Water catchments – issues and options for research

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Output 1and 2

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1. Background

1.1 DFID and FRP research priorities

DFID has recognised the need for reliable mechanisms to capture and distribute the costs of improved forest management activities to deliver better water. It knows that better hydrological data is needed to support such mechanisms. It would like to see the development of decision support systems to enable land-use managers to value catchment water values holistically. This includes:

- Taking in different stakeholder views.
- Working out how to downstream users can compensate upstream land-managers for changed activities.
- Recognising that the process of developing systems, mechanisms and values is at least as important as the end value itself.

FRP is willing to support relatively long-term study into the effects on water flows and quality of land-use change in water catchments with significant cloud forest cover. It wishes to see hydrological research backed up by work that will help land use decision makers to come to sensible decisions about different management and policy options and their effects on up- and down-stream stakeholders.

FRP is looking for original thinking and experimental research in this area. Observational case studies are not adequate. It wants to see work that turns theoretical research into understanding of practical impacts on livelihoods.

1.2 Terms of reference

The consultant was to make use of available documents and human resources (email and telephone) to derive criteria for:

- choosing physical locations of hydrological research, and
- characteristics of the human populations which should be addressed.

Populations should include both upstream forest managers and downstream users of water.

These criteria should then be applied in order to propose locations and populations for research.

Whilst there is no limit to the number of sites, it is anticipated that 1-3 will be finally selected.

This document is very much a draft, after rapid review of available literature. Proposals are far from 'written in stone'. Feedback on sites and populations before and/or during the workshops is expected to further inform decisions. Issues in* <u>underlined bold</u> *inparticular require clarification.

2. Criteria for selecting locations

2.1 Forest and watershed criteria

Location: Is the catchment in a DFID forest partner country*?

Why? Current activities in these countries may help to fund research efforts.

***Forest/land-use type*:** Is the catchment at least **25%** (significantly) cloud forest?

Why? TMCF is known to have a positive role in increasing water flows, compared to other forest types. It can be expected that removing cloud forest wil have a significant effect on downstream flows. (An alternative aproach might be to look for catchments that receive 50% of their water from cloud forests.)

Is the catchment especially high in biodiversity?

Watershed size. Is the catchment **100km^2** or less?

Why? - Larger watersheds mean that there is more disassociation between upstream land-users and downstream water-users.

- Land-use/water linkages can only be reliably determined at the small-scale and these findings cannot easily/reliably be extrapolated to entire basins. Several small scale efforts are likely to be better than one large-scale?

- Impacts of land-use changes are more likely to predominate over human/natural impacts in small watersheds.

- Impacts in a small watershed are more likely to be seen over the time period of research. The larger the watershed, the longer the potential time lag between cause and effect.

- Debate over optimum catchment size for effective research/ information generation – 100-5000km^2.???

***Scale of land-use change*:** Is land-use change a significant proportion of the watershed area? (**x%??**):

Why? If potential land-use change is only a small proportion of the total land area, then impacts on the water resource will be limited, and more likely to be influenced by natural or other events. It may not be worth intervention.

Representative: Is the site representative of others?

Why? Water quality and quantity issues are highly site specific. Most value will be gained from studying sites that are not unusual.

* Belize, Bolivia, Brazil, Cameroon, E.Caribbean States, Ghana, Guyana, India, Malawi, Nepal, Nigeria, South Africa, Uganda, Zimbabwe.

2.2 Relevant available information

***Existing information**:* Is there existing hydrological data?

Is there existing management data?

Why? Use of existing data adds to the efficiency of research and provides a baseline and history against which to compare current data, and guidance to forecasting the future. Rainfall and geology data is especially important.

Historical information: Does existing data reach back 20 years or more?

Why? Climatic patterns (e.g. rainfall) can vary widely from decade to decade. Using data only from shorter periods can produce biased and unrealistic results.

Also, there is typically a time lag between cause and effect in watershed management and water resources. e.g. sedimentation.

***Types of land-use*:** Is there a 'baseline' undisturbed natural forest?

Why? Quality of forest rather than simply tree cover is important in terms of impacts on water resources, for erosion control in particular. Management practices (roading, cultivation, compaction, drainage) can have a major influence on water resources, e.g. on flooding. Undisturbed natural forest is recognisd as a 'baseline' for comparison of other land-uses.

Existing indicators: Are there any locally established easy indicators of water quality and quantity?

