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Feasibility of Payments for Watershed Services

Part II: Evaluation of business opportunities

IND 3025 0/52 "Development of Tools and Methodologies to Implement the Payment for Environment Services (PES) concept in Watersheds in India" between Norwegian Institute for Water Research (NIVA) and Centre for Interdisciplinary Studies in Environment and Development (CISED), Bangalore, India

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– an institute in the Environmental Research Alliance of Norway

REPORT

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Abstract

The following report is a literature review in the India PES Project "Development of Integrated Tools and Consulting Services for Watershed Management, and Payments for Environmental Services in India", supported by the Royal Norwegian Ministry of Foreign Affairs (MFA). Part II of the report contains a review of international programmes working in PES in Asia, research and consulting organisations working in this field, a review of expertise required to carry out rapid appraisals for watershed services and an annotated bibliography for the combined literature review Part I and II.

4 keywords, Norwegian	4 keywords, English
1. Betaling for nedbørfeltsbaserte økosystemtjenester	1. Payments for Watershed Services
2. Næringsmuligheter	2. Business opportunities
3.	3.
4.	4.

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India PES project

Feasibility of Payments for Watershed Services

Part II: Evaluation of business opportunities for NIVA

Preface

The following report is a literature review in the India PES Project "Development of Integrated Tools and Consulting Services for Watershed Management, and Payments for Environmental Services in India", supported by the Royal Norwegian Ministry of Foreign Affairs (MFA). The review has been split into two reports (Part I and Part II). The Part I report reviews seminal papers on payments for watershed services from the point of view of institutional, biophysical and economic feasibility of PES. Part II provides a review of programmes promoting watershed services in Asia, organisations currently working in PES, as well as an evaluation of the expertise required to carry out rapid feasibility appraisals of watershed services. Part II has been written by Nadine Reis and edited by David N. Barton.

Oslo, March 2007

David N. Barton

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1 Introduction

Two sub-objectives of the "India PES"[1] project are to:

1. Identify potential clients and demonstrate PES tools which could lead to business for the two partners
2. To strengthen co-operation between NIVA and south Asian partners for joint consultancies.

The project has chosen to focus on markets for watershed services. The evaluation of "business opportunities" for NIVA and CISED are therefore also two-fold. Firstly, a case must be made for the feasibility of markets for watershed services based on theory and the study of its implementation in case studies in areas and for services similar to those studied in the Malabrabha River Basin. Can a convincing case be made for markets for watershed services based on existing experiences in India and South-East Asia? What do these cases tell us about the financial, institutional and biophysical[2] limitations that must be overcome for markets for watershed services to function? Are these limitations common across countries, and geographical scales for the same types of watershed services? An evaluation of the market opportunities for payments for watershed services constitutes Part I of the review and can be found in a companion report to this one.

If the broad pre-conditions for establishing and then sustaining markets for watershed services can be identified, a case may also be made for market opportunities of a second kind, involving consulting services in how to carry out such feasibility studies. A number of research institutes and consultancies in Asia have conducted case studies, often in cooperation with northern hemisphere counterparts. The second part of this report contained here (Part II) constitutes an evaluation of which institutes and companies have been most involved in studying markets for watershed services, which agencies have and are financing such studies, and what are fields of expertise may be required to conduct rapid feasibility appraisals of watershed services discussed in Part I. We review the steps and expertise involved in rapid hydrological appraisals and water audits, two forms of appraisal that seem especially well suited as a foundations for conducting a more detailed feasibility analysis of markets for watershed services.

This report is also meant to provide an easy to use overview of potential partners for organisations looking to work with payments for watershed services, but which are relatively new to this topic (as such) in the region. Some additional projects and organisations working in India and Karnataka State (where the "India PES" project is located) have also been provided. Rather than extensive textual reviews on these organisations and projects web-links have been provided so that the reader can search for the information at source. Finally, an annotated bibliography is provided on seminal papers on payments for watershed services internationally, as well as more specifically for case studies from Asia and India. This section may be of interest to water professionals who are unfamiliar with the notion of payments for watershed services and would like a rapid introduction to key studies. We acknowledge that we have only reviewed published studies and that a large grey literature and a number of on-going projects have not been covered in this review.

[1] Development of Tools and Methodologies to Implement the Payments for Environmental Services Concept in Watersheds in India, supported by the Royal Norwegian Ministry of Foreign Affairs.

[2] Environmental constraints as well as limitations in knowledge of biophysical linkages.

2 Current PWS-programmes in India and Asia

2.1 Developing A System of Payments for Environmental Services: A Case for Philippine Upland Dwellers (The Philippines)

Implementing institutions:	IVM, REECS
Funded by:	DGIS
Duration:	unknown
Web:	http://www.premonline.nl/index.php?p=projects&cid=5
Contact:	Ms. Eugenia C. Bennagen: bennagen@skyinet.net
	Dr. Pieter van Beukering: beukering@ivm.vu.nl
Central Publication:	BENNAGEN, M.E. ET AL. (2006): Developing a system of Payments for Environmental Services: A case for Philippine upland dwellers. REECS, Quezon City.

The project is part of the programme 'Poverty Reduction and Environmental Management' (PREM), which was initiated by the Institute for Environmental Studies (IVM, Amsterdam). The main objective of the PREM programme is to deepen and broaden the exposure of economic researchers and policy advisors in developing countries to the theory and methods of natural resource and environmental economics. It is envisaged that this exposure will, in turn, encourage effective policy change in developing countries, with the joint goals of poverty reduction and sustainable environmental management. The main activities of PREM are:

- Research and policy analysis in environmental and resource economics in developing countries, specifically focused on the relationship between poverty and the environment
- Training (short courses tailored to the needs of specific projects, seminars or courses proposed by the regional clusters, or training workshops organised at a programme level)
- Outreach (special emphasis on involving local policy makers and other key stakeholders in projects at an early stage)

A new goal of the PREM programme is to specifically contribute to the poverty reduction strategies as defined in the Poverty Reduction Strategy Papers (PRSP) of the participant countries.

The project 'Developing A System of Payments for Environmental Services: A Case for Philippine Upland Dwellers' proposes to develop a system PES in two sites in the Philippines. The objective of the research is to generate empirical support to the policy on the institutionalisation of PES-systems.
The study will

- identify and quantify the environmental services provided by two groups of forest dwellers,
- estimate the willingness to pay of end users for the services and

- design a system of payments to reward the forest dwellers for the environmental services they provide to society.

2.2 Developing Markets for Watershed Protection Services and Improved Livelihoods (India, Indonesia, China)

Implementing institutions:	IIED, WII (India), PSDAL-LP3ES (Indonesia), COHD (China)
Funded by:	DFID, The Shell Foundation, DANIDA, SDC
Duration:	October 2003 - March 2007
Web:	http://www.environmental-incentives.org/
Contact:	chetan@winrockindia.org
Central publication:	SAYER, J. (2007): Policy learning in action: developing markets for watershed protection services and improved livelihoods. Report of an evaluation. IIED, London.

The aim of this project was to increase the understanding of the potential role of market mechanisms for the provision of watershed services and improving livelihoods in developing countries. IIED established agreements with partners in India, South Africa, Indonesia and the Caribbean to develop action learning programmes on PWS. It also collaborated with partners in China and Bolivia on diagnostic work on PWS. Field work has been successfully conducted in all of the countries and a number of interim reports have been published. *An overview publication thoroughly revising and updating the PWS components of 'Silver Bullet or Fools' Gold?' is nearing completion and will be a major synthesis report of the project.*

In India, IIED, WII and a number of partner organisations (including IIFM, PSI) undertook action research in 3 sites in Kangra district of Himachal Pradesh, and around Bhopal town in Madhya Pradesh, with a focus on rural micro-watersheds, urban water supply catchments and hydropower project catchments. Research was based on the following questions:

- How can incentive-based mechanisms help maintain and enhance environmental services and improve livelihoods?
- What is the scope for downstream watershed service receivers like villages, cities, dams etc. supporting upstream communities to manage land use and improve water quality and quantity?
- What is the potential for incentive-based mechanisms such as PES in India?

Results and conclusions of the India-project are documented in the following publication:

SENGUPTA, S. ET AL. (2003): Developing markets for watershed protection services and improved livelihoods in India. WII, IIED. New Delhi, London (unpublished draft).

2.3 Economic Instruments for Managing Forest Ecosystem Services (India)

Implementing institutions:	WWF India, IEG
Funded by:	The World Bank, WWF Alliance for Forest Conservation and Sustainable Use

Duration:	September 2006 – June 2007
Web:	http://www.wwfindia.org/about_wwf/what_we_do/forests/pes/index.cfm
Contact:	T.R. Manoharan, WWF India
Central publication:	WWF India (ed.) (n.y.): Economic Instruments for Managing Forest Ecosystem Services in India. Online. URL: http://assets.wwfindia.org/downloads/economic_instruments_project__brief.pdf (Issue: Feb. 2007).

The objective of this project is to examine the opportunities for sustainable economic instruments, including PES, for forest conservation in India. The work will follow an approach of combining field-based case studies, policy research and stakeholder consultations. The activities and workplan are based on the following:

- Assess the design and implementation of existing economic instruments in selected Indian states and ecoregions where such mechanisms are already in place.
- Build awareness about and assess potential for PES for forest protection with special reference to watershed protection based on selected sites within the priority ecoregions.
- Results would be assessed and used to identify opportunities for broader application or replication at other sites to strengthen the motivation for improved management of protected areas or sustainable management of production forests.

The results of this project will be fully documented case studies at selected field sites, a national workshop to discuss findings and possible applications to a broader range of sites and situations, a project outcome brief and a proposal for prospective follow-up activities based on results and workshop discussions with key stakeholders.

2.4 Environmental Services Program (ESP, Indonesia)

Implementing institutions:	USAID
Funded by:	USAID
Duration:	2004 - 2008
Web:	http://www.esp.or.id/
Contact:	info@esp.or.id
Central publication:	http://www.esp.or.id/

The Environmental Services Program (ESP) is a five-year program which was developed by USAID/Indonesia in response to the Presidential Initiative of 2002 to improve sustainable management of water resources. This initiative supports activities in the following three key areas:

- Access to clean water and sanitation services
- Improved watershed management

- Increasing the productivity of water

USAID's Environmental Services Program (ESP) works with Indonesia's government, the private sector, NGOs, community groups and other stakeholders to promote better health through improved water resources management and expanded access to clean water and sanitation services. ESP is developing a number of approaches to PES in order to demonstrate and finance the up-stream and down-stream connection to water supply. This study includes specific PES models to explore, one in Sumatra and one on Java. ESP is also establishing three PES models, in Central and West Java as well as North Sumatra. (http://www.worldagroforestry.org/sea/portals/2/lombok/material/3.6.pdf)

2.5 Equitable payments for watershed services (Philippines, Indonesia)

Implementing institutions:	WWF, CARE, IIED
Funded by:	DANIDA, DGIS
Duration:	early 2006 – ca. 2010
Web:	http://www.panda.org/about_wwf/what_we_do/ forests/our_solutions/protection/pes/index.cfm
Contact:	Julio Tresierra (Global project coordinator): jtresierra@wwf.nl
Central publication:	WWF/CARE/IIED (eds.) (n.y.): Equitable payments for watershed services: delivering poverty reduction and conservation. Online. URL: http://assets.panda.org/downloads/ factsheet_pes_english.pdf (Issue: Feb. 2007).

WWF, CARE, and IIED are developing and implementing a holistic PES approach - equitable PWS - that explicitly aims to balance poverty reduction with watershed conservation. Equitable PWS-systems are supposed to be established in 10 watersheds in 5 countries, among them the following sites in Asia:

- Philippines: Cantingas watershed (Sibuyan) and Mt. Isarog watershed (Camarines Sur)
- Indonesia: Kapuas Hulu (Borneo) and Eastern Nussa Tengara (Timor)

The programme is currently in phase 1, an 18-month preparatory phase, whose main objective is to prepare and establish solid, verifiable business cases for both buyers and sellers in the project sites. Phase 2, which will last for 3-4 years, will focus on implementation at the sites that have demonstrated a viable business case through the process of phase 1.

2.6 Forest Restoration for Climate, Community and Biodiversity (China)

Implementing institutions:	TNC
Funded by:	TNC, Conservation International (CI), State Forestry Administration (SFA), The Wold Bank
Duration:	2005 –

Web:	*http://www.nature.org/aboutus/howwework/ conservationmethods/conservationfunding/ (no project web page)*
Contact:	Zhang Shuang: shzhang@naturechina.org
Central publication:	TNC (ed.) (2006): Ecosystem services. Status and summaries. Online. URL: http://www.nature.org/partners/files/ecosystem_ services_may_20061.pdf (Issue: Feb. 2007).

The project's main focus has been on carbon sequestration and biodiversity conservation so far, but a feasibility study for expanding the initiative to include payments for stabilising water supplies through forest restoration activities is now undertaken with a grant from the World Bank. Currently, the project is

- establishing formal relationships with key partners,
- supporting Yunnan Forestry Bureau to fully execute their first Clean Development Mechanism project,
- facilitating stakeholder engagement and building technical and financial capacity of stakeholders,
- launching a pilot watershed project at the local scale to explore practical policies and finance mechanisms to account for and value carbon sequestration and watershed services and
- conducting relevant policy and finance mechanism research to inform policy development.

The future plan is to develop framework and capacity of the Chinese government and partners to implement multiple-benefit ecosystem service projects.

