/Ecosystems Marketplace 2008; RGGI 2007; The Gold Standard 2006; CCX 2004

Investor/Buyer Criteria for Community Benefits

Investors or buyers who can impose community benefit criteria on carbon reduction projects were identified in the literature. Carr and Rosembuj (2008) discuss how CERs tend to be sold through a contract known as an Emissions Reductions Purchase Agreement (ERPA). The ERPA can contain various conditions that give the investor some control over the project development. The PDD of the Cote small-scale hydropower CDM project in Costa Rica illustrates this further. The project was developed using finance guaranteed by the World Bank's Prototype Carbon Fund through an ERPA. The PDD states that the project sponsor agreed to develop local environmental (related to forest cover and vegetation, water flow, water quality, biodiversity, and ecosystem protection) and social (local job creation and improvements and assistance in maintaining local access ways and roads) positive impacts. Annual progress on targets is monitored by a Compliance Committee through a Sustainable Development Monitoring Plan; meeting the targets is enforced under the ERPA.

Secondly, the World Bank's Carbon Finance for Sustainable Development Report 2007 illustrated the use of carbon fund criteria. The World Bank is involved in ten different carbon funds that together are valued at over US\$2 billion in carbon finance. Each fund differs in its nature and aims. Of particular interest when considering community benefits is the Community Development Carbon Fund (CDCF) which specifically supports projects that contribute to community development. It is also designed to fill a recognized CDM investment gap by investing in smaller CDM projects in poorer countries, particularly in sub-Saharan Africa. Each CDCF project includes a Community Development Plan that operates throughout the project lifetime. The Fund has now signed 20 ERPAs, valued at over US\$60 million in total. The hydropower projects that have been developed under the CDCF and a summary of the community benefits each delivers are listed in Table 2.4.

Table 2.4: World Bank Community Development Carbon Fund (CDCF) Hydropower Projects

Country/ Project Name	Project Description	Community Benefits	CDCF Contracted ERs (tCO2e)
China: Guangrun Hydropower Development	Construct and operate three hydropower plants with total capacity of 28MW (10, 10 and 8 MW) on the Guangrun River.	20% of carbon revenue will be earmarked for a county government poverty alleviation fund which will provide increased water supply, upgraded flood control, and water for 1,000 hectares of irrigated farmland.	485,000
Georgia: Small Hydro Rehabilitation	15MW additional power through rehabilitation and construction of small hydropower stations.	A potable water supply system that will benefit 45 households and the village primary and secondary school; rehabilitation of 3 small bridges, the current condition of which inhibits mobility and access to services; construction of a social and cultural center for the entire village.	
Kenya: Optimization of Kiambere Hydro	Expansion of a hydropower station by upgrading the turbines, which would increase the output by 20MW.	The community benefit plan, which is intertwined with the Kenya Olkaria II Geothermal project and the Redevelopment of Tana Power Station through an overarching community benefits scheme, includes: Clean water (construction of water lines and storage tanks); educational benefits (construction and equipping of classrooms, administration blocks, and boarding facilities); health benefits (construction and equipping of health centers); livestock improvements (rehabilitation and construction of cattle dips); and improved access to markets and educational and health facilities (upgrading of rural roads).	215,000
Kenya: Redevelopment of Tana Power Station	Expansion of hydropower station by constructing 2 x 4.3 MW and 2 x 5.5 MW run of river dams.	As above.	226,000
Nepal: Village Micro-hydro	Development and installation of micro-hydropower plants ranging from 5 to 500kW with a cumulative capacity up to 15MW.	Reduction in diesel consumption by replacing diesel power with electric agro-processing mills (the schemes to be financed will replace manual milling with machine grinding, reduce cereal losses and increase yields in the case of oil expellers) and provision of household lighting (142,00 households would benefit).	191,000

Widening the Scope of Community Benefits

The BioCarbon Fund is another of the World Bank's carbon funds documented in the Carbon Finance for Sustainable Development Report 2007. The Brazil Reforestation around Hydro Reservoirs Project uses the Social Carbon methodology, developed by the hydropower operator, to leverage carbon finance from a reforestation project around hydropower reservoirs in Brazil. Although the project brings the operator

indirect benefits by helping avoid soil erosion and thus sedimentation of the reservoirs, on its own this is argued as sometimes an insufficient incentive to undertake a reforestation program. By using the Social Carbon methodology the community benefits of the project are particularly enhanced. The project can thus contribute to maintaining biodiversity, improve soil nutrient content, and employ local people; it also involves a local sustainable forestry education program. Hydropower operators in other areas could use the same approach, thus delivering community benefits that might otherwise be beyond the scope of a typical hydropower project.

Carbon Finance Revenue and Community Benefits

What happens to the revenue created by carbon finance projects appears to be poorly documented, and it is generally assumed that it is regarded as just another stream of project finance. However, there are some examples found at the global, national and project scale where carbon finance revenue has been directed towards community benefits.

At a global scale, 2 percent of CERs issued to each CDM project go to an Adaptation Fund that helps finance adaptation to climate change in the most vulnerable regions of the world, particularly the least developed countries and small island developing states. The Fund currently contains over three million CERs, which today are valued at over US\$40 million in total. This revenue is added to other funds for adaptation and is managed by the GEF.

At a national scale, a host country is entitled to claim ownership of CERs generated in its territory if it wishes. So far it appears that only China has done so. In fact, China has various policies associated with the development of CDM projects that are designed to enhance the benefits the mechanism brings to the country. For example:

- Government ownership of a percentage of CERs from each CDM project, creating a national climate change fund. For hydropower projects this is 2 percent, as renewable energy is a priority area, whereas for hydrofluorocarbon and perfluorocarbon projects, 65 percent of CER revenue goes to the government, and for N₂O projects.
- Only allowing Chinese companies to develop CDM project in China, to “protect the benefits of the CDM.”
- Capacity building – to enhance awareness of potential benefits of CDM use among local stakeholders. This includes, for example, training for enterprise managers throughout China.

The literature states that the revenue collected by the government is used for supporting other activities related to climate change mitigation. The Chinese Ministry of Finance, the National Development and Reform Commission and other relevant departments jointly decide how the collected funds will be spent. No literature was identified that examined the specific use of the funds.

At a project scale, only one example of direct reinvestment of CER revenue into the community was found. As part of China’s Guangrun Hydropower CDM project developed under the World Bank’s CDCF, 20 percent of the carbon revenue is earmarked for a county government poverty alleviation fund to provide increased water supply, upgraded flood control, and water for 1,000 hectares of irrigated farmland.

CONSTRAINTS TO ENHANCING DEVELOPMENT BENEFITS IN HYDROPOWER PROJECTS

Enhancing development benefits is related to social and environmental issues that many in the hydropower industry are still addressing through mitigation and compensation programs. Moving beyond mitigation and compensation approaches towards an increased use of benefit sharing and enhancement approaches that complement mitigation and compensation measures will require further changes in the way in which policy makers and practitioners plan or carry out their work. Several authors identify some key constraints, which are summarized below. In addition, Figure 1 provides a list of constraints that was generated at a panel of international experts meeting held at the World Bank in Washington DC in June 2008.

Égré et al. (2008) find that the risk of leakage of funds is higher in poor communities that lack technical know-how, institutional capacity, commercial and infrastructural resources. They also advice on the importance of the involvement of other relevant stakeholders to help administer, implement and monitor the delivery of benefit sharing schemes. They also highlight the challenge of measuring economic rents, which in turn makes it difficult to determine what should be shared through benefit sharing mechanisms that are based on such rents. Determining what constitutes a fair share of economic rents for PAP communities is not clear for practitioners. Guaranteeing the accountability of implementing agencies involved in the redistribution of benefits is discussed. Égré et al. propose that inclusive stakeholder forums and full public disclosure are helpful for improving transparency. Institutional strengthening is also identified as a means of helping local agencies deal with large sums of money and complex procedures.

Box 2: Constraints in Enhancing Development Benefits

- Confusion between compensation and benefits sharing
- Corruption
- Lack of local planning
- Lack of government presence
- Lack of consultation with different stakeholders
- Access and trust in conflict areas
- Political will
- Lack of community organization
- Implementation capacity of sponsor, government and communities
- Capacity to invest resources effectively
- Lack of clarity in roles between government, communities and developers
- Using evaluation at end instead of throughout
- Legislation
- Uncertainty over who pays

The authors recognize the clear political dimensions of benefit sharing, mentioning the complexities related to designing benefit sharing with a fixed amount to share in a context of conflicting interests, goals, and stakeholder values. Different sets of goals and values are described for four groups of stakeholders: developers, project beneficiaries, PAPs, and the state. It is noted that district governments may also face political dilemmas trying to balance equity issues among PAP communities and those which are more remote and also lack infrastructure. The authors recommend that the rights and risk approach set out in the WCD be used as a framework for stakeholder analysis.

The absorptive capacity of recipients responsible for managing development funds also can be a constraint. This is particularly the case for large hydropower projects for which fixed royalty percentages may produce a windfall (Upadhyaya, 2006b) for beneficiaries that they do not have experience to manage. Certainly absorptive capacity for both individuals and organizations has been an issue long acknowledged in development circles, especially in remote areas with high incidences of deprivation

indices. Haas and Tung (2007), in their discussion on a revenue sharing fund, indicate that capacity building tools (e.g., training courses, operational and guidance manuals) are needed to facilitate a smooth national rollout of the mechanisms, in parallel with preparation of legal instruments.

