Groundwater Futures in Sub-Saharan Africa

A Field Guide on Participatory Research for Identifying and Analysing Groundwater Development Pathways

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GroFutures Social Science Team

2018

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It also draws from the *Field Manual for Community Level Data Collection* by K. Schreckenberg, et. al. (2016) at Southampton University, UK, produced for the ASSETS Project (*Attaining Sustainable Services from Ecosystems through Trade-off Scenarios*) funded under the Ecosystem Services and Poverty Alleviation (ESPA) Programme of NERC-ESRC-DFID. In addition, it is informed by Chambers, R. (2008). *Revolutions in Development Enquiry (*New York: Earthscan); Pretty, J. N., Guijt, I., Thompson, J., and Scoones, I. (1995) *Participatory Learning & Action: A Trainer's Guide* (London: IIED); and Kumar, S. (2002) *Methods for Community Participation. A Complete Guide for Practitioners* (Warwickshire: Practical Action).

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1 INTRODUCTION

Groundwater Futures in Sub-Saharan Africa (GroFutures) is an interdisciplinary, collaborative research project funded by the *Unlocking Groundwater's Potential for the Poor* (UPGro) programme of NERC-ESRC-DFID in the UK (http://upgro.org/).

This manual provide guidelines for GroFutures and other UPGro social scientists on how to carry out community level research on *'groundwater development pathways'* and to assess local-level groundwater development challenges and opportunities in different settings, particularly in Africa. It focuses primarily on qualitative data collection obtained through the use of Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) methods. The aim is to provide sufficient information to ensure that a standard set of information would be collected across all local partners and in all the communities involved in the research. Although clearly designed to meet the specific research objectives of the GroFutures and UPGRo, we hope that the methods presented here will also be of interest to other researchers working on agriculture, water and natural resource governance and management issues.

This manual does not constitute a fixed step-by-step manual. Methods, tools and research queries contained in the text are presented as informed suggestions for fieldwork; they should not stifle the creativity of the GroFutures and UPGro researchers concerned to select appropriate approaches and, where of interest to themselves or the community, to incorporate additional elements.

This document consists of several sections. Section 2 provides a brief introduction to the GroFutures Project, its research questions and main concepts. Section 3 summarises some of the guiding principles of Participatory Rural Appraisal. These should be followed by all data-collection teams. Section 4, in turn, presents the data-collection protocol and list of information outputs to be generated through different exercises in relation to our research questions. Section 5 contains detailed instructions for the application of individual and group data-collection activities relevant to the research questions of the project. Diagrams from pilot test events and from other studies are included as illustrative examples. Section 6 contains the project information sheet and written and verbal consent forms required for the data-collection process. Finally, section 7 contains a proposed structure for a summary report containing the information collected through the different methods presented.

The methods, procedures and lines of questioning outlined in this manual are meant to complement a separate set of guidance documents that are being prepared by the GroFutures Social Science Team to support the implementation of quantitative surveys for examining household level decision-making related to groundwater availability, access and use.

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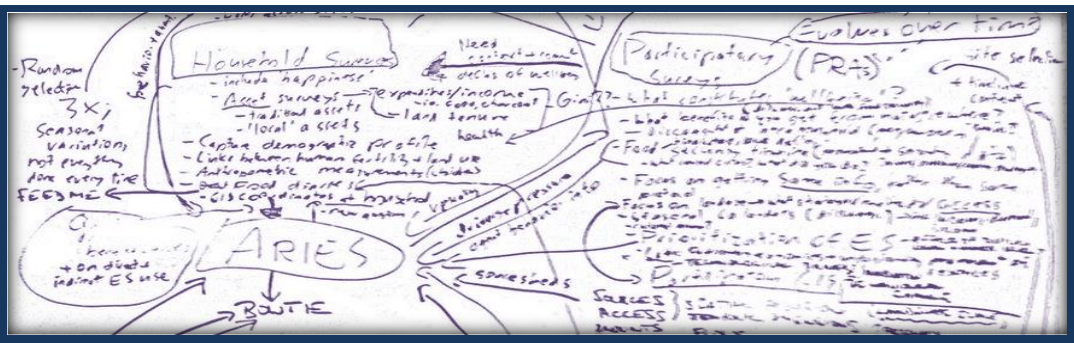


THE RESEARCH FRAMEWORK

2.1. Themes and Questions

The Groundwater Futures in Sub-Saharan Africa (GroFutures) project is predicated on the following assumptions which have been informed by growing empirical evidence and the practical experience of the project team:

- rising water demand and climate change will amplify dependence upon groundwater resources over the next few decades in SSA;
- sustainable groundwater use requires robust quantitative evidence of spatio-temporal variations in demand for, and renewable supply of, groundwater; and
- climate, land use and socio-economic pressures affect both the demand and supply of groundwater at different scales so that inclusive, transparent and integrated approaches to groundwater resources planning and management are needed to ensure resilience and equitable benefit-sharing.

This manual presents a series of participatory research exercises that address the overall research objective of the Groundwater Futures in Sub-Saharan Africa project:

The overall aim of GroFutures is to develop the scientific basis and participatory management processes by which groundwater resources can be used sustainably for poverty alleviation in Sub-Saharan Africa.

This goal will be achieved through the realisation of four specific objectives addressed directly through an interlinked set of five Work Packages (WPs) (Figure 1). Through these five Work Packages the GroFutures project will seek to:

1. substantially improve knowledge of the renewability and sustainably exploitable groundwater resources in SSA (WP1);
2. construct a set of plausible, stakeholder-informed groundwater development pathways (WP2);
3. quantify the impacts of development pathways, climate change and land-use change on groundwater recharge, storage and demand (WP3);
4. develop, test and apply an inclusive, transparent and scientifically-informed Pathways Approach to inform groundwater development and management decision-making for greater poverty alleviation (WP4); and
5. Our Pathways to Impact are cross-cutting and will be implemented from the outset. We will foster close engagement with stakeholders at both basin and site levels (through Learning Platforms); ensure the production, distribution and uptake of a range of high-quality academic and policy-relevant outputs; and track impacts, outcomes & learning by employing a 'Participatory Impact Pathways Approach' (PIPA) at different stages of the project (WP5).

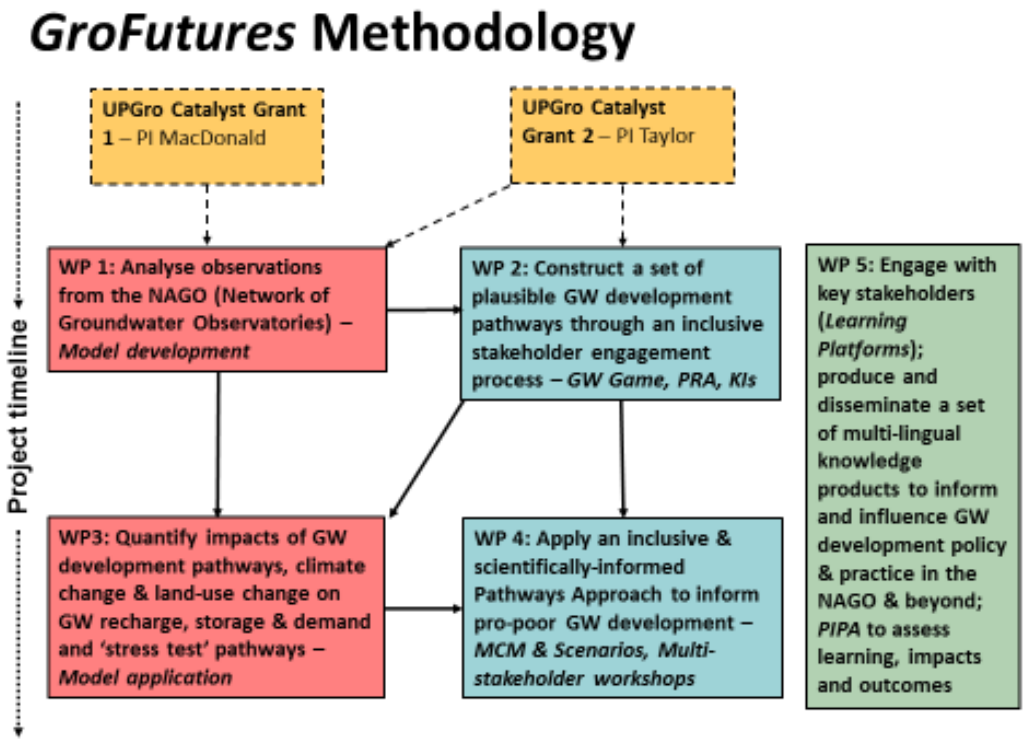


Figure 1. GroFutures Work Packages

In order to achieve these objectives, GroFutures will:

1. deploy an international consortium of scientists with an unmatched track record of groundwater research and stakeholder engagement in SSA that both leverages substantial additional investment and sustains pro-poor groundwater development pathways across Anglophone and Francophone Africa;

2. establish a **Network of African Groundwater Observatories (NAGO)** representing the primary groundwater systems and governance challenges in SSA that features: (i) a newly collated set of 25 time series of multi-decadal, groundwater-level observations across SSA enabling the most rigorous analysis of the relationships among climate, land-use and groundwater recharge ever conducted in the tropics; and (ii) construction of dedicated basin observatories enabling both high-frequency monitoring of surface meteorology, soil and groundwater, and application of a new in situ geophysical technique (Magnetic Resonance Sounding) to characterise recharge processes and quantify in situ groundwater storage thereby overcoming fundamental limitations in present knowledge of groundwater in SSA (Figure 2); and

3. employ an innovative and participatory **Pathways Approach** to groundwater governance that provides a framework for both explicit representation of poor people in decision making and transparent consideration of trade-offs associated with development pathways (e.g. small-scale irrigation versus intensive irrigation) (described below).

The basin observatories will enable high-frequency monitoring at stations along upland-lowland transects in each observatory to improve conceptual and quantitative understanding of recharge processes and surface-groundwater interactions (Figure 3).

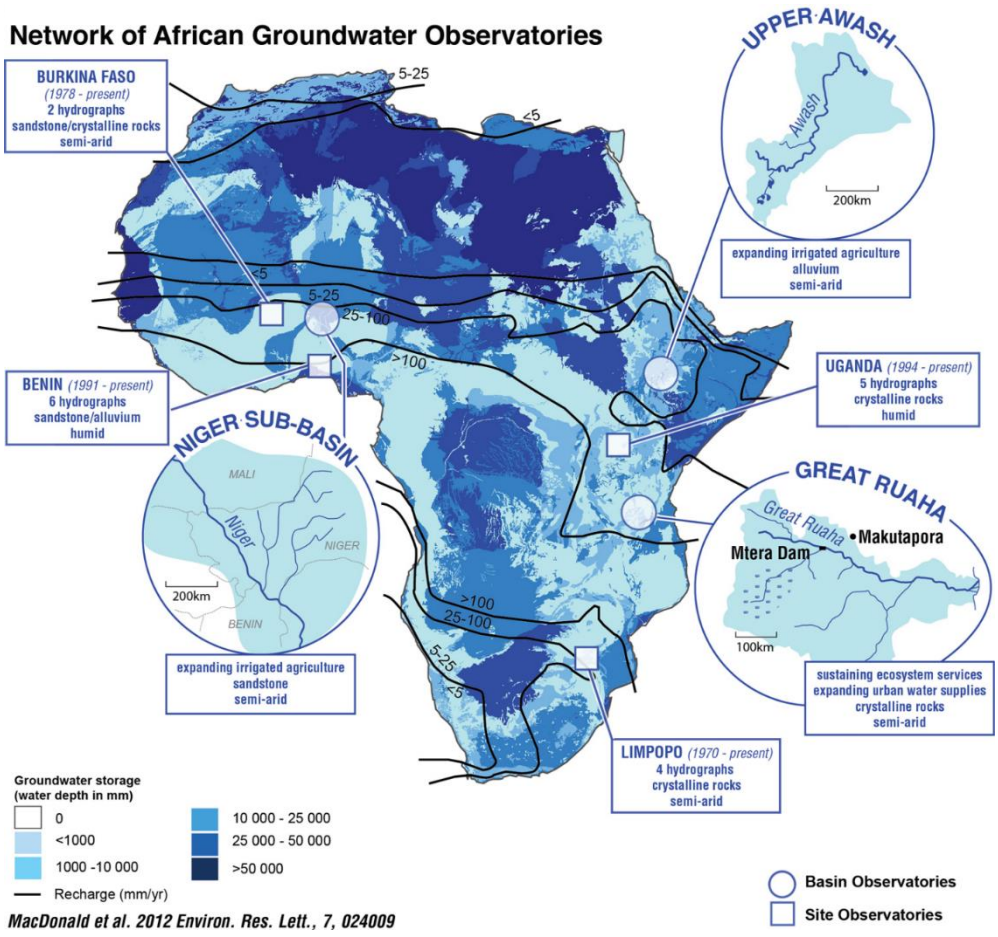


Figure 2. Network of African Groundwater Observatories

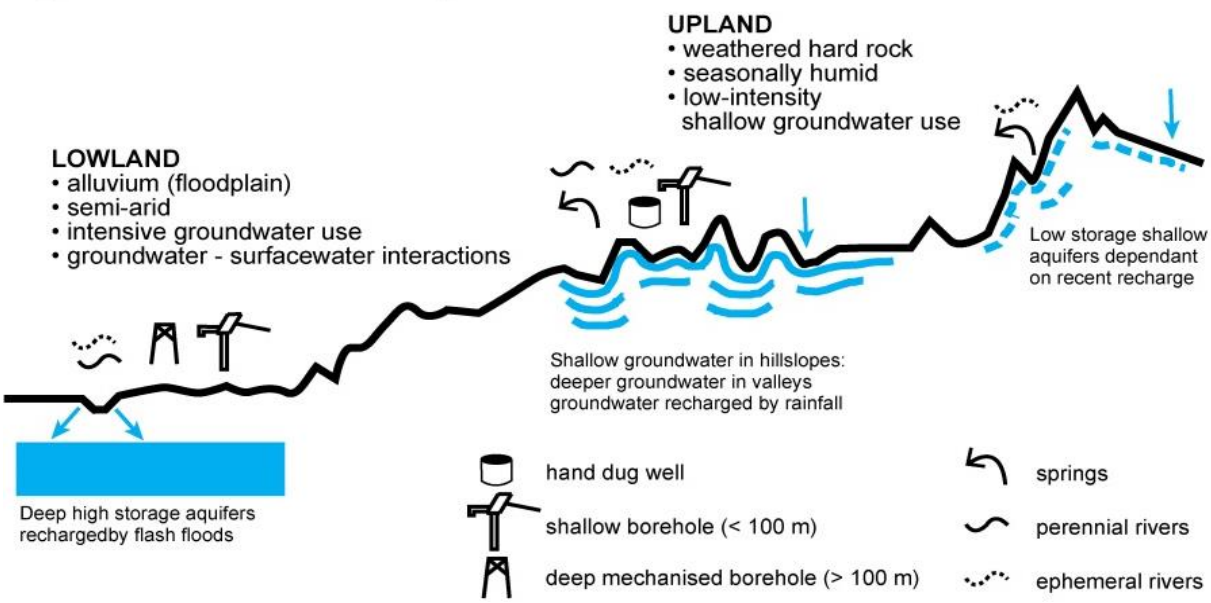


Figure 3. Basin transects with upland and lowland sites

Through this multi-level, multi-sited, mixed-methods research, we are seeking to address the following social science related questions:

1. *How has use of groundwater use changed over time and what are the drivers that shape current trends and plans for groundwater development and management?*
2. *What are the dominant and alternative narratives that 'frame' groundwater challenges and possible solutions and what opportunities are there for more pro-poor groundwater development pathways to emerge?*
3. *What are current informal and formal groundwater governance approaches? How do they interact? To what extent do they support or hinder access of poor people to groundwater resources and the benefits derived from them?*
4. *What tools and processes can be used to open up and broaden out visions of plausible pro-poor groundwater development pathways?*
5. *How do we engage stakeholders to identify plausible groundwater development pathways? – through stakeholder workshops; participatory appraisals in the upland and lowland field sites; key informant interviews using the 'Groundwater Game'.*

In addressing these questions, GroFutures recognises that enhanced knowledge of groundwater resources alone will not necessarily lead to more equitable access to water or poverty reduction in SSA. The ability of poor rural and urban people to benefit from private (e.g. individual, community-based) or public investment in groundwater resources is limited to a large degree by unequal power relations and their lack of effective representation in decision-making processes (Mehta 2010). Those processes are open to a variety of competing narratives about key development problems and potential solutions, each suggesting different **'pathways' (i.e. *self-reinforcing, co-evolving trajectories of social, environmental and technological change) to reach more sustainable groundwater futures*** (Leach et al. 2010). These narratives are promoted by particular actors in specific contexts and embody different system framings, values and goals (Thompson and Scoones 2009). Thus, a key aim of GroFutures will be not only aim to improve understanding of evolving informal and formal groundwater development pathways but also seek to create opportunities for poor people to shape those arrangements.