2.7 Negotiating watershed services (India)

Implementing institutions:	CLUWRR, IIED, WII
Funded by:	DFID
Duration:	August 2002 – January 2006
Web:	http://www.cluwrr.ncl.ac.uk/research_projects/ongoing _research/prj_costa_rica.php
Contact:	Ian Calder: i.r.calder@ncl.ac.uk
Central publication:	CLUWWR et al. (eds.) (2006): Socio-economic opportunities from upland catchment environmental services: A negotiation support system. Final technical report. Online. URL: http://www.cluwrr.ncl.ac.uk/related_documents/costa_rica/Web-docs/A1-FTR.pdf (Issue: Feb. 2007).

The project was undertaken in India and Costa Rica in order to better understand socio-economic opportunities and outcomes from markets for environmental services. The aim was to generate new knowledge relating to land-use and forest decision making promoted for the benefit of small-scale farmers within the forest/agriculture interface. Research objectives included to better understand social responses and impacts from land use change from different land and water management scenarios in Costa Rica and

India, and to develop a generic negotiation support approach which promotes improved understanding between beneficiaries and policy makers. Negotiation support methodologies will be applicable to developing countries facing increasing water resource constraints and competition in Africa, Asia and Latin America.

2.8 Promoting Payments for Ecosystem Services (PES) and Other Sources of Sustainable Financing for Rural Conservation and Development (international)

Implementing institutions:	WWF
Funded by:	WWF, SIDA
Duration:	2004 - 2007
Web:	http://www.panda.org/about_wwf/what_we_do/policy/ macro_economics/about_us/index.cfm (no project webpage)
Contact:	Pablo Gutman: pablo.gutman@wwfus.org
Central publication:	http://www.conservationfinance.org/Documents/CFA_ documents/sida.pdf

So far, most PES schemes are small in size, cumbersome to manage and are not rural-poor friendly. This WWF initiative addresses those limitations by focusing on how to scale-up current PES experiences so that they deliver substantial and long-lasting conservation while alleviating rural poverty. Activities of the project are:

- Building a roster of internal and external expertise that may support WWF-PES activities
- Providing in-house and consulting expertise to WWF country staff and other national and regional stakeholders to support the design and implementation of PES initiatives. This will include providing complementary and start-up funding and supporting fund raising.
- Organising PES regional clinics to review and support WWF network PES projects
- Organising, sponsoring or facilitating training on PES best practices
- Establishing a forum with private businesses to discuss approaches to PES schemes that bring on board the marketing and economic experience and perspectives of the private sector.
- Convening international meetings to take stock and advance the understanding of PES potentials and limitations in (a) less developed countries; (b) middle income countries; (c) rich countries; and (d) international PES schemes to pay for the global commons.
- Producing and disseminating a series of publications including stock taking, manuals on “how to” and “best practices.”

2.9 Rewarding Upland Poor for Environmental Services (RUPES, Philippines, Nepal, Indonesia)

Implementing institutions:	ICRAF and others
Funded by:	IFAD and others
Duration:	2002 - ?
Web:	*http://www.worldagroforestrycentre.org/sea/Networks/RUPES/*
Contact:	rupes@cgiar.org
Central publication:	see publications on http://www.worldagroforestrycentre.org/sea/Networks/RUPES/publications.htm

The goal of RUPES is to enhance the livelihoods and reduce poverty of the upland poor while supporting environmental conservation on at local and global levels. ICRAF has taken on the role of coordinating a consortium of partners interested in contributing and being a part of RUPES. These include the following organizations:

- Center for International Forestry Research (CIFOR)
- World Resources Institute (WRI)
- World Conservation Union (IUCN)
- Winrock International
- Conservation International (CI)
- the Economy and Environment Program for Southeast Asia (EEPSEA)
- the Ford Foundation
- The Nature Conservancy (TNC)
- International Institute for Environment and Development (IIED)
- Worldwide Fund for Nature (WWF)
- national partners from the countries in Asia where RUPES is conducting action research, and other international and national investors in poverty alleviation and natural resource management.

RUPES has six action research sites for testing reward mechanisms. These are in the Philippines (Kalahan Reserve & Ancestral Domain and Bakun), Nepal (Kulekhani) and Indonesia (Bungo, Sumberjaya and Singkarak). In addition to the sites directly funded through the RUPES project, the program is identifying with its partners other sites that can add to the knowledge base on environmental services, environmental service rewards and recognition initiatives and institutional mechanisms to facilitate environmental service payment schemes. The exchange of information and knowledge corresponds with the RUPES partnership framework and ranges from sharing activity results through to provision of technical advice (from both directions). To date six sites have been identified in the Philippines (Sibuyan Island and North Sierra Madre National Park - both WWF sites) and Indonesia (Setulang - CIFOR, Cidanau and Rinjani - IIED sites and Halimun - USAID funded site, implementing agency is ICRAF).

3 Relevant organisations for implementing PWS in India and Asia

3.1 Organisations involved in project implementation

Name	**CARE**
Location	Chatelaine, Switzerland (International office)
About	CARE tackles underlying causes of poverty so that people can become self-sufficient. Recognizing that women and children suffer disproportionately from poverty, CARE places special emphasis on working with women to create permanent social change. CARE helps families produce more food and increase their income while managing their natural resources and preserving the environment for future generations. CARE works with farmers to increase their crop and livestock yields through activities such as planting new seed varieties, animal husbandry, home gardening and irrigation.
Relevant projects	Equitable payments for watershed services (international, partners: IIED, WWF)
Web	http://www.care.org/index.asp
Contact	Phil Franks (CARE International): phil@ci.or.ke Morten Fauerby Thomsen (CARE Denmark): care@care.dk

Name	**Centre for Land Use and Water Resources Research (CLUWRR)**
Location	Newcastle upon Tyne, UK
About	CLUWRR is the focus at the University of Newcastle upon Tyne for research into integrated environmental management. CLUWRR's mission is to 1) develop integrating methodologies for linking ecology, hydrology, and economics, taking account of issues of sustainability, equity, socio-economics and stakeholder participation. 2) Apply technologies and methodologies to assist the development of plans, strategies, guidelines, and policies for improved environmental, land use and water resources management at the local, regional, national and international scale.
Relevant projects	Negotiating watershed services (India, Costa Rica; partners: IIED, WII; Universidad Nacional de Costa Rica)
Web	http://www.cluwrr.ncl.ac.uk/index.php
Contact	Prof. Ian Calder: I.R.Calder@newcastle.ac.uk

Name	**Centre for Water and Land Resources Development and Studies (PSDAL-LP3ES)**
Location	Jakarta, Indonesia
About	
Relevant projects	Developing markets for watershed protection services and improved livelihoods (Indonesia; partner: IIED)
Web	http://psdal.lp3es.or.id/ (in Indonesian only)
Contact	psdal@indo.net.id

Name	**College of Humanities and Development (COHD), China Agricultural University**
Location	Beijing, China
About	
Relevant projects	Developing markets for watershed protection services and improved livelihoods (China; partner: IIED)
Web	http://www.cau.edu.cn/cohd/ (English version currently not available)
Contact	Jin Leshan: jinls@cau.edu.cn

Name	**Indian Institute of Forest Management (IIFM)**
Location	Bhopal, India
About	The Indian Institute of Forest Management is a multi-disciplinary institute for research, education and training in the area of forest, environment and natural resources management. IIFM regularly undertakes consulting work for national government agencies, multi-national organisations, international donor agencies and private organisations in its sphere of expertise.
Relevant projects	Developing Markets for Watershed Protection Services and Improved Livelihoods (India; partner: IIED)
Web	http://www.iifm.ac.in/index.html
Contact	Dr. Madhu Verma: mverma@iifm.ac.in

Name	**Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam**
Location	Amsterdam, The Netherlands
About	IVM is the oldest environmental research institute in the Netherlands and has built up considerable experience in dealing with the complexities of environmental problems. Its purpose is to contribute to sustainable development and the rehabilitation and preservation of the environment through academic research and training. The institute has repeatedly been evaluated as the best Dutch research group in this field. The institute has four departments: Biology and Chemistry, Economics and Technology, Environmental Policy Analysis, and Spatial Analysis and Decision Support.
Relevant projects	Developing A System of Payments for Environmental Services: A Case for Philippine Upland Dwellers (partner: REECS)
Web	http://www.ivm.falw.vu.nl/home/index.cfm
Contact	Dr. Pieter van Beukering: beukering@ivm.vu.nl

Name	**Institute of Economic Growth (IEG), University of Delhi**
Location	New Delhi, India
About	IEG is an Indian research institution in the fields of economic and social development. The institute works in the following fields: Agriculture and rural development, environment and resource economics, globalisation and trade, industry, labour and welfare, macro economic issues and models, population and health policy, social change and social structure.
Relevant projects	Economic Instruments for Managing Forest Ecosystem Services (India)
Web	http://iegindia.org/
Contact	Dr. Vikram Dayal (project coordinator): vikday@idegindia.org

Name	**International Institute for Environment and Development (IIED)**
Location	London, UK
About	IIED is an international policy research institute and NGO, and is one of the international leaders in research on PES.
Relevant projects	Equitable payments for watershed services (international, partners: CARE, WWF) Developing markets for watershed protection services and improved livelihoods (international; partner: WII)

	Negotiating watershed services (India, Costa Rica; partners: CLUWRR, WII, Universidad Nacional de Costa Rica)
Web	http://www.iied.org/SM/eep/projects/mes/mes.html
Contact	Maryanne Grieg-Gran: Maryanne.Grieg-Gran@iied.org.uk Ivan Bond: ivan.bond@iied.org

Name	**Peoples' Science Institute (PSI)**
Location	Dehra Doon, India
About	Peoples' Science Institute (PSI) is a non-profit public research and development support organization. The Institute's main aim is to undertake research and provide technical and development support services to social action groups.
Relevant projects	Developing Markets for Watershed Protection Services and Improved Livelihoods (India; partner: IIED)
Web	http://www.psi-india.org/
Contact	D. Sen: spwdpsi@rediffmail.com

Name	**Resources, Environment and Economics Center for Studies (REECS)**
Location	Quezon City, The Philippines
About	REECS has provided expertise in the conduct of interdisciplinary research, economic analysis, policy study, resource planning and management, project planning and implementation, technical assistance, training programs and consultancy services. Working as an interdisciplinary team in range of projects in the environmental and natural resources field, it pioneered the introduction of environmental accounting and application of resource economics as a 'decision tool' for improving the environment and natural resources conditions in the Philippines. In 2006, REECS was awarded the ReSource Award for Sustainable Watershed Management by SwissRe for its PES project.
Relevant projects	Developing A System of Payments for Environmental Services: A Case for Philippine Upland Dwellers (partner: IVM)
Web	http://www.psdn.org.ph/reecs/index.htm
Contact	reecs@reecsph.bayandsl.ph

Name	**The Nature Conservancy (TNC)**
Location	Arlington, USA
About	TNC works with conservation supporters and partner organizations to create funding for conservation worldwide using a variety of creative methods. It seeks to create market incentives for conservation, such as debt for nature swaps. It also strives to increase funding for public land acquisition and management through appropriations and public finance campaigns.
Relevant projects	Forest Restoration for Climate, Community, and Biodiversity (China)
Web	http://www.nature.org/index.html
Contact	Zhang Shuang (TNC China Program): shzhang@naturechina.org

Name	**The World Agroforestry Centre (ICRAF) South East Asia**
Location	Bogor, Indonesia
About	The mission of Southeast Asia regional programme is to reduce poverty and sustain the natural resource base in the uplands of Southeast Asia through improved agroforestry systems. Strategic research remains focused on Indonesia (humid rainforest margins), the Philippines (monsoonal hillside agriculture) and Thailand (northern tropics landscape mosaics). Major themes: National policy constraints to agroforestry and upland resource management; management of landscape-level impacts of land-use change; rehabilitation and improved utilization of degraded lands by smallholder agroforestry systems; agroforests as a sustainable upland resource management system; capacity building.
Relevant projects	RUPES
Web	http://www.worldagroforestry.org/sea/
Contact	(ICRAF) icraf-indonesia@cgiar.org (RUPES-programme): rupes@cgiar.org

Name	**U.S. Agency for International Development (USAID)**
Location	Jakarta, Indonesia (ESP)
About	U.S. state agency for development cooperation.
Relevant projects	The Environmental Services Program (ESP) (Indonesia)

Web	http://www.usaid.gov/ http://www.esp.or.id/contents/en_51.php
Contact	(ESP) info@esp.or.id

Name	**Winrock International India (WII)**
Location	New Delhi, India
About	WII is a non-profit organization working in the areas of natural resource management (especially water and forests), clean energy and climate change. In NRM, WWI has special strengths in: Capacity building, project management, technical assistance, sector strategy research and project evaluation.
Relevant projects	Developing markets for watershed protection services and improved livelihoods (India; partner: IIED) Negotiating watershed services (India, Costa Rica; partners: CLUWRR, IIED, Universidad Nacional de Costa Rica)
Web	http://www.winrockindia.org/index.htm
Contact	Chetan Agarwal: chetan@winrockindia.org Natural Resource Management**:** mamta@winrockindia.org Bangalore office: ramesh@winrockindia.org

Name	**Worldwide Fund for Nature (WWF)**
Location	Gland, Switzerland (international office)
About	Since 2000, several WWF offices have developed or supported specific PES projects related to the conservation of a local watershed or the management of a protected area. In 2002, WWF-MPO launched a world-wide initiative to scale up WWF's PES schemes and related activities with the goal of delivering substantial rural conservation and rural livelihood improvements. This initiative is undertaken in partnership with WWF offices in countries around the world and includes training, capacity-building, development of policies and standards, and development and support for on-the-ground PES projects.
Relevant projects	Economic Instruments for Managing Forest Ecosystem Services (India) Equitable payments for watershed services (international, partners: CARE, IIED) Promoting Payments for Ecosystem Services (PES) and Other Sources of Sustainable Financing for Rural Conservation and Development (international)
Web	http://www.panda.org/about_wwf/what_we_do/forests/our_solutions/protection/pes/index.cfm