Milewski et al (1999) looked solely at mechanisms that ensure a direct monetary redistribution of project-related revenues or profits. They identified the financial and administrative autonomy and institutional capacity of implementing agencies as well as the accountability of implementing agencies entrusted with the redistribution of benefits as critical aspects for the efficiency of transfers of benefits to concerned communities. They also raised the issue of the sustainability and equity of the redistribution of benefits and uses of funds.

Review of Existing Case Study Information

There is a large amount of information written about hydropower projects. As alluded to above, benefits are often cited but authors do not necessarily make a distinction between mitigation, compensation and benefit sharing.

Case studies in which benefit sharing features include those from the WCD, namely:

- Brazil: Tucuruí Dam, Amazon Tocantins River.
- Pakistan: Tarbela Dam, Indus River Basin.
- Norway: Glomma and Lagen River Basin Development.
- Thailand: Pak Mun Dam, Mekong Mun River Basin.
- Turkey: Aslantas Dam, Ceyhan River Basin.
- USA: Grand Coulee, Columbia River Basin.
- Zambia / Zimbabwe: Kariba Dam, Zambezi River.

In addition to the above project and river basin specific case studies, country case study reviews of China, India and Russia were also undertaken.

Égré has produced various articles which use the same basic set of case studies. For example, Égré et al (2002) provide short case studies on various benefit sharing mechanisms for monetary benefits. Each case study provides a short project description, details the mechanism and provides a half page summary assessment; a few of them provide context. Case studies include:

- Colombia: Urra 1.
- Brazil and Paraguay: Itaipu.
- Canada: Eastman 1, 1A and Rupert Diversion (this one is lengthier and provides a context, background, contents of benefit sharing mechanisms as well as the other information); Columbia River Basin; Pesamit, Minashtuk.
- Lesotho and South Africa: Lesotho Highland Water Project.
- China: four projects in Hubei area; Shuikou.
- Norway: Glomma and Lagen River Basin Development; Tokke Project.

The same case studies were used as a basis for the Égré et al 2008 article which provides short case examples of benefit sharing through: legislation related to revenue transfers to affected municipalities and watershed management agencies (in Colombia); payment of royalties to national, regional and local authorities (in Brazil); legislation on post resettlement and rehabilitation on hydropower projects (in China); partnership strategy in public projects (by Hydro-Québec in Canada); and taxation of electricity

companies and preferential electricity rates (in Norway). Examples of economic rent measurement for Columbia Rivers Basin Development in Canada and the Lesotho Highlands Water Project are presented in their Appendix.

In 2006, the International Energy Agency produced a set of 60 case studies as part of its Implementing Agreement for Hydropower Technologies and Programmes. Key findings were presented in a Summary document. The most recurrent reasons cited for success were: “implementation of environmental impact assessment,” “consultation with experts,” “detailed preliminary surveys,” and “appropriate planning and design.” To mitigate socio-economic impacts, “coordination with stakeholders” was frequently cited, while “partnership with local communities and collaboration with NGOs” was also given importance, as was “participation of local residents in the decision-making process”. In cases focused on sharing of development benefits, the analysis highlights the importance of ensuring economic spin-offs for the project implementation area.

The summary recommends that information on good practices in properly addressing adverse environmental, social, and economic impacts associated with hydropower development and optimizing the benefits obtained, should be disseminated by hydropower policy makers and practitioners around the world and utilized to guide and support hydropower development in future. Another key recommendation was that mitigation and enhancement measures need to be project specific.

Another source worthy of mention is Phillips et al (2006) work on transboundary water cooperation as a tool for conflict prevention and broader benefit sharing. The case studies cover the Jordan River Basin, the Kagera River Basin and the Mekong River Basin in detail.

GAPS IN THE LITERATURE

This study has reviewed numerous documents readily available from the public domain on the general theme of enhancing the benefits of hydropower projects with a particular emphasis on benefits to local communities. While there may be additional relevant materials already published, and new ones appearing, it is apparent based on the material reviewed in this study that currently there are several significant gaps that pose more or less significant constraints to a better understanding of the issues.

A key question that is hardly addressed in the literature is: how much of the monetary benefits should be shared? This question raises both an equity issue and an absorptive capacity issue. The number of beneficiaries and stakeholders among whom benefits are to be shared may affect the value of benefits as well as the rate of return of the investment for the project proponent. For example, when communities are very small, royalties have more value per capita. Negotiations related to sharing benefits will also be influenced by assumptions regarding the sharing of risks. As per water basin benefits, riparians that were previously unable to agree on volume allocations will not be able to agree on benefits just by swapping the concepts. Introducing benefits in the dialogue can create a two tier step whereby riparians calculate benefits back into volume allocations or possibly another quantifiable unit to ensure they are getting their perceived appropriate portion of the resource benefits.

Haas and Tung (2007) say the bottom line question is what is the appropriate balance between the level of revenue sharing (as a percentage of revenue generated by the hydropower project) and the impact of revenue sharing on retail tariffs? Mokorosi and van der Zaag (2007) point out that there is extensive literature on benefit sharing between riparian countries; however, there is comparatively little on the issue of distribution within states or on equity considerations between beneficiaries.

This gap in analysis of how much of the benefits to share and with whom reflects the lack of documentation on actual practices. There is scarce documentation in the public domain of contractual details between private HEP developers and governments and regional government entities and local communities. It is understandable that certain financial information is confidential, but it is a major barrier to the documentation of the effects of benefit sharing that neither the commitments between developers and communities or between developers and governments that relate to either monetary or non-monetary development benefits are published.

It is unsurprising then that there is also little documentation of the perceptions of private developers in regard to benefit sharing. To what extent have they found it useful, or to have benefited their project and/or their larger corporate interests? This leads to an additional observation: in addition to gaps in the literature, there is a significant gap in where the literature is found. The trade publications of the hydropower industry, which is “the literature” for most of those who routinely design, construct, and manage HEPs, simply do not currently cover issues of enhancing or sharing of benefits. Most of the case study feasibility assessments and agreements are to be found directly in the project proponent studies, which are not always accessible to the public domain.

Other specific topics with notably little coverage include, among others, the hedge value that hydropower provides against rising fossil fuel and carbon prices, enhanced employment benefits and livelihood benefits.

Conclusion

The key findings of this literature review study – on what is known and not known – can be summarized as follows:

- Overall, based on the literature reviewed it can be said that there is a limited amount of substantive analytical information to make the concept of benefit sharing as useful as it should be to practitioners in the hydropower sector.
- There is a systematic classification and documented examples on mechanisms for transferring monetary benefits, which tend to have a more developed country focus. However, there is little systematic information, except for CIPs that are addressed in various formats, on mechanisms for transferring non-monetary benefits.
- Legislation for monetary benefit sharing is often regarded as an enabler or necessary pre-condition. It can help distribute the additional, and in some cases substantial, resources that benefit sharing mobilizes, to go beyond what is required for compensation and mitigation.
- In the literature reviewed, PAPs as stakeholders are given particular emphasis. Resettlement in particular is seen as a development opportunity to provide a wide range of both monetary and non-monetary benefits to communities.
- Monitoring and evaluation of benefit sharing and enhancement activities are rarely documented and would contribute to increasing operational knowledge of benefit sharing.
- Finally, there is a need for the expanded use of integrated multi-sectoral approaches that integrate disciplines and different types of knowledge to better understand the real contributions and limitations of benefit sharing mechanisms.

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Annex 1: Literature Review Summary

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
ADB news letter	Improving Resettled Lives	ADB newsletter http://www.adb.org/media/printer.asp	2007	The article summarizes the benefits of the additional Technical Assistance (TA) support provided by ADB and financed by the Poverty Reduction Cooperation Fund, to increase the capacity of both resettlement authorities and grassroots stakeholders to develop appropriate livelihood programs for the resettled people.	<p>The US\$ 1 million technical assistance (TA) support to increase the capacity of both resettlement authorities and grassroots stakeholders to develop appropriate livelihood programs for resettled people.</p> <p>Over period of two years project has provided following training to both government official and project affected stakeholders</p> <p>Training program on how to select appropriate relocation sites using GIS, how to assess soil types and availability of natural resources, and how to plan and implement suitable and sustainable livelihood activities- such as farming and livestock rearing – in the resettlement areas.</p> <p>At six resettlement sites, Technical Assistance conducted livelihood development training programs to show the people that their incomes can be restored and their lives rebuilt even with limited and different types of farmland and away from forests, which they have traditionally depended on for subsistence.</p> <p>In addition to farming, training programs on new methods of livestock rearing were also provided at six sites.</p> <p>Community Benefits: Improved understanding of site selection process and methods of government officials Improved harvest and higher earnings for PAPs.</p>	