At the national and basin level, the GroFutures team will also analyse groundwater governance and policy issues. Groundwater governance is intimately intertwined with the political economy of broader land and water management policy processes in SSA (Wijnen 2012). By investigating these issues, GroFutures will seek to reveal how particular narratives (*'framings'* of groundwater development problems and solutions) give rise to specific, dominant groundwater development pathways shaped by powerful actors and interests, often with substantial financial, institutional and political backing. These are the 'motorways' (e.g. large-scale commercial irrigation) that direct current mainstream (i.e. formal) formal development efforts and guide investments in particular forms of research and development, infrastructure, technology and services. These dominant pathways can sometimes block alternative, informal 'bush paths' (e.g. self-funded, smallholder irrigation) that represent different goals, values and forms of knowledge. These alternative pathways, which may better serve the needs of poor people, present challenges to formal groundwater governance and management (Villholth 2013). They may also give rise to different strategies to respond to shocks and stresses (e.g. climate variability/extremes, fluctuations in food and labour costs/availability) or the absence of effective and equitable water service provision.

GroFutures will adapt and extend an interdisciplinary and scientifically rigorous **Pathways Approach** to analyse these formal and informal narratives and pathways (Leach et al. 2007; 2010; Thompson et al. 2010). This work will link our interdisciplinary, multi-scale research with a deliberative, multi-stakeholder engagement process in order to inform and influence the groundwater governance and planning processes at nested scales 'opening up' new pathways towards more sustainable and socially just groundwater futures in SSA (Stirling 2008) (Figure 4).

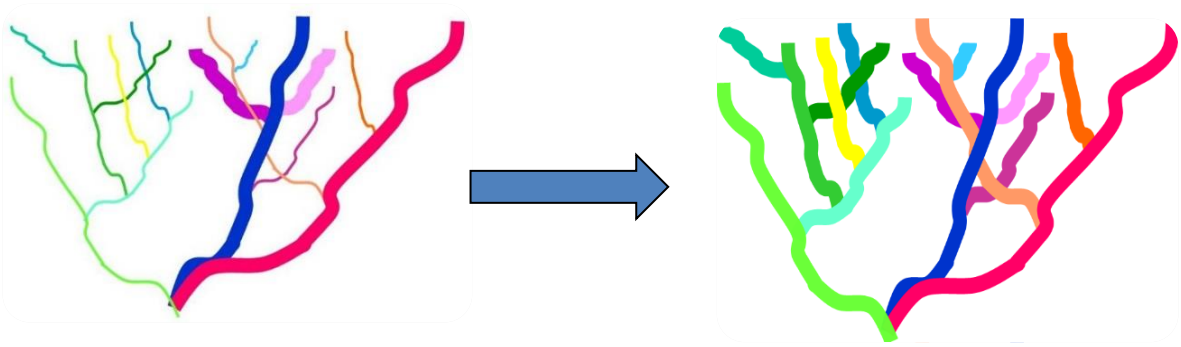


Figure 4. 'opening up' pathways

Our deliberative, multi-stakeholder Pathways Approach will enable us to: (i) improve the legitimacy of constructed pathways by engaging with a wider group of stakeholders to incorporate more representative values and perspectives; (ii) avoid a situation of potential manipulation where individuals or groups exert undue influence; and (iii) better incorporate expert and local knowledge of particular hydrogeologic and socio-economic contexts. Thus, the GroFutures researchers will select a number of representative communities along the basin transects in the upland and lowland parts of each observatory in which to conduct in-depth **Participatory Rural Appraisals** to assess trends and changes in groundwater availability, access and use. This work will take a disaggregated approach to draw out the perspectives from different social groups who rely on groundwater resources and associated ecosystem services directly and indirectly. Thus, the communities will be stratified along the following lines:

- Gender
- Well-being / income level
- Dependence on groundwater resources
- Involvement in and influence over groundwater development and management decisions
- Possibly other social dimensions – e.g. age, livelihoods, etc.

Participatory sampling techniques will need to be employed (e.g. social mapping, wealth/well-being ranking, etc.) combined with available secondary data (e.g. village lists) to stratify the communities and identify different types of local informants.

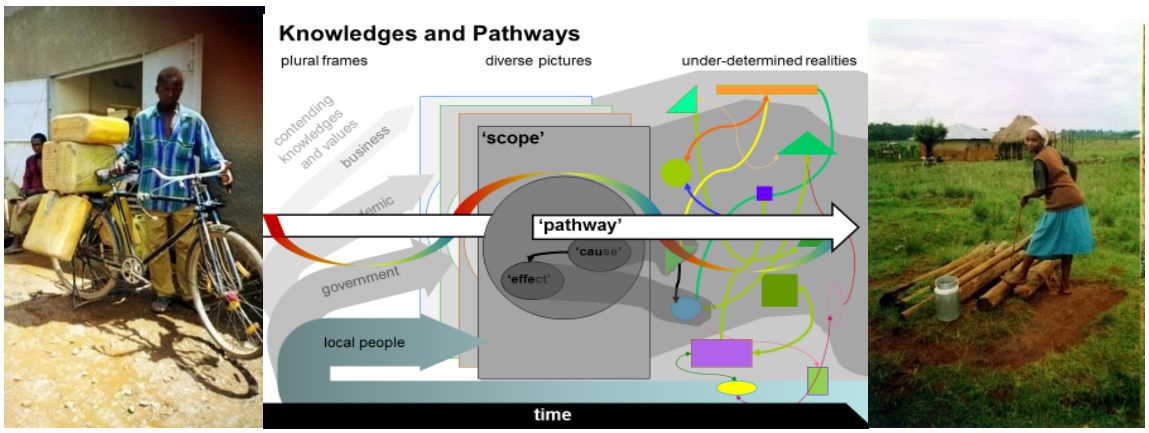


Figure 5. analysing pathways from different perspectives

By conducting these PRAs in selected upland and lowland stations GroFutures will seek to: (i) gain insight about local perceptions of changing patterns in groundwater supply and demand including perceptions of changing climate, land-use and water resources change; (ii) ground the Pathways Approach in specific socio-ecological contexts; (iii) document life histories and stories of emerging groundwater development pathways through written field reports and short videos; and (iv) identify basin-level representatives who can contribute to Pathways Approach in WP4, when selected stakeholder groups will be involved in analysing alternative groundwater development pathways using their own criteria (employing Multicriteria Mapping (MCM) and Scenarios Analysis – to be addressed in a separate field manual for Work Package 4 later in the project).

Central to the construction of plausible pathways will be a series of key informant and focus group interviews with technical experts, policy makers from groundwater and related sectors, and water-user associations. This approach will include the development and application of an interactive **Groundwater Game**, a simulation exercise that will enable players to explore the implications of competing groundwater uses under different pathways. A separate manual will be prepared for this after further testing and refinement of the game.

2.2. Key working definitions

The GroFutures Social Science research team will need to clarify a number of key concepts and terms so that they are used in a consistent fashion throughout the data-collection process.

Some suggested concepts include:

a) Ecosystem

This can be defined as "a dynamic complex of plant, animal and microorganism communities and their non-living environment [such as air, water and minerals] interacting as a functional unit"(MA 2005: v). They are typically defined by the network of interactions between living and non-living components, which give specific environmental and biological characteristics to rather limited spaces (e.g., different types of forest grow in places with specific climate and soil, in turn, favouring the presence of certain animal species that could be unique to that habitat).

b) Ecosystem Services

Broadly speaking, these are "the benefits that people obtain from ecosystems" (MA 2005, p. v). These include goods, such groundwater, as well processes, such as pollination and wetland regulation. They refer to the components of nature that are directly or indirectly enjoyed, consumed or used by humans in order to maintain or enhance their well-being (Boyd and Banzhaf 2007)

At present, there is no agreed classification of ecosystem services (ES) (Haines-Young and Potschin 2009). The most widely used classification was proposed by the Millennium Ecosystem Assessment and postulates four general types of ES (Figure 6):

- *Provisioning services*: Tangible products that people obtain from nature for direct consumption / use (e.g., drinking water, food, timber and firewood).
- *Regulating services*: Processes that regulate the workings of ecosystems from which human beings benefit (e.g., water regulation).
- *Cultural services*: Non-material benefits that people obtain from ecosystems through cognitive development, spiritual enrichment, recreation or aesthetic experiences (e.g., religious values, social relations, sense of identity place, recreational spaces).
- *Supporting services*: Those necessary for the production of all ES, which operate as very long-term processes and whose impact are indirect, often unnoticed by human-beings (e.g., photosynthesis or soil formation).

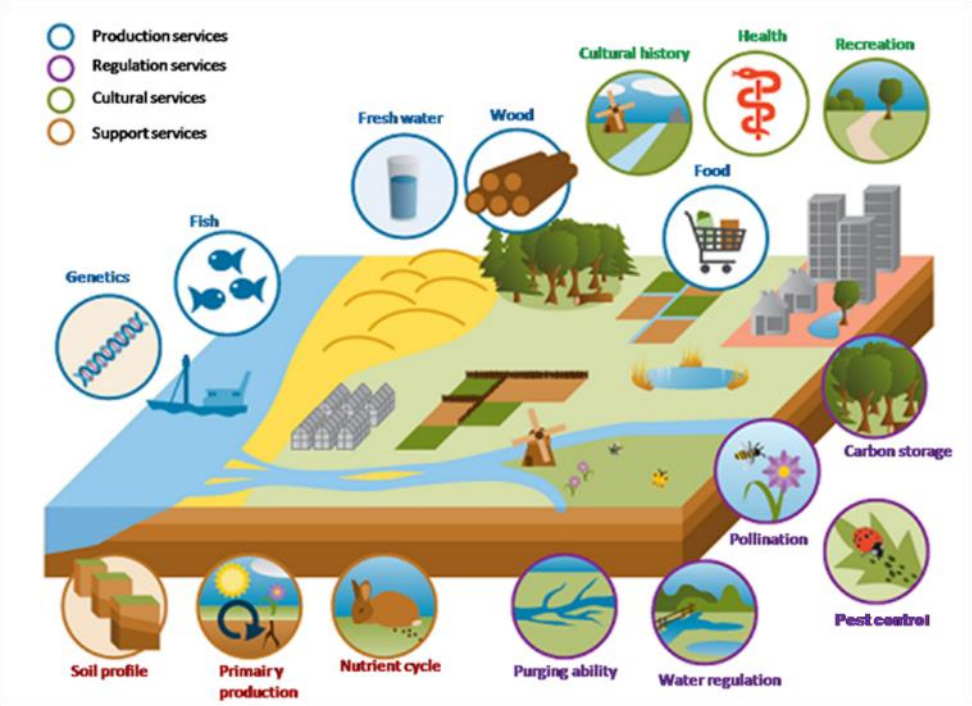


Figure 6. Types of Ecosystem Services

c) Water security

Water security has been defined as "the reliable availability of an acceptable quantity and quality of water for health, livelihoods and production, coupled with an acceptable level of water-related risks" (Grey and Sadoff 2007). A water secure world integrates a concern for the intrinsic value of water with a concern for its use for human survival and well-being. A water secure world harnesses water's productive power and minimises its destructive force. Water security also means addressing environmental protection and the negative effects of poor management. It is also concerned with ending fragmented responsibility for water and integrating water resources management across all sectors – finance, planning, agriculture, energy, tourism, industry, education and health. A water secure world reduces poverty, advances education, and increases living standards. It is a world where there is an improved quality of life for all, especially for the most vulnerable – usually women and children – who benefit most from good water governance.

Borrowing from the FAO's concept of Food Security (FAO 2001), it could be argued that Water Security entails four key dimensions:

- *Availability*: When sufficient quantities of appropriate water are supplied.
- *Access*: When people have the entitlements required to obtain water. Among others, these could involve legal and political rights (e.g., formal segregation); socio-cultural arrangements (e.g., informal discrimination) or economic rights (e.g., adequate employment and income).
- *Utilisation*: When water is adequately stored, and consumed so as to ensure it satisfies individuals' health needs.
- *Stability*: When people can satisfy their water needs at all times.

Critically, local people will have their own interpretations and definitions of water 'security' and 'insecurity', which we will try to understand through our participatory interactions.

d) Drivers and Pressures

The relationship between natural resources (including water), ecosystems and societies / communities is continuously changing. The diverse factors leading to change can be grouped into two broad categories: drivers and pressures (Rounsevell, et al. 2010). Drivers are the underlying causes of environmental change that are **exogenous** to the system or region in question (e.g., climate change, national environmental laws or international policies). Drivers are also called 'indirect drivers' by the Millennium Ecosystem Assessment (2005).

Pressures, in turn, refer to the **endogenous** variables that reflect the impact of drivers within a system or region (e.g., land use change, local water demand, or prevalent forms of commercialisation of natural resources). Pressures can be also be identified as 'direct drivers' (MA 2005), which are the physical, biological or chemical processes that directly cause changes in water availability.

e) Tipping points

Tipping points refer to critical thresholds at which small changes generate big impacts. Certain human activities may set in motion reinforcing processes that push an ecosystem in a different direction, leading to a new state that alters the availability of natural resources that people use, including water. The resulting changes may be very difficult (if not impossible) to reverse despite significant investments. For example, if deforestation occurs on a steep slope, surface water may run off quickly and not infiltrate the soil and recharge the aquifers in an area.

f) Households

Typically, a household refers to a person or group of persons who live together and make common provision for food or other essentials for living (United Nations 2008). These persons may pool their resources (monetary and non-monetary) to satisfy their needs; may be related or unrelated (or a combination of persons both related and unrelated); and may share housekeeping responsibilities. In summary, "households" usually signify domestic and economic social units (i.e., people jointly generating and/or managing resources).

Be aware that households cannot be equated to families. The latter alludes to social relationships, bonds of blood and matrimony whilst the concept of household refers fundamentally to a production unit.

Understandings of what a household is vary according to context. Some countries use a "household-dwelling" concept, in which a household consists of all persons living together in a housing unit. In other settings, a "household" is usually equated to a couple (married or non-married) living together with dependents (children or aged parents). In polygamous communities, in turn, this definition requires some adjustments (e.g., the entire family unit would be considered a single household if all wives and husband live together and share their meals; if the husband has wives in other locations, some of the latter may be considered female-led households).

For a participatory data-collection process, it is important to work with the local definition and understanding of "household". This may or may not match the definitions presented above. Take careful note of the key differences and be consistent in your use of the dominant local understanding.

In a similar vein, the **head of household** is the person who is commonly seen by the members of the household as their head. Generally, this is the main economic contributor to the household and the one who makes the main decisions. Make sure to determine and abide by the decisions of the members or informants.

g) Well-being

There is no single agreed definition of "well-being". The World Bank's "Voices of the Poor" research project, for instance, contends that it may consist of the following dimensions: i) material well-being (e.g., food, assets and work); ii) bodily well-being (physical and mental

health); iii) social well-being (self-respect, dignity and good social relations); iv) security (safety in life and confidence in the future) and v) freedom of choice and action (Narayan, et al. 2000). This is the multidimensional definition adopted by the Millennium Ecosystem Assessment (2005).

However, there are also other approaches. The Organisation for Economic Cooperation and Development (OECD), for instance, prefers to work with three dimensions: i) material living conditions (or economic well-being); ii) quality of life, the set of non-monetary attributes that shape an individual's life chances and have intrinsic value under different cultures and contexts (e.g., education, social connections, happiness); and iii) the sustainability of the socio-economic and natural systems where people live and work (OECD 2013).