Contact	Pablo Gutman: pablo.gutman@wwfus.org Julio Tresierra (Global Coordinator, WWF-CARE-IIED Equitable PWS Program): jtresierra@wwf.nl Kirsten Schuyt (Head Forests Program, WWF-Netherlands): kschuyt@wwf.nl T R Manoharan (PES programme, WWF-India): Main Office, New Delhi T: +91 11 41504787

3.2 Supporting and funding organisations

Name	**Danish International Development Cooperation Agency (DANIDA)**
Location	Copenhagen, Denmark
About	Danish state development cooperation (part of the Ministry of Foreign Affairs)
Supported projects	Developing markets for watershed protection services and improved livelihoods (IIED) Equitable payments for watershed services (WWF, CARE and IIED)
Web	http://www.um.dk/en/menu/DevelopmentPolicy/DanishDevelopmentPolicy/DanishDevelopmentPolicy
Contact	um@um.dk

Name	**Department for International Development (DFID)**
Location	London/Glasgow, UK
About	British state development cooperation agency
Supported projects	Developing markets for watershed protection services and improved livelihoods (IIED)
Web	http://www.dfid.gov.uk/
Contact	Jim Harvey (Environment Division): enquiry@dfid.gov.uk

Name	**Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)**
Location	Eschborn, Germany
About	German state agency for development cooperation
Supported projects	'Developing markets for watershed protection services and improved livelihoods' - project (IIED/Winrock) is supported by the Indo-German Changar Eco-Development Project (IGCEDP)

Web	http://www.gtz.de/en/
Contact	Rajan Kotru (IGCEDP): rkotru@gtzindia.com

Name	**Dutch Development Cooperation (DGIS)**
Location	Amsterdam, The Netherlands
About	Dutch state development cooperation (part of the Ministry of Foreign Affairs)
Supported projects	Equitable payments for watershed services (WWF, CARE and IIED)
Web	http://www.minbuza.nl/en/developmentcooperation
Contact	Environment and Water Department: dmw@minbuza.nl

Name	**International Fund for Agricultural Development (IFAD)**
Location	Rome, Italy
About	UN-agency dedicated to eradicating rural poverty in developing countries.
Supported projects	RUPES
Web	http://www.ifad.org/
Contact	ifad@ifad.org

Name	**Swedish International Development Cooperation Agency (SIDA)**
Location	Stockholm, Sweden
About	Swedish state agency for development cooperation
Supported projects	'Promoting Payments for Ecosystem Services (PES) and Other Sources of Sustainable Financing for Rural Conservation and Development' (WWF-MPO)
Web	http://www.sida.se/
Contact	sida@sida.se

Name	**Swiss Agency for Development and Cooperation (SDC)**
Location	Berne, Switzerland
About	Swiss state development cooperation (part of the Ministry of Foreign Affairs)
Supported projects	Developing markets for watershed protection services and improved livelihoods (IIED)
Web	http://www.sdc.admin.ch/index.php?navID=21202&langID=1
Contact	Martin Sommer, Franz Hossli (Division for Natural Resources and Environment): snru@deza.admin.ch

Name	**The Shell Foundation Sustainable Energy Programme**
Location	London, UK
About	Corporate foundation established by Shell
Supported projects	Developing markets for watershed protection services and improved livelihoods (IIED)
Web	http://www.shellfoundation.org/
Contact	info@shellfoundation.org

Name	**The World Bank**
Location	Washington D.C., USA
About	The World Bank also has own PES-projects, but none of them in Asia so far.
Supported projects	Economic Instruments for Managing Forest Ecosystem Services (WWF India) Forest Restoration for Climate, Community and Biodiversity (TNC)
Web	http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTEEI/0,,contentMDK:20487926~menuPK:1187844~pagePK:210058~piPK:210062~theSitePK:408050,00.html
Contact	Kirk Hamilton (Environmental Economics and Indicators Team): eadvisor@worldbank.org

3.3 Possibly relevant organisations in the NIVA/CISED-project region

3.3.1 NGOs

Name	**'JalaSpandana' - South India Farmers' Organisation for Water Management**
Location	Bangalore
About	The main objective of JalaSpandana is to promote general advocacy of participatory approaches, by initiating networks of farmers in the South Indian States of Andhra Pradesh, Karnataka, Kerala, Maharashtra, Pondicherry and Tamil Nadu in order to increase and strengthen their role in water sector policy formulation and implementation. JalaSpandana is based on and extends initial and very positive experience with this approach, gained particularly in Karnataka through Pragathi - Farmers Society for Rural Studies and Development, Bangalore.
Web	http://www.jalaspandana.org/index.php?&MMN_position=1:1
Contact	JalaSpandana-South India Farmers Organisation for Water Management 72, 7th Cross, C.T. Street, Vasanthnagar Bangalore 560 052 Tel.: +91 80 5113 1887, 2228 6161 (residence) Mobile:+91 9448268401, 9448381431 E-mail: doraiswamyr@vsnl.net, jalaspandana@yahoo.co.in

Name	**MYRADA**
Location	Bangalore (head-office), other project offices in several Karnataka districts
About	MYRADA manages rural development programmes (including watershed projects) in 3 states of South India and provides on-going support including deputations of staff to programmes in 6 other states. It also promotes the Self Help Affinity strategy in Cambodia, Myanmar and Bangladesh.
Web	http://www.myrada.org/index.html
Contact	MYRADA No.2, Service Road, Domlur Layout Bangalore 560 071 Tel.: +91 80 25352028, 25353166, 25354457 Fax : 25350982 E-mail: myrada@vsnl.com

Name	**'Pragathi' - Farmers' Society for Rural Studies and Development**
Location	Bangalore
About	Praghathi coordinates the activities of the farmers network in Karnataka and has been instrumental in advocating for the formation of farmer federations and water user associations. It also publishes a newsletter called 'Raitha' (in English and Kannada).
Web	no webpage
Contact	Pragathi Farmers Society for Rural Studies and Development 72, 7 Cross, Chikkathayappa Street, Vasanthnagar Bangalore 560052 Tel.: +91 80 51131887, 22286161 Fax: +91 80 22251707 E-mail: pragathi_kar@yahoo.co.in

Name	**WWF-India, Karnataka State Office**
Location	Bangalore
About	WWF-India is very committed in PWS (see details above) and might therefore be a useful address.
Web	http://www.wwfindia.org/index.cfm
Contact	WWF-India, Karnataka State Office 'Kamla Mansion' 143, Infantry Road Bangalore 560001 Tel.: +91 88 2863 206 Fax: +91 88 2866 685

3.3.2 Related Projects

Name	**Indo - Swiss Participative Watershed Development Project - Karnataka (ISPWD-K)**
Organisation	Intercooperation (leading Swiss NGO engaged in development and international cooperation)
Location	Karnataka
About	ISPWDK began as a bilateral project in 1995 in collaboration with the Government of

	Karnataka and NGOs in 5 districts of north Karnataka. Now in its second phase, the project operates in three districts with the same NGO partners. The overall goal is to reduce poverty and to enhance the choices & opportunities of the people in the project areas, through the restoration, improved management and sustainable use of natural resources to address rural livelihoods. The project aims to contribute to policy dialogue in watershed development in India through the use of innovative approaches and techniques, and appropriate documentation. The project is process oriented, people centered and equity focused, with emphasis on the rural poor, landless, small & marginal farmers, women and their institutions. The main activities of the project revolve around capacity building, watershed rehabilitation, agriculture production, livelihoods promotion, community support, planning, monitoring and documentation. The institutions at village level are Village Development Societies (VDSs), Watershed Management Committees (WMCs), SHGs etc. The partner NGOs, coordinated through SDC/IC's Programme Support & Management Unit, facilitate and support activities at watershed & programme level respectively.
Web	http://www.intercooperation.ch/projects/p2
Contact	Intercooperation Delegation Office 8-2-351/R/8, Road no. 3 Banjara Hills, Hyderabad 500034 India Tel.: +91 40 2335 6273 / 74 Fax: +91 40 2335 6275 E-Mail: info@intercooperation.org.in

Name	**Second Karnataka Rural Water Supply and Sanitation Project**
Organisation	The Worldbank Implementing organisations: Government of Karnataka, Department of Rural Development and Panchayati Raj
Location	
About	The project will assist the Government of Karnataka in increasing rural communities' access to improved and sustainable drinking water and sanitation services; and institutionalizing decentralization of Rural Water Supply and Sanitation service delivery to Gram Panchayats (GP) and user groups. The project consists of three components. 1) The community development and infrastructure building component will support will support subcomponents as community development, women development programs, water supply schemes, ground water recharge measures, household sanitation, community sanitation, and indigenous peoples development program. 2) The institution building component will finance project

	management, sanitation and hygiene promotion, capacity building, and GP strengthening. 3) The sector strengthening programs will finance technical assistance to strengthen its rural water supply and sanitation sector policy and management via creating enabling environment, establishing a sector information management system, supporting continuous learning, procuring state-of-the-art equipment, and monitoring water quality.
Web	http://web.worldbank.org/external/projects/main?pagePK=104231&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P050653
Contact	Government Of Karnataka Karnataka Rural Water Supply and Sanitation Agency (KRWSSA) Cauvery Bhavan, KHB Complex, Bangalore 560 009 Contact Person: Mr. Raj Kamal Tel.: +91 80 2240508 Fax: 2240509 E-mail: ppmubng@Blr.Vsnl.Net. Department of Rural Development and Panchayati Raj MS Building Bangalore 560 001 Contact Person: Mr. S.L. Gangadharappa Tel.: +91 80 2261322 Fax: 2264650 E-mail: secrdpr@secretariat2.kar.nic.in

3.4 Other possible relevant organisations

Name	**Centre for Environment, Social and Economic Research (CESER)**
Location	Roorkee, India
About	CESER is a non-government and non-profit research organization. CESER conducts interdisciplinary research and policy analysis, with a focus on: Environment; ecological economics and statistics; mathematical and statistical modeling; rural and child development; ethnic and women Issues, and sustainable development. CESER releases the International Journal of Ecological Economics and Statistics and welcomes research collaboration in all forms.

Web	http://www.ceser.res.in/
Contact	ceserres@ceser.res.in, kks_ceser@yahoo.com

Name	**Centre for International Forest Research (CIFOR)**
Location	Bogor, Indonesia
About	CIFOR's mission is to contribute to the sustained well-being of people in developing countries, particularly in the tropics, through collaborative strategic and applied research and related activities in forest systems and forestry, and by promoting the transfer of appropriate new technologies and the adoption of new methods of social organisation, for national development. CIFOR has a PES-programme, but no projects in Asia at the moment.
Web	http://www.worldagroforestry.org/
Contact	Daniel Mudiyarso (Researcher, CIFOR Environmental Services Programme; Carbon forestry, forests and water, Indonesia) Email: d.murdiyarso@cgiar.org Enrique Ibarra (Researcher, CIFOR Environmental Services Programme; Socioeconomics, Vietnam, Costa Rica) E-mail: e.ibarra@cgiar.org

Name	**Community Forestry International**
Location	South Lake Tahoe, USA
About	Community Forestry International, Inc. (CFI) assists rural communities to stabilize and regenerate forests by helping policy makers, development agencies, NGOs, and professional foresters create the legal instruments, human resource capacities, and negotiation processes and methods to support resident resource managers. CFI enables community forest management strategies to become an integral part of sustainable forest management world-wide. CFI programs are implemented through four interrelated thematic areas: 1) Regional and National Policy Dialogues, 2) Mediation Processes and Methods, 3) Participatory Research and Field Programs, and 4) Communication.
Web	http://www.communityforestryinternational.org/index.htm
Contact	Mark Pfoffenberger (contact form on web page)

Name	**Economy and Environment Program for Southeast Asia (EEPSEA)**
Location	Singapore; New Delhi, India
About	EEPSEA is a programme of the International Development Research Centre (IDRC) (Ottawa, Canada).It was established to support training and research in environmental and resource economics. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers. The program uses a networking approach to provide not only financial support but meetings, resource persons, access to literature, publication outlets, and opportunities for comparative research across its ten member countries. These are Thailand, Malaysia, Indonesia, the Philippines, Vietnam, Cambodia, Laos, China, Papua New Guinea and Sri Lanka. Projects to date have tended to fall within four areas: a) management of forests and wetlands b) policy instruments for control of urban pollution c) resource pricing d) economy-wide and global issues.
Web	http://www.idrc.ca/eepsea/
Contact	Regional office for Southeast and East Asia (Singapore): asro@idrc.org.sg Regional offive for South Asia (New Delhi): saro@idrc.org.in

Name	**Forest Trends**
Location	Washington D.C., USA
About	The mission of Forest Trends, a public/private, non-profit coalition, emphasizes promoting incentives and accelerating the evolution of economic systems that will result in the maintenance and restoration of forest ecosystems. It also identifies three goals: new commerce for ecosystem services, market recognition for sustainable management, and equitable distribution of benefits from commerce returned to local communities. Forest Trends has also launched four independent initiatives, to supplement its primary mission: ▪ The Katoomba Group ▪ The Ecosystem Marketplace ▪ The China and Asia-Pacific Initiative ▪ The Business Development Facility
Web	http://www.forest-trends.org/index.php
Contact	info@forest-trends.org