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Asianics Agro-Dev. International (Pvt) Ltd.	Case Study, Pakistan: The Tarbela Dam and Indus River Basin – Case Study of the World Commission on Dams	World Commission on Dams	2000	The Case Study outlines the effects, both positive and negative, of the project on water resources, irrigation, salinity, flood attenuation, water supply, resettlement etc as well as covering the lessons learned from the project. Many of the stakeholders contacted during the study consider Tarbela a useful project in terms of development effectiveness for the country since it has helped stabilize and expand agricultural production and avert severe power shortages. However, there was general agreement that there was inadequate participation in the decision-making processes.	Benefits of the project included: Water Resources –overall, actual releases were on average 20% more than predicted. Surface Water Irrigation – the dam has achieved the goal to replace water lost to India and increased diversions for irrigation. The rural farming population directly affected by irrigation benefits is estimated to be in the order of 7 to 10 million. Groundwater Irrigation – in areas with fresh groundwater, the water lost from the canal system can be re-used by pumping. The groundwater irrigation provided a level of reliability that was deteriorating in the surface irrigation system. Flood attenuation – not foreseen as a positive impact.	Pakistan
Bartle, A.	Hydropower potential and development activities	Energy Policy 30, pp. 1231-1239	2002	Examines benefits of multi-purpose water resources scheme, often enabling it to subsidize other valuable functions of a reservoir or river system.	Focus on Energy Source; Geographic spread; Proven advanced technology; Peak load production; Low operating costs; Part multi-purpose schemes and subsidies other functions – irrigation, water supply, navigation, recreation	Global
Biswas, K., Tortajada, C.	Development and Large Dams: A Global Perspective	Third World Centre for Water Management, Mexico City	2001	Global development of Dams over the last 50 years exploring the differences between the projects in developed and developing countries with respect to climatic, technical, economic social, environmental and institutional.	Urbanization, the ever increasing need for electricity and the movement of goods by water means that dams need to be built to satisfy various purposes.	Global

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Carr, C., Rosembuj, F.	Flexible Mechanisms for Climate Change Compliance: Emission Offset Purchases Under The Clean Development Mechanism (CDM)	N.Y.U. Environmental Law Journal	2008	The article summarizes the different emission trading mechanisms, focusing on the CDM. It provides a general overview and discusses in more detail legal contracting issues around the buying and selling of CERs. Main examples are drawn from World Bank experience of the authors.	GHG Reductions; Use of CDM and CERs; Revenue sharing mechanism	Global
Chicago Climate Exchange (CCX)	CCX Exchange Offsets and Exchange Early Action Credits	CCX	2004	Outlines the rules for exchanging offsets between CCX projects to help member compliance.	Offset projects can be used to generate Carbon Financial Instruments (CFIs) that CCX members can use towards compliance. In order to be eligible, the offset projects must avoid negative environmental and social impacts.	US
Collier, U.	Promoting Good Practice for Hydropower – a Role for ECAs (Power Point presentation)	World Bank	2005	Rights and risk approach; indicates that the WCD needs to be incorporated in all developments; hydro projects are seen as an opportunity.	Environmental impacts; resettlement	Global
Collier, U.	Meeting Africa's Energy Needs: The Costs and Benefits of Hydropower	WWF/ Oxfam/ WaterAid	2006	Lessening the negative impacts, maximizing the benefits of hydro-schemes: 2 case studies, one small, and one large HEP scheme.	Small HEP schemes sized to meet the specific energy needs of small rural, using local labor, local materials, incorporate other renewable technologies (biomass boilers)	Africa
Collier, U.	To dam or not to dam? Five years on from the World Commission on Dams	WWF	2005	WCD suggested guiding principles and recommendations to be incorporated into the development of new dams by developers, governments, lenders. 6 case studies were found to have omitted the WCD guidance.	Modeling work to restore environmental flood releases associated with dam operations that had environmental benefits without affecting productivity of the dam.	Global

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Correa, E.	Hydropower: SDV Pilot Initiative for Enhancing Development Benefits to Local Communities	Social Development Department, World Bank	2008	Seven step method to enhance development	Strategies and methodology for enhancing development benefits for local communities via 7 steps: regional physical surveys, socio-politico-economic surveys; demands for project; identify positive and negative impacts of project; identify mitigation measures; enhancement of positive measures; minimization of negative impacts; design impact management plan and local development plan.	Global
Diduck, A., Sinclair, J., Pratap, D., and Hosteller, G.	Achieving meaningful public participation in the environmental assessment of hydro development: case studies from Chamoli District, Uttarakhand, India	<i>Impact Assessment and Project Appraisal 25 (3), September 2007, pages 219-231</i>	2000	<p>Using qualitative research with over 100 interviews with multiple stakeholders, research investigation of two large hydro projects in Chamoli District in India was carried out.</p> <p>The result shows that meaningful participation in project planning and implementation did not exemplify characteristics of meaningful involvement.</p> <p>The participation process would have been improved with greater opportunities for advanced, decentralized, and more active involvement.</p>	<p>The general community feeling was that benefits (primarily employment and infrastructure upgrades) accruing from the project would be short-lived while the detrimental effects of the environmental degradation would be deeply felt permanent</p> <p>The promise of paid employment was welcomed by the people but many of the higher paying jobs would go to workers from outside the region, and that the vast majority of jobs for locals would be confined to the construction period and so would not contribute to long-term economic growth and development.</p>	India

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
EBRD	Sreden Iskar Cascade HPP Portfolio Project	UNFCCC (JISC)	2006	PDD of the only hydropower JI project that has been accepted by the UNFCCC.	Highlights social benefits to the local community, through bringing new investment and employment to an economically depressed part of the country. It will increase local employment by utilizing local specialists in the design phase, creating up to 60 jobs during the construction phase of each hydropower unit (for both qualified & unqualified workers) and employing up to 5 qualified specialists on a permanent basis for each unit. Also states that stakeholder consultation took place.	Bulgaria
Égre, D.	UNEP Dams and Development Project, Compendium on Relevant Practices - 2nd Stage, Revised Final Report - Benefits Sharing Issue	UNEP	2007	Survey of experience to date on monetary benefit sharing mechanisms for hydropower developments. Types of benefit sharing mechanisms include revenue sharing, development funds, equity sharing, taxes and preferential tariffs.	Monetary benefit sharing mechanisms: Revenue sharing mechanisms need to provide long-term compensation to PAPs; establish long-term regional economic development funds, establish partnerships between developers and local communities.	Global

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Égré, D., Roquet., V. and Durocher, C.	Benefits Sharing to Supplement Compensation in Resource Extractive Activities: The Case of Dams; Can Compensation Prevent Impoverishment? Reforming Resettlement through Investments and Benefit-Sharing, edited by Michal M. Cernea and Hari Mohan Mathur	Oxford University Press	2008	This article reports findings on the mechanisms for sharing part of the monetary benefits of hydropower projects with the reservoir-displaced population, thus supplementing compensation payments. Conceptually, their argument is grounded in the economic theory of rents generated by hydropower projects, currently channeled to distant consumers of electricity through subsidized power, which can be redistributed more equitably. The authors recommend five possible benefit sharing mechanisms, backing up their recommendations with recent experiences from several countries that confirm feasibility. The rationale (economic and ethical) of benefit sharing to prevent impoverishment, and the necessary legislation for enacting such benefit sharing mechanisms are documented.	Most important finding is that benefit sharing mobilizes resources additional to compensation budgets. Practical functionality.	
Empresas Públicas de Medellín; Electric Power Development Co.	La Vuelta and La Herradura Hydroelectric Project	UNFCCC (CDM EB)	2006	The purpose of this proposed CDM project activity is to build a hydroelectric power plant, with a total installed capacity of 31.5 MW, in order to take advantage of the capacity of La Herradura river in the west of Antioquia Department, by means of two subprojects in a chain (La Vuelta and La Herradura).	The project improves electricity service in the Department of Antioquia, contributes to regional sustainable development, and reduces CO2 emissions by providing clean energy through electricity produced from hydropower.	Colombia

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Fette, W., Werhli, F.	Hydropower production and river rehabilitation: a case study on an alpine river	Environmental Model Assessment	2007	Examination of impacts upon hydrology and fish ecology in the River Rhone, due to the discharge from dam. Rehabilitation tools (river channel widening), effects of hydro peaking; hydrology as key to rehabilitation of Rhone using retention reservoirs and slower up/down ramping to turbines.	Design impacts on flow regime -improve fish habitat and structure and looks at river widening as a rehabilitation tool.	N. Europe
Fields, D.	Multi-purpose Water Infrastructure: Exploring the Paradigm of Benefit-Sharing	World Bank	2006	Benefit sharing is introduced as: project design, supplementary elements, supplier benefits; financial allocations; institutional development; policies. The portfolio approach is a means of building benefit sharing into a project in a robust and practical manner.	Framework, referent groups, definition of benefit sharing.	Global
Fields, D.	Growing the business of benefit sharing	Hydro 2006 conference, Porto Carras, Greece	2006	Hydropower projects are moving from single outputs to multiple-interests; defines benefit sharing: project design, supplementary investments, financial allocations, policies.	Refining and strengthening tools for practitioners, portfolio approach tailored to specific situations.	Global
Fields, D.	Benefits Sharing and Hydropower: An Overview. Power Point presentation to Government of Uttarakhand	World Bank	2008	Benefit sharing defined as differing from resettlement and rehabilitation. Stakeholders (developer, affected people, government) each evaluated for their needs/ value and benefit sharing identified as a basis for partnership.	Definition of benefit sharing, how benefit sharing differs from R&R. evolution in thinking, implementation tips.	India

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Grein, H., Kalberer, A., Muller, E.	Surface Protection against Hydroabrasive Wear	Sulzer-Esher Wyss Ltd.	1992	The parts of a hydro-electric power station that come into contact with moving water can be subject to abrasive wear or sediment erosion if the water contains particles. This can be a significant issue in regions where there is a high concentration of hard mineral sediment and can result in rapid equipment damage and a massive increase in downtime and repairs. This article investigates advances in coating technology and seeks to demonstrate effectiveness by comparing experience from operational power stations.	Improved efficiency lowers costs and improves energy yields.	Global
GTZ	Hydropower Tibet Factsheet and Small-scale power supply for Rural Development Impact Report	GTZ	2004	The provision of electricity should lead to increased employment/ local development; training and loans available to develop the community and local businesses.		Tibet
GWP	Technical Background Paper No. 4 – “Integrated Water Resources Management.”	GWP	2000	The first part puts forward a strong case for applying IWRM globally and defines the IWRM concept and process. The second part provides additional advice and guidance on how IWRM could be implemented.	IWRM allows benefits of clean water to be shared amongst all water users in the basin. Brief Case Study – Tamil Nadu, India Brief Case Study – Focal subsidies, Chile NB case studies not hydropower related	Global