As is the case with the concept of *household*, it is necessary to work with local understandings of well-being in relation to groundwater access, management and use. In particular, make informants aware that we are not interested solely in financial or material indicators of wealth (income, savings, size of landholdings, livestock, etc.) but also in non-material ones (e.g. health, levels of formal education, political participation, etc.).

2.3. Integration of research components

As discussed above, **water security** constitutes the most basic human need and hence the GroFutures project should help identify and prioritise groundwater development 'pathways' that are most important to poor local people in our basin observatories.

This requires us to look at the relationship between groundwater and households through various dimensions: i) *availability* (e.g., presence of groundwater available at different times of the year and its potential use for different productive and consumptive purposes); ii) *access* to water (affected by factors such as community cohesion and resource governance, in turn, shaped by the scarcity or abundance of key natural resources like land and ground and surface water); iii) *use* (e.g. shaped by both the quantity and quality of the water for irrigation, livestock, washing and cooking, etc.); and iv) *stability* (e.g., seasonal variations affect groundwater's contributions to local livelihoods, on occasions even generating regular periods of hunger).

Groundwater's (direct and indirect) contribution to livelihood security, however, may have dissimilar effects on individuals within **households** and **communities** due to the differentiated needs and access of specific social groups (e.g., men and women; poor and rich; the landless and large landholders, etc.). The potential impact of groundwater access, and use on people's **health and well-being** is not direct. There is thus a need to distinguish and disaggregate potential and actual beneficiaries (users of groundwater in the communities).

These different linkages are subject to continuous changes due to impacts from **drivers** and **pressures.** Endogenous factors (i.e., pressures), like the continuous and expanding demand for certain natural resources for commercialisation or direct consumption may affect the provision of groundwater (because of land use change – e.g. deforestation, intensive commercial irrigation). External drivers (e.g., increases in temperature or rainfall), in turn, may indirectly affect local uses of groundwater due to changes in **ecosystem services**. These influential factors may lead to significant changes that can push ecosystems over critical thresholds or **tipping points** (e.g., climate change may alter rainfall patterns thereby changing recharge rates).

These trends and changes may lead local people and governments and external agencies to consider how to increase the availability, access and use of groundwater resources in the communities. However, not all those involved in this process may agree on which form of groundwater development is most appropriate for the area and there may be competing and even conflicting visions of which **'pathway'** is most suitable. There may be some pathways that would lead to rapid drawdown of the groundwater resources (e.g. intensive pumping for plantation agriculture) that could lead to large profits for some, but potentially serious damage to the resource and the marginalisation of some community members (e.g. pastoralists). There may be other groundwater development pathways that are preferred by one social group more than another (e.g. women vs. men; wealthier vs. poorer groups; etc.). When thinking about these contrasting visions about possible groundwater development futures, we need to be mindful of how powerful interests both inside and

outside communities can influence which pathways are prioritised and which are ignored or even actively blocked. By developing our deliberative, multi-stakeholder, participatory Pathways Approach, we will try improve the legitimacy of pathways assessments, avoid a situation of potential 'capture' or manipulation by powerful actors, and better incorporate a range of goals, values and understandings of groundwater development pathways, particularly of poor women and men.

Thus, we envisage a **four-step research and engagement process for GroFutures**, the first two of which relate to Work Package 2, while the latter two relate mainly to Work Package 4:

1. **Engage actors:**
    1. **Engage decision makers in process and select provisional study sites** → review relevant histories, consult on plans and priorities, access policy documents, obtain official support ('buy in')
    2. **Engage specialists and networks** → (ground)water R&D, climate change, food and water security, urban planning, rural development, etc → key informant interviews, snowball interviews, trends analysis
    3. **Engage users (particularly poor and marginal people)** → focus group interviews, relevant system histories, participatory mapping...
        - **Analyse dynamic drivers of change** in land use / GW development, climate, changing water availability, access and use
        - **Examine local governance and institutional issues**
        - **Disaggregated study communities** - gender, wealth, GW access
        - **Identify basic pathway visions of possible groundwater futures**
2. **Explore framings:**
    1. **Examine emerging framings and narratives of 'pathways'** to groundwater futures in specific locations
    2. **Scope out contrasting perspectives of different stakeholders** → Groundwater Game?
    3. **Establish initial list/typology of pathways for closer analysis**
3. **Characterise and constrain pathways:**
    1. **Use modelling informed by physical science to 'constrain' the possible pathways and identify those that are 'plausible' (in biophysical and technical terms)**→ Scenarios analysis of groundwater development in a climate constrained future
    2. **Analyse 'plausible pathways' and what facilitates/inhibits access to them based on stakeholder criteria** → Multicriteria Mapping (MCM) and Scenario Analysis
4. **Reveal strategies:**
    1. **Re-engage key decision-makers and other stakeholders** → present findings, explore points of convergence and divergence
    2. **Identify opportunities for action** → identify action points for policy, research and development on pro-poor GW development pathways; promote increased transparency and accountability in decision-making about groundwater futures

3

PRA PRINCIPLES AND GUIDELINES

PRA practitioners need to take into consideration various key principles during the processes of data collection and analysis. Although these could be numerous, the various precepts that guide good practice in PRA research can be aggregated into three broad themes (Chambers 1997, 2008; Narayanasamy 2009):

i. *Attitudes and Behaviour*: PRA can be considered both 'an attitude and method'; researchers need to adopt a mind-set that will allow them to see reality from a villager's point of view.
ii. *Methods*: PRA makes flexible use of visual / symbolic instruments developed collectively through inclusive groups from the community.
iii. *Sharing*: PRA demands openness both between practitioners and between practitioners and informants.

3.1. Attitudes and Behaviour

a) Reversal of Learning

PRA demands from researchers and practitioners that they reverse their role; from one of knowledgeable, informed and trained 'experts' to one of 'outsiders' and uninformed 'novices'. Research, in this scenario, progresses as a learning process in which the fieldwork team sees each activity as an opportunity to learn from the villagers, to understand their local situation, knowledge and cultural values and understandings. Emphasis should be placed on building rapport with the community by showing respect, answering questions, and generally showing interest and willingness to learn from residents' testimonies and outputs.

b) Handing over the stick

A cornerstone of PRA is to offset the power imbalance observed in mainstream research contexts, where the interviewer or expert 'imposes' a specific set of structured questions on the informant. It is thus paramount that researchers let residents take the initiative and take control of the process of representation, description and explanation (Pretty et al. 1995).

The team will facilitate group discussion and guide it around the key topics of interest. However, participants should be able to freely contribute to the agenda of discussion and introduce any additional pieces of information and reflections they consider relevant. Likewise, group diagrams, mapping and ranking exercises (i.e., visual techniques) should be oriented by the PRA team but executed by participants (Figure 7). Symbols, materials, selection or ranking criteria should be defined and represented by residents in their own terms (e.g., using local material such as leaves, rocks, or seeds to represent different parts of their community).

Figure 7. Woman presenting local trends analysis to community members

Photo by John Thompson

c) Self-critical Awareness – Reflexivity

PRA practitioners need to examine their own behaviour continuously and critically reflect on it so as to identify areas for improvement in rapport building and data elicitation. They must see themselves as engaged in a continuous dialogue with 'the other', in a relationship in which both influence each other, thus moving away from top-down forms of inclusion, integration, and interpretation.

This process, also called 'reflexivity', aims to put the researcher in direct contact with his/her own subjectivities so as to close the gap with those of the researched. Three key tensions that should be addressed are: (i) differences in terms of *values, assumptions and taken-for-granted practices* (the result of personal development and social background); (ii) the *attitudes that local people adopt towards the study and its members*, by virtue of the expectations and assumptions they have (both of the visitors and the project); (iii) *tensions between priorities*, between what the team consider important – due to scientific and professional interest – and what locals believe relevant (Finlay 1998; Parker 2004).

d) Offsetting Biases

Practitioners must avoid any kind of bias that could lead to exclusion of the most vulnerable groups by hurrying up the data-collection process or trying to come up with easy answers or depictions of local realities. PRA practitioners should invest time and resources in dealing with various forms of biases:

- *Spatial*: Look beyond areas of easy access (usually by the road) and explore those that are more isolated from mainstream society.
- *Personal*: Build inroads into the less talkative, less active social groups (usually worse-off and/or marginalised) rather than relying solely on key informants and their associated networks.
- *Gender*: Gender is a basic power differential in most communities. Women should be given equal opportunities to express themselves during PRA exercises.
- *Seasonal*: Try to get to know how rural lives change from one season to another (e.g., variations in food stocks or prevalence of illnesses) instead of relying on snapshots of community life.
- *Project*: Make an effort to listen to those who are less interested in the (research) project in order to examine more critical views and assessments of its proposals.

3.2. Methods

a) Inclusive group work:

PRA exercises constitute collaborative efforts in which informants not only describe their local reality but also discuss and analyse it. This approach provides two key advantages as compared with one-to-one interactions: i) it covers topics in a broader fashion, by including participants' different perspectives and experiences and ii) it can generate a more in-depth analysis since participants of dissimilar backgrounds can reflect on the differences between their respective circumstances, experiences and opinions.

It thus becomes critical that PRA exercises are conducted such that ALL participants have equal opportunity to contribute to the group work. Although some exercises demand a specific profile of participants (e.g., women-only groups), the team should be sensitive to any social, cultural, or economic differences within those groups. Efforts should be made to prevent individuals or groups from assuming a dominant role in the discussion (to the detriment of the most vulnerable). Furthermore, giving equal footing to local elites and disadvantaged groups may help to empower the latter (Chambers 2008).

b) Visual methods

PRA makes extensive use of various forms of visual representations, such as symbols, maps, diagrams, etc. This approach facilitates a more inclusive and open environment, in which the illiterate and less articulate will have the opportunity to participate. In addition, the graphical representation of topics and issues will help local people to progressively depict more complex realities as they start visualising the diverse connections between them. Data-elicitation, then, can constitute an amenable task; a fun exercise that allows residents to show their creativity whilst promoting a greater proximity between them despite their socioeconomic or cultural differences.

In order to achieve these aims, it is necessary that these different forms of visual expression are developed locally. Symbols, diagrams, graphs and other visuals should be developed by the participants, using shapes, colours or local materials that participants consider easy to work with and that are meaningful to them (Figure 8).

Figure 8. Agreeing on symbols for diagrams

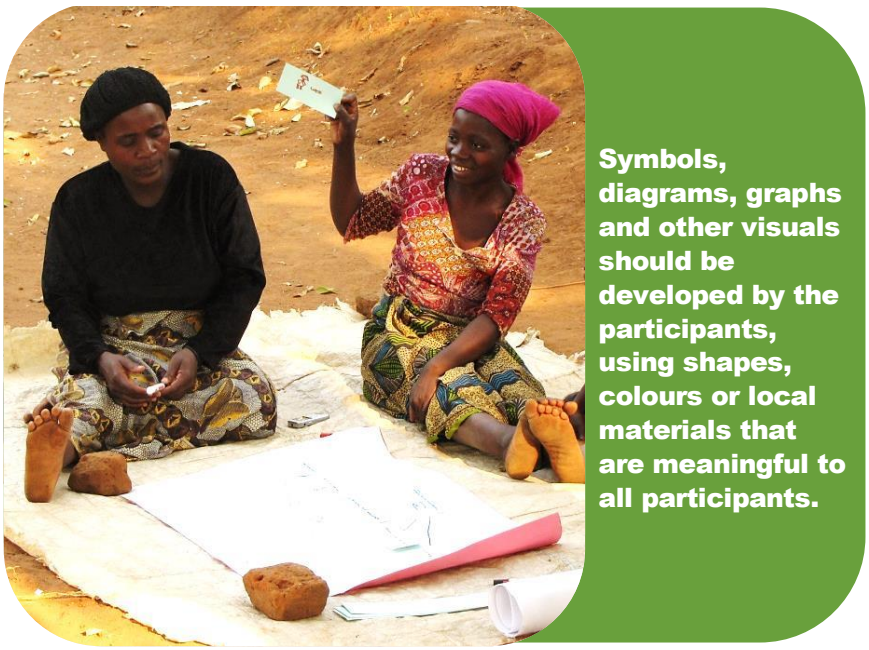


Photo by Simon Willcock

c) Seeking complexity and diversity

PRA methods do not intend to outline a 'typical' profile of residents or communities based on averages. Rather than assuming that communities are homogeneous social units, PRA learns from

'maximising diversity' by looking for analytically relevant differences, outliers and contradictions (Kumar 2002).

Aside from "giving voice" to all participants within group discussions, this approach demands two additional considerations: First, where necessary, exercises should be repeated with different analytically relevant groups so as to attain a comprehensive and in-depth description of local realities (e.g., farmers and landless residents could provide rich complementary information on livelihood-centred discussions). Second, the exploration of ideas and research topics should be conducted in a flexible manner. The tools and questions described in the present text are informed suggestions; they could be modified by practitioners when encountering new information or unexpected findings.

d) Progressive and sequential learning

PRA makes use of a variety of visual exercises and group discussions that are applied in sequence. A single type of data-elicitation is not considered enough to cover all the dimensions associated with a particular subject of study nor to prompt the kind of critical and empowering reflexive process pursued by participatory approaches (Kumar 2002). Instead, PRA methods are implemented in a systematic manner, progressively adding different layers of complexity.

Participants are expected to engage in a collaborative effort of building up a complete picture of their local reality by continually adding and discussing more complete and detailed information. In this manner, they will be able to develop a more in-depth and comprehensive critical reflection of their own circumstances and those of their neighbours. Additionally, this systematic and iterative process will help practitioners to cross-check their different pieces of information, thus ensuring a greater level of validity in their findings (Pretty, et al. 1995).

To this aim, practitioners need to adopt two basic practices: i) they should share information between each other at the end of the day, discussing their new findings and key contradictory issues or outliers; ii) they should be ready to re-order the set of activities initially programmed as new findings and lines of enquiry emerge.

e) Triangulation

PRA data is collected through the use of more than one approach to data-collection. Different forms of cross-checking are thus possible, hence securing the validity and reliability of findings (Flick 2004):[1]

- *Data triangulation:* This refers to gathering the same type of information from different sources; it could imply working with different informants (e.g., poor and non-poor); at different times (e.g., summer and winter); or contexts (e.g., during an open community assembly or a private meeting).
- *Investigator triangulation*: This refers to the use of different facilitators to gather similar data or different researchers to interpret the same piece of information.
- *Methodological triangulation:* This refers to discussing the same topic using different data-elicitation techniques (e.g., participatory mapping and system diagram exercises on land and (ground)water use and opportunities and constraints) (Figure 9).

A particular topic or question could thus be discussed with different participants and facilitators as well as analysed through different data-collection methods (e.g., mapping, matrix scoring, diagrams, etc.). This will allow the research team to verify testimonies, compare perspectives, gain insights on a subject, and achieve a more comprehensive understanding of the issue at a community level.

As a result, there will be some overlap between the tools presented in this manual. The overlap between different sources of information also takes into account the fact that it is not always possible to get through all the desired questions in one exercise or with one set of people.

[1] There are other types of triangulation; such as *discipline triangulation* (when members of different disciplines analyse the same data) or *theoretical triangulation* (when different theoretical frameworks are used to interpret the same information). Given that these are analytical tasks; they are not included in the core text. However, PRA's reliance on various sources and techniques to explore complex realities in a comprehensive manner, makes it suitable for these other forms of triangulation (Kumar 2002).

When choosing your methods, make sure you have at least two different sources of information for each of the research outputs listed in Table 1.