Name	**Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC)**
Location	Bangkok, Thailand
About	RECOFTC is an international non-profit organization that works to support community forestry

	and community-based natural resource management. Through strategic partnerships and collaboration with governmental and non-governmental institutions, programs, projects and networks, RECOFTC aims to enhance capacity at all levels and to promote constructive multi-stakeholder dialogues and interactions to ensure equitable and sustainable management of forest and natural resources.
Web	http://www.recoftc.org/site/index.php?id=6
Contact	info@recoftc.org

Name	**The World Conservation Union (IUCN)**
Location	Gland, Switzerland
About	The World Conservation Union is the world's largest conservation network and it brings together 82 States, 111 government agencies, more than 800 NGOs, and some 10,000 scientists and experts from 181 countries in a worldwide partnership. The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. IUCN has two projects related to PES: 1) Project VALUE: The economic valuation project works in the field projects to apply economic valuation. There, the economics team identifies valuable resources and areas of particular management interest, for instance because of the dependence of poor communities on resources. They produce tool books, case studies, policy advice and capacity building exercises to make economic valuation a standard tool in water management. 2) Project PAY This project tries to identify, based on valuation studies, similar payment schemes that benefit conservation and poor communities. It works in the Initiative's field projects to implement such measures, sets up networks of experts, produced tool book and policy guidance, and trains local staff.
Web	http://www.iucn.org/
Contact	Joshua Bishop (Senior Adviser - Economics and the Environment): joshua.bishop@iucn.org

Name	**World Agroforestry Centre (ICRAF)**
Location	Bogor, Indonesia
About	The mission of Southeast Asia regional programme is to reduce poverty and sustain the natural resource base in the uplands of Southeast Asia through improved agroforestry systems. Major themes are: ▪ National policy constraints to agroforestry and upland resource management ▪ Management of landscape-level impacts of land-use change ▪ Rehabilitation and improved utilization of degraded lands by smallholder agroforestry systems ▪ Agroforests as a sustainable upland resource management system ▪ Capacity building.
Web	http://www.worldagroforestry.org/
Contact	icraf-indonesia@cgiar.org

Name	**World Resources Institute (WRI)**
Location	Washington D.C., USA
About	The World Resources Institute (WRI) is an environmental think tank that whose mission is to move human society to live in ways that protect Earth's environment and its capacity to provide for the needs and aspirations of current and future generations. WRI provides - and helps other institutions provide - objective information and practical proposals for policy and institutional change that will foster environmentally sound, socially equitable development. WRI organizes its work around four key goals: ▪ People and Ecosystems: Reverse rapid degradation of ecosystems and assure their capacity to provide humans with needed goods and services. ▪ Access: Guarantee public access to information and decisions regarding natural resources and the environment. ▪ Climate Protection: Protect the global climate system from further harm due to emissions of greenhouse gases and help humanity and the natural world adapt to unavoidable climate change. ▪ Markets & Enterprise: Harness markets and enterprise to expand economic opportunity and protect the environment.
Web	http://www.wri.org/
Contact	rspeight@wri.org

4 Further relevant resources on the web

Name	**Conservation Finance Alliance (CFA)**
Web	www.conservationfinance.org
About	Alliance of government agencies, international organisations, NGOs and private actors in order to combine forces to support conservation finance mechanisms. Web site with information on existing and new conservation finance mechanisms and on related training and events.

Name	**Ecosystem Marketplace**
Web	http://ecosystemmarketplace.com/index.php
About	Source of information by the Katoomba group on markets and payment schemes for ecosystem services.

Name	**International Network on Participatory Irrigation Management (INPIM)**
Web	http://www.inpim.org/
About	Global network promoting participatory irrigation management in irrigation and water resource management through the exchange of best practices, lessons learned and training materials and through networking among professionals, researchers, policy makers and farmers.

Name	**Nature Valuation and Financing Network**
Web	http://topshare.wur.nl/naturevaluation
About	Network for the development and exchange of practical tools and best practice for the valuation of ecosystem goods and services.

Name	**The Katoomba Group**
Web	http://www.katoombagroup.org/
About	International working group founded by Forest Trends. Composed of leading experts from forest and energy industries, research institutions, the financial world and environmental NGOs dedicated to advancing markets for ecosystem services provided by forests.

5 Key professional competences required to carry out a project on PWS in Asia

5.1 Introduction

The following chapter presents two approaches for the assessment of the necessary information before carrying out a watershed-related project. The aim is to present possible methods for analysing the basic feasibility of PWS and to provide a picture of the professional competences needed to carry out such an analysis.
The firsst approach presented (RHA) was especially developed for the context of PWS and is relatively specified in terms of methodology as well as time and effort needed. The second approach, 'water auditing', is a method promoted by organisations such as the International Water Management Institute (IWMI) and the Global Water Partnership that applies to watershed development projects in general. Elements of the 'water audit' approach could be adapted within a feasibility analysis for PWS.

5.2 Rapid Hydrological Appraisal (RHA)

5.2.1 Overview

Building on the tools and methods of PRA and RRA, ICRAF developed an approach named 'Rapid Hydrological Appraisal' (RHA) as a quick (target of less than 6 months) and cheap (US$ 5.000-10.000) instrument for intermediary organisations to analyse the feasibility of PWS in a specific context.[3]
In a watershed, biophysical relations on the flow of water are translated into human relations between upstream and downstream people. The human perceptions of watershed functions may only have a weak connection to the biophysical reality, and there is often a gap between three types of knowledge: Public/policymakers' knowledge, local ecological knowledge and scientists' knowledge. This gap is a constraint to communication for the negotiation between the different stakeholders in a watershed. RHA aims to be the tool for supplying the information that facilitates communication and the building of agreements.

The overall objectives of RHA are

- to improve the effectiveness of communication among stakeholders by clarifying and analysing the various perceptions that exist, and
- to lead to a decision point whether or not it is worthwhile to pursue negotiations for an environmental-service reward mechanism.

RHA offers a framework for analysing stakeholders' perceptions on:

- the severity of 'watershed problems' in relation to land use,
- the positive contributions made by specific land use practices that help reduce the problems and
- the potential basis for forms of 'environmental service rewards' that provide incentives for supporting 'protective' activities as alternatives to more 'degrading' ones.

3 The following details refer TO JEANES, K. ET AL. (2006): Rapid Hydrological Appraisal in the context of Environmental Service Awards. ICRAF. Bogor.

The five basic steps in the implementation of an RHA are:

1. 'Inception' and reconnaissance of stakeholders and 'issues'
2. 'Baseline data collection' – desktop survey of literature and reports
3. 'Baseline data collection fieldwork': ground truthing for spatial analysis, participatory landscape analysis, local ecological knowledge (LEK) and public and policy makers' environmental knowledge (PEK) surveys
4. 'Data Processing' (modeller's ecological knowledge , MEK) and Scenario analysis
5. 'Communication' and refinement of the findings.

Table 1 presents a chronological overview on the steps to be implemented in each phase and the expertise required.

The aim of chapters 5.2 to 5.8 is to describe more precisely, which activities are carried out in an RHA, and which expertise is needed in order to do so. At this, the different elements are presented along the field of expertise.

5.2.2 Component No. 1: Spatial analysis and land-use appraisal

The technical component of RHA follows three steps:

Step 1: Geospatial extent and definition:

- Spatial framework analysis (river-basin and sub-catchment boundary definition)
- Administrative framework analysis (provincial, district and village administrative boundary definition)

Step 2: Geospatial data collection/map acquisition on

- Landform and river network
- Geology
- Soils
- Geomorphology
- Land cover/land use
- DEM, land form, river network
- Village administrative boundaries
- Other administrative boundaries

Step 3: Geospatial data processing and outputs with focus on 4 streams of data processing:

- Map digitising
- Map finalisation and GIS development
- DEM processing
- Land-use/land-cover mapping

Phase	Work plan	Required expertise	Time (person days)		
			Junior[4]	Intermed[1]	Senior[1]
I. Inception phase (month 1)	Review of RHA concepts and documentation	Liaison person	10	2	2
	Initial collection and review of site-related documentation				
	Inception workshop, roundtable discussion with local stakeholders				
	Workshop field trip and reconnaissance of field site				
	Compilation of workshop outputs and initial stakeholder contributions				
II. Baseline data collection (desktop study) (months 2-4)	Further collection and review of site-related reports and documentation	EEK & MEK specialists	20		
	Collect hydrology and rainfall data				
	Collect topographic, administrative and drainage maps for site and river basin				
	Collect maps and reports relating to geology, landform (land systems) and soils				
	Collect maps relating to past land-use patterns and development zonations				
	Collect reports relating to environmental impacts and water quality status				
	Spatial analysis of physical boundaries (river basin and catchment boundaries)				
	Spatial analysis of institutional boundaries (provincial and district)				
	Collection and preparation of digital location map and DEM				
	Selection and ordering of Landsat imagery				
	Review of project stakeholders and initial list for PEK and LEK surveys				
	Spatial analysis of landform, geology and soil patterns within lake basin				
	Review of environmental water-related issues within lake basin and downstream				
III. RHA methodology development & survey planning (months 2-3)	Preparation of detailed project workplan	EEK, MEK & LEK specialists	6	1	0,5
	Initial preparation for GenRiver model simulation				
	Consultation and review of RHA methodology and operational process				
	Planning for spatial analysis (Digital Elevation Model (DEM), base map and land use mapping)				
	Consultation and planning for stakeholder survey and prioritization				
	Consultation and planning for LEK and PEK social surveys				
	Preparation of field work schedule and key stakeholder appointments				
	RUPES project meeting and sub-project coordination discussions				
III. Baseline data collection (field survey) (month 3)	Collection of site-related project and research reports from field sources	MEK, LEK, EEK/PEK & spatial analysis specialists	50	10	
	Collection of rainfall, hydrological and lake limnological data from field sources				
	Collect information on hydropower scheme operational procedures				
	Reconnaissance survey of lake basin landforms and farming systems				
	Field confirmation of focus sub-catchment and river/lake basin boundaries				

[4] Junior: bachelor level; intermediate: masters level; senior: PhD level

	Scoping review of stakeholders and preparation of LEK and PEK focus lists				
	Field confirmation of village, sub-district and district administrative boundaries				
	Collect updated planning, land and forestry agency development zonation maps				
	Collect planning and forestry agency land-use maps, images or aerial photos				
	Implement PEK surveys within lake basin and at provincial level				
	Collect information on fishery, kale and related environmental issues				
	Collect information on environmental impacts, pollution and water quality				
	Collect information on the environmental history of lake-basin landscapes				
	Collect information on water use upstream from and downstream of the lake				
	Scoping profile of new projects and developments within the lake basin				
	Environmental profile of lake-basin (hydrology/water quality issues)				
	Review likely and desired future land-use/catchment management scenarios (PEK)				
	Implement LEK surveys in focus sub-catchment				
	Scoping assessment of land-use and recent changes within lake-basin catchment				
	Detailed assessment of landform, vegetation and land-use of focus sub-catchment				
	Review likely and desired future land-use/catchment management scenarios (LEK)				
IV. Data Processing and problem analysis (months 3-7)	Develop DEM and base-maps of river basin and focus sub-catchment	MEK, PEK, LEK & spatial analysis specialists	20	5	2
	Finalise image correction and spatial analysis of river-basin landscape				
	Prepare map of administrative boundaries				
	Prepare detailed current land-use/vegetation cover map for focus sub-catchment				
	Prepare of coarse land-use/vegetation cover map for lake- and river-basin				
	Analyse LEK-survey and data sets				
	Analyse PEK-survey and data sets				
	Environmental impact analysis of hydrology/water quality issues within basin (EEK and MEK)				
	Analyse LEK, PEK, EEK and MEK perception gaps				
	GenRiver simulation of focus catchment and lake basin (current situation)				
	GenRiver simulation of focus catchment and lake basin (future scenario)				
	Analyse land-use influence on lake-basin/focus sub-catchment function				
	Analyse landform/climate influence on lake basin and focus sub-catchment function				
	Analyse other environmental impacts on lake basin/focus sub-catchment function				
V. Reporting phase (month 7)	Preparation of final RHA project report	Liaison persons & MEK specialists	10	4	2
	Repare study results and conclusions for presentation to project stakeholders				
	Final field workshop – presentation and consultation with project stakeholders				

Table 1: Requirements of expertise and time for carrying out an RHA (source: compiled by the author according to JEANES ET AL. 2

5.2.3 Component No. 2: Scoping environmental survey and stakeholder analysis

This component is also known as Environmentalists' Ecological Knowledge (EEK) and is implemented by environmental scientists and hydrologists. It involves six steps:

Step 1: Desktop scoping review:

- Baseline review of existing environment-related reports
- Basin-wide scoping analysis of the spatial data (maps) on the landform (land system and land unit), geology, soil, natural vegetation, climatic features and patterns within the river-basin macro-study area.

Step 2: Environmental data collection:

- Conduct district-, province- and regional-level data and report collection specific to environmental impact issues
- Provide a more comprehensive set of written materials to form a modeller's environmental knowledge (MEK) view of environmental issues (independently from PEK and LEK perceptions)
- Make visits to hydropower corporations, provincial planning, forestry, water management agencies etc.

Step 3: Specific reconnaissance field inventory and ground truthing:

- Conduct specifically targeted reconnaissance trips around the river and lake basin macro-study area to view and digitally photograph the landscape, land use, development and infrastructure.

Step 4: Field level stakeholder and issue identification:

- Conduct interviews with selected provincial and regional agency officials (during data collection)
- Aim is to develop the target checklist of stakeholders and to form the focus of the PEK survey
- Development of a checklist of environmental-issue discussion points to guide the structure of PEK interviews.