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Gyawali, D	Best Practice on Water: Nepal	UNESCO	2001	Bhaldanda water supply and sanitation project was undertaken by a local NGO called Jana Chetana Samudayik Bikas Samuha (People's Awareness Community Development Group), supported by NGO called Nepal Water for Health (NEWAH).. The project has adopted gender and poverty approach in addressing water supply and sanitation project.	The project has demonstrated following benefits: Women having more time and higher self esteem Reduction in conflicts related to water fetching People started having regular baths and started washing clothes more than before People whose land was closer to tap, grow vegetables by using the waste water and some of the them even sell the vegetable in the market nearby.	Global
Haas, L., Tung, D.	Benefits Sharing Mechanisms for People Adversely Affected by Power Generation Projects in Viet Nam	ADB	2007	Sharing mechanism guidelines based on formula and standard procedure to share revenue (by eligibility) generated by hydropower project, through a fund and to internalize costs in the retail electricity tariff. The mechanisms must be clear, transparent and accountable.	There are three minimum forms of benefit sharing 1. equitable access, 2. resource access entitlements and 3. revenue sharing	Vietnam
Hawker, P.	A Review of the Role of Dams and Flood Management	Halcrow Water	2000	The document is a contribution to the flood control thematic review of the WCD paper and addresses the role of dams in flood control. It details some case studies where dams are used for flood control across the world and outlines lessons learned and policy measures based on the case study findings.	Flood protection benefits: will depend on dam design and reservoir characteristics and whether the dam serves other purposes which depend upon an abundant supply of water being stored behind it at certain times of year. In such cases, conflicts of interest can arise. Case Studies: Honduras – El Cajon Dam, Norway – Glomma – Lagen Case Study	Global

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Head, C.	Financing of Private Hydropower Projects	World Bank Discussion Paper 420, World Bank	2000	This study provides an overview of the issues and challenges related to the private financing of hydropower projects in developing countries. From the very limited pool of projects that have already reached or are nearing financial closure, ten have been chosen for the study from five countries that have been among the most active in promoting private hydro development. The selected projects cover a range of physical and market characteristics, regulatory and concession environments, public-private risk-sharing arrangements, and financial structures. Collectively the case study projects provide a reasonable cross-section of private hydro schemes that have been or are being developed.	Issues in the financing of hydro projects Regulatory background and concession agreements Off-take contracts Financing arrangements	
Heggelund, G.	China's Climate Change Policy: Domestic and International Developments	Asian Perspective, Vol. 31, No. 2, 2007, pp. 155-191.	2007	The article outlines Chinese commitments to climate change mitigation, highlighting the CDM as its preferred mechanism for channeling efforts. Initial reluctance to be involved with the CDM was due to concern that it would displace overseas development aid (ODA) but China is now becoming an active host country for CDM projects. This is in the context of rapidly growing energy requirements and associated GHG emissions – in the 1990s China's emissions increased by nearly 40%.	CDM innovation – China has various policies associated with the development of CDM projects: <ul style="list-style-type: none"> • Government ownership of a % of CERs from each CDM project, creating a national climate change fund • Only allowing Chinese companies to develop CDM project in China, to “protect the benefits of the CDM’ • Capacity building – to enhance awareness of the possible benefits of using the CDM among local stakeholders 	China

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Hoagland-Grey, H., Montgomery, R., Palma, A.	Community Investment Programs Associated with Private Sector Projects – Annex 1 Examples of Good Practice in Community Investment Programs	Inter-American Development Bank	2006	Community investment programs (CIPs) are considered an essential contribution of private sector investment as a way to give back to communities that suffer negative impacts from a project. CIPs are designed and aimed at improving / restoring the livelihoods of communities. The objective is benefit sharing for long-term sustainable enhancement of the environment and communities for present and future generations (as a result of a project).	CSR, community engagement. The article summarizes the benefits of CIPs and tries to draw parallel from the successful thermal and other infrastructure projects which can be replicable in a hydropower context.	Global
Hydro 2006 sessions	Maximizing the Benefits of Hydropower - Key outcomes from the Hydro 2006 sessions	Hydro 2006	2006	Development needs and potential, planning and financing; environmental and social planning; technology use in maximizing benefits.		Global
Idaho National Laboratory	Virtual Hydropower Prospector	Idaho National Laboratory	2008	Use of satellite imagery to determine the feasibility of hydro sites. Potential small hydro sites in the United States have been identified through satellite imagery and entered into a database. The same technology can also be used for digital terrain mapping and watershed management.	Website for the dynamic use of GIS to identify potential hydro sites at feasibility level.	USA

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IHA	IHA Sustainability Guidelines	IHA	2004	Guidelines to encourage consideration of environmental, social and economic impacts of new hydro projects, and of management and operation of existing projects. The guidelines promote and enhance sustainability assessment. They build on the 3 pillars of sustainable development: economic development, social development and environmental protection. They also accept the core values of the WCD 2000 report (equity, efficiency, participatory decision-making, sustainability and accountability).	Projects should be developed so that they achieve or complement objectives in surrounding and downstream areas. Stakeholder consultation and engagement from an early stage with local and national agencies will help identify local priorities and needs. If the project developer / manager works with local communities and authorities to improve catchment management practices, it can have significant water quality benefits to both the hydro project and the local community. Also, proper reservoir management can be very effective in eliminating mosquito-carried diseases, e.g., malaria. Monitoring of water quality at the reservoir will improve early-warning of potential health risks.	Global
IHA	IHA Sustainability Assessment Protocol	IHA	2006	Assessment framework to be used with the criteria outlined in the IHA Sustainability Guidelines. Divided into 3 sections: new energy projects; new hydro projects; operating hydro facilities.	Aims to cover all topics relating to sustainability best practice, as outlined in the IHA Sustainability Guidelines. Best practice would be for a project to gain top scores in as many aspects as possible. Top scores are only awarded if projects have maximized the opportunities for providing additional benefits (including employment, health, education, economic value, infrastructure, etc.) to the community, in terms of volume, types and distribution. Therefore top scoring projects have to show an enhancement of benefits for the community, rather than just mitigation and zero net benefits.	Global

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Inter-American Development Bank	Community Investment Programmes Associated with Private Sector Investment Projects	Inter-American Development Bank	2006	Community investment programs (CIPs) are considered an essential contribution of private sector investment as a way to give back to communities that suffer negative impacts from a project. CIPs are designed and aimed at improving / restoring the livelihoods of communities. The objective is benefit sharing for long-term sustainable enhancement of the environment and communities for present and future generations (as a result of a project).	CSR, community engagement. The article demonstrates the benefits of community development programs such as Education, Health, Poverty Reduction, Children and youth, Environment, Community empowerment and development, Cultural and historical resources, Indigenous Peoples, Emergency responses.	Global
Inter-American Development Bank	Background Sheet, Venezuela – Caroni River Watershed Management Plan (VE-L1006) and Tocoma Hydroelectric Project (VE-L1003)	Inter-American Development Bank	2003	This IADB case study briefly outlines the Integrated Watershed Management Plan (IWMP) set up in 2003 to enhance watershed management of the Caroni River, a basin with significant hydropower developments.	The IWMP is improving watershed management to maintain hydropower potential. Activities within the plan include: water and soil conservation, revision and improvement of the relevant legislation, environmental education, implementation of research studies, and monitoring and enforcement.	Venezuela, Guyana Region
International Experience Sharing Workshop on “Land Acquisition	International Experience Sharing Workshop on “Land Acquisition, Resettlement and Rehabilitation, and Benefits Sharing”	Best Western Country Club and Resort, Gurgaon, India	2007	International experience on land acquisition, resettlement and rehabilitation together with benefit sharing; 4 main themes: legal/policy framework; project preparation; community participation and benefit sharing; transparent modeling	Inconsistent policies and ambiguity; cumbersome procedures and poor record keeping; centrally coordinated locally delivered clear and consistent guidelines to include citizen participation are recommended. Benefit sharing scheme should not only be compensation, but look further to development of the communities.	India

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International Institute for Sustainable Development (IISD)	Making Development Work in the CDM: Phase II of the Development Dividend Project	IISD	2006	The IISD's Development Dividend project examines how the CDM's twin goal of contributing to sustainable development in host countries can be achieved. The project is guided by 35 members of an international task force.	There has been criticism that many CDM projects do not adequately fulfill the sustainable development criteria, due to a lack of clear definition and widely differing approaches between host countries. The IISD found that the general approach of host country governments is that if, on balance, a project brings a "net benefit" to the country, it gets approved. However, in some cases the simpler approval criterion of "no harmful impacts" is adopted. They recommend that capacity building initiatives are targeted at helping host countries better define sustainable development goals to assess projects against.	Developing countries
ISAGEN SA; AgCert International	Reconstruction of Calderas Hydroelectric Power Plant	Norway (DNV)	2008	PDD of a CDM project to rebuild the Calderas Hydroelectric Power Plant, with a total installed capacity of 26 MW. The Calderas Hydroelectric generation power plant is considered a new plant due to the total destruction caused by 10 years of insurgent activity in the region.	<ul style="list-style-type: none"> - Improving the local population's standard of living by bringing sustainable development to an abandoned region previously held by anti-government insurgents. - Increasing local employment of skilled labor for the installation, operation and maintenance of equipment. Improved safety condition in the region by clearing personnel mines	Colombia
Itaipu Tourist Complex	Itaipu Tourist Complex Website	Itaipu Tourist Complex	2008	Itaipu has promoted social responsibility initiatives since construction started in an effort to encourage the community's sustainable development by protecting environmental and cultural resources as well as fostering a decrease in social inequality.	Eco Tourism, environmental innovation (fish migration channels), conservation, community development.	Brazil, Paraguay