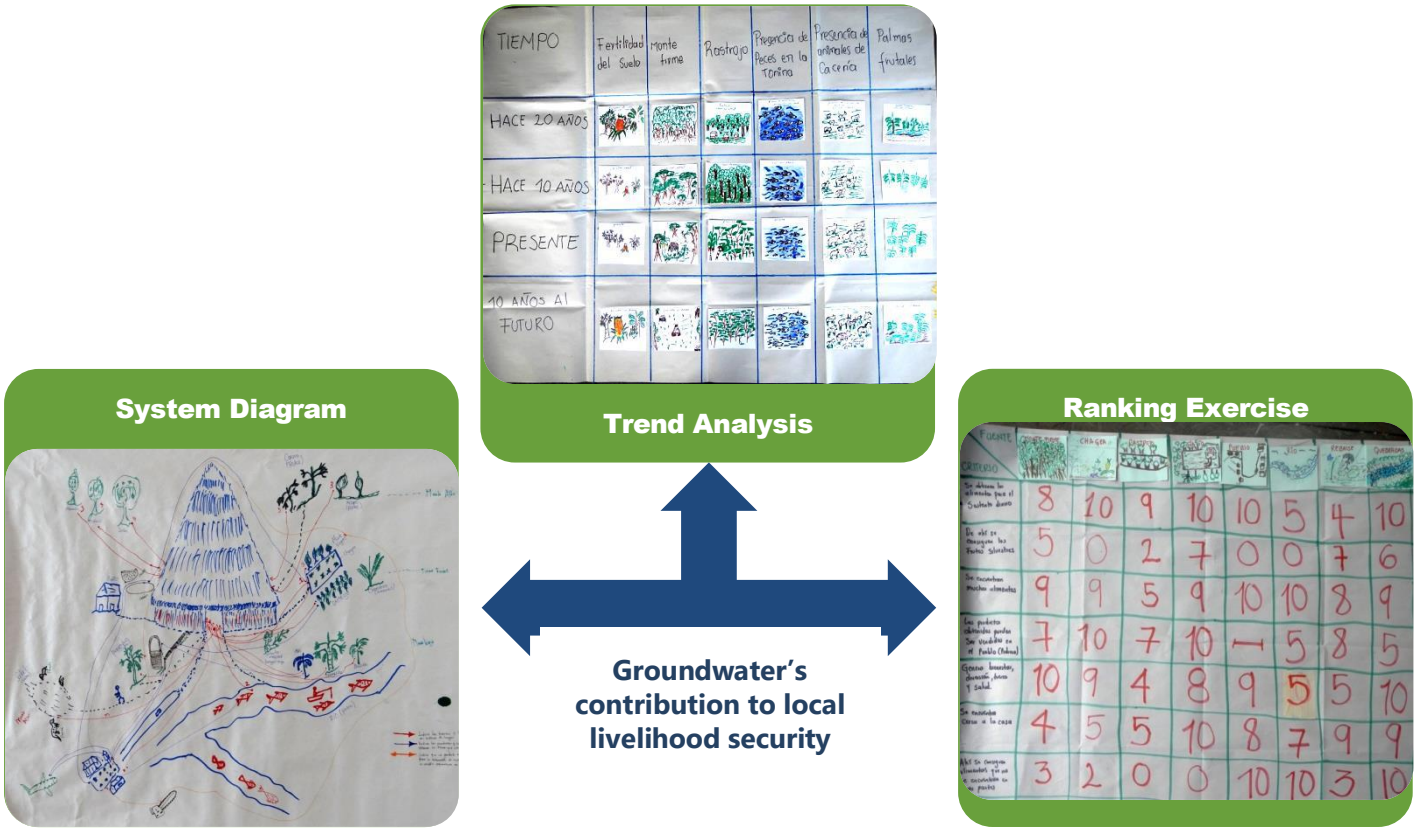


Figure 9. Triangulation of methods for GroFutures research

f) Using PRA in multiple communities

For the purposes of research it is often desirable to compare between different case study communities. Although PRA exercises do include quantitative outputs and deal with common themes, they are essentially qualitative in nature, reflecting the perceptions of participants in one community. Great care should therefore be taken when comparing the results from different communities, even if these appear to be similar in terms of socio-economic and biophysical characteristics.

This is particularly true for exercises such as well-being ranking (Exercise E) where the conception of 'well-off' and 'poor' may vary greatly between communities, meaning that these categories are useful for a relative analysis within one community but direct comparison between, for example, the 'poor' in different communities is not straightforward. In the same way, the fact that participants in one village do not mention a particular groundwater source / service does not mean that they are necessarily less important than in another community. It may simply be a result of the way the discussion was facilitated and the particular group of participants. If comparisons of this kind are desired then it is important to think about including prompts in exercises to ensure that the discussions in different communities all cover the same ground.

3.3. Sharing: Presenting Back

PRA is guided by the principles of openness and transparency "among the people, between the people and (...) among practitioners" (Kumar 2002: 38). Practitioners should thus be willing to share their findings and interpretations at all levels, particularly within the research context.

In this setting, sharing information has various implications: i) it facilitates building trust and rapport between researchers and residents; ii) this, in turn, allows for greater disclosure of detailed information and of personal experiences and perceptions; and iii) leads to a more comprehensive data-collection process and richer mutual learning efforts. In addition, iv) this open exchange of ideas generates more opportunities for cross-checking and corrections and so more valid findings.

PRA's emphasis on a participatory learning process that empowers participants, however, implies looking beyond the data-collection context. Given that the PRA outputs have been produced by local informants, it is considered that they belong to the local population. Acknowledging local ownership to research findings is a core feature of sharing since it requires that the processed information be returned to the local population in a way that could be most useful to them and lead to some form of action.

Returning the information to participants in clear and systematised form will strengthen the learning process that took place during data-collection; it will provide a printed record that the population can consult and use when required. In addition, possession of it will give locals the freedom to decide how best to use it to improve their conditions, hence facilitating the formation of bottom-up initiatives. It is useful to consult with local informants to ensure that desired information is returned to participants in a format that best suits their interests.

4

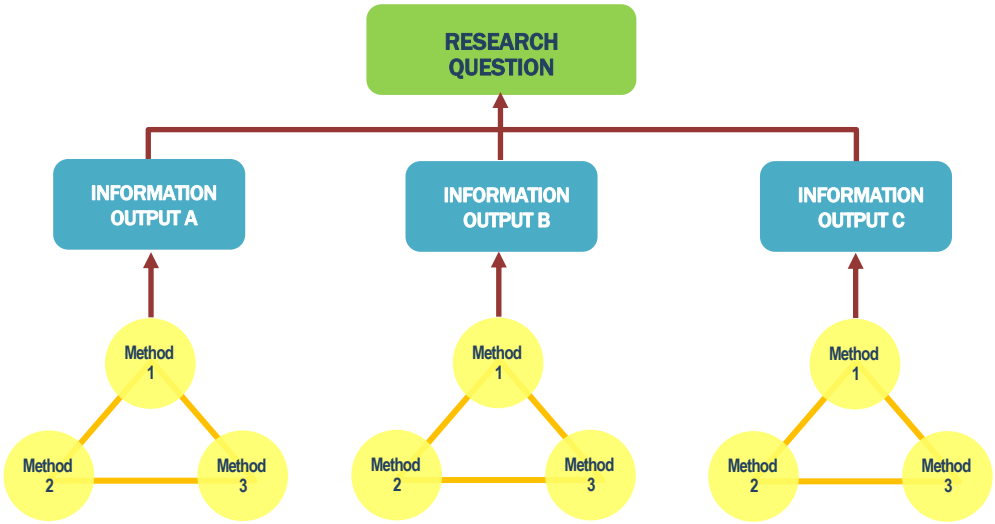
THE DATA COLLECTION PROCESS

4.1.1 Methods selection

This manual presents a series of participatory data-collection techniques that can be used to obtain ground-based information changing patterns of groundwater availability and use and local people's perceptions and practices associated with them.

The PRA methods presented here directly respond to each of the research questions discussed in Section 2. In order to answer them, valid and reliable information is needed; which, in turn, is obtained following the principle of triangulation (Figure 10). The complete list of information outputs and associated data-elicitation techniques is presented in Table 1.

Figure 10. Rationale for selection of methods



4.2 The data-collection process

Data collection is conducted by means of individual semi-structured interviews, review of secondary data, focus groups and standard PRA exercises. These are organised sequentially and thematically in five main phases (Table 1).

a) Phase 1: Preparation for community consultation meeting

Before any data-collection takes place, the research team needs to make sure that the village to be visited is suitable for the research objectives of this study and that their leaders and population consider the research project useful to their particular interests and needs.

Table 1. Participatory data-collection techniques according to research questions and required information outputs

RESEARCH QUESTION	INFORMATION OUTPUTS REQUIRED	PARTICIPATORY TECHNIQUES
What is the contribution that groundwater resources are making to the livelihoods and wellbeing of poor people?	***Local well-being*** 1.1 An outline of local definitions of 'well-being', 'wealth' and 'poverty' used by local residents. 1.2 A list of (non)economic indicators that characterise local socio-economic groups. 1.3 A description of the socio-economic composition of the study areas – stratification of the community into different wealth / well-being categories using local definitions of wealth, well-being and poverty	▪ Group discussion ▪ System diagrams ▪ Well-being-ranking / social mapping
	Local livelihood strategies 1.4 A description of local livelihood strategies (including farm and non-farm activities). 1.5 A description of seasonal variations in livelihood strategies. 1.6 An outline of within-household distribution of domestic and economic roles. 1.7 A description of seasonal variation in households' income and expenditure, key causes and overall balance. 1.8 An assessment of the effectiveness of current livelihood strategies to attain adequate levels of material well-being and food security.	▪ Group discussion ▪ System diagrams ▪ Well-being ranking
	Local (ground)water security conditions 1.9 An outline of local definitions of 'water security' and 'water insecurity' and relevant indicators (at the household and community levels). 1.10 An assessment of local (ground)water security conditions in terms of i) Availability, ii) Access, iii) Utilisation and iv) Stability. 1.11 A general description of within-household differences in terms of (ground)water security. 1.12 A description of seasonal variations in access to groundwater	▪ Group discussion ▪ Seasonal calendar
	Local land use change 1.13 A generic classification of main forms of land use reported in the study areas. 1.14 A description of each form of land use in terms of natural resources (e.g., vegetation, animals, soil type, etc.) and main (non) productive uses. 1.15 A description of current land exploitation systems in the study areas. 1.16 A spatial representation of local land and water use changes.	▪ Group discussion ▪ Participatory mapping ▪ Transect walks
	Groundwater's contributions to livelihoods and well-being 1.17 A list of GW sources locally used for farm and non-farm economic activities. 1.18 A list of GW locally used for domestic and cultural activities. 1.19 A general ranking of GW sources developed by local residents (with explanation of rationale). 1.20 An outline of perceived changes in the importance of GW benefits' contributions over time. 1.21 An outline of perceived differences in the importance of GW across local social groups 1.22 An outline of perceived differences in the importance of GW for different household members.	▪ Group discussion ▪ System diagrams ▪ Ranking and scoring exercises ▪ Participatory mapping ▪ Transect walks

RESEARCH QUESTION	INFORMATION OUTPUTS REQUIRED	PARTICIPATORY TECHNIQUES
What is the contribution that groundwater resources are making to the livelihoods and wellbeing of poor people? (cont.)	***Sources and flows of groundwater benefits*** 1.23 Spatial representations of GW resources and relevant flows for local productive and consumptive use. 1.24 Spatial representations of sources of GW used for farm and non-farm economic activities. 1.25 Spatial representations of sources of GW used for cultural uses and other symbolic uses.	▪ Participatory mapping ▪ System diagrams ▪ Transect walks
	Groundwater resource management 1.26 A description of land and water tenure arrangements (at the community, household and individual levels). 1.27 A description of rights of access and forms of ownership over natural resources, including groundwater. 1.28 A description of challenges and threats to availability, access and use of GW. 1.29 A description of community-based organisations for local management of water resources, including GW. 1.30 A description of the operational structures and decision-making procedures for key community organisations managing GW resources. 1.31 A description of influential governmental and civil society organisations shaping local management of GW resources. 1.32 General depiction of relationship / effects between community and external organisations and general impact on the current state of local water resources, including GW.	▪ Group discussion ▪ System diagrams ▪ Venn diagrams
What are the human and environmental drivers of change that have the greatest effect on groundwater resources that are most important for local livelihood security and wellbeing?	***Changes in general well-being*** 2.1 An outline of key changes in local living conditions and inequality issues in the recent past. 2.2 An outline of key factors driving changes in local living conditions for the recent past.	▪ Group discussion
	Changes in livelihood strategies 2.3 A description of significant changes in local livelihood strategies in the recent past. 2.4 An outline of key factors driving changes in local livelihoods in the recent past.	▪ Group discussion
	Changes in land and water use 2.5 A description of key changes in local forms of land use in the recent past. 2.6 An outline of key drivers leading to changes in land and (ground)water use (external and internal). 2.7 An outline of perceived effects of changes in land use over the provision of (ground)water services.	▪ Group discussion ▪ Trend analysis ▪ Participatory mapping

RESEARCH QUESTION	INFORMATION OUTPUTS REQUIRED	PARTICIPATORY TECHNIQUES
What are the human and environmental drivers of change that have the greatest effect on groundwater resources that are most important for local livelihood security and wellbeing? *(cont.)*	***Changes in water security*** 3.1 A depiction of perceived changes in terms of overall water and food security for the recent past (last 10-20 years). 3.2 A description of key factors driving changes in local water security. ***Changes in groundwater's contributions to local water security*** 3.3 A description of key factors driving changes in the increased / decreased use of GW over time and space. 3.4 A description of the effects of these perceived trends. ***Changes in groundwater's contributions to livelihoods and material well-being*** 3.5 An outline of changes in GW availability, access and use for livelihood strategies. 3.6 An outline of changes in GW availability, access and use for domestic / cultural activities. 3.7 A description of the direct and indirect drivers that affect GW availability, access and use 3.8 A description of the effects of perceived trends in GW benefits for livelihoods and well-being.	▪ Group discussion ▪ Trend analysis ▪ Community timeline ▪ Group discussion ▪ Trend analysis ▪ Cause-effect diagrams ▪ Group discussion ▪ Trend analysis ▪ Cause-effect diagrams
What are the current visions of groundwater development pathways under future land use and climate change scenarios?	***Visions of the future*** 4.1 General description of visions of the future (10 years) for groundwater development and use and the rationale behind it. 4.2 Description of visions of the future (10 years) for groundwater development and use if current trends remain unchanged (perhaps discussed in terms of a 'most likely' scenario) 4.3 Description of visions of the future (10 years) for groundwater development and use if current trends get worse (perhaps discussed in terms of a 'worse case' scenario) 4.4 Description of visions of the future (10 years) for groundwater development and use if preferred future is to be achieved (perhaps discussed in terms of a 'best case' scenario or 'ideal' future)	▪ Group discussion ▪ Trend analysis ▪ Cause effect diagrams
How can the risks associated with future environmental and social change be managed to minimise effects on human beings and their groundwater resources?	***Responses and adaptations to trend*** 5.1 A description of the main forms of local adaptation to changes in land and (ground)water use. 5.2 A description of current responses and interventions conducted in the area by communities and external actors (governments and civil society) to address groundwater access and use and associated water security issues 5.3 A description of past initiatives to manage or redress perceived changes in GW availability and water security, either from the community or external actors (government or civil society). ***Potential future responses*** 5.4 A description of potential future responses from organised communities and forms of support required. 5.5 An outline of potential external interventions that the communities need to address / redress the reported changes in GW supply and demand.	▪ Group discussions ▪ Cause-effect diagrams ▪ Community timeline ▪ Trend analyses ▪ Group discussion

- **Activities:**

  A. *Secondary data review*: demographic data (e.g., from censuses); socioeconomic data from previous studies; reports from water departments, agricultural offices, etc.).
  B. *Semi-structured interviews with key informants*: community authorities (traditional and formal), government officials, local NGO staff, etc.

- **Estimated time:** 2 to 3 days, depending on availability of key informants.
- **Observations:** This phase should be conducted with enough time to process the initial information collected so as to examine the suitability of the community for the research objectives and the interest local people may have in this kind of research.

b) Community consultation meeting

After the potential study sites have been selected, the research team needs to present the project and explain the data-collection process to the population in general (do not assume that coordination with local authorities alone will suffice). This will ensure that residents will be engaged in the study from the beginning and that any initial doubts and concerns will be addressed, hence preventing the emergence of substantial misinterpretations later on.

- **Activities:**

  C. *Community consultation meeting*: The presentation should include the project's objectives, parties involved, data-collection methods, data-management and outputs to be generated. Discuss with participants the compensation policy to be adopted for informants and the potential benefits that the community, as a whole, may accrue in the future (see guidelines in Section 6).

- **Estimated time:** ½ a day, depending on local customs.
- **Observations:** Do not rely only on a verbal presentation. Prepare information sheets and dissemination material (e.g., posters and leaflets) that make the information accessible to the population in general.

c) Phase 2: Livelihoods and land and (ground)water-use

This is the start of the core primary data-collection process. The different activities in this stage aim to give us a general understanding of the socioeconomic and bio-physical characteristics of the study site, with emphasis on the relationship between local livelihoods and land-use.