Step 5: General reconnaissance field inventory and ground truthing:

- Conduct the same activities as during the specific reconnaissance field inventory, whilst conducting the PEK survey interviews within, adjacent to and downstream of the lake-basin, and in river-basin areas not previously covered during the earlier exercises.

Step 6: Modeller's ecological knowledge (MEK) initiation:

- Conduct a separate and concurrent analysis of the data and comments from the PEK and LEK survey respondents to produce a separate MEK conclusion on the environmental impact trends and cascading interconnected influences and causal factors which may be found if the total data of LEK, PEK and MEK surveys are combined in a spatial manner. A model of the expected result of this step is displayed in Figure 1.

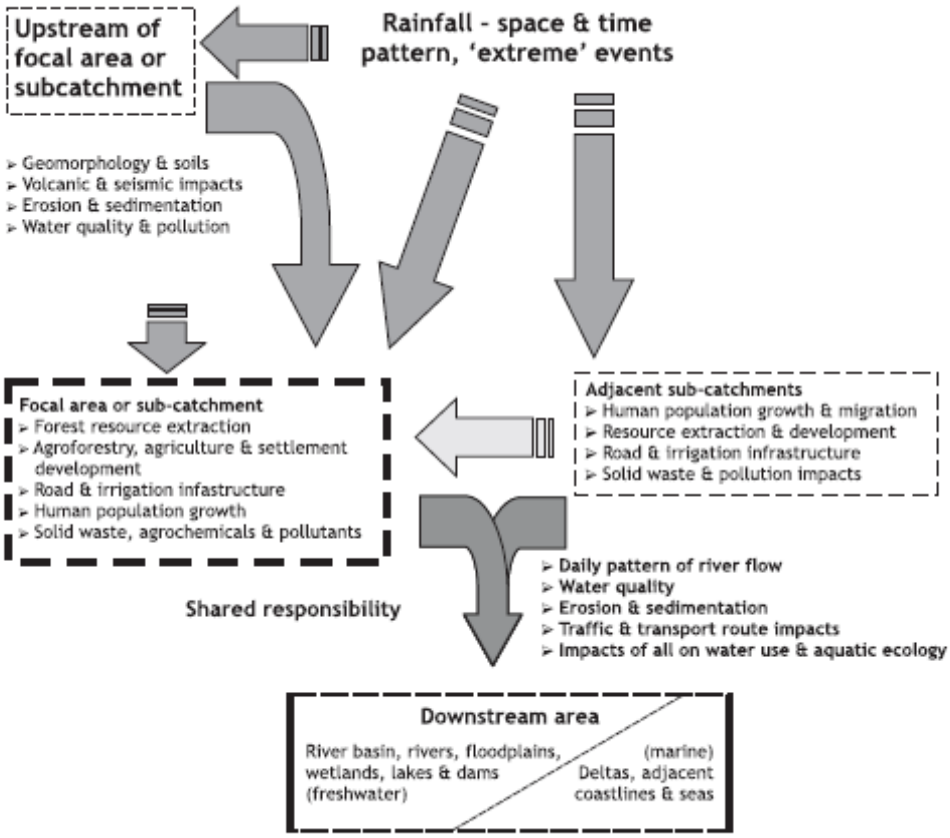

Figure 1: Model of environmental impact trends/causal factors after combining LEK, PEK and MEK surveys (source: JEANES ET AL. 2006)

5.2.4 Component No. 3: Public and policy makers' ecological knowledge (PEK) survey

The goal of this component is to explore the knowledge, experiences and perceptions of the major groups of stakeholders, i.e. people who have direct influence upon the management of all sub-catchments of the study area, through semi-structured interviews. PEK is basically limited to the identification of issues, their location and the identification of possible causal factors; this is due to the large number of interview topics, stakeholder groups and physical locations, combined with limited time access to those to be interviewed. PEK is carried out in six steps:

Step 1: Rapid orientation and characterisation of main issues:

- Reconnaissance field trips
- Introductory workshop with stakeholders
- Desktop review of related reports, maps and development plans.

Step 2: Defining a spatial framework:

- Manual definition of related sub-catchment, lake-basin, river-basin and administrative boundaries from topographic maps.

Step 3: Planning for PEK interviews:

- Discussion with supervising social scientist

- Review of different survey methodologies
- Decision on applicable methodology for PEK in view of stakeholder numbers, issues and time available.

Step 4: Stakeholder and issue identification:

- Interview with selected provincial and regional agency officials
- Reconnaissance tour of land-basin landscape
- Interview with selected local leaders or agency staff.

Step 5: Knowledge articulation

- Planning location and time schedule for stakeholder interviews
- Interview and discussions (groups if possible) (2-7 interviews a day).

Step 6: Data compilation and preliminary evaluation:

- Report of public and policy makers' knowledge and perception of different stakeholder groups.

5.2.5 Component No. 4: Local ecological knowledge (LEK) survey

In contrary to PEK, LEK puts more emphasis on exploring stakeholders' perceptions of problems and their causal factors in the study region. The aim of LEK is to explore the knowledge, experiences and perceptions of selected local communities which have a direct influence upon the management of one focus sub-catchment. In order to save time, in the rapid LEK methodology individual interviews are replaced with detailed discussion with small homogeneous groups of people. The following steps are implemented:

Step 1: Scoping:

- Observation, expert consultation, sketch mapping
- Stakeholder group selection.

Step 2: Planning for group interviews:

- Site visits and discussion.

Step 3: Knowledge articulation

- Group interview and discussion during transect walk (one group a day).

Step 4: Data compilation and preliminary evaluation:

- Report of knowledge and perception of different stakeholder groups.

5.2.6 Component No. 5: Hydrologist's or modeller's ecological knowledge (MEK) analysis

The goal of this step is to explore how current and future land use changes may influence modelled values of river flow, buffering of river flow versus rain, water quality and landslide risk. This is done by utilising past river-flow and rainfall conditions as well as current data on the river-basin landscape in the ICRAF modelling software GenRiver. The GenRiver analysis requires the following elements:

- The spatial data

- Specific land-use and land-cover estimates, DEM river-network characterisation and sub-catchment delineation inputs
- The target datasets
- Specific data-processing 'activities':

Datasets	Activities needed for location-specific GenRiver parametrization
Rainfall	▪ Collect basic datasets ▪ analyse for consistency ▪ apply downscaling routines ▪ apply SpatRain module to generate space/time models of local rainfall
Other climate data	▪ Calculate monthly potential evapotranspiration
Soil depth and type	▪ Interpret available data ▪ Apply ICRAF-SEA soil pedo-transfer functions
River-flow data for model calibration	▪ Analyse datasets and use for model calibration
Existing reservoirs and operating rules	▪ Definition of storage volume, and likely monthly pattern of filling and release of water

5.2.7 Component No. 6: Communication of findings

To communicate the findings of the study, the different perceptions on on-going environmental processes have to be presented and clarified to all stakeholders. Seven 'communication steps' are used for this purpose:

1. Gaps in perception: On which topics are the views far apart?
2. Source of the views: So that all can understand the basis and explanation of each other's knowledge and logic
3. Past land use reality
4. Present land use reality
5. Land use plus other development reality: impact of additional developments upon the total catchment-lake-down river environment as compared to the 'land use only' impact
6. Future likelihoods: Possible future land-use change scenarios
7. Future options: Which of the scenarios does each stakeholder group wish to be avoided or promoted? Can they develop a consensus?

5.2.8 Final assessment of the opportunities for PWS

The feedback from the different stakeholders is finally used to assess the options for negotiations on reward mechanisms. In this process, four apects have to be considered:

1. *Value*
Is there a shared perception of the way in which watershed services are influenced by upland land-use and of the way that this affects downstream interests? If this is not the case, there will be no basis for negotiations.

2. *Threat*
Are there elements in the upstream land-use that are beneficial to the respective land-users, but are a real threat to the environmental services provided to downstream stakeholders? In this context it is important to consider that these threats must be based on activities that are allowable within the existing regulatory frameworks. If the current negative environmental externalities are caused by illegal activities, legal enforcement rather than a PWS-mechanism will be the basis for solution.

3. *Opportunity*
Are community institutions present, which effectively constrain individual land-use decisions and the identifiable watershed services? If there is no effective local regulation, it will be difficult to change the land-use behaviour of individual stakeholders.

4. *Trust*
Is there a basic level of trust between local communities, governments and outside actors? Where power-relations are strongly assymentrical or past experiences with actors from the outside or government officials have been negative, it is unlikely that reach a freely negotiated agreement.

The RHA methodology does not propose more detailed guidance on how to evaluate these four aspects. Implementers will have to interpret stakeholders' views, discuss possible outcomes and design their strategy in accordance with their responsibility as 'honest brokers'.

5.3 Water auditing

5.3.1 Overview

The concept of 'water audit' is based on the assumption that knowledge of the current status of water resources, trends in demand and use, and the patterns of access and entitlements to water resources of different social groups is a precondition for successful water management.[5] The goal of a water audit is to produce practical recommendations that identify the trade-offs associated with different courses of action.

A water audit wants to assess information on:

- Occurrence of surface and groundwater, levels of sustainable use and extreme events (droughts or floods)
- Demand trends for different uses
- Main driving forces influencing demand and use
- Functionality and effectiveness of institutions charged with developing and managing water resources
- Factors that affect access and entitlements to water for both domestic and productive uses.

[5] The following presentation is based on BATCHELOR, C.H./RAMA MOHAN RAO, M.S./MANOHAR RAO, S. (2003): Watershed development: A solution to water shortages in semi-arid India or part of the problem? In: Land Use and Water Research 3, 1-10.

5.3.2 Methodological elements in water auditing

Although large amounts of data exist for the rural regions of India, data generation may be problematic as information is not always easily accessible and the quality of the data is variable. It is therefore essential to conduct a *quality control process* in the process of data collection. Data from different sources have to be compared and if there are disparities, the reasons for this have to be understood through the involvement of local people, NGOs, research institutes and government agencies. Quality control of data is a key step in water audit, because it evaluates whether the data is based on commonly accepted, but scientificly unsustainable, wisdom.

Water balance calculations are used to assess the current status of water resource availability in a watershed. Particular attention is to be dedicated to the impacts of land use change, groundwater extraction and water harvesting structures of temporal and spatial patterns of water availability and use. In many cases, difficulties arise as many components of the water balance are difficult to estimate by means of the data available. In order to overcome these problems, it is essential to make maximum use of quality-controlled secondary information and to cross-check estimates with the often qualitative observations and experiences of specialists and local people. In addition, data may also be cross-checked with results from studies in areas with similar characteristics.

For a *participatory assessment of socio-economic information*, like access and entitlements to water, the functionality of village-level institutions and the status of domestic water supplies, in the 'water audit' approach the Quantitative Participatory Assessment (QPA) approach is used.

After *data analysis* in spreadsheet software, spatial and non-spatial data on the relevant aspects is to be consolidated and *displayed in GIS databases*.

5.4 Conclusion

After carrying out an RHA, stakeholders and water-related problems in a region are identified. However, this is only the first step in a PWS feasibility analysis. If the 'brokers'after the implementation of an RHA come to the conclusion that it is worth following up the establishment of a PWS scheme in the study region, further steps regarding an analysis of local conditions have to be undertaken. There is a substantial number of success conditions for PWS, which was evaluated and discussed in Part I of this report. A model of proposed steps of a PWS feasibility analysis is presented in Figure 2.

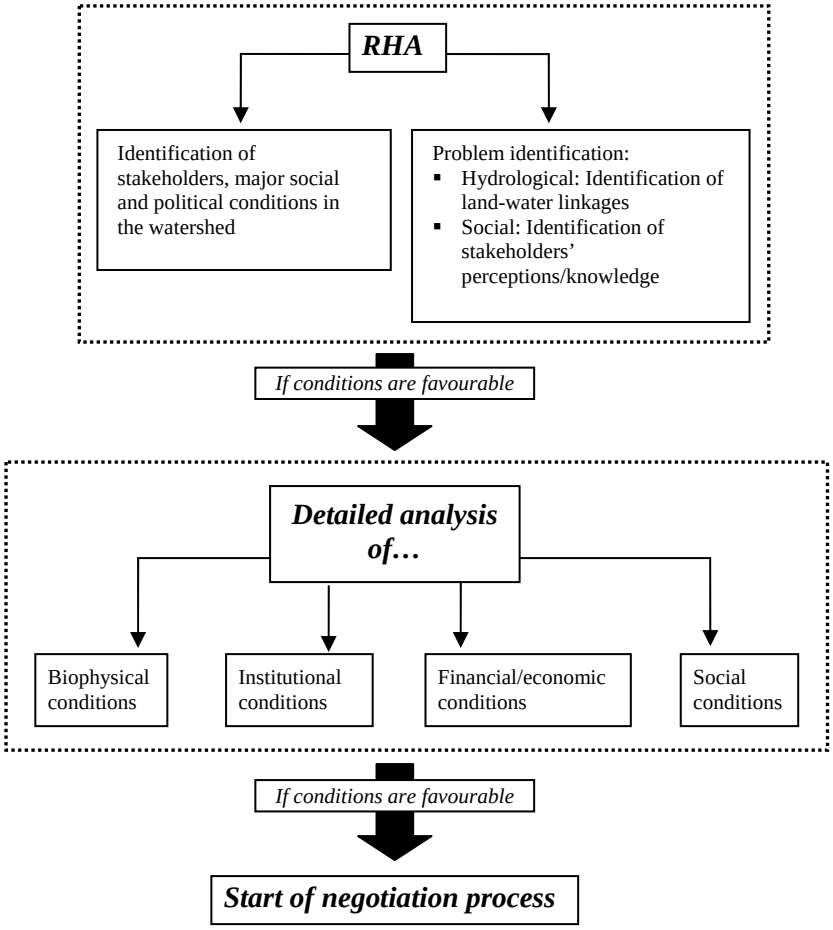

Figure 2: Model of PWS feasibility analysis (source: own illustration)

6 Annoted bibliography

6.1 International policy documents

CFA = Conservation Finance Alliance (ed.)(n.y.): Conservation Finance Guide. Chapter: Payments for Watershed Services. Online. URL: http://guide.conservationfinance.org/chapter/index.cfm?IndexID=18 (Issue: Jan. 2007).