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IUCN	Pay – Establishing payments for watershed services	IUCN	2006	This is a handbook for the creation of economic mechanisms and tools that compensate for environmental services provided by a basin and its developments. “Pay” clarifies what watershed services are, how to measure them, and how to put a value on them. It also distinguishes a range of payment schemes for watershed services and defines how to bring buyers and sellers together. It also defines the range of policy and legal issues involved in establishing and running a payment scheme.	“Watershed services” are benefits people obtain from properly managed ecosystems. They include: Provisioning services (e.g., freshwater supply, fish production, hydro-electric power) Regulating services (e.g., regulation of hydrological flows, erosion protection, control of water quality) Supporting services (e.g., flow regime required to maintain downstream habitat) Cultural and Amenity Services (e.g., aquatic recreation, landscape aesthetics).	Global
Jagerskog, A., and Lundqvist, J.	Benefits Sharing in International River Basins	Stockholm International Water Institute	2006	“Benefit sharing” should focus more upon the sharing of benefits that may be derived from the use of the water.	Conceptual analysis of benefit sharing dealing with political and risk elements.	Global
Khennas, S. and Barnett, A.	Best Practices for Sustainable Development of Micro Hydro Power in Developing Countries: Final Synthesis Report	United Kingdom (DfID) and World Bank	2000	This report synthesizes the experience of micro hydro developments in Nepal, Peru, Sri Lanka, Zimbabwe and Mozambique. It reviews the role and objectives of micro hydro, and its profitability and affordability. It draws out best practice from this experience and expanding the use of micro hydro.	Provides an economic and financial framework and case study for various micro hydro projects. Also looks at the poverty impact of, and gender relationships in micro hydro. It concludes that micro hydro has a beneficial impact on poverty levels and contributes to addressing gender disparities in rural communities in developing countries although more research is needed to confirm.	Nepal, Peru, Sri Lanka, Zimbabwe and Mozambique

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Klimpt, J., Rivero, C., Purannen, H., Koch, F.	Recommendations for sustainable hydroelectric development	Energy Policy, Vol. 30, pp. 1305-1312	2002	This article also documents the challenges confronting sustainable hydropower development e.g., coping with ethical dilemma, restructuring of electricity sector, comparing power generation options, and addressing the environmental and social issues of hydropower. In addition to this, it also documents the recommendations for energy policy framework, recommendations for decision-making process, recommendations for improving environmental management of hydropower plans, and recommendations for sharing benefits with local communities.	The report provides the guidelines for allocation of project benefits; while limiting the adverse consequences for locally affected communities. There is no reference to case studies, all the recommendation are made based on multiple case studies across the world.	Global
Loney, M.	The Construction of Dependency: The Case of the Grand Rapids Hydro Project	The Canadian Journal of Native Studies VII, 1 (1987):57-78	1987	The focus of the paper is to highlight the issues which were responsible for destroying the traditional Cree way of life while offering no alternative economic future.	More negative impacts than work on benefit sharing mechanisms.	Canada
Lorica, M	Community- based micro-hydro power generation project (renewable energy) – Philippines	UNESCO	-	The article is based on the case study of a community based micro hydro power generation project. The project was selected as best practice due to its gender and poverty approach to the project. The project has reduced the workload of women in remote areas by providing energy for cooking, lighting and other electricity usages.	Community development through micro hydropower - addressing gender disparities, poverty reduction, educational facilities, higher savings for the families, improved living and working conditions, improved distribution of work between men and women.	Philippines

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Milewski, J., Égré, D., Roquet, V.	Dams and Benefits sharing- Annex Summary Review Case Studies	Hydro-Quebec, Canada	1999	As part of its follow-up to the WCD report, the World Bank has put forward a Dams Planning and Management Action Plan. This Action Plan aims to improve the quality of the Bank's operations by building on the core values and strategic priorities identified in the WCD report. The present study on benefit sharing from Dam Projects constitutes one of the 20 projects which are part of this Action Plan.	Four case studies: contractual long-term purchase agreements, Indigenous Peoples, distribution of royalties to local governments	Global
Mokorosi, P. and van der Zaag, P.	Can local people also gain from benefit sharing from water resources development? Experiences from dam development in the Orange Senqu river basin	Physics and Chemistry of the Earth, Vol. 32, pp. 1322-1329	2007	Assessment of benefit sharing is based on 4 factors: appropriate legal and policy framework, public participation, sustainable compensation measures, equitable access of derived benefits; Analysis found: legal/institutional framework strongly influences protecting/ marginalizing PAPs; unsustainable compensation measures resulted in food insecurity and homelessness; PAPs received only indirect benefits	a) national legislation must support concept; b) mechanisms must be defined at project planning stage; c) local authorities must have sufficient capacity.	Southern Africa
New Carbon Finance / Ecosystem Marketplace	State of the Voluntary Carbon Markets 2008	New Carbon Finance / Ecosystem Marketplace	2008	Summarizes progress in the carbon markets, with a particular focus on the voluntary market.	Outlines the different standards that have been developed for certifying voluntary carbon offset projects, including the environmental and social criteria they require projects to meet.	Global

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Office of National Coordination Committee on Climate Change	Measures for Operation and Management of CDM Projects in China	Government of China	2005	The measures outline the procedures to be followed by all involved in CDM projects in China, including the procedures that the relevant Government departments will follow and any requirements of project developers.	Case study of CER revenue retained by a host country government as a fund, thereby providing additional benefits to the country. The CER revenue from any CDM project developed in China is owned jointly by the Government of China and the project owner. The allocation ratio is dependent on the project type. For hydropower projects it is 2%.	China
Phillips, D., Daoudy, M., McCaffrey, S., Öjendal, J., and Turton, A.	Trans-boundary Water Cooperation as a Tool for Conflict Prevention and for Broader Benefit-Sharing	Ministry of Foreign Affairs, Sweden	2006	Analyses of the potential for co-operation on international transboundary conflict and for broader sharing of benefits by co-riparians. Work focuses on the Rivers Jordan, Kagera and Mekong, using the Inter-SEDE model.	Transboundary cooperation, international waters, rights to water, water and poverty	Global
Pritchard, S.	Water Power and Dam Construction	International Water Power and Dam Construction	2008	The Son La HEP project in Vietnam is being developed for flood control as well as electricity generation. Early completion of the dam by using a new method for the placement of concrete for the construction of a Roller Compacted Concrete (RCC) dam will enable flood mitigation practices to commence a season earlier than had another type of dam been selected.	Innovation – methods for placing RCC relatively new for dam construction.	Global

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Prototype Carbon Fund	Cote small-scale hydropower CDM project in Costa Rica	UNFCCC (CDM EB)	2006	PDD for the Cote small-scale hydropower CDM project in Costa Rica, being developed by the World Bank and registered with the UNFCCC in March 2006.	The PDD states that the project sponsor agreed to develop positive local environmental (related to forest cover and vegetation, water flow, water quality, biodiversity, and ecosystem protection) and social (local job creation and improvement and assistance in maintaining local access ways and roads) measures. Annual progress on targets is monitored by a Compliance Committee through a Sustainable Development Monitoring Plan ("SDMP"). Progress of the SDMP is included in the monitoring report submitted to the UNFCCC as part of the request for issuance of the CERs.	Costa Rica
RGGI	Overview of RGGI CO2 Budget Trading Program	RGGI	2007	The Regional Greenhouse Gas Initiative (RGGI) is a cap and trade program that commences in 2009 across various Northeastern and Mid-Atlantic US states.	Voluntary renewable purchases from within the RGGI region may be used to offset emissions, including from hydropower projects. There are no social or environmental benefit requirements for the offset projects.	USA
Rothman, M.	Measuring and Apportioning Rents from Hydroelectric Power Developments	World Bank	2000	Defines the concept of economic rents and its application to hydroelectric project developments.	Discuss the concept of economic rents and the two main sources of these rents, namely differential rent and scarcity rent. The article illustrates economic rents by using examples of projects.	USA, Laos, Canada, Sweden, Norway, Brazil