- **Activities:**

  D. *Well-being and livelihoods:* Group discussion on indicators of poverty and wealth, socioeconomic structure of the community and description of local productive activities.
  E. *Well-being ranking:* Ranking exercise of households according to their material well-being.
  F. *Household system diagram:* System diagram exercise and group discussion on sources of (ground)water and daily water use activities and destination of outputs of productive activities.
  G. *Participatory land and (ground)water use mapping:* Participatory mapping exercise on key physical and social features of the communities.
  H. *Participatory GIS mapping:* A geographically accurate mapping exercise based on local information on land and (ground)water use (to be determined if we do this).
  I. *Focus group on land and water use:* Group discussion on land tenure rights and land and water management systems, including groundwater.
  J. *Transect walks:* Direct visit of relevant landscape areas of the community and description of main topographical and biodiversity features, including surface and GW sources, as well as economic use and tenure.

K. *Trend analysis on land and water use*: Review of changes in the predominant forms of land use and water use (including groundwater) and visions of the future (10 years).

- **Estimated time:** 3 to 4 days, depending on the number of groups of informants consulted and on whether or not they are being conducted simultaneously or sequentially.

d) Phase 3: Water Security

This second stage of data-collection should begin AFTER the first set of exercises has been completed. These activities aim at understanding various water security related issues: seasonal variations in livelihoods, health and access to water; local definitions and assessments of water security; discussion on the causes and effects of water insecurity and description of the various manners in which residents deal with water shortages / scarcity.

- **Activities:**

L. *Seasonal calendar:* A visual representation of agricultural calendars and other productive activities that depend on water resources. It is complemented with information on expenditure and health.

M. *Focus group on water security:* Group discussion aimed at identifying all key GW sources and changing patterns of supply and demand, as well as assessments of local conditions.

N. *Cause-effect diagram on water insecurity:* Visual exercise aimed at identifying the drivers and pressures leading to water insecurity problems in the area and their respective impacts on local well-being.

O. *Community timeline on water (in)security:* A timeline representing the historical trajectory of the community, registering key events and their respective impacts on water security.

P. *Coping strategies focus group*: Group discussion on how various people – women/men, pastoralists/small farmers - deal with water scarcity and the different measures they adopt according to the severity of this problem. Some interviews with individual informants could be done at the end of this discussion to capture their 'life histories' of GW use.

- **Estimated time:** 3 to 4 days, depending on the number of groups you need to work with and on whether exercises take place simultaneously or sequentially.

e) Phase 4: Groundwater Governance and Management

This last group of exercises focus on local management and governance of groundwater (and other natural resources).

- **Activities:**

Q. *Focus group and trend analysis on groundwater resource management:* Allows a review of trends and changes in GW resource management and a discussion of formal and informal regulation and governance questions.

R. *Cause-effect diagram of changes in groundwater resources:* Identifies the direct and indirect drivers of key changes in the development, management and use of groundwater resources for local livelihoods and their consequences. Can highlight key formal and informal institutions in shaping access and use.

S. *Matrix scoring and trend analysis on benefits of water resources:* A matrix scoring exercise that quantifies changes in water availability from surface and GW sources and promotes a discussion on potential causes. Participants are asked to identify the dominant and emerging groundwater development pathways and rank or score so as to identify those that are most essential to local well-being. This could be done in different groups at the same time – women/men, large/small landholders, etc. – to draw out contrasting perspectives on GW development pathways.

T. *Venn Diagram on formal and informal governance arrangements for groundwater management*: This discussion aims to identify all key community-based organisations (e.g. Water Users' Associations) as well as those from the government and civil society that influence the management of groundwater resources. It includes discussions on formal and informal institutions and decision-making processes, accountability, stakeholders and potential future activities.

- **Estimated time:** 2 to 3 days, depending on the number of groups you need to work with and on whether exercises take place simultaneously or sequentially.
- **Observations:** This last group of exercises demands good understanding of local socioeconomic and environmental conditions. Make sure to review the findings from previous stages of data-collection so as to avoid repetition and to adapt the discussion topics to issues of local interest (e.g., for the cause-effect diagrams or the Venn diagrams on groundwater governance).

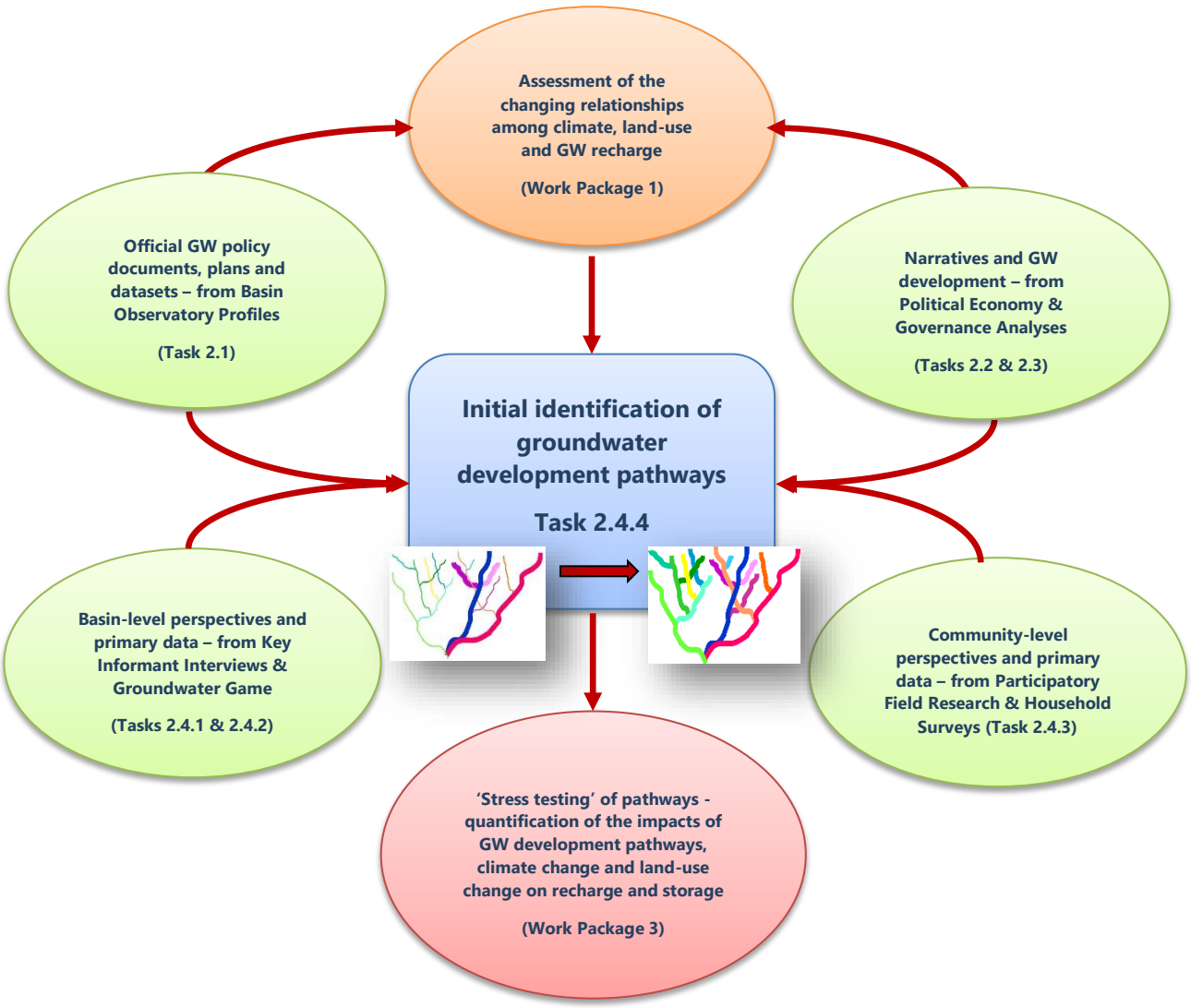
f) Phase 5: Feedback meeting with communities

- **Activities:**

  A. *Feedback meeting with communities*: Open meeting with residents where summarised key findings are presented for discussion and validation. Local participants who played a role in the research can be encouraged to present their analyses to their neighbours (this includes children) so that the findings are discussed among community members (a process of 'handing over the stick' by the research team). The GroFutures team can facilitate this discussion and use it as an opportunity for further triangulation and cross-checking of findings.

- **Estimated time:** Half a day depending on local customs.

Figure 11. Preliminary GroFutures data-collection process linked to Work Packages 1, 2 and 3



4.3 Data-collection protocol:

a. Make use of the secondary data collected for each village (Exercise A). The lead researcher should brief the fieldwork team about the main socioeconomic and ecological features of the community and other issues to be aware of (e.g., culturally acceptable practices).

b. A named member of the fieldwork team should be allocated responsibility for putting together all the data obtained from a particular village. This person will be in charge of compiling all material produced, including photos and audio files, and handing them over to the lead researcher.

   It is recommended that this person keeps a diary of events, which details the dates, times, and key features of the fieldwork process (e.g., logistical challenges).

c. **BEFORE** conducting a new exercise or interview:

   - The team should prepare for each exercise by reviewing all the relevant information from previous exercises and secondary data sources (e.g., the results from the participatory mapping exercise and some historical maps should be consulted before conducting the focus groups on land use).
   - The team should review the research outputs they are expected to produce from each exercise (See "What for?" section in the instructions for each exercise) and the corresponding topic guides for group discussion (See "How?" section).
   - The team members in charge of conducting an exercise should divide their roles between main and supporting facilitators in advance.

     The main facilitator should work with the lead researcher to coordinate the logistics involved for the exercise they will conduct. Review the "What with" section in the exercises' instructions to check the materials needed.
   - *Selection of participants*: Review the "Who with" section in the exercises' instructions to verify the social, economic or cultural profile of participants required for each exercise.

     At the beginning of the data-collection process you can rely on the information obtained from key informants and local authorities to invite suitable residents to the first exercises. However, after the first exercises have been conducted (Well-being Ranking of households: Exercise E) and the team's local knowledge increases, they should be more directly involved in the selection of informants for future events.

     Be aware that participants should be invited, not ordered, to attend. Make sure that when coordinating with local authorities, the latter do not force anybody to participate.

     In addition, depending on the number of households present in a village, try to vary the group composition from one exercise to another. Although some PRA exercises are interrelated, there is no need to rely on the same set of informants.

d. **DURING** the exercises or interviews:

   - Informed consent should be obtained from participants at the beginning of each group exercise or interview. The necessary forms are found in Section 6. Proceed as follows:

     i. Make sure all participants are well informed about the project (e.g., its objectives and parties involved), their rights as informants (e.g., to refuse to answer some questions, risks and benefits, if present), as well as the research outputs planned.

ii. For individual key informants, read the consent form with them and ask them to initial the corresponding boxes detailing their agreement with the study policies. Ask them to sign the form (Section 6, "Consent Form for Key Informants").

iii. For participants in PRA group exercises, use an oral consent form. The form should be read out at the start of the exercise and consent recorded on a dictaphone or witnessed by another researcher. Participants' names should be recorded at the bottom of the sheet with signatures if participants are literate, verbally if illiterate (Section 6, "Oral Consent Form").

- It is the responsibility of the lead facilitator:
  - to make sure the necessary material is available for the relevant exercise;
  - to guide participants during the visual exercises and group discussions; particularly by reminding them of the topic and specific issues we would like to know more about;
  - to take written notes of the discussion and events;
  - to coordinate the implementation of the form of compensation agreed with the local population for their participation.
- It is the responsibility of the supporting facilitator:
  - to take notes of the group discussions but in a more structured manner (by topic or question);
  - to remind the lead facilitator of questions in the topic guide (but this does not imply following them strictly or using the questions verbatim);
  - to ensure that the digital recorder is working throughout the exercise and it is placed in a suitable location. Remember, however, that participants have the right to request that you stop recording at any time.
  - To take photographs of all the material produced during the exercise.

e. **AFTER** completing the exercises**:**

- The main and supporting facilitator(s) should meet to produce a field report in which they summarise the main findings for each of the topics presented in the topic guide and any other that was included by the informants. To this effect, they should compare their notes, review the charts and tables generated, and listen to the recording of the group discussion.
- Before handing over the flipcharts to the lead researcher, the facilitators must catalogue the materials produced. Write down the following information on the backside of the flipchart: (i) the village name, (ii) type of exercise and the (iii) social group represented (e.g., men or women). If many flipcharts were used, number each page used. Record the same information on the tape used to secure the roll of paper.
- Be aware that participants' names should not be included in any of the outputs generated so as to guarantee them the necessary confidentiality. The identity of participants can only be recorded in the corresponding consent forms.
- Hand over the consent forms to the lead researcher.
- Hand over the digital files containing the pictures and recordings obtained during the group exercises.

f. The lead researchers should keep all consent forms, flipcharts, and written field reports in a locked cabinet. Audiovisual digital files should be kept in a password-protected computer. Always make copies of diagrams.

g. After all the field reports have been filled in for each exercise, the person responsible for a given village should compile all the different reports into a single document and verify that all the produced material has been duly returned to the lead researcher.

h. Field reports for each exercise should be typed in a word processor document. Each PRA exercise should be associated with an individual file. Once the information has been typed in, name the file in the following manner for identification purposes:

- COMMUNITY NAME_EXERCISE NAME_SOCIAL GROUP_DATE OF EXERCISE
- The DATE should be as follows: DDMMYY – e.g. 6 January 2016 = 060216
- For example: *"Njoro_Seasonal Calendar_Women_060216.docx").*
- Files should be kept in different directories according to the community.

i. All digital files produced during a given exercise (recordings of interviews, pictures of flipcharts, scanned maps or transparencies, etc.) should be named containing the following information:

- COMMUNITY NAME_EXERCISE NAME_TYPE OF DOCUMENT_NUMBER OF FILE_DATE OF EXERCISE
- TYPE OF DOCUMENT = could be: map, picture of landscape, picture of chart, etc.
- NUMBER OF FILE = more than one version of a map, chart, or audio files may be generated for a single exercise.
- The DATE should be as follows: DDMMYY – e.g. 6 January 2016 = 060216
- For example: *"Njukini_Men's Venn Diagram_Chart 2_060216.docx").*
- For photographs, the name of the author (photographer) should also be included in the file name.

j. A feedback meeting should be organised in order to return the information obtained to the communities. In addition to presenting our key findings to local authorities provide some form of printed dissemination material (e.g., leaflet, poster) and summarised report containing the key findings of the study to the community in the local language.

5

PARTICIPATORY EXERCISES

EXERCISE A: COLLECTING USEFUL SECONDARY DATA

What for?

This will serve to provide background information for case-selection purposes and to help answering some of the research questions (Table 1):

- To describe livelihood strategies within and beyond case-study communities.
- To describe land use practices for livelihood purposes within and beyond case-study communities.
- To describe seasonal variations in livelihood strategies, water security and health in the communities.
- To outline the formal natural resource governance structures operating in the study area.
- To spatially locate sources and flows of relevant water resources within and beyond the case-study communities.
- To identify current conditions and trends in supply and demand of water resources, especially GW.
- To identify (in)direct drivers affecting current trends of GW.

How?

1. One person should be responsible for collecting together materials relating to each community.
2. This person should look for the following types of material:
   - ☑ Household lists
   - ☑ Maps (historical as well as current) and aerial photos (if available)
   - ☑ Climatic information
   - ☑ Forest inventories
   - ☑ Reports by other projects or local authorities
   - ☑ Thesis / dissertations
   - ☑ Census information
   - ☑ Journal articles
   - ☑ Newspaper reports
   - ☑ Community documentation (e.g. forest management plans, administrative records, etc.)
3. A literate member of a community may be contacted to help with the collection of materials available locally (e.g., school enrolment figures, list of households).
4. A reference list of all the materials should be compiled. References should detail the institution from which the document was obtained. Where possible, keep a hard copy of documents/maps.
5. Extract data related to the information outputs required for each research question as detailed in Chapter 4 (Table 1). See if they provide information on any of the questions listed and share the key findings with the team. Ideally, this should happen before the community level work.
6. Collection of secondary data should continue throughout the duration of the project as the team finds out about more secondary data sources.