The Conservation Finance Guide by the CFA presents potential finance mechanisms for nature conservation with a special focus on 'market-based' approaches. The guide is written to help stakeholders to understand, select, assess and implement the most appropriate financial mechanism for a particular situation. The chapter on Payments for Watershed Services describes the different types of PWS-mechanisms, the advantages and disadvantages of the approach and offers a step-by-step methodology to analyse its feasibility. Guidance for the establishment of a PWS-mechanism is given.

FAO (ed.) (2004): Payment schemes for environmental services in watersheds. Regional forum, 9-12 June 2003, Arequipa, Peru. Online. URL: ftp://ftp.fao.org/docrep/fao/006/y5305b/y5305b00.pdf (Issue: Jan. 2007).

This report summarises the results of a large Latin American forum on PES in 2003, which had the main objectives of exchanging experiences of PES in watersheds in Latin America and identifying criteria and formulating recommendations for the valuation of watershed services and the design and implementation of PWS-schemes. The results of the forum include a characterisation of the experiences, general lessons learned, advantages and opportunities of PWS as well as difficulties and limitations of PWS. Recommendations for the future establishment of PWS-systems are given. (In the first part of this NIVA-report, it is referred to the report more in detail).

FAO/REDLACH (eds.) (2004): Electronic forum on payment schemes for environmental services in watersheds. Final report. Online. URL: http://www.rlc.fao.org/foro/psa/pdf/report.pdf (Issue: Jan. 2007).

This report is a summary of the discussions at the Electronic Forum on PWS organised by the FAO as a follow-up to the Arequipa conference in order to validate conclusions and recommendations. During the 6 week discussion, 215 presentations of 118 professionals from 26 countries were made addressing the following issues:

- Definition and scope of PES in watersheds
- Design of PES schemes
- Execution of PES schemes
- Impacts of PES schemes
- PES, sensitisation and awareness rising
- PES and legislation.

The report was referred to frequently in the preparation of the first part of this NIVA-report.

6.2 Review studies on PES/PWS

DAILY, G. C. (1997): Nature's services: Societal dependence on Natural Ecosystems. Washington D.C.

Daily defines ecosystem services as the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life. They maintain biodiversity and the production of ecosystem goods such as seafood, forage, timber, biomass fuels, natural fibre and many pharmaceuticals, industrial products and their precursors. In addition to the production of goods, ecosystem services are the actual life support services provided such as cleansing, recycling and renewal, and they confer many intangible aesthetic and cultural benefits as well. In her book, daily lists and describes environmental services from different surroundings, including forest, marine, freshwater, wetlands, grasslands etc.

DIEDERICHS, N./MANDER, M.(eds.) (2004): Payment for Environmental Services baseline study. Future works! Maloti-Drakensberg Transfrontier project. Online. URL: http://www.maloti.org/za/progress/Final%20MDTP%20PES%20Report.pdf (Issue: March 2007).

The authors define environmental services rather broadly, including both goods and services supplied by ecosystems, even though not all goods and services might be appropriate for trading in a market based system. A list of goods and services is provided.

GUTMAN, P. (2003): From goodwill to payments for environmental services. A survey of financing options for sustainable natural resource management in developing countries. WWF. Online. http://www.biodiversityeconomics.org/document.rm?id=707 (Issue: Jan. 2007).

The first part of this report is a discussion on financing options for Sustainable Natural Resource Management (SNRM) in developing countries. A closer look is taken at PES and private sector – community partnerships. Section 2 of the report includes a list of all financing options and a description card for each of them, a short compilation of case studies and a guide to accessing resources and references for financing SNRM.

HOPE ET AL. (2005): Negotiating watershed services. Centre for Land Use and Water Resources Research, International Institute for Environment and Development, Winrock International India and Centro de Investigacion Politica Economica/Universidad Nacional Costa Rica. Online. URL: http://www.cluwrr.ncl.ac.uk/related_documents/costa_rica/Web-docs/A3.2.6-Negotiation.pdf (Issue: Jan. 2007).

Based on field experiences and methodologies tested within CLUWRR's PWS research project in India and Costa Rica, this article develops a framework for guiding the negotiation process among stakeholders in a PWS project.

JEANES, K. ET AL. (2006): Rapid Hydrological Appraisal in the context of Environmental Service Awards. ICRAF. Bogor.

Building on the tools and methods of PRA and RRA, ICRAF developed an approach named 'Rapid Hydrological Appraisal' (RHA) as a quick and cheap instrument for intermediary organisations to analyse the feasibility of PWS in a specific context (see chapter 5 for details).

LANDELL-MILLS, N./PORRAS, I.T. (2002): Silver bullets or fool's gold? A global review of markets for forest environmental services and their impact on the poor. Instruments for sustainable private sector forestry series. International Institute for Environment and Development. London.

This comprehensive paper develops a framework for guiding research on PES and applies this framework in a global review of emerging markets for carbon sequestration, biodiversity conservation, watershed protection and landscape beauty. Six research questions are identified:

- What form do markets take?
- Why do markets evolve?
- How do markets evolve?
- What does market development mean for human welfare?
- What do markets mean for poor people?
- What are the key constraints to market development?

Regarding markets for watershed services the authors conclude that cooperation in demand and supply is the key for market development. It is further found that markets have mostly evolved as a result of growing willingness to pay amongst beneficiaries. The authors also raise concerns to the development of market mechanisms for watershed services. They put into question, whether markets are a preferable mechanism for delivering watershed services, and point out that there is the risk of further marginalisation of poor people in developing countries.

LANDELL-MILLS, N. (n.y.): Watershed markets linking land managers and water users to raise welfare. Online. URL: http://www.rinya.maff.go.jp/faw2002/32%20%20N.%20Landell-Mills%20(S.%20Vermeulen)%20(IIED).pdf (Issue: March 2007).

This paper highlights the growing role of of private companies, individual landholders, NGO's and communities in delivering and financing for watershed services. The authors argue that because watershed services benefit groups of individuals, and are associated with threshold effects, cooperation in supply and demand is key. Market development depends on strengthening cooperative and hierarchical arrangements to allow beneficiaries and providers to come together to formulate group payment strategies, and tackle free riding. Where such arrangements exist, but have come under strain due to inequitable benefit sharing and high costs, markets are being introduced to ease tension. The author also identifies high transaction costs as a hindrance for entry for anyone lacking financial resources and political connections. Also the the cost of participating in an emerging market rise with the number of individuals living in a watershed area, the weaker the governments regulatory capacity, the less hydrological reliable data, and the les secure property rights.

PAGIOLA, S. ET AL. (eds.) (2002): Selling forest environmental services. London, Sterling.

The authors have reviewed literature and concluded that the evidence points towars a strong link between deforestation, rising water tables and increased dry season flow. However in some cases dry season flow has been reduced after removal of forest. The author states that factors that influences the outcome is tree species and the nature of landuse that replaces the forest.

ROSA, H/KANDEL, S./DIMAS, L. (2003): Compensation for environmental services and rural communities. Lessons from the Americas and key issues for strengthening community strategies. Programa Salvadoreño de investigación sobre desarrollo y medio ambiente (PRISMA).Online. URL: http://www.prisma.org.sv/pubs/CES_RC_En.pdf (Issue: March 2007).

This report describes and discusses different case studies from Costa Rica, Brazil, Mexico and El Salvador. The author has chosen the case study because of the different characteristics of the cases. Costa Rica stands out with a state driven national system of payment for environmental services. In Mexico farmers have ample access to, and control over natural resources by peasant and indigenous communities, while in Brazil the expansion, innovation and the defence of the rights of communities to resources still play an important role. The author examines compensation for environmental services as a part of wider strategies, and draw lessons from each of the cases to form general key elements of successful watershed development services.

SAVY, C. E./TURPIE, J. K. (2004): Payments for ecosystem services: A review of existing programmes and payment systems. Maloti-Drakensberg transfrontier coservation and development programme: Ecosystem services trading project. Anchor Environmental Consultants. Rhodes Gift.

The authors argue that suitable enabling framework has been recognised in the lack of adoption in South Africa, and they identify issues of importance for PES implementation. The importance of stakeholders linked to the use and provision of ecosystems is among the key elements to successful PES according to the authors. Other factors mentioned are clear and established property rights, the need to identify the producers as targetable units, and local participation and decision-making. The authors also describe characteristics of types of PES program arrangements. The ones described are self organized private deals, open trading schemes, and public payment schemes.

WAAGE, S. ET AL. (2006): Research Summary: A scoping assessment of current work on payments for ecosystem services in Asia, Latin America and East & Southern Africa. Forest Trends. Online. URL: http://wcln.org/modules.php?name=UpDownload&req=getit&lid=7 (Issue: Jan. 2007).

This paper provides a short overview over the current global status of PES, the main constraints that have to be overcome for implementation and currently available courses, workshops and materials on PES.

WUNDER, S. (2005): Payments for environmental services: Some nuts and bolts.

The article provides basic information about the instrument of PES. The author comes to the conclusion that PES only makes sense when there is some current or projected threat. However, if opportunity costs are high, other tools should be used. PES is most useful in the intermediate range of positive but numerically small opportunity costs, like degraded pastures, marginal croplands and forests in slow-moving agricultural frontiers.

WWF (ed.) (2006): Payments for Environmental Services. An equitable approach for reducing poverty and conserving nature. Online. URL: http://assets.panda.org/downloads/pes_report_2006.pdf (Issue: Jan. 2007).

The paper first provides an overview over the approaches to PES worldwide, referring to different environmental services addressed and also to different aims followed by these approaches. It then introduces WWF's approach of 'equitable PES', which explicitly aims to balance poverty reduction with conservation. Six of WWF's PES projects are presented. WWF sees great potential for 'equitable PES' as a valuable financing mechanisms for conservation that can deliver both sustainable natural resource management and improved livelihood for the poor.

6.3 Land-water linkages

BOSCH, J.M../HEWLETT, J.D. (1982): A review of catchment experiments to determine the effect of vegetation changes on wateryield and evotranspiration. In: Journal of hydrology 55, 1, 3-23.

The authors have summarized results of 94 catchment experiments and found that in none of the experiments have wateryield increased with increases in forestcover. The approximate magnitude of changes can also be estimated. Pine and eucalyptus forest types cause on average 40-mm change in water yield per 10% change in cover and deciduous hardwood and scrub ~25 and 10mm, respectively.

BRUIJNZEEL, L. A. (2000): Tropical forests and environmental sercives: Not seeing the soil for trees? Faculty of Earth and Life sciences, Vrije Universiteit. Amsterdam.

The author argues that forests can generate more precipitation than pasture or agricultural crops. This has been attributed to higher evatranspiration and greater aerodynamic roughness which will lead to higher propabilities of cloud formation and rainfall generation, but revievs has not found any total effect. Any increase in precipitation has been attributed to orographic effects, that is forests beeing forund upland where chances of cloud formation were greater because of athmospheric cooling of raising air, OR to differences in rain gauge exposure to wind and rain.

CALDER, I. R. (2000): Land-use impacts on water resources. Electronic Workshop on Land-Water Linkages in Rural Watersheds, 18.09. - 27.10. 2000. FAO Background Paper No. 1.Online. URL: http://www.cluwrr.ncl.ac.uk/related_documents/camp/calder.pdf (Issue: March 2007).

This article reviews the perceived notions of the relationship between catchment land use and hydrology. Gaps in our present knowledge are identified, and separated from empirical knowledge. Some key questions are:

- Do forests increase rainfall?
- Do forests increase runoff?
- Do forests regulate dry season flows?
- Do forests decrease erosion?
- Do forests reduce floods?
- Do forests improve water quality?

CALDER, I. R. (2001): Canopy processes: Implications for transpiration, interception and splash induced erosion, ultimately for forest management and water resources. In: Plant ecology 153, 203-214.

From studies in the tropics (Indonesia, India and Sri Lanka it has been deduced that conventional interception models, although adequate in temperate regions, cannot be used in tropical areas. The author argues that this is due to neglect of the process of drop size dependent canopy wetting.These studies have also demonstrated that the drop size of secondary drops falling from vegetation is dependent on the vegetation type and is very much greater for large leafed species such as Tectona grandis as compared with species such as Pinus caribaea with smaller needle formed leaves. The author argues that different types of vegetation have different drop sizes, and that this has important implications for splash induced erosion and the choice of tree species on soils subject to erosion.

CALDER, I. R. (2005): Blue revolution, integrated land and water management. London.

Calder argues that competing processes might result in either reduced or increased dry season flow. He suggests that the geological conditions which determine groundwater storage capacity may be a critical factor in determining the range of low flow response following a change in vegetation cover. In none of the cases can evidence of the "spunge effect" be found, that is that forested soil stores water for then to gradually release it. Calder argues that afforestation cannot be expected to increase dry season flows.