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Rush, J.	Lao PDR Hydro Project Improves Families' Standard of Living, Health	ADB	2007	The ADB funded, Nam Theun 2 hydropower project will ultimately generate 1,070 megawatts of electricity when commercial operations commence in December 2009. The project has taken initiatives, such as supporting preservation of forests, and relocation with improved social infrastructure. The project has introduced new livelihood programs for affected families, e.g., agro-ecological (organic farming, fishing and animal husbandry).	Incidents of anemia have gone down, incidents of malaria have gone down, and child and maternal health has improved. The project is also committed to support for fiscal reform and improved revenue management in the country. Every relocated village has a school – a first for these communities – and villagers are receiving free monthly health checkups from qualified medical providers.	Laos
Sabinis, S.	Environmental Overview of the Sardar Sarovar Project	Water Resources Development, Vol. 17, No. 1, 99–107, 2001	2001	Studies to investigate environmental, social and ecological issues resulting from the Sardar Sarovar and Narmada Valley projects. Long-term, integrated sustainable plan sought for river system. Water distribution and benefit: cost ratios.	Water transfer – irrigation, industrial development, etc. to water deficient area Flood control	India
Sadoff S., Grey, D.	Beyond the river: the benefits of cooperation on international rivers	Elsevier, Water Policy, 2002	2002	Assessment of politics and management surrounding transboundary basins and the inherent resources. Presentation of a 4 part typology: to/from river, because of river and beyond the river. Cooperative management and development of international rivers are key to effective management of rivers.	Benefits, international rivers, water resources management	Global
Sadoff S., Grey, D.	Cooperation on International Rivers: A Continuum for Securing and Sharing Benefits	Water International	2005	Discusses the use of Cooperative Regional Assessments as a practical approach to bring together project stakeholders.	Attempts to induce better cooperation by removing perceived inequities in the distribution of benefits.	Global

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Schelle, P.; Collier, U.; Pittock, J.	Rivers at Risk – Dams and the Future of Freshwater Ecosystems	Dams Initiative, WWF	2004	Use of environmental flows to lessen the impacts of dams to natural resources, fresh water supply, biodiversity.	Changes needed to ensure that economic and social benefits are facilitated by the minimum environmental cost and mitigatory measures. Environmental flows are beneficial mitigation.	Global
Shah, Z. & Kumar, D.	In the Midst of the Large Dam Controversy: Objectives, Criteria for Assessing Large Water Storages in the Developing World	Water Resources Management, Vol 22, Number 12, December 2008.	2007	The report illustrates the significant positive impacts of large reservoirs. Little is said about how these benefits could be enhanced and shared, but the report argues that the economic viability of dam projects should be assessed in relation to these positive externalities and that the negative externality effects should be built in to the cost of dam projects. The authors have derived a new index called sustainable water index (SWUI) to capture attributes relating to water.	The benefits defined include: groundwater recharge for agricultural production; provision of domestic water supply by dams; positive ecological impacts; improved regional and national food security.	Global
Simpson, M.	Community Benefit Tourism Initiatives - A conceptual oxymoron?	Tourism Management, Vol. 29, pp.1–18	2008	The paper introduces, defines and examines the concept of Community Benefit Tourism Initiatives (CBTI); considers the role of key stakeholders in CBTI and seeks to identify the critical components of CBTI development.	Community participation in tourism initiatives - Role of stakeholders in CBTI - Community and local benefits integrated into the principles of tourism planning and management - Adoption of business principles to develop tourism potential	Global

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Snowy Mountains Scheme Website	NA	Snowy Hydro Ltd.	2008	Built over a 25 year period from 1949 to 1974, the Snowy Mountains Scheme diverts water for irrigation and to produce clean, renewable, hydro electricity through a complex integrated infrastructure which includes sixteen major dams, seven power stations, 145 km of interconnected tunnels and 80 km of aqueducts. Each year the Snowy Scheme produces on average 4,500 gigawatt hours of clean, renewable, hydro electricity.	Website discusses the development of the scheme which took 25 years. Innovation – various design, technological and construction techniques developed during project implementation. Resettlement of refugees from Europe after World War II. Irrigation – Transfer of water from rivers on one side of a mountain range to the other.	Australia
The Gold Standard	The Gold Standard: Manual for CDM Project Developers	The Gold Standard	2006	Helps developers comply with requirements to gain Gold Standard certification for CDM, JI or voluntary market carbon reduction projects.	The Gold Standard acts as a quality label for CDM, JI or voluntary market carbon reduction projects. It can only be applied to projects that demonstrate clear benefits in terms of sustainable development. Small low-impact hydropower CDM projects of up to 15MW that comply with the WCD guidelines may be eligible for the Gold Standard. Each project is assessed against indicators under the following 3 categories: <ul style="list-style-type: none"> • Local / global environmental sustainability • Social sustainability and development • Economic and technological development 	Global

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Trembath, B.	Beyond compensation: sharing of rents arising from hydropower projects	Can compensation prevent impoverishment? Reforming resettlement through investments and benefits sharing, Oxford University Press	2008	Presents theoretical basis for rents associated with HEP projects. Identifies situations where rent sharing would be appropriate. Provides case study examples of rent capture by governments and examples of explicit and implicit rent sharing which are emerging in pioneer countries and regions.	Revenue sharing mechanisms: conclusion from looking at Nam Theun – where HEP is transferred across borders, more attention must be given to economic rent arising, sharing/capturing arrangements need to be more explicit. Indirect benefits: capital goods formation and boom to regional economy, consolidation of small villages into urban towns - critical mass - viability of community services, dike construction provided flood protection which catalyzed urban renewal project, highway development (not planned as part of project). Most important benefit was modernization of rural economy. Multi-purpose benefits: irrigation and water supply. Mechanisms used were tax incentives and locally subsidized electricity, improved access.	
Trinnaman, J., Clarke, A.	Survey of Energy Resources 2007	World Energy Council	2007	The document includes a chapter on hydropower. This gives an overview of the current status and future potential of hydropower globally, and highlights some of the particular issues around sustainability. The chapter was contributed by the IHA.	Hybridization of hydropower with other renewable technologies. The renewable synergies allow electricity demand without any need for fossil fuel generation, thereby maximizing the GHG reduction benefits of hydropower.	Global
Tshering, S., Tamang, B.	Hydropower - Key to sustainable, socio-economic development of Bhutan	Poverty Environment Net website	2007	The project demonstrates how hydropower projects have changed the economic scenario for Bhutan.	Revenues from exports of hydroelectricity have provided much needed capital to finance social projects and achieve economic self reliance.	Bhutan

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UNDP / GEF	Affecting Electricity Policy through a Community Micro Hydro Project, Kenya	UNDP / GEF	2003	The document provides details of how an effective community hydro project experience should be replicated through policy.	Excellent case study touching on renewable energy, technical capacity development, institutional capacity development; policy and legislation; poverty alleviation; and health and environment issues.	Kenya
UNEP	Dams and Development – Relevant Practices for Improved Decision-Making	UNEP	2007	The UNEP Dams and Development Project Paper: “Relevant Practices for Improved Decision-Making” is directed towards achieving internationally agreed development goals for reducing poverty through environmentally and socially sustainable development of water and energy resources. Chapter 5, “Compensation Policy” discusses mechanisms that work towards the restoration and improvement of the livelihoods of affected people, including benefit sharing mechanisms.	The chapter describes the current status of benefit sharing mechanisms and outlines guidelines for their implementation. It covers issues such as reconciling the goals of stakeholders, ensuring the efficiency of benefits redistribution, ensuring the involvement of local communities and ensuring the accountability of agencies entrusted with benefits redistribution. Brief case studies illustrate compensation practices of different projects.	Global
UNFCCC	ACM0002 Version 7: Approved consolidated baseline and monitoring methodology – “consolidated baseline methodology for grid-connected electricity generation from renewable sources”	UNFCCC	2007	CDM methodology that can be applied to installation / modification / retrofit of run-of-river or reservoir hydropower projects. In the case of a reservoir project, the reservoir must either already exist or not change in volume. Where a reservoir size is increased or a new reservoir is created, the methodology can only be applied if the power density of the plant will be greater than 4W/m ² .	CDM methodology for large (>15MW) grid connected renewable energy projects. Where the plant power density >4 but < or equal to 10W/m ² , a default emissions factor from reservoirs of 90kgCO ₂ e/MWh is applied. Where power density >10W/m ² , reservoir emissions are considered as 0. The project must demonstrate additionality (i.e., it cannot be the likely choice if business as usual applied). Therefore by using the CDM the project is able to bring power generation and GHG mitigation benefits that otherwise would not have been achieved.	Developing countries

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UNFCCC	AMS-I.D.: Grid connected renewable electricity generation v13	UNFCCC	2007	CDM methodology for small scale grid connected renewable energy project (not specifically for hydropower but includes qualifications to use when applying it to hydropower projects).	CDM methodology for projects up to 15MW (including modification or retrofit to existing larger projects where capacity is increased by up to 15MW). It provides the methodology to calculate the reduced emissions from the project, from a baseline of the emissions factor of the grid that it is being connected to. It takes into account possible leakage e.g., equipment being taken from an existing project, and deducts emissions accordingly. The methodology is simpler than ACM0002 in order to reduce the administrative burden for smaller projects.	Developing countries
UNFCCC	CDM methodological tool v4 – Tool for the demonstration and assessment of additionality	UNFCCC	2007	This is a tool to be used to demonstrate the additionality of a project that is applying to register under the CDM so that it can claim CERs.	The requirement to demonstrate additionality means that CDM projects only receive the financial benefits of the CDM if they would not be developed without using the mechanism.	Developing countries

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Upadhyaya, S.	Reorienting the distribution and use of hydropower royalty to promote equity and justice – proceedings of a national workshop on sharing hydropower royalty	Winrock International	2006	Investigation into how royalties derived from hydropower projects are distributed/ invested to promote equity and justice.	<p>Legislative changes since the late 1990s had provided the beginnings of a framework for channeling a share of royalties to affected parties. Need for central guidelines for distribution and use of royalty.</p> <p>Need to invest a share of royalty in “upstream watersheds” to ensure environmental service provision</p> <p>Need to include downstream areas, often excluded at present</p> <p>Need for some kind of pooling arrangement to ensure fair allocation of royalty across affected parties (so as to ensure beneficiaries of large projects do not earn windfall).</p> <p>Value of investing surplus monies in infrastructure (transport, rural electrification, etc)</p>	Nepal