Why? Tried and tested, reliable indicators which are quick and easy to read migh help efficiency of research and can be useful for monitoring (for example) erosion and sedimentation.

***Alternative land-uses*:** Are the land-use changes/alternatives acceptable to local people?

Why? If land-use options are to be changed, local people must still have viable livelihoods. Also, all stakeholders must consider interventions to be fair if they are to adopt them over the long term.

***Cause of impacts*:** Is forest land-use change the main cause of impacts on the water resource?

Why? Human (e.g. urbanisation) and natural (e.g. landslides or storm events) activities are often of greater influence on water resources than land-use change. Where human and natural influences predominate, changing land-use will have minimal impact. Land-use changes are likely to be more important in small watersheds.

Surface/Ground water: Is surface water more important than groundwater?

Why? Groundwater routes of movement are more difficult to follow and consequently quantify. Where they are a dominant part of the hydrology, they will make linking land-use to water Q&Q more challenging.

2.3 Concerns

Local concerns: Are water resource issues a concern in the catchment area?

Why? If there is no perceived concern about the state of water resources there will be no support or commitment to changing practices or negotiating and introducing payment or compensation mechanisms.

Downstrean demand: Does the catchment feed a downstream area of high/increasing demand or scarcity?

Why? Cloud forests catchments that feed an arid downstream area will be more critical than those that feed a wet downstream area. Also, water scarcity in an arid area, or high downstream demand, is more conducive to efforts to work with upstream land users.

Attributed disasters: Is upstream deforestation being identified as the cause of downstream 'disasters' (flooding, etc)?

Why? Myths and misconceptions about the role of forests vs other landuses need to be clarified. Better evidence of the linkages is needed.

2.4 Socio-economic context

Land tenure: Are land tenure issues settled in the area?

Why? Land-users may have little incentive to change management practices at their own cost if they do not have secure tenure. Changes will only be made if immediate benefits can be made, otherwise investments cannot be justified, especially for the poor.

Enabling environment: *Is there supportive and capable government for interventions?*

Why? For integrated planning and/or application of mechanisms to link upstream activities and downstream impacts, there needs to be appropriate institutional and legal framework, capacity and/or political will to provide it.

***Organised groups*:** *Are there already organised groups of land/water users?*

Why? The existence of organised groups of stakeholders makes information sharing, communication and negotiation over costs and benefits more feasible in limited time periods.

Are there conflicts between any of the groups?

Why? Conflicts between groups make it more difficult to clearly see the costs and benefits of land-use and water resource impacts. To enable understanding and compromise about land-use, the stakeholders must be able to 'talk'.

Do organised groups include all stakeholders?

Why? The poorest and most marginalised may not be represented – these must be considered, as are most likely to be disadvantaged further by land-use changes.

***Scale of Effect**:* *Size of populations*.

Why? How many people will the land-use change affect in total? (many in a larger watershed, fewer in a smaller, where upstream populations may be more important).

3. Shortlisted locations

Suggested shortlisted locations have been seived from the literature. They are:

1. El Salvador – El Imposible National Park. Municipal water users agred to pay upstream protection fees –pilot project [more info coming]
2. Uganda – Mount Elgon Forest, East Uganda. Contributes to Kenya's water supply (??). High population density in upper catchment
3. Bolivia – Tarija Valley – Tariquia Reserve. Arid belt downstream. Catchment-dependent populations. Severe pressure from agriculture and colonisation.
4. [Awaiting further suggestions from contacts]

These are compared against the location selection criteria, and given a score:

- -1 (do not meet criteria), or
- 0 (unknown), or
- 1 (meet criteria) or
- 2 (meet **critical*** criteria).

The total score for a location suggests its priority as a research site for this FRP research cluster.

Locations shortlisted so far have been gathered from the quick review of literature. At this stage they are not exclusive. Others may be suggested and have the criteria applied to them.

[At this stage I do not have full enough information about the catchments to rank them properly.]