CALDER, I. R./DYE, P. (2001): Hydrological impacts of invasive alien plants. Online. URL: http://www.cluwrr.ncl.ac.uk/related_documents/camp/01_01_08calder&dye.pdf (Issue: March 2007).

This paper examines the reasons for increased water-use from trees compared to short crops. This is explained by increased interception and evaporation from taller trees, and the ability of the deeper roots to extract more water from the soil during dry periods. Also drop size and radiation have proven to be important factors. In tropical dry climates, whereas southern India is used a case example, tree size, advection and soil moisture were the dominant factors concerning water use.

CHOMITZ, K. M./KUMARI, K. (1998): The domestic benefits of tropical forests. A critical review. In: The World Bank Observer, 13, 1, 13-35.

Sedimentation is a result of erosion processes. Gully erosion and mass wasting are important sources of sediment, but these processes are more complex than sheet erosion, and less is known about them. Still, the authors conclude that little sedimentation-related damage results from converting natural forests to appropriately managed plantations, The authors state that the amount of sediment received downstream varies inversely with catchment size. Bsic methods for the estimation of sedimimentation is described.

JEWITT, G. ET AL. (2004): Water resources planning and modelling tools for the asseement of land use change in the Luvuvhu catchment, SA. In: Physics and Chemistry of the Earth 29, 1233-1241.

The author argues that in semi-arid areas, total evaporation is a major component of the hydrological cycle and seasonal water shortages and droughts are common. In these areas, the role of land use and land use change is particularly important and it is imperative that land and water resources are well managed. To aid efficient water management, it is useful to demonstrate how changing land use affects water resources. A convenient framework to consider this is through the use of the blue-water and green-water classification of Falkenmark, where green-water represents water use by land and blue-water represents runoff.

For the Upper Mutale quaternary catchment it has been shown that both forestry and irrigated agriculture reduce the amount of blue water, whilst conversely, removal of forest or irrigated agriculture increases bluewater flow.

Moss, A. J./Green, T. W. (1987): Erosive effects of the large water drops (gravity drops) that fall from plants. In: Australian Journal of Soil Research 25, 9-20.

A large proportion of rainfall, intercepted by plants, is released again as large "gravity drops". The size of these drops makes them more erosive than rainfall, and height is the primary factor of erosivety. Experimental studies shows that erosion effect increase over the height of 2m, and it was found that drops that was released below 0,3m had no noticeable effect on erosion.

NAIR, V. D./GRAETZ, D. A. (2004): Agroforestry as an approach to minimizing nutrient loss from heavily fertilized soils: The Florida experience. In: Agroforestry Systems 61, 269-279.

Nutrient build-up in the soil caused by increased animal manure and fertilizer use in agricultural and forestry practices may increase the potential for their loss from the soil, leading to groundwater contamination and no point source pollution. Studies in the tropics have suggested that agro forestry practices can reduce such nutrient (especially nitrogen) losses because of enhanced nutrient uptake by tree and crop roots from varying soil depths, compared to more localized and shallow rooting depths of sole crop stands.

NAKASONE, H./KURODA, H. (1999): Relationship between water quality in irrigation reservoirs and the land use of the watershed. In: Lakes and reservoirs: Research and management 4, 135-141.

Irrigation reservoirs are likely to receive upstream run-off containing high concentrations of nitrogen and phosphorus, leading to deteriation of water quality due to eutrophication. The authors suggest that there is a strong relationship between upstream land use and reservoir water quality. To control etrophication, measures must be taken to reduce N and P inputs from watersheds. Limiting the use of Nitrogen fertilizer was found to be the most important factor in regard to controlling the eutrophication of irrigation reservoirs. Next was the importance of building adequate sewage systems, and preserving the forested area between the irrigation reservoir and the upland fields. In addition wetland in the watershed area, where nitrogen concentrations were found to be height (paddy) must be preserved.

ONG, C. K./SWALLOW, B. M. (2003): Water productivity in forestry and agroforestry. In: Kijne, J.W./Barker, R./Molden, D. (eds.): Water productivity in agriculture: limits and opportunities for improvement. Wallingford, Cambridge, 217-228.

This article suggests a height temporal complementary between the crop and the tree components of the landscape. It also describes some of the technical approaches that can be used to improve land and water management, the role of trees and its relation to hydrology and the challenges for rational land-use decition-making

PANDEY, A. ET AL. (2003): Estimation of runoff for agricultural watershed using SCS Curve Number and Geographic Information System. Map India. Online. URL: http://www.gisdevelopment.net/ application/agriculture/soil/pdf/48.pdf (Issue: March 2007).

This article describes the Soil Conservation Service (SCS) model for predicting runoff from an agricultural watershed. The model is used in the Karso watershed (2793ha) in India. The author propose that this method may be suitable to use in other Indian watersheds

RAO, K. P. C. ET AL. (1998): Rainfall infiltration and runoff from an Alfisoil in semi-arid tropical India. No till systems. In: Soil and Tillage Research 48, 51-59.

Alfasoils, which are abundant in the semi-arid tropics, are fragile and subject to crusting. This results in exsessive runoff amounts and large soil losses.

The authors argue that the surface crust formed on alfasoil greatly affect the infiltrationrate in the soil. The regression analysis performed on the data showed that when the soil was covered by less than 30% with organic residue or amendments, the rainfall amount was the best predictive parameter for estimating runoff. When the soil was covered by more than 30%, rainfall amount and intensity, soil cover, and time from the beginning of the experiment were needed to estimate the runoff. Loss of rainwater as runoff on the structurally unstable crusting Alfasoils was reduces effectively by maintaining high soil cover. Therefore, from a management point of view, amount of water available to the crop can be increased by application of straw and farmyard manure.

SAMRA, J. S./SIKKA, A.K./SHARDA, V.N. (2001): Hydrological Implications of Planting Bluegum in Natural Schola and Grassland Watersheds of Southern India. In: Stott, D.E./Mohtar, R.H./Steinhardt, G.C. (eds.): Sustaining the Global Farm. Selected papers from the 10th International Soil Conservation Organization Meeting. West Lafayette, 338-343.

This paper presents the results in a long term (1968 - 92) experimental watershed study conducted by Central Soil & water Conservation Research & Training institute, Research Center, Udhagamadalam at Glenmorgan in Nilgiris on the hydrlological implications, tree growth, and economies of planting Ecalyptus globulus (bluegum) in a natural mixed "Shola" and grassland forest watershed following the paired watershed technique.

59% of the area in one of the two watershed was replaced with bluegum. Average change in water yeald was recorded to 16% decline in the first rotation and 25,4% decline in the secound rotation period. Maximum reduction in Runoff was observed in July - October and this was attributed to greater availability of rainfall. The dry period flow was reduced and moderation in peak flow was also observed as a result of the bluegum plantation. During the first rotation the depletion of moisture was mostly from the surface layers while the older bluegum of the secound rotation depleted mosture also from deeper layers. Increased wood biomass of coppiced bluegum during the secound rotation resulted in 40% increased income over the first rotation, but at a cost of 60% more reduction in annual water yealds as compared to the first rotation. The results suggest to addopt practices like planting of such fast growing trees species at wider spacing, and having mixed plantations in the catchments of hydroelectric resovoirs in the Nilgris.

SURESH, D. S. ET AL. (2000): Siltation analysis in the Neyyar reservoir and forest degradation in its catchment: a study from Kerala state, India. In: Environmental Geology 39, 390-397.

The article discusses how erosion and siltation from a catchment area leads to forest degradation. The article also defines the various hydraulic aspects of the study of sediment motion.

6.4 Economic valuation/willingness to pay

ARCHARYA, G. (2000): Approaches to valuing hidden hydrological services of wetland ecosystems. In: Ecological economics 35, 63-74.

This paper investigates the role of the production function approach in capturing the value of hydrological services of wetland ecosystems It is based on research done in the Hadejia-Nguru wetlands in the Northern Nigeria emphasizing the major role wetlands have during the wet season while recharging groundwater aquafiers. This paper synthesizes two approaches related to the value of indirect benefits of wetlands maintaining underlying water resources.

AYLWARD, B. A. (1998): Economic valuation of the downstream hydrological effects of land use change: Large hydroelectric reservoirs. Ph.D thesis, Fletcher school of Law and Diplomacy.. Medford.

The author states that wherever hydrological outcomes play a direct or indirect role in production as factor inputs the production function approach, or the "changes in productivity approach" will be an appropriate technique. Aylward examines the difference between the production function approach and the changes in productivity approach, including a review on how they can be used.

The production function valuation method is based on that the production of a good, the output, is dependent on an environmental function, as an input in production Aylward uses the example of sedimented irrigation canals. The externality imposed by this sediment may be valued by either estimating the cost of cleaning the canal, so as to restore the production to normal, or by estimating the loss in production in the absence of any maintenance. Alternatively both the levels of inputs and outputs could be valued simultaneously, to maximize the firms profit. In the first case the valuation would reflect an adjustment of inputs. Other markets would be used to substitute for the economic loss caused by the sedimentation. In the secound example the valuation reflects a drop in production associated with the loss of hydrological input. These two cases reflect the intuition behind the changes in productivity approach. In the third case, where both inputs and outputs can vary simultaneously, leading to changes in both output and prices reflects the production function approach.

HOPE, R.A./BORGOYARY, M../AGARWAL, C. (2005): Designing a choice experiment to evaluate adoption of organic farming for improved catchment environmental services and poverty reduction. Technical report for DFID FRP R8174: Socio-economic opportunities from upland catchment environmental services. A negotiaton support system. Online. URL: http://www.cluwrr.ncl.ac.uk/related_documents/costa_rica/Web-docs/A3.2.4-Design.pdf (Issue: March 2007).

This report describes the designing of a choice experiment to evaluate adoption of organise farming for improved catchment environmental services and poverty reduction. As the use of inorganic fertilizers has increased in development contries, so has the the agricultural production of the farmer. However this has contributed to increased pollution in water bodies leading to environmental degradation. The study examines farmers willingness to move towards organic farming, risks and benefits taken into account. The scenario attributes include land conversion towards organic farming, price incentive thresholds, collective organisation choices and preferences to buy or make their own compost. The site of the experiment is the Kolans catchment wich drains into the Bhoj wetlands, India

KRAMER, R./PATTANAYAK, S. K. (2001): Worth of watersheds: A producer surplus approach for valuing drought migitation in eastern Indonesia. In: Environment and Development Economics 6, 123-146.

This case from eastern Indonesia combines hydrological modelling with production function methods for valuing the worth of watershed services with the focus on drought mitigation provided by tropical forested watersheds. The author claims that a focus on producer surplus is appropriate for valuation as long as markeds for commodities related to the environmental services are complete.

PAGIOLA, S./VON RITTER, K./BISHOP, J. (2004): Assessing the Economic value of ecosystem conservation. The World Bank: Environment department papers, 110. Washington, D.C.

The authors give an overview of valuation techniques feasible for valuing ecosystem services. In chapter 3 the different approaches are briefly presented with their pros and cons. The concept of Total Economic Value is presented, and divided into direct use values, Indirect use values, Option values and non use values.

PATTANAYAK, S. K. (2004): Valuing watershed services: concepts and empirics from Southeast Asia. In: Agriculture, Ecosystem and the Environment 104, 171-184.

The author argues that public of tropical watersheds is necessary because the market cannot provide an optimal level of watershed services, due to the difficulty of trading such services.

The author also argues that the hedonic pricing mechanism is suitable in valuing watershed services because the raise in welfare following change in watershed services, will be reflected by prices of private commodities. In this article the author aims to reviewing the economic and ecological literature on watershed services, describing a suitable framework, presenting a case study form Flores, Indonesia, and evaluate the valuation framework used.

RODGERS, C./HELLEGERS, P. J. G. J. (2005): Water pricing and valuation in Indonesia: Case study of the Brantas River Basin. IFPRI discussion paper. Washington D.C.

The authors argue for the improtance of decreased wateruse in agriculture and to direct water to domestic and industrial sectors. Reducing water use in agriculture can be achieved through various means. Rationing, improved user management, and water markets are discussed. On the case site rationing is practiced, with the result of leavin the non-paying with insufficient supplies. Also very low irrigation service fees are hampering on-going water sector reforms. It is argued that increased fees would be be a substantional burden on the welfare of the farmers, and that alternative management systems are proposed, including "integrated crop and system management" and a water brokerage mechanism.

VENKATACHALAM, L. (2004): Economic Valuation of Watershed Services of Commons: Marginal opportunity cost within the environmental accounting framework. Institute for social and economic change. Bangalore.

In the introduction to these conference proceedings the author lists and describes the most common environmental valuation techniques, feasable for watershed valuation.The techniques are divided into stated preference methods and revealed preference methods.

6.5 Institutional aspects

AGGARWAL, R. M. (2000): Possibilities and Limitations to cooperation in Small Groups: The case of group owned wells in Southern India. In: World Development 28, 8, 1481-1497.

This study examines the incidence of group owned wells in India. The author finds that activities such as everyday allocation of water and routine maintenance are managed by most sample groups but large investments are made individually, in spite of the rewards of pooling capital and risk. The paper attempts to find out why this is so by looking at the transaction costs associated with these activities.

BARDHAN, P. (2000): Irrigation and cooperation: An empirical analysis of 48 irrigation communities in South India. In: Economic Development and Cultural change 48, 4, 847-865.

The author performs a quantitative analysis of the physical, institutional, and socioeconomic determinants of cooperation in irrigation societies sampled from the South Indian state Tamil Nadu. The data is sampled over six districts in Tamil Nadu . Half of the irrigation systems belonged to canal systems and the other half to more traditional tank systems. Samples within the villages were stratified on the size of irrigated area.