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Upadhyaya, S.	Addressing inequities and injustices in hydropower development in Nepal – lessons from abroad	Winrock International	2006	Investigation into which communities are affected negatively by the development and how initiatives have surmounted problems.	Case studies: compensating affected parties and allocating a part of the benefits of hydropower developments to local communities. Legislative initiatives required to ensure developers consider upstream communities. Careful documentation of affected people; effective post-resettlement support can mitigate negative impacts. Presence of independent judiciary for affected communities to seek redress for past wrongs; where possible resettlement nearby and socio-cultural harmony preserved. Strong post resettlement support also provided. Brazil and India are beginning to recognize the need to extend affected parties to communities downstream. Empowerment of affected peoples is important to providing equitable solutions to hydropower development.	Brazil, Costa Rica, Columbia, US, India, China
Vincent Roquet & Associates Inc.	Benefits sharing from Dam Projects	The World Bank Group	2002	The paper was written to bring attention to the adverse impacts of dam projects on displaced peoples, downstream users, taxpayers and the natural environment and bring attention to benefit sharing opportunities that can alleviate the livelihood effects of these impacts through direct monetary redistribution of project related revenues.	Types of (economic) benefit sharing schemes: revenue sharing mechanisms; development funds; equity sharing or full ownership; taxes paid to local / regional authorities.	Global

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
Watershed Management Department of the Philippines	Watershed Management Department of the Philippines website	Watershed Management Department of the Philippines	2006	Outlines practices currently in place to effectively manage forestry and agricultural practices of watersheds and improve livelihoods.	Benefits include: 1. Improved livelihoods of communities living in watershed areas. 2. Improved hydropower potential of reservoir.	Philippines
WCD	Dams and Development: a New Framework for Decision-Making	Earthscan	2000	Global review of large dams used to develop core values for decision-making and recommendation for new policy framework. Incorporation of the 7 key policies: gain public acceptance, comprehensive options assessment, addressing existing dams, sustaining rivers and livelihoods, recognizing sharing benefits, ensuring compliance, development security.	Those bearing the costs and risks of large dams (poor, vulnerable, future generations), are often not the same groups that receive water and electricity and the economic benefits from these: must address large inequalities in distribution of costs and benefits. Clarifying the rights context for a proposed project is an essential step in negotiating specific agreements related to benefit sharing.	Global
WCD	Chapter 5 of Dams and Development Report: "Options for Water and Energy Resources Development"	Earthscan	2000	Includes an overview of some of the practical options available for improving the benefits of agricultural development and domestic water supply linked with dam projects. Some case studies from around the globe are given to illustrate some of the good practices in place.	Benefits detailed: Agricultural development – enhancement mechanisms given. Domestic water supply – enhancement mechanisms given.	Global
World Bank	Carbon Finance for Sustainable Development Report	World Bank	2007	Summary of the World Bank's involvement in the carbon markets in 2007, including details of all 10 carbon funds they operate and their project portfolios.	Highlights the different carbon funds that the World Bank operates. Of particular interest is the Community Development Carbon Fund (CDCF). This has special criteria that the projects it invests in must deliver community benefits. Projects invested in by the fund so far include 5 hydropower projects.	Poorest developing countries, particularly sub-Saharan Africa

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
World Bank Carbon Finance Unit	Brazil Reforestation Around Hydro Reservoirs	World Bank Carbon Finance Unit	2008	Website article describing a carbon finance project developed under the World Bank's BioCarbon Fund. The project developer is the operator of the hydropower dams.	By reforesting land around hydropower reservoirs the project generates carbon reduction credits. The project helps increase biodiversity, improves soil nutrient content, will employ local people and will also involve a local forestry education program. The article highlights that hydroelectric operators in other areas could use the same approach. The operator benefits from protection of the area around the reservoirs, reducing the risk of soil erosion and sediment build up that would reduce hydropower output.	Brazil
World Water Assessment Programme	The 2nd UN World Water Development Report – "Water, A Shared Responsibility"	UN	2006	Book covering whole range of issues relating to water resources globally. It includes various specific references to hydropower.	Hybridization of hydropower with other renewables, enhancing GHG reduction benefits.	Global
WWF/SEI/Tricorona	A Comparison of Carbon Offset Standards	WWF	2008	Summarizes the different standards that have been developed to certify projects in the voluntary carbon market.	Highlights the environmental and social requirements that a voluntary carbon market project must meet to comply with each standard.	Global
Xiaogushan Hydropower Company Ltd; World Bank (IBRD) Carbon Finance Unit; Netherlands Ministry of Housing, Spatial Planning and the Environment Ltd.	China Xiaogushan Hydropower Project – CDM PDD	UNFCCC (CDM EB)	2006	PDD for the Xiaogushan hydropower CDM project, a 102MW run-of-river project. It is financed by a loan from the ADB and the CDM. The CDM application was submitted by the IBRD (Government of Netherlands) as a trustee of the World Bank Prototype Carbon Fund. It was one of China's first CDM projects.	Gansu is the second poorest province in China and Zhangye City is one of the province's poorest areas and. The Zang is a Tibetan minority that dominates the project area (98% of local population). They have an average poverty level of 94%. The project will create new jobs and improve transport routes to the area. The project will bring zero carbon renewable energy generation, providing power for the remote area as well as to the Gansu grid.	China

Author	Document title	Publisher / Book / Journal	Date	Article abstract	Summary of benefits issues / case studies	Geog focus
	An IEG Impact Evaluation	The International Bank for Reconstruction and Development / The World Bank	2008	Rural electrification greatly improves the quality of life. Lighting alone brings benefits such as increased study time and improved study environment for school children, extended hours for small businesses, and greater security.	<p>Electrification brings more than light. Its second most common use is for television, which brings both entertainment and information. The people who live in rural areas greatly appreciate these benefits and are willing to pay for them at levels more than sufficient to cover the costs. However, the evaluation of these and other benefits (for example, in terms of public goods), as well as of their distribution, has been sparse.</p> <p>This report reviews recent methodological advances made in measuring the benefits of rural electrification and commends them. It also notes that the understanding of the techniques shown in project documents is sometimes weak, and quality control for the economic analysis in project documents lacking. This study shows that willingness to pay for electricity is high, exceeding the long-run marginal cost of supply.</p>	

Annex 2: Summary of Issues Addressed in Literature

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Best Practice on Water: Nepal	None	✓	✓	✓		✓	✓
Community- based micro-hydro power generation project (renewable energy) – Philippines	None						
Background Sheet, Venezuela – Caroni River Watershed Management Plan (VE-L1006) and Tocoma Hydroelectric Project (VE-L1003)	Unknown	✓	✓	✓		✓	
Watershed Management Department of the Philippines website	Unknown	✓	✓	✓		✓	
Improving Resettled Lives	ADB new letter	✓	✓	✓		✓	✓
Hydropower potential and development activities	Alison Bartle		✓	✓		✓	
Achieving meaningful public participation in the environmental assessment of hydro development: case studies from Chamoli District, Uttarakhand, India	Allan Diduck, John Sinclair, Dinesh Pratap and Glen Hosteller	✓	✓	✓		✓	✓
Development and Large Dams: A Global Perspective	Asit K. Biswas and Cecilia Tortajada, President and Vice-President, Third World Centre for Water Management, Mexico City		✓			✓	

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Beyond compensation: sharing of rents arising from hydropower projects	Barry P. Trembath				✓		✓
Flexible Mechanisms for Climate Change Compliance: Emission Offset Purchases Under the CDM	Carr, C. and Rosembuj, F. (World Bank)				✓		✓
CCX Exchange Offsets and Exchange Early Action Credits	Chicago Climate Exchange (CCX)				✓		
Financing of Private Hydropower Projects	Chris Head	✓	✓	✓	✓		✓
Financing of Private Hydropower Projects	Chris Head	✓	✓	✓	✓		✓
Multi-purpose Water Infrastructure: Exploring the Paradigm of Benefit sharing	Daryl Fields, World Bank		✓			✓	✓
Growing the business of benefit sharing	Daryl Fields, World Bank	✓	✓	✓		✓	✓
Benefit sharing and Hydropower: An Overview. Power Point presentation to Government of Uttarakhand	Daryl Fields, World Bank	✓	✓	✓		✓	✓
Trans-boundary Water Cooperation as a Tool for Conflict Prevention and for Broader Benefit Sharing	David Phillips, Marwa Daoudy, Stephen McCaffrey, Joakim Öjendal and Anthony Turton		✓	✓		✓	✓

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Benefit Sharing to Supplement Compensation in Resource Extractive Activities: The Case of Dams, in Can Compensation Prevent Impoverishment? Reforming Resettlement through Investments and Benefit-Sharing, edited by Michal M. Cernea and Hari Mohan Mathur	Dominique Égré, Vincent Roquet and Carine Durocher	✓	✓			✓	✓
Benefit Sharing in International River Basins	Dr. Anders Jagerskog and Professor Jan Lundqvist, SIWI		✓			✓	✓
Promoting Good Practice for Hydropower – a Role for ECAs. Power Point presentation	Dr. Ute Collier, Global Freshwater Programme, WWF, ucollier@wwf.org.uk		✓	✓		✓	
Sreden Iskar Cascade HPP Portfolio Project	EBRD	✓	✓		✓		✓
Hydropower: SDV Pilot Initiative for Enhancing Development Benefits to Local Communities	Elena Correa, World Bank	✓	✓	✓			
La Vuelta and La Herradura Hydroelectric Project	Empresas Públicas de Medellín; Electric Power Development Co.				✓		
Hydropower production and river rehabilitation: a case study on an alpine river	Fette, Weber, Peter. Werhli		✓	✓		✓	
China's Climate Change Policy: Domestic and International Developments	Gørild Heggelund				✓		✓
Hydropower Tibet Factsheet and Small-scale power supply for Rural Development Impact report	GTZ		✓				