Catchment criteria	Possible Locations									
	1	2	3	4	5	6	7	8	9	10
25+% TMCF*	0	1	0							
+/- 100km2*	0	0	0							
x% land use change	0	0	1							
Representative	0	0	0							
High biodiv. value	1	1	1							
Info avail*:										
Hydrology	0	0	0							
Management	1	0	0							
Info historical	0	0	0							
Baseline forest	1	1	1							
Indicators exist	0	0	0							

Land use alternatives	0	0	0							
Forest loss IS a problem vs other land use vs local av. identified as a cause	0 0 0	2 -1 0	2 -1 0							
Perceived water concern	1	0	0							
High/increasing water demand*	2	2	2							
Settled land tenure	1	1	1							
Enabling environment	1	0	0							
Organised stakeholders	1	0	0							
High scale of effect	0	1	0							
Score/rank	9	8	7							

Top 5 locations:

4. Characteristics of populations to consider

4.1 Types of water-users

Water users come in various forms and at various levels (up/downstream) in the catchment. Research needs to prioritise them in terms of who will be most significantly affected by land-use change, and thus identify whom it is doing the research for. This will help define the research, the ouputs and the communication of outputs.

Water users can include:

- Farmers – subsistence and large-scale (irrigation)
- Fisheries – local and industrial
- Foresters – plantations, woodlots, agroforestry, reserves
- Public – domestic consumption and sanitation, recreation
- Industry demands
- Municipal water suppliers
- Hydroelectric power providers– dams/reservoirs
- Mining companies

4.2 Considerations

In identifying who the demands for information are from and on whom the focus of research should be, FRP's focus is on improving equity and livelihoods through efficient research. Considerations include:

- Up *and* downstream issues: Focus on local groups only ignores wider concerns for down/upstream populations (e.g. flood-control). Research cannot simply focus on benefits to upstream land-users.
- Livelihood dependency: What impacts will changes in land use or water quality/quantity have on people's livelihoods? Do they have alternative options?
- Marginalised people: Are the needs of marginalised groups (such as women, landless poor) taken into account?
- Likelihood of success: Are the 'pre-conditions of success' in place? These might include:
  - Few, organised groups of stakeholders
  - Good negotiating platforms and communication routes
  - Adequate public awareness of the concerns/issues.
  - Readiness of land/water users to accept and implement changes.

4.3 Relevant characteristsics

Characteristics to consider when looking at populations that will be affected by land-use change in a catchment include:

- ***Communication conditions***

Level of literacy, infrastructure (telephones, roads) and strength of links into wider professional or stakeholder networks will influence:

- *awareness of external issues* (such as downstream needs for water quality and flow, or upstream land management constraints). This influences e.g. the willingness to change land-use practices or to pay for the water resources.
- *access to information* – e.g. on new theories regarding land use and water linkages, management techniques, policies etc.
- ability to mobilise stakeholder groups and lobby for their interests (i.e*. gain power and influence*).

- ***Groupings of stakeholders****.*

  Interventions will be easier to manage if there are few clear groups of stakeholders. e.g. fishermen/farmer example.

  'Preferred' populations (i.e. those with whom interventions have more chance of efficient success) are those who are well organised and have clear groups and/or are relatively homogenous – diversity of culture and or economic status will complicate things (though is more real…).

  Groups may not include everyone – generally the poorest are not represented.

- **Financial security and livelihood dependence**

Markets and profit – can the populations supply and access markets? Can they make profits?

Risk – How far does this allow them to bear financial risk? This influences the ability/vulnerability to change land-use practices or pay for access to water.

Alternative options – do they have alternative ways of survival should changes be implemented? Are these better or worse than the status quo?

- **Water demands**

Type of water use – for livelihood (e.g.consumption, sanitation) or profit (irrigation, power generation)

Importance of what element of water change (e.g. flood risks drought/dry season flows, erosion, sedimentation, quality). Different land-uses have different effects on different elements of the water resoiurce – which element takes priority?

Balance of demand – some population/users may place much higher demands on the water resource than others.

- **Rate of population growth**

It is critical know if the main forest land user populations or water demanding populations are growing to predict changing pressures on the resources.

Note: the further upstream the populations are the more isolated they are likely to be. This has negative implications on characteristics such as:

- Communication conditions
- Awareness of external issues
- Financial security.

4.4 Location-specific populations

[Unless I can get a lot more information, I feel this may have to be done during the workshop??? I have limited info on the catchments as yet]

Shortlisted Location 1. (e.g.)					
Population characteristics	Population				
	Farmers		Municipal water supplier	4	5
Communication conditions	Poor		Average		
Groupings of stakeholders	none		Good		
Financial and livelihood security					
Water demands			High		
Population growth			Increasing		

5. Summ-up

Locations and population summary