EXERCISE B: KEY INFORMANT INTERVIEWS

What for?

Interviews will provide preliminary information about the general socioeconomic context within the field sites. This will ensure that we are aware of any sensitive or contentious issues (e.g. disputes over groundwater use activities) before fieldwork while also contributing to information outputs:

- To identify and describe livelihood strategies within and beyond case study communities.
- To identify and describe current uses of land for livelihood purposes and land and (ground)water management systems within and beyond case study communities.
- To identify seasonal variations in (ground)water resource availability, access and use.
- To describe existing rights of access to and ownership of local (ground)water and land resources.
- To outline the formal and informal (ground)water governance structures operating in the area.
- To identify and describe the operations of community organisations and external stakeholders shaping local decision-making with regards to access, management and use of GW specifically.
- To identify current conditions and trends in supply and demand of GW.
- To identify (in)direct drivers affecting current trends of GW.

Who with?

- Leading villagers, who are knowledgeable about the community, such as chiefs, their assistants or representatives of local organisations (e.g., farmers or religious associations).
- Government officials working in the village (e.g., water, agriculture or health professionals based in the area or local community development workers) and those whose responsibilities include overseeing activities that affect the community (e.g., basin-level or district-level authorities of the Ministry of Water, Ministry of Agriculture or Basin Management Organisation). Officers from NGOs or other Civil Society Organisations working in the area.
- Residents with no formal authority but who possess rich local information (e.g., religious leaders, traders, healers, or older residents).

How?

1. Informants can be interviewed separately and/or in a small group.
2. Hold the interview in a quiet place with no other people around, so as to guarantee privacy.
3. You may cover the following topics, depending on the expertise of the informant:
   - ☑ Community history (political, economic, cultural, and ecological).
   - ☑ Main ethnic/religious groups and presence of any related form of segregation or conflict.
   - ☑ Current population level and trends (migration issues or increase in mortality rates).
   - ☑ Migration issues: prevalence of permanent and seasonal migration, profile of migrants (men or women, young or old, etc.) and any reports of immigration.
   - ☑ Poverty levels in the district.
   - ☑ Water and food security and nutritional status of community members.
   - ☑ Current tenure and decision making power over each major land and water use type.
   - ☑ Main livelihood strategies in the community and dependence on GW.
   - ☑ Internal/external drivers of (ground)water insecurity outcomes.
   - ☑ Main changes in land and (ground)water use over time.
   - ☑ Internal/external drivers of changes in land and (ground)water use.
   - ☑ Potential forms of intervention (at the local, regional, national level) to influence trends in GW management that negatively affect people's livelihoods, water security and health.
4. Towards the end of each interview ask informants if they have any questions or observations.

☞ Be aware that it may not be possible to cover all items in a single session and that more than one interview session may be required with informants.

EXERCISE C: COMMUNITY CONSULTATION MEETING

What for?

- To present the project's research plans to the community.
- To agree on a compensation policy with local residents.

Who with?

It is essential that the community makes an informed decision about taking part in the research. This meeting should therefore be held with a group of community members who are sufficiently representative of the community as a whole. These may include:

- Chiefs and other formal community-level authorities.
- Representatives of various local associations (farmers', religious, and women's organisations).
- Members of the community who do not hold a formal leading position in the community but are influential: elders, heads of large families, healers, shop-owners, etc.

☞ Make sure to use the background information collected through exercises A and B to invite all relevant residents. If some feel excluded, they may undermine the research project at a later stage.

How?

1. Follow local practice (e.g. organise a large meeting if it is customary for communities take decisions in large assemblies or talk to the village elders if they are the main decision-makers).
2. Prepare dissemination and presentation material to present during the community meeting. Provide copies of a project information leaflet to ALL participants before presenting the project.
3. Begin by presenting the research objectives of the project.
4. Discuss the data-collection activities to be conducted during the fieldwork process: group discussions, visual exercises, etc. Also discuss the length of time this work is planned to last and the potential numbers of people to be involved.

   If subsequent research activities will take place after participatory methods (e.g., surveys), present some preliminary information about these activities too.
5. Explain the rationale used to select the community for the research.
6. Discuss how the project will use the data collected and how information will be given back to the community.
7. Discuss how the study may overlap with some information needs of the community. If applicable, make absolutely sure that the participants understand that this is not a development project. Explain, however, that research projects may help the community take more informed groundwater resource management decisions as well as contributing to better policies at the regional level.
8. Discuss the compensation policy to be used in the area. Agree on a procedure that is considered suitable and can be administered in a transparent manner.
9. Make explicit the commitment of the research team to organise a feedback meeting with residents and local authorities in order to return and validate the information collected. If possible, agree on the most suitable timing for this activity.
10. Provide the contact details for the local contact person who can provide more information after the meeting.
11. Agree on the starting date for the research.

EXERCISE D: WELL-BEING AND LIVELIHOODS DISCUSSION

What for?

- To outline the concepts of 'well-being' used by residents.
- To establish a list of (non)economic indicators that characterise different local socioeconomic groups and describe the village's socioeconomic composition.
- To describe local livelihood strategies (including farm and non-farm activities) and assess their effectiveness.
- To describe main forms of land and water use for productive activities.
- To identify any (in)direct contributions of groundwater to livelihoods and well-being.
- To identify any seasonal variations in livelihood strategies / economic practices.
- To describe significant inter-annual changes in livelihood strategies and perceived causes.
- To outline current rights of access to and ownership of local GW and other resources.

Who with?

- We recommend working with a representative cross-section of the community. The discussion group should therefore include members of different social, economic, and cultural groups.
- As you may not know which residents are particularly relevant for a livelihood analysis, make sure to consider the most typical variables:
  - Wealth: Well-off and very poor participants (e.g., large landowners and landless residents).
  - Occupational profile: Farmers, traders, fishers and other dominant economic sectors.
  - Gender: Men and women.
  - Cultural: Members of ethnic or religious based-groups.
  - Geographical: Residents living in different parts of the village.

☞ Make sure to work with 'viable' groups. This means

- They should neither be too small (at least 4 people) nor too large (e.g., 20 people).
- Be cautious with regards to including groups or individuals that are in conflict (e.g., antagonist ethnic or religious groups).

What with?

- A spacious area/room.
- A flipchart or board. Alternatively, you can use cards.
- Writing / drawing materials of different colours (at least 3).
- A camera to register the material produced.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise to participants. Mention that you want to learn about the following:

☑ *How do people make a living in the area?*
☑ *How do people know who is rich or poor?*
☑ *How does nature affect the manner in which people make a living in the area?*

2. Discuss participants' understanding of 'wealth', 'poverty' and 'well-being'. The following prompts may be helpful to probe their views:

☑ *What do you understand by 'wealth'?*
☑ *Are there any members in the village who can be called 'poor'?*
☑ *What are the key characteristics that define someone as 'well-off' or 'very poor'?* (Use local terms if these are preferred for describing socioeconomic condition).
☑ *How do residents define 'well-being' in terms of material possessions? (e.g., land or livestock)*
☑ *What aspects other than money or material possessions are associated with 'well-being'? (e.g., education, membership of certain organisations, being friends with public officials, etc.).*

3. Let people talk freely and take notes of all the indicators and features they identify and discuss. Look for common indicators, such as quality of house, ownership of livestock, land ownership, size of farm, access to the market, etc., and make a list of these criteria.

4. Write the criteria in the first column of a table on flipchart paper or the board. If most participants are illiterate, use drawings or symbols.

5. Ask the participants to define three or four well-being groups using the indicators they consider most relevant in their community and write these across the top of the table. If they wish to do so, participants may attribute names to each group. [NB. If working in many communities, it is useful to decide in advance whether you wish to have a fixed number of well-being groups in each community or leave the choice up to participants. See exercise E for more discussion on this.]

6. For each of the well-being groups identified, review the value of the different criteria and capture this information by writing or drawing in the table or using cards on the ground.

7. Ask participants to identify the main productive and income generation practices conducted by these groups.

8. Ask participants to estimate the proportion of residents that belong to each category.

☞ If, as you progress with the table, you notice that two groups have most of the same identifying features, discuss with the group whether it is worth keeping them as two separate categories or not. Similarly, indicators which do not distinguish between the groups should be removed.

Example. Detailed socioeconomic classification of households

CRITERIA	"Well-off"	"Better-off"	"Poor"	"Very Poor"
Living conditions	• Permanent house. • Walls and roofs made of bricks and concrete. Walls are plastered and painted. House has glass windows. • House is usually well-preserved and clean	• Permanent house. • Walls made of bricks and concrete but not plastered. Most roofs are made of iron-sheets. Some have glass windows. • House in good condition.	• Semi-permanent house (seasonal migration). • Walls made of mud bricks (no cover). Some roofs are made of iron-sheets but most of thatch. • House is moderately preserved.	• Semi-permanent or temporary residence (tenants). • Houses made of mud bricks or reeds / timber. Thatched roofs. • Bad condition.
Farmland	• Over 10 acres (owned). • Irrigated farmland.	• Between 5 to 10 acres (owned). • Irrigated farmland and some rain-fed farmland	• Between 1 to 5 acres (some rented). • Mainly rain-fed farmland.	• Less than 1 acre (mainly rented). • Rain-fed farmland.
Livestock	• Herds of more than 10 goats. • Poultry.	• Herds of 5 to 10 goats. • Poultry.	• Less than 5 goats. • Poultry.	• Poultry only
Assets	• Own motorised vehicle and bicycles. • Own diesel water pumps. • Have mobile phones.	• Own bicycles. • No pumps. • Some have mobile phones.	• Some own a bicycle, most don't. • No pumps. • Some have mobile phones.	• No transport. • No pumps. • No phones.
Food	• Owns fishponds (for consumption and trade). • Stored food can last for more than 3 months (maize, rice, and other products).	• Some own small fishponds. • Stored food can last between 1 to 3 months (mostly maize).	• No fishponds. • Stored food can last 1 month at most (only maize).	• No fishponds. • No stored food.
Labour hire	• Hire labour (5 to 10) for farm and non-farm activities.	• Hire some labour (less than 5) mainly for farm activities according to season.	• Occasionally hire labour for farm activities but mainly use family labour.	• Family labour.
Education	• Most members have some secondary education and children go to school in town.	• Members have basic education and children go to local school	• Members have some primary education (many illiterate among the elderly). Children go to local school, but miss classes due to work.	• Members have little education (many illiterate among the elderly). Children go to local school if their work allows it.
Health	• Go to hospitals when ill. Mainly public hospitals but can also pay for private care.	• Go to public hospitals.	• Go to public hospitals only if illness is severe (cannot afford medicines). • Local healers are consulted first.	• Only access local healers.
Social aspects	• Members of the chief's family. • Most local authorities come from this group. • Travel frequently to town and cities.	• Some local authorities come from this group. • Are socially active (visit friends and organise parties) mainly in the village but also travel sometimes.	• No authority positions. • Some are socially active but have no money to organise big celebrations. Mainly visit friends. • No political involvement.	• No authority positions. • Little social activity. Mainly visits to friends or neighbours from the village. • No political involvement.

	• Affiliated to political parties.	• Some are active politically but are not leaders.		
Income-generation activities	• Cash-crops. • Rent out land. • Local shops. • Agricultural / livestock traders. • Lend money.	• Cash-crops. • Rent out land. • Local shops (small). • Lend money (some).	• Some crops are sold, most are for self-consumption. • Rent out land (occasionally). • Wage labour. • Seasonal migration to towns and cities. • Some collect and sell forest products (e.g., firewood).	• Crops are for self-consumption. • Wage labour. • Seasonal migration to towns and cities. • Collect and sell forest products (e.g., firewood).
Percentage of HHs that belongs to category	**10%**	**20%**	**40%**	**30%**

9. Review the table with the participants so as to make sure they agree with its content.

10. Discuss the results:

Local well-being and livelihoods

a) Which of the items listed do participants consider the most important to define a household's condition? Why?
b) Which of the resources that people own are the most important in determining how people make a living (e.g., farm equipment, land, education, political involvement, etc.)? Why?
c) To what extent does the way people make a living vary across seasons? Why?
d) Which socioeconomic groups are the most affected by seasonality issues? Why?

Changes in general well-being and livelihoods

e) Have there been any major changes in the way residents make a living in the past *'20 years'* (change time interval according to what is more meaningful to local people)? Why?
f) Do participants think that residents' well-being has improved or worsened during this time? Why?
g) Has inequality increased or decreased in the last *'20 years'* (use your local knowledge to set an appropriate period)? How has that affected residents' relations (in economic and social terms)?

Groundwater's contributions to well-being and livelihoods

h) Which of the benefits /products that people obtain from groundwater (e.g., irrigation water, livestock watering, domestic water, etc.) do they consider the most important for making a living and satisfying their daily needs?
i) Which social organisations or government programmes have the greatest impact over the way people use GW resources for making a living (e.g., water users' associations)? Why?

(Ground)water resource management

j) How is access to surface and GW resources managed in the area?
k) Are there any struggles between individual residents or groups over access to these benefits? How do residents solve these conflicts? Are there any community organisations or authorities in charge of dealing with conflicts? Can they manage?

11. Take a few minutes to review your notes with the participants and ask them if they have any questions or comments.

12. Copy the table and take pictures of it.

EXERCISE E: WELL-BEING RANKING

What for?

- To establish (non)economic indicators that characterise local socioeconomic groups.
- To estimate the socioeconomic composition of study areas.
- To provide a sampling framework for future PRA exercises and household surveys.

Who with?

There are two main approaches to well-being rankings. You can either work with:

- A small group of informants (10 at most) that constitute a cross-sectional representation of the community (i.e., different economic and social groups). Under this approach, you classify households based on group consensus. You can follow the same instructions as the ones presented in Exercise D to select informants.
- Different small groups of informants or, on occasions, individual informants interviewed one after the other (i.e., separate rounds of rankings). This approach requires calculating overall averages afterwards. These groups or key informants should come from a cross-section of the community.

☞ The main advantages of the first approach are: i) informed group consensus requires an agreement on classification criteria, which may vary from informant to informant in the second approach; ii) larger groups are likely to guarantee greater representativeness and iii) it is faster.

☞ Well-being rankings are limited to small communities where households know each other well. If the community has more than 100 households, consider working with a smaller (geographically or ethnically distinct) section of the community. Alternatively, you can run parallel discussions with groups or key informants from different areas of the community.

What with?

- Obtain an up-to-date list of all households in the village. This could have been obtained previously through secondary sources (Exercise A). If not available, you can develop one with local authorities. Another alternative is to rely on the information obtained from the participatory map of the community (Exercise G).
- Cards containing the name of the head of each household.
- A spacious area/room that guarantees privacy.
- A camera to register the material produced.
- A digital recorder to record people's interventions.
- A notebook to take notes.

☞ Use the same definition of 'household' established in the well-being and livelihoods discussion so as to ensure consistency.

How?

1. Explain the purpose of the exercise to participants. In general, you want to learn about:

☑ *What is the socioeconomic composition of the community?*
☑ *What is the socioeconomic profile of each household?* (Stress that this information will be kept confidential and will be used ONLY for future research activities).
☑ *What aspects differentiate the local socioeconomic groups from each other?*

2. Start by reviewing with participants the definition of *'well-being'* generated in Exercise D and the main material and non-material indicators used to differentiate between the three / four socioeconomic groups established.

3. Take the pile of cards with the households' names. Make sure the cards are shuffled and, taking one card at a time, give it to the participants. Alternatively, if some of them are illiterate, you can read the names on the cards one at the time.