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Technical Background Paper No. 4 – “Integrated Water Resources Management”	GWP	✓	✓	✓		✓	
Surface Protection against Hydro-abrasive Wear	H Grein, A Kalberer, E Muller	✓					✓
IHA Sustainability Guidelines	IHA				✓	✓	✓
IHA Sustainability Assessment Protocol	IHA				✓		
Making Development Work in the CDM: Phase II of the Development Dividend Project	International Institute for Sustainable Development (IISD)				✓		
Reconstruction of Calderas Hydroelectric Power Plant	ISAGEN SA; AgCert International	✓	✓		✓		
Pay – Establishing payments for watershed services	IUCN	✓	✓	✓		✓	
Lao PDR Hydro Project Improves Families’ Standard of Living, Health	Jason Rush	✓	✓	✓		✓	✓
Recommendations for sustainable hydroelectric development	Jean-Etienne Klimpt, Cristina Rivero, Hannu Purannen, Frans Koch	✓	✓	✓		✓	✓
Dams and Benefit Sharing - Annex Summary Review Case Studies	Joseph Milewski; Dominique Égré; V. Roquet		✓			✓	✓
Benefit Sharing Mechanisms for People Adversely Affected by Power Generation Projects in Viet Nam	Lawrence J.M. Haas, UK, Dr. Dang Vu Tung, Viet Nam		✓			✓	✓
The Construction of Dependency: The Case of the Grand Rapids Hydro Project	Martin Loney					✓	

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Can local people also gain from benefit sharing from water resources development? Experiences from dam development in the Orange Senqu river basin	Mokorosi, van der Zaag		✓			✓	✓
UNEP Dams and Development Project, Compendium on Relevant Practices - 2nd Stage, Revised Final Report - Benefits Sharing Issue	Dominique Égré					✓	✓
Community Benefit Tourism Initiatives - A conceptual oxymoron?	Murray C. Simpson	✓	✓	✓		✓	✓
Maximizing the Benefits of Hydropower - Key outcomes from the HYDRO 2006 sessions	NA		✓			✓	✓
Community Investment Programs Associated with Private Sector Projects – Annex 1 Examples of Good Practice in Community Investment Programs	NA	✓	✓	✓		✓	✓
Community Investment Programmes Associated with Private Sector Investment Projects	NA	✓	✓	✓		✓	✓
International Experience Sharing Workshop on “Land Acquisition, Resettlement and Rehabilitation, and Benefits Sharing”	NA		✓	✓		✓	✓
Meeting Africa’s Energy Needs: The Costs and Benefits of Hydropower	NA		✓	✓		✓	
To dam or not to dam? Five years on from the World Commission on Dams	NA		✓	✓		✓	

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Survey of Energy Resources 2007	NA				✓		
Snowy Mountains Scheme Website	NA	✓		✓			✓
Virtual Hydropower Prospector	NA						✓
Itaipu Tourist Complex Website	NA	✓	✓	✓	✓		
State of the Voluntary Carbon Markets 2008	New Carbon Finance / Ecosystem Marketplace		✓	✓	✓		
Measures for Operation and Management of CDM Projects in China	Office of National Coordination Committee on Climate Change				✓		
A Review of the Role of Dams and Flood Management	Patrick Hawker, Halcrow	✓	✓	✓		✓	
Cote small-scale hydropower CDM project in Costa Rica	Prototype Carbon Fund				✓		
Overview of RGGI CO2 Budget Trading Program	RGGI				✓		
Rivers at Risk – Dams and the Future of Freshwater Ecosystems	Schelle, P.; Collier, U.; Pittcock, J.		✓	✓		✓	
Environmental Overview of the Sardar Sarovar Project	Sharad Sabnis		✓	✓		✓	
Reorienting the distribution and use of hydropower royalty to promote equity and justice – proceedings of a national workshop on sharing hydropower royalty	Shyam K. Upadhyaya	✓	✓	✓	✓		✓
Addressing inequities and injustices in hydropower development in Nepal – lessons from abroad	Shyam K. Upadhyaya		✓	✓		✓	✓
Beyond the river: the benefits of cooperation on international rivers	Claudia W. Sadoff, David Grey		✓	✓		✓	
Hydropower - Key to sustainable, socio-economic development of Bhutan	Sonam Tshering and Bharat Tamang	✓	✓	✓		✓	✓

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Water Power and Dam Construction	Suzanne Pritchard						✓
The Gold Standard: Manual for CDM Project Developers	The Gold Standard				✓		
Dams and Development – Relevant Practices for Improved Decision-Making	UNEP	✓	✓	✓		✓	✓
ACM0002 Version 7: Approved consolidated baseline and monitoring methodology – “consolidated baseline methodology for grid-connected electricity generation from renewable sources”	UNFCCC				✓		
AMS-I.D.: Grid connected renewable electricity generation v13	UNFCCC				✓		
CDM methodological tool v4 – Tool for the demonstration and assessment of additionality	UNFCCC				✓		
Case Study, Pakistan: The Tarbela Dam and Indus River Basin – Case Study of the World Commission on Dams	Unknown	✓	✓	✓		✓	
Benefit sharing from Dam Projects	Dominique Égré, Vincent Roquet, and Carine Durocher	✓	✓	✓			✓
Dams and Development: A New Framework for Decision-making	WCD		✓			✓	✓
Chapter 5 of Dams and Development Report: “Options for Water and Energy Resources Development”	WCD	✓	✓	✓		✓	

Title	Author	Economic Benefits	Social Benefits	Environmental Benefits	Monetary Benefits Transfer Mechanisms	Non - Monetary Benefits Transfer Mechanisms	Equity Distribution Issues
Carbon Finance for Sustainable Development Report	World Bank				✓		
Brazil Reforestation Around Hydro Reservoirs	World Bank Carbon Finance Unit				✓		
The 2nd UN World Water Development Report – “Water, A Shared Responsibility”	World Water Assessment Programme				✓		
A Comparison of Carbon Offset Standards	WWF/SEI/Tricorona		✓	✓	✓		
China Xiaogushan Hydropower Project – CDM PDD	Xiaogushan Hydropower Company Ltd; World Bank (IBRD) Carbon Finance Unit; Netherlands Ministry of Housing, Spatial Planning and the Environment Ltd; World Bank (IBRD) Carbon Finance Unit; Netherlands Ministry of Housing, Spatial Planning and the Environment		✓	✓	✓		
In the Midst of the Large Dam Controversy: Objectives, Criteria for Assessing Large Water Storages in the Developing World	Zankhana Shah & M. Dinesh Kumar	✓	✓	✓		✓	
Affecting Electricity Policy through a Community Micro Hydro Project, Kenya						✓	

Annex 3: Pro-Forma of the Literature Review Summary Sheet

Enhancing Development Benefits of Hydropower Projects Literature Review Summary Form

1. Name of reviewer:	
2. Name of team:	
3. No. of review (per team)	
4. Document title:	
5. Author name(s):	
6. Publisher name(s):	
7. Date:	
8. Availability /cost:	
9. Where stored:	
10. Literature type: (e.g., single case –study / comparative analysis / think piece / etc?)	
11. Region/country focus:	
12. Project(s) size/type: (e.g. run-of-river)	
13. Project setting: (e.g., rural, urban, proximity to communities, environmental sensitivity, etc.)	
14. Motts involvement?	
15. Article abstract:	
16. List of topics of key relevance (benefits, innovation, lessons learned, etc.) to this study:	
17. Paragraphs on the following key topics if relevant. Please select topics by highlighting : <input type="checkbox"/> Irrigation & agricultural production <input type="checkbox"/> Power generation & electricity provision <input type="checkbox"/> Dam tours <input type="checkbox"/> Other tourism potential _____ (specify) <input type="checkbox"/> Positive resettlement <input type="checkbox"/> Building of community infrastructure	

<ul style="list-style-type: none"> <input type="checkbox"/> Improved accessibility _____ (specify) <input type="checkbox"/> New skills <input type="checkbox"/> Employment opportunities <input type="checkbox"/> Institutional strengthening <input type="checkbox"/> Positive worker influx or integration processes <input type="checkbox"/> Revenue sharing mechanisms <input type="checkbox"/> Hedging fuel prices <input type="checkbox"/> Improved governance <input type="checkbox"/> Improved community health <input type="checkbox"/> Improved water management _____ (specify) <input type="checkbox"/> Fish-stock management <input type="checkbox"/> Integrating with other energy sources _____ (specify) <input type="checkbox"/> Use of CDM and CERS <input type="checkbox"/> GHG mitigation <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____ (please specify) 	
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<p>18. Additional key issues to those in above list (consider planning, implementation and M&E issues of benefits):</p>	
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<p>19. Useful sources of further information/reference identified:</p>	
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<p>20. Relevance of literature to other teams (name topic, page and team):</p>	
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<p>21. Comment on case study potential (whether relevant or not, and the probable ease of gathering more information) or contributions for case study framework:</p>	
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<p>22. Additional comments:</p>	
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