DEVELOPMENT SUPPORT CENTRE (ed.) (2003): Tail Enders and Other deprived in the Canal water distribution. Prepared for the Planning Commission, Government of India. Karnataka chapter. Ahmedabad.

The study was carried out in two tanks and two major irrigation systems in Karnataka. The report discusses the concept entitlement or water right as recognized by the State in its policy

documents and the actual realisation of the same by the local traditional institutions and other formal and informal institutions. It examines the impact of these as deprivation on particular farmers at different levels of the irrigation systems. The study focuses on 1) the factors responsible for deprivations, 2) the extent of deprivation, and 3) strategies adapted by various institutions engaged in the irrigation domain.

JAMES, A. J. (ed.) (2003): Institutional challenges for water resources management: India and South Africa. WHIRL Project working paper 7.Online. URL: http://www.nri.org/WSS-IWRM/Reports/Working_papers/WHIRL%20working%20paper%207_final.pdf (Issue: March 2007).

This working paper describes different water institutions in India and South Africa. National level institutions as well as local institutions are described. Also the author lists and discusses factors affecting the different institutions, and proposes areas where the functioning of the existing institutions can be improved.

KOLAVALLI, S./KERR, J. (2002): Scaling up participatory watershed management in India. In: Development and change 33, 2, 213-235.

This article examines how far community participation has been advanced by recently adopted reforms in India. One of the two cases is from Kartanaka. Key aspects are acting collectively and influencing decisions. Watershed development distributes benefits and cost unequally since downstream users share the benefits and upstream providers share the costs. Cost sharing is therefore important. Obtaining consensus and mutual assurance has proven to be easier in the presence of committed internal leadership or external agents that help to understand the value of benefits and to resolve conflict. Also there has been a lack of social training skills in government officials from state and natonal level.

NAYANATARA, S. N. (2006): Targeted approach vs. liberated and chaotic farmers participation in Water Resource Management: lessons from Irrigation Management Transfer (IMT) in Karnataka. Center for Multi Disciplinary Research, CEPT University. Online. URL: http://www.idpad.
org/pdf/Nayanatara%20-%2002.pdf (Issue: March 2007).

This paper analyzes the role of institutions in the creation and development of users participation. An attempt is made to answer why farmers organise them selves for irrigation management, are the water user groups equipped in terms of capacity building, financial empowerment, administrative know-how and legal powers to take over irrigation management, and weather IMT has influenced cooperation, water distributions and its use, resource mobilization, management of irrigation structures and conflict resolution in the sample region(Malaphraba, Karnataka) The findings of the author reveal that handing over management to user groups without planning for complete rehabilitation of irrigation structures and the lack of power to collect taxes has resulted in chaotic behaviour among the farmers.

OSTROM, E. (1990): Governing the commons. Cambridge.

The author criticises the foundations of policy analysis as applied to natural resources, and provides a body of empirical data to explore under which common-pool resource problems have been solved satisfactory or unsatisfactory. Ostrom provides design principles illustrated by long enduring CPR institutions: Clearly defined boundaries, Congruence between appropriation and provision rules and local conditions, collective choice agreements, monitoring, graduated sanctions, conflict-resolution mechanisms, minimal recognition of rights to organize and nested enterprises.

PETER, J. R. (2004): Participatory irrigation management. World Bank Technical Paper 442. Online. URL: http://www.maff.go.jp/inwepf/documents/inaugural/inpim-note.pdf (Issue: Jan. 2007).

This paper deals with the institutional aspects of participative irrigation management. The author reviews examples of Participatory Irrigation Management schemes worldwide. Although the approach to PIM in the examples varies, the trend is consistent. The paper gives a brief overview of the different types of institutional arrangements of water users associations and suggests a realignment of incentives for promoting effective participatory irrigation management.

PRADHAN, P./GAUTAM, U. (eds.) (2002): Farmer managed irrigation systems in the changed contexts. FMIS promotion trust. Kathmandu.

The book is a gathering of the key speeches given and the papers recievd for the 2nd International seminar on Farmer Managed Irrigation Systems(FMIS) in the changed contexst. The book contains papers from scientists of many nationalities with focus on the role of the farmer, irrigation management and irrigation systems. The list of key speakers includes Elinor Ostrom.

RAJARAMAN, I. (2006): Fiscal perspective on irrigation water pricing: A case study from Karnataka state India. In: Water policy 8, 171-181.

This paper presents a case study of Karnataka state in India to argue that, given the rent seeking possibilities in crop specific water rates and the infeasibility of metering in the developed country context, a flat quantum of water entitlement per net hectar of command area, with an accompanying fixed share is best. Local user groups may be the best mechanism for enforcing a flat entitlement and could oversee any informal water trading that might develop.

SAMAL, C. K./KOLANU, T. R. (2004). Water pricing and decentralized irrigation management in Andhra Pradesh - schism between objectives and realities. Rural Poverty Reduction through Research for Development. Deutscher Tropentag. Berlin.

The authour discusses water pricing and under what institutions watermarkeds can be expected to function. The authours stress the importance of decentralization and clearly defined local waterlaws. Also local participation in decision processes is seen as factors neccesary for a sustainable and successful water-institutions. Prices of water can be set following different criteria, and it is important that water pricing reflects the economic value of water. The authours review a case from Anhra Pradesh, and analyse the result of the water act of 1997. Water prices have increased substantially and more area have been cultivated with less water. Decentralisation and establishment of water user associations are seen as factors that have improved the situation in the irrigation sector. Hovever under-reporting and corruption are still occuring in the state.

SARKER, A./ITOH, T. (2001): Design principles in long enduring institutions of Japanese irrigation common pool resources. In: Agricultural water management 48, 89-102.

The authors examine how Ostrom's eight decition principles apply to Japanese CPR management. These design principles refer to irrigation case studies in developing countries mainly, and the authors wish to examine them in Japan which has a developed economy and where irrigators self govern their irrigation CPRs.

6.6 PWS and poverty reduction

GRIEG-GRAN, M./PORRAS, I./WUNDER, S. (2005): How can market mechanisms for forest environmental services help the poor? Preliminary lessons from Latin America. In: World Development 33, 9, 1511-1527.

This article presents a synthesis of findings on social and development impacts of PES initiatives in South and Central America, dealing primarily with impacts on potential poor service providers. It is suggested to use the Sustainable Livelihoods Approach as a framework for analysis in this context. By means of 8 case studies the following issues are discussed:

- Access and market shares of smallholders
- Livelihood effect on poor service providers
- Livelihood effect on the other poor.

The authors conclude that it is the rules of the scheme set by the administrators that have most influence on the extent to which small landholders participate in PES-systems.

KERR, J. (2002): Watershed development, environmental services, and poverty alleviation in India. In: World Development 30, 8, 1387-1400.

This article examines international donors' watershed management projects in India with a focus on their impacts on landless people. It is found that the projects most successful in achieving conservation and productivity benefits have also had the most negative impact on the landless. The author states that most projects do not allow for the fact that watershed development often asks the poorest people to provide a valuable environmental service to the wealthiest landowners and calls for a greater commitment to distributing the costs and benefits of watershed management projects more equally.

PAGIOLA, S./ARCENAS, A./PLATAIS, G. (2004): Can Payments for Environmental Services help reduce poverty? An exploration of the issues and the evidence to date from Latin America. In: World Development 33, 2, 237-253.

This paper examines the main ways in which PES might affect poverty groups. The authors find that PES may reduce poverty mainly by raising the income of poor upstream service providers. However, it is highlighted that PES is not primarily an instrument for poverty reduction as it cannot be targeted to areas with high poverty rates. It is concluded that PES can contribute to poverty reduction, when the programme is well designed and the local conditions are favourable. The authors also warn of possible negative effects, where property rights are insecure or where the programme encourages less labour-intensive practices.

ZILBERMAN, D./LIPPER, L./MC CARTHY, N. (2006): When are Payments for Environmental Services beneficial to the poor? ESA Working Paper No. 06-04. Agricultural and Development Economics Division, FAO. Online. URL: ftp://ftp.fao.org/docrep/fao/009/ag074e/ag074e00.pdf (Issue: Jan. 2007).

The authors examine, under which conditions PES are beneficial to the poor from an economic point of view. Through economic models of different PES schemes, they calculate impacts of certain schemes on certain poverty groups. The main conclusion is that the impact of PES on poverty groups will depend on the question whether it is a land diversion programme, which

reduces labour opportunities for the poor, or a "Working Lands Program" (PES-programme that aims on modification on farming acitivities), which increases the demand for labour.

6.7 Case studies Asia

DUNG THE, B./THANH HA, D./QUOC CHINH, N. (2004): Rewarding upland farmers for environmental services. Experiences, constraints and potential in Vietnam. IFAD, Sida and World Agroforestry Centre. Bogor.

This report reviews RUPES-related experiences of rural development projects in Vietnam, with a special focus on SIDA and IFAD-funded projects in the north, in order to assess constraints and potentials for RUPES in Vietnam. After an introduction to the idea of environmental reward mechanisms and a characterisation of the study region, three IFAD-projects, the Vietnam-Sweden mountainous rural development program (MRDP) and a few other local and national initiatives are presented. In most cases, projects aimed on the conservation or restoration of forests for watershed protection, increase of water availability, reduction of soil erosion and sedimentation and improvement of local microclimate. Applied reward mechanisms were secured tenure rights, cash, employment opportunities, in creased income through harvesting of timber and NTFP and improved local environmental services. The authors conclude that sustainability of the programmes is a serious issue as they have depended on subsidies so far. Concerning the impacts on poverty alleviation, no conclusions can be made yet. There have been positive environmental impacts though. Constraints to RUPES in Vietnam are the diverse physical conditions of the uplands, the great ethnic and cultural diversity, the slow implementation of the allocation of state-owned forestland and the low education level of mountainous residents. Enabling factors for RUPES are seen in the serious concern of the government, the recent enhancement of local capacities through decentralisation, the experience from related projects and the greater availability of new agricultural technology provided by academic and research institutes. Finally, suggestions for further RUPES action research sites are made.

GEOGHEGAN, T. (2005): Challenges to establishing markets for watershed services: learning from country diagnostics. International Institute for Environment and Development. London.

The report is a synthesis of a number of IIED studies carried out in 2001-2002 in order to explore the potential of market-based approaches for watershed protection. Studies were conducted in four countries/regions: the Caribbean, India, Indonesia and South Africa, and generally found little evidence of the existence of or demand for market-based mechanisms by governments or potential service-buyers. However, a number of PWS-related approaches were identified and classified. As there has been little experience, the authors warn of the dangers connected to implementing market-based approaches. Finally, directions that show the greatest potential are high lightened for every country/region and mechanisms for pilot testing are suggested.

MUNAWIR ET AL. (2003): Action-learning to develop and test upstream-downstream transactions for watershed protection services: a diagnostic report from Segara River basin, Indonesia. PSDAL-LP3ES and International Institute for Environment and Development. Jakarta, London.

The report summarises IIED's activities within the 'Developing markets for watershed protection services and improved livelihoods' project in Segara River basin, Indonesia. Key opportunities and constraints for implementing PWS in Indonesia are discussed. Enabling factors are the public concern over land and water management, positive attitudes to environmental management, the new policy environment in favour of community-based forest

management, the manageable scale regarding geography and number of stakeholders as well as the fact that the concept of downstream-upstream payment transfers is already accepted as a paradigm in the basin. Constraining factors are the lack of hydrological evidence, the resistance to policy changes due to uncertainty and the fact that downstream users have less money than upstream service providers. It is concluded that any new market-based instruments in Indonesia will be primarily a tool for integrated river basin management, and that it is critical to bring stakeholders together to negotiate rights and responsibilities over water.

WUNDER, S./DUNG THE, B./IBARRA, E. (2005): Payment is good, control is better. Why payments for forest environmental services in Vietnam have so far remained incipient. CIFOR. Bogor.

This study reviews what kind of schemes related to PES currently exist in Vietnam, to which extent the implementation of PES has been successful and which obstacles are present. Only a number of PES-like initiatives can be found in Vietnam and the PES-principle as such has not been implemented so far. The reasons for this are:

- No real land-use choice: The state fully owns the land and completely controls land-use choices. In most sites, little forestland has been allocated to households.
- There is seldom true conditionality: Payments are normally not truly conditional, in the way that compliance is monitored and payments would be stopped or diminished in the case of non-compliance.
- Too little money: The amounts offered to households are normally insufficient to fully compensate the opportunity costs for forgone alternative uses.

The authors conclude that in Vietnam, being a country with substantial planning tradition and only an incipient market orientation, the established command-and-control measures provide a much greater likelihood of securing the desired land-use than allocating the critical lands to households. Research on PES in Vietnam would therefore not be much about PES as developed in the literature, but more about how to introduce effective economic incentives at the margin of a state-run land-use planning system.

6.8 Case studies India

SENGUPTA, S. ET AL. (2003): Developing markets for watershed protection services and improved livelihoods in India. Winrock International India and International Institute for Environment and Development. New Delhi, London (unpublished draft).

The paper summarises the results of the India scoping study on the potential of PWS by IIED and WII (as part of IIED's 'Developing markets for watershed protection services and improved livelihoods' project). The states of Himachal Pradesh and Madhya Pradesh were chosen for conducting the study and market-based approaches for watershed services were identified on the micro, meso and macro scale. It is concluded that in the two Indian states PWS has the greatest potential on the macro level. Large downstream beneficiaries such as hydropower projects and urban water supply agencies can provide poor upstream communities with an incentive to participate in watershed protection activities and thereby improve their livelihoods.