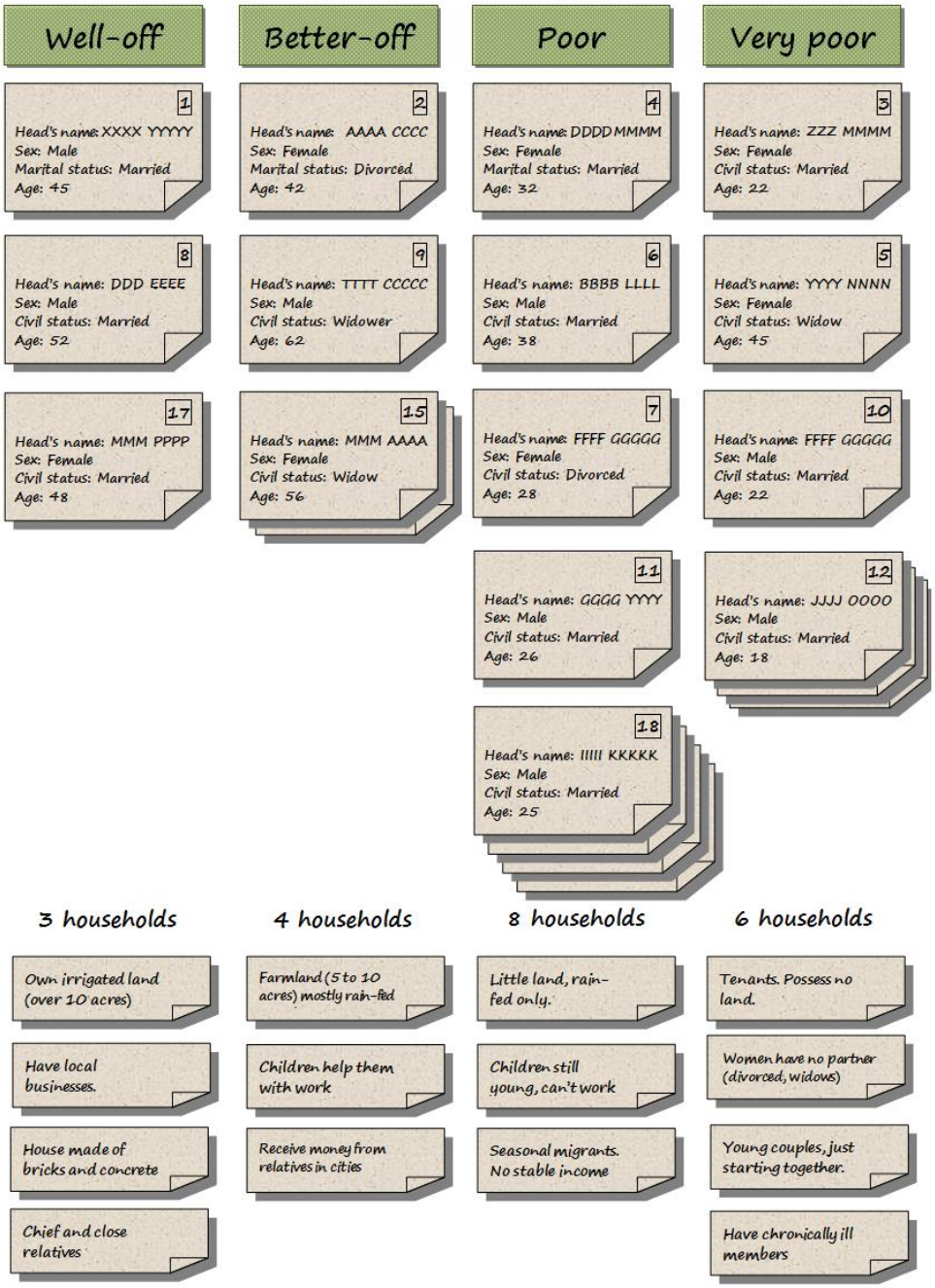
4. Ask the participants to think about their well-being and assign them one of the three or four groups identified in Exercise D.

5. For each card, after being assigned to a group, ask the participants about the following information: (i) is it a male or female headed household? (ii) does the head of household have a partner or is s/he single, divorced / separated, or widowed?, (iii) what is the age of the head of household? (an approximation is sufficient).

6. Continue the process until all the cards have been grouped into the three / four well-being groups.

7. When the piles are completed, ask informants which were the MOST salient characteristics that allowed them to classify all households into the different groups. Remember not to discuss the ranks of individual families but stick to the differences between groups.

Example of well-being ranking



8. After finishing the well-being-ranking, use the opportunity to discuss the following topics with the participants:

Groundwater's contributions to livelihoods and well-being:

a) Are there any socioeconomic groups that heavily depend on groundwater (e.g., livestock herders, small-scale farmers, etc.) for making a living?

Changes in well-being and livelihoods:

b) Have there have been any major changes in the socioeconomic composition of the village in the last *'20 years'* (use your local knowledge to set the most suitable recall period)? What were the main reasons?

c) Are any of these changes related to any significant changes in the condition of local (ground)water resources (e.g., deforestation, increased frequency of erratic rains, etc.)?

d) Have there been any policy measures (e.g., land expropriation, restrictions to the commercialisation of land and water resources), governmental or NGO interventions that have significantly affected the socioeconomic conditions of local residents.

e) At present, is it common that households change their socioeconomic condition from one year to another?

f) What is more likely, that households move up into a better-off group or that they become poorer? What are the main reasons for these changes?

9. Review your notes with participants and ask them if they have any question or comment to add.

10. Take pictures of the lists generated. Make sure you capture all the information on each card.

☞ Well-being-ranking exercises can be sensitive affairs. Make sure that the discussion does not focus on the ranks of individual families. This may cause bad feelings within the community. Emphasise that the data collected will be kept confidential.

☞ Make sure participants understand that the information generated is not linked with any specific distribution of material or monetary benefits. Some informants may believe that being placed in the least-poor group could mean they will not have the right to access some form of assistance, thereby providing inaccurate data.

EXERCISE F: HOUSEHOLD SYSTEM DIAGRAM

What for?

- To identify and describe local livelihood strategies and assess their effectiveness.
- To describe current land uses for livelihood purposes.
- To outline local farming systems.
- To identify the most important (in)direct contributions of GW to local livelihoods and water security.
- To identify any seasonal / monthly variations in livelihood strategies and water management practices.
- To describe significant inter-annual changes in livelihood strategies and perceived causes.
- To outline current rights of access to and ownership of local natural resources and struggles over access to / use of GW resources.

Who with?

- We recommend conducting this exercise with informants from different socioeconomic profiles: a group of better- and well- off residents and a group of poor and very poor residents (use list of households generated in the well-being ranking in Exercise E). Each of the groups should incorporate men and women and members of any other relevant social group (e.g., ethnic minorities) as well as those living in different areas of the community.
- If in the area of study there is a group of residents with a very distinctive livelihood strategy (e.g., fishermen), you may need to organise a separate group with them.

What with?

- A spacious area/room.
- A flipchart, a board or the ground.
- Writing/drawing material of many colours.
- A camera to register the material produced.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following topics:

☑ *How do people use local (ground)water resources from farm and non-farm areas to make a living?*
☑ *How rights of access to and ownership affect local water and other natural resources and struggles over access to / use of GW resources.*

2. Ask participants to draw a farm that represents the kind of house in which they live. The drawing should be placed in the centre of the board / flipchart / ground.

Make sure the drawing includes all typical elements of a farm: living space, kitchen, farm structures (e.g., barn, cowshed), common types of farmland (irrigated farmland, rain-fed farmland, wetland, etc.) and livestock (e.g., poultry, goats, etc.) and any patches of forest or ponds they own, among other key features.

3. Ask participants to represent the sources of water available to them on their farms.

4. Connect the water resource inputs and sources with farm items through arrows (e.g., shallow well -> household or livestock watering; borehole → irrigated farmland).

5. Going back to the initial list of farm components, proceed to ask participants about OUTPUTS generated from them: the main crops cultivated, fruits or timber obtained from forest areas, meat and livestock by-products as well as any other derived products (e.g., handicrafts). Proceed again to review the inputs and input sources used for these purposes.

6. Connect outputs and destinations with farm items or non-farm areas through arrows (e.g., irrigated farmland -> maize -> market; home gardens -> fruits ->sales by roadside).

7. Ask participants to specify the labour used to perform each of the different farm-based activities listed (e.g., household members, hired labour, visiting relatives). You can expand the analysis by differentiating if it is men, women or children who are responsible for bringing in inputs, producing derived products, and taking them to the market.

8. Give the participants some minutes to review the completed diagram and make corrections.

Example of Household System Diagram

9. Discuss the drawing with participants:

Local well-being and livelihood assessments

a) Do participants consider these activities allow them to obtain an adequate and stable income? Why?
b) Do they consider that these activities enable them to acquire enough water and food for their families and animals? Why?
c) How does this system of activities change during the year (according to season)?
d) Is this system of practices different in other areas of the community (e.g., closer to the road, river or forest)? Why?

Changes in well-being and livelihoods

e) Has this system of activities changed in the past 10-20 years (use the most relevant time interval according to your knowledge of the local area)? Why?

Groundwater's contributions to well-being and livelihoods

f) Looking at the drawing, ask participants to identify the water sources – including GW sources - that contribute to their local livelihoods and well-being. Ask them which ones they consider the most important and why.
g) Do participants use any of these natural resources for non-economic purposes such as religious festivities, medicines, or for recreation? Which ones in particular?

Groundwater Resource Management

h) How is access to key surface and GW resources managed in the area?
i) Is there a single set of rules or do they change according to the intended use (i.e., economic use as compared with traditional celebrations or collection of natural medicines)?
j) Are there any bottlenecks with regards to accessing and using key GW resources and/or any associated conflicts?
k) How do residents solve these conflicts? Are there any organisations or authorities in charge of dealing with them? Would you say they are able to adequately manage these struggles?

10. Ask the participants if they have any questions or additional comments.

11. Take pictures of the diagrams and lists generated.

EXERCISE G: PARTICIPATORY LAND & WATER USE MAPPING

What for?

- To identify and map current land and water uses for livelihood purposes.
- To identify and map the main sources of surface and groundwater that contribute to local livelihoods and food and water security.
- To identify tenure and forms of ownership of land and water resources.
- To identify changes over time in land and (ground)water use and perceived positive and negative efforts.

Who with?

- We recommend that this exercise is conducted separately with men and women as they usually have different domestic roles and routines.
- Make sure that each group contains a cross-section of the community. The groups should include residents of different ages, socioeconomic condition and geographical areas.

What with?

- A spacious area/room.
- A large writing space, preferably on the ground.
- Writing / drawing materials of different colours.
- If preferred, local materials can be used as markers (e.g., seeds, leaves, flowers, etc.).
- A camera to take visual records of maps.
- A digital recorder to record people's interventions.
- A notebook to take notes.

☞ Allow participants to choose their own markers. Be aware that taking seeds or fruits to a community during the dry season, for instance, could be inappropriate due to food shortages.

How?

1. Explain the purpose of the exercise to participants. In general, you want to learn about the following:

☑ *How are houses and public services distributed in the village?*
☑ *How do people use the land available in the area?*
☑ *What key natural resources (e.g., rivers or streams, etc.) are located in the area?*

2. Discuss different categories of land use with participants. Ask about particular types of local land use (e.g. home garden, food crops, fallow land, cash crop plantation, taboo or sacred patches of forest, wetlands, diverse types of farmland, etc.).

3. Ask people to choose one person to draw the map (try to avoid everyone trampling over the map), and 'hand over the stick'. However, make sure that everybody participates so as to avoid bias.

4. Help people get started with clear instructions (e.g., by suggesting they start with a well-known landmark (e.g. a river, lake or borehole) to help them focus on the water resources (or otherwise a road), but let them draw the map themselves.

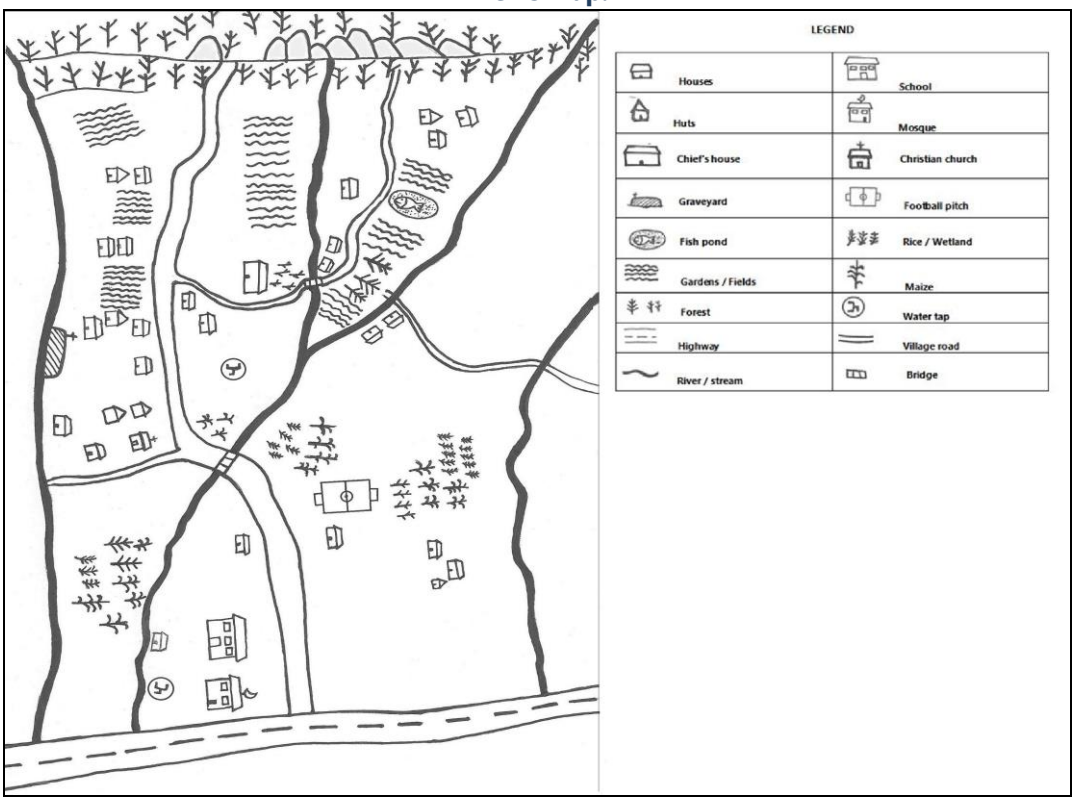
5. Do not worry about the scale or exact orientation – the map is more important as a tool for discussion than as an exact image of reality.

6. Ask the participants to agree on symbols to indicate different land uses, etc. Make sure to write down the meanings attributed to each symbol (i.e., the legend).

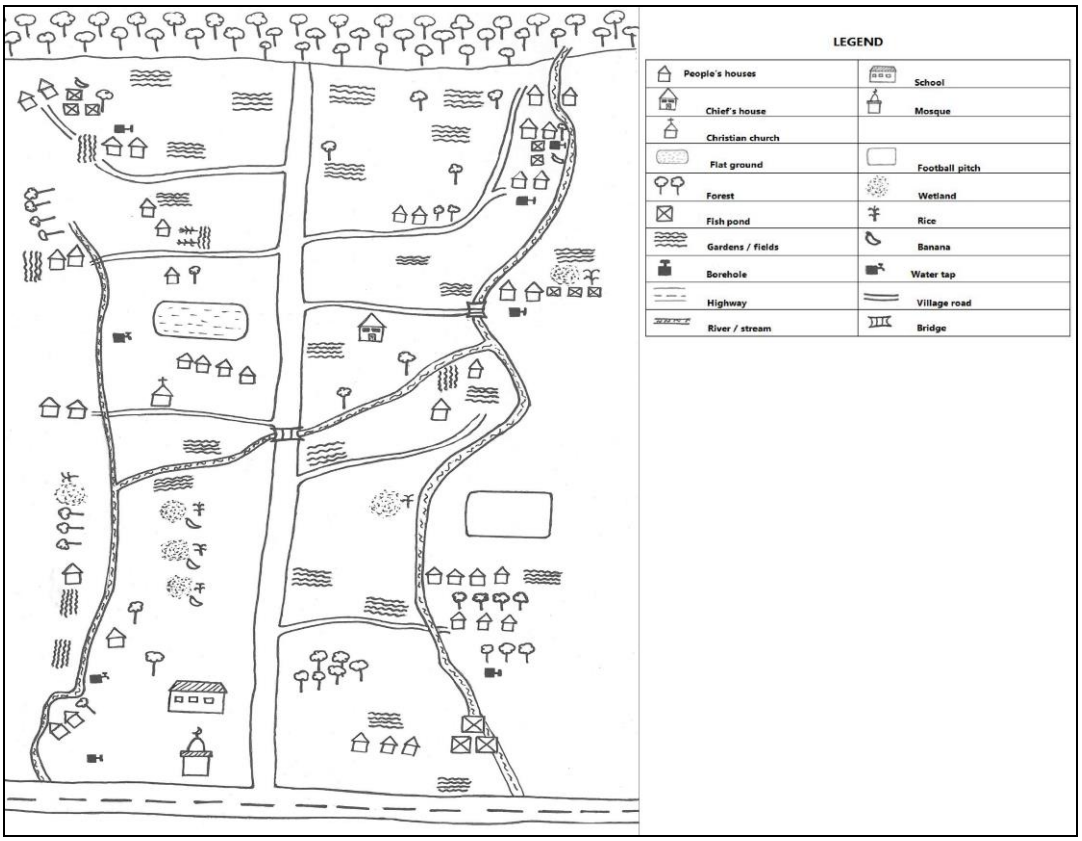
7. Include houses and key buildings.

Example of participatory maps

Men's map:



Women's map:



8. Discuss the following topics using the maps as reference:

Village characteristics

a) Who are nearest neighbours (villages)? Where are they located in reference to the map?
b) Are the village boundaries well delineated and recognised or is there any ongoing land dispute with neighbours?
c) What infrastructure exists in the village (church, school, wells)? Who built them? Who maintains them?
d) In terms of locations of houses, is there a particular area where the poor are more likely to live than the better-off? Why?
e) Are there any other significant differences between residents living in different areas of the community (e.g., different religious orientations or ethnic background, etc.)?

Local land and water use

f) Where are residents' farmlands? What type of farmland do participants possess (e.g., irrigated, rain-fed, wetland, etc.)? What types of crops do they commonly grow?
g) How do they grow them (in what combination of crops)? What kind of land rotation system do you have for agriculture?
h) How are land and water disputes managed? Is there any community organisation or local authority in charge of dealing with these disputes? Have they been successful? Why?
i) Where are the main water resources found in the community? What types of sources are these (e.g., shallow wells, spring boxes, etc.) and what is their tenure status (ownership and management)?

Groundwater resource management

j) What are the local land and water tenure arrangements? Is land tenure different for men and women? Do men and women have their own/separate land?
k) What happens in cases of separation / divorce, additional marriages (i.e., polygamy) or death of a partner?
l) From which sources do different community members access their water? Have these sources always been available here or have they changed over time?
m) Are there any conflicts over land and water use (e.g. illegal activities, encroachment by non-community members, etc.)?
n) How do residents solve these conflicts? Are there any community organisations or authorities in charge of dealing with them? Are they able to manage those struggles?

9. Review your notes with participants. Ask them if they have any questions or comments to add.

10. Copy the map and take pictures of it.

EXERCISE H: LAND AND WATER USE DISCUSSION

What for?

- To identify current land uses for livelihood purposes.
- To outline local farming systems.
- To identify the most important (in)direct contributions of groundwater towards local livelihoods and food security.
- To describe current conditions and trends in land use within the study area.
- To identify perceived effects of changes in land and water use, including GW, on local livelihoods and food security.
- To identify direct and indirect drivers of changes in GW availability and access.
- To describe existing rights of access to and ownership of local GW resources and mechanisms of negotiation and enforcement.

Who with?

This type of exercise can be conducted using two different approaches:

- A relatively large group with a cross-section of the community (i.e., men and women, better and worse off residents, inhabitants from different sections of the village, etc.). This approach has the advantage of rendering results in a short time.
- A more in-depth discussion can be obtained by working with a few small groups of informants with different forms of land use for livelihood strategies (e.g. owners of larger land areas, small farmers or herders / ranchers).

What with?

- A large space or a spacious room.
- Maps produced in Exercise G.
- Transparency sheets and suitable markers to draw over maps.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following:

☑ *How do people use the land and water available to generate an income and to obtain food?*
☑ *What have been the main changes in land and water use, especially GW, over the past decades?*
☑ *What forms of land tenure operate in the area and what restrictions do people have in order to access and benefit from GW resource?*

2. You may flexibly use the following topic list to lead the discussion. Remember to use the participatory maps to facilitate the discussion.

Local land and water use

a) Start by reviewing the participatory map (Exercise G). Ask participants if they agree with the main land use areas identified and if there is some information missing. Add the new information to the maps using a labelled transparency.
b) How do these different land uses contribute to local livelihoods? Aside from agriculture, what other income-generating activities are derived from them?
c) How do these different land and (ground)water uses contribute to families' access to adequate food and water?

Farm systems

d) What are the main crops grown in the area? How are they distributed in different areas of the village (e.g., grown in hills or plains)?

e) What land rotation strategies are most commonly used? Are these also applied to communal farmlands (if any)?
f) What other measures do residents take to preserve the fertility and general good condition of their land (e.g., to prevent soil erosion)? Are these also applied to any communal farmland (if any)?
g) What are the main constraints faced in local agriculture? Prompt about the following limitations:

- ☑ Technical (e.g., lack of machinery),
- ☑ Labour (e.g., only children help in farm),
- ☑ Financial (e.g., no access to credit),
- ☑ Deterioration of natural resources (e.g., decreasing land and water availability, soil erosion).

h) How do people deal with each of these constraints?
i) What measures do residents take to look after the condition of other private landscape areas key to their livelihoods (e.g., ponds, wells, etc.)? Are these equally applied to non-farm communal areas (e.g., lakes, etc.)?

Changes in land and water use

j) What changes have been observed in the last 10-20 years (use the same recall period established in previous exercises) with regards to land use, crops cultivated and problems faced in agriculture?
k) How have these changes affected the condition and functioning of local natural resources (e.g. depletion of groundwater, contamination of water sources, etc.)?
l) What caused these changes? Were these factors local (e.g., change in crop preferences) or external (e.g., infrastructure projects)?

Groundwater resource management

m) What are the local land tenure arrangements? Is land tenure different for men and women? How does that affect their access to water resources? What happens in case of divorce or death of a partner?
n) How is land allocated in the area (e.g., when a new resident migrates to town)? Is there any land presently unassigned? If so, who uses it?
o) What tenure and admission rights regulate people's access to groundwater in private and communal areas (e.g., lake, forest, communal farmland, etc.)? Are they different for men and women?
p) Have tenure and access rights to land and water resources changed in the past 10-20 years (use the same recall period established in previous exercises)? How?
q) Is there enough water for all at present? How do residents deal with issues of water scarcity?

3. Take a few minutes to review your notes with the participants. Ask them if they have any questions or comments.

EXERCISE I: PARTICIPATORY GIS

What for?

- To identify and accurately map current land and water use patterns within the case-study communities.
- To identify and accurately map key water sources, including GW, which are important to local livelihoods and food and water security.
- To identify changes over time in land and water use and perceived effects on different social groups.

Who with?

- This exercise can be done with a group that constitutes a representative cross-section of the community. It should incorporate men and women, residents from different geographical areas of the village, and members of different relevant social groups.

What with?

- A copy of the participatory land and water use maps (Exercise G), both men's and women's.
- An aerial photo (or Google Earth image) of the village.
- Transparency sheets and suitable markers to draw and mark areas over maps.
- A camera to take visual records of landmarks (with a GPS location system)
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise to participants. In general, you will enquire about:

☑ *Where are the boundaries of the village located?*
☑ *What are the dominant forms of land use in the area?*
☑ *Where are the main public and private sources of water located?*
☑ *What are the key landmarks in the village?*

2. Review the key findings from the participatory mapping (Exercise G) with participants. Make sure that all are familiar with the key landmarks and forms of land use depicted in the maps.

3. Compare the information contained in both men's and women's maps. Check the commonalities and differences with informants and consolidate the results from the two maps with regards to the following key features on the aerial view of the village:

☑ The boundaries of the village.
☑ Main forms of land and water use (e.g., irrigated farmland, wetlands, etc.).
☑ Main natural landmarks (e.g., river trajectory, streams, etc.).
☑ Distribution of dwellings.
☑ Important man-made structures (e.g., school, churches, access roads, boreholes, well fields, etc.)

4. Proceed to locate the consolidated land use areas and landmarks on the aerial view of the village making use of transparencies. Use different transparencies and colours according to the subject in question (e.g., one layer for access roads drawn in red, another for dwellings drawn in black, a different one for forest areas drawn in green, etc.).

WE RECOMMEND THAT THE FOLLOWING STEPS TAKES PLACE DURING THE TRANSECT WALK EXERCISE (EXERCISE J). RELEVANT TASKS CAN BE SPLIT BETWEEN GROUP MEMBERS:

5. Review the main features of the new version of the village map and identify key features to visit with local residents. Trace a path that would let you walk across the community visiting the geographical areas depicted on the transparencies.

6. Accompanied by some key informants, visit each of these areas with GPS equipment. During the walk, take pictures of key landmarks with GPS enabled cameras and note the coordinates of each landmark.
7. Throughout the process, verify the information from participatory maps with participants and update any new pieces of information that arise during the walk.
8. Review your notes with participants. Ask if they have any questions or additional comments.

EXERCISE J: TRANSECT WALKS

What for?

- To identify current land and water uses for livelihood purposes.
- To identify areas in the landscape that are main sources of surface and GW.
- To describe land tenure and forms of management and ownership that influence access and control of (ground)water resources.
- To describe changes over time in land use and perceived effects on GW availability, access and use.

In addition, this exercise also serves to familiarise researchers with the layout of the community, and to talk with smaller groups of end-users about stocks of natural resources, forms of land and water use, tenure and boundary issues, as well as implementation of rights to access and use water resources.

Who with?

One or more transect walks can be carried out with different groups of informants. The latter should be selected according to their knowledge of the areas to be visited. For instance:

- It may be appropriate to visit water source areas with members of a water users' association (if these exist).
- A specific walk could be made with women to explore areas that face particular problems with water availability, management and use (e.g. over-pumping, conflicting uses, etc.).
- Equally, if there is a site where some innovation groundwater management and use is taking place, it would be useful to visit these sites.

☞ Try to combine transect walks with the Participatory GIS mapping exercise (Exercise I).

What with?

- A copy of the participatory map generated in Exercise G or of the PGIS map from Exercise I.
- A camera to take visual records (with GPS location system).
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise to participants. In general, you want to know about:

☑ *How is land and water used in different areas of the community?*
☑ *What are the main surface and GW sources present in the area?*
☑ *What kinds of benefits do people obtain from these water sources either for income-generation or food security?*

2. Review the participatory map or the PGIS map with the group of informants and decide which paths to follow. You can outline as many routes as necessary to attain a comprehensive picture of the community. However, it is rarely necessary to do more than three transects.

Use the following criteria:

I. Visit the boundaries of the community. Pay attention to any areas that are not clearly defined (but avoid getting engaged in any land or water disputes).
II. Visit all key communal areas.
III. Visit each different type of farmland and other key private areas described in previous discussions (e.g., fish ponds, etc.).
IV. Visit any sections of the community located at different levels of altitude.
V. Visit areas separated from the village centre by key landmarks (e.g., boreholes, rivers or swamps).

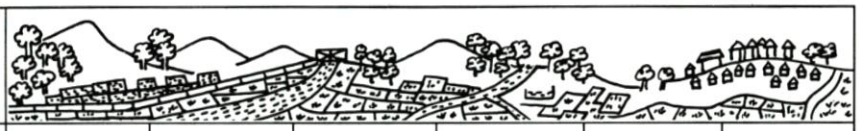
3. Ask the following questions along the way (when applicable):

a) What are the main topographic features of the area (altitude, soil type, extension of vegetation, presence of water sources, etc.)?
b) What is the main use that people give to the area being visited?
c) What main crops / plants / trees are prevalent in this area?
d) What kinds of livestock / wildlife are prevalent in this area?
e) Can residents recall any water sources that used to be prevalent in the area but are no longer available?
f) Who owns these resources? If public access: are there any groups from the community particularly involved in collecting such products from this area (e.g., the poorest residents)?
g) Are there any restrictions? How are they established and enforced?
h) Is there any competition or conflict over these resources? How are they managed or resolved?

4. In addition to these enquiries, use this opportunity to clarify any doubts from the participatory mapping exercise.

☞ Take pictures of the areas visited along the way to illustrate the main areas of enquiry pursued during the transect walk (topography, land use, crops, plants and wildlife). Use the GPS functionality to register the coordinates of sources of ES, land use areas and other key local landmarks.

Examples of TW output:



Land scape / Features	TentelKhunti	Karla Pita	Kara Dungri	Gharla Munda	Latha Kend	Ghantabahal
Area locality	TentelKhunti	Karla Pita	Kara Dungri	Gharla Munda	Latha Kend	Ghantabahal
Land types (local name)	Up land (Aat) Low land (Bahal) Hills (Parbat)	Mostly upland (Aat) Very little low land (Bahal)	Rocky mountain (Parbat) Upland (Aat) Forest (Patra)	Up land (Aat) Low land (Bahal) Plantation forest	Only low land (Bahal)	Mostly low land (Bahali and Bahal)
Water source	Kankara Jor	Dor Jodia	Seasonal stream	Karla Munda Lathakend Munda	Archu Munda	Ningi Munda, wells, tube wells
Species	Mahua, Rengal, Char, Dharua, Bija Sahas, Palsa, Womb, Kendu (wild animal)	No Forest Railway line	Chakunda, Niligiri, Bamboo Bhamar, Neem, Sipol Tental	Nou Munda, Akari Chakunda, Niligiri, Bhamar, Sipo, Mango, Kaju (Patra land)	Mostly Palsa, Mahua	Neem, Banyan, and Mahua
Uses	Less cultivation Low productivity Forest produces	Cultivation of vegetables	Less cultivation Grass land, Plantation	Encroached field plantation, culti-vation of more rice	Good cultivation of Paddy and vegetables	High yield, good cultivation of rice, millets, pulses
Ownership	Government and people	Government and people	Government and people	Soil conservation department and people	People	People

Source: Kumar 2003

EXERCISE K: TREND ANALYSIS OF LAND AND WATER USE

What for?

- To describe current conditions and trends in land and water use within the study area.
- To identify changes in food and water security.
- To identify perceived effects of changes in land use on local livelihoods and food security.
- To outline plausible future pathways of groundwater development and use.
- To outline potential future responses from communities and support required.

Who with?

- Small groups of people (typically no more than 10).
- Choose a few old people (both men and women) and a few respected younger members of the community. Try to incorporate older community leaders in the group.
- This exercise can be carried out with one group of community members or with separate groups of different well-being status or men/women. The latter is recommended when there are distinctive land use practices for different social groups (e.g., larger land-owners as compared with micro-farmers; herders as compared with hunters, etc.).

☞ Be aware of local customs that prevent younger residents from speaking freely in front of elders. If this is the case, it may be necessary to conduct separate groups for younger residents.

What with?

- A spacious area/room.
- A flipchart, board or the ground.
- Writing/drawing materials of different colours.
- A camera to register all the material produced.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise to participants. In general, you will enquire about:

☑ *How do people use the land and water available to earn an income and to obtain food?*
☑ *What have been the main changes in land and water use (including GW) over the past decades and what is their vision of the future in this respect?*

2. Start the discussion by asking people about the present condition of the main forms of land use in the area (e.g., types of farmland and productivity, access, or conflict issues emerging, etc.). Use the maps obtained from the participatory mapping exercises (Exercise G) to focus the conversation on the main forms of land and water use previously identified.

3. Facilitate the discussion so as to define a series of land and water use aspects for which it would be worth analysing changes over time in order to understand current conditions. You may discuss the following topics:

☑ Changes in land and water uses that are important for local livelihoods and food security purposes.
☑ Changes in availability or access to land and water.
☑ Changes in the tenure arrangements and how these influence access to water and other natural resources.
☑ Changes in the types of water sources being used – i.e. the proportion of water drawn from surface vs. groundwater sources

4. Facilitate the selection of time landmarks across which the trends can be studied. You can use time intervals (e.g., 10 years ago, 20 years ago, etc.) or identify certain years that had a significant effect on local land use regimes and practices (see the timeline in Exercise Q). These should be relevant to the topic in question and easy for people to relate to. Choice of the method should be agreed upon with participants.

5. Ask participants to outline a matrix. Across the top you list the different elements that the group has decided to analyse and down the side you note the different time-periods established.

6. Take up one of the aspects to be analysed and ask participants to depict the situation today and then go backwards through each time-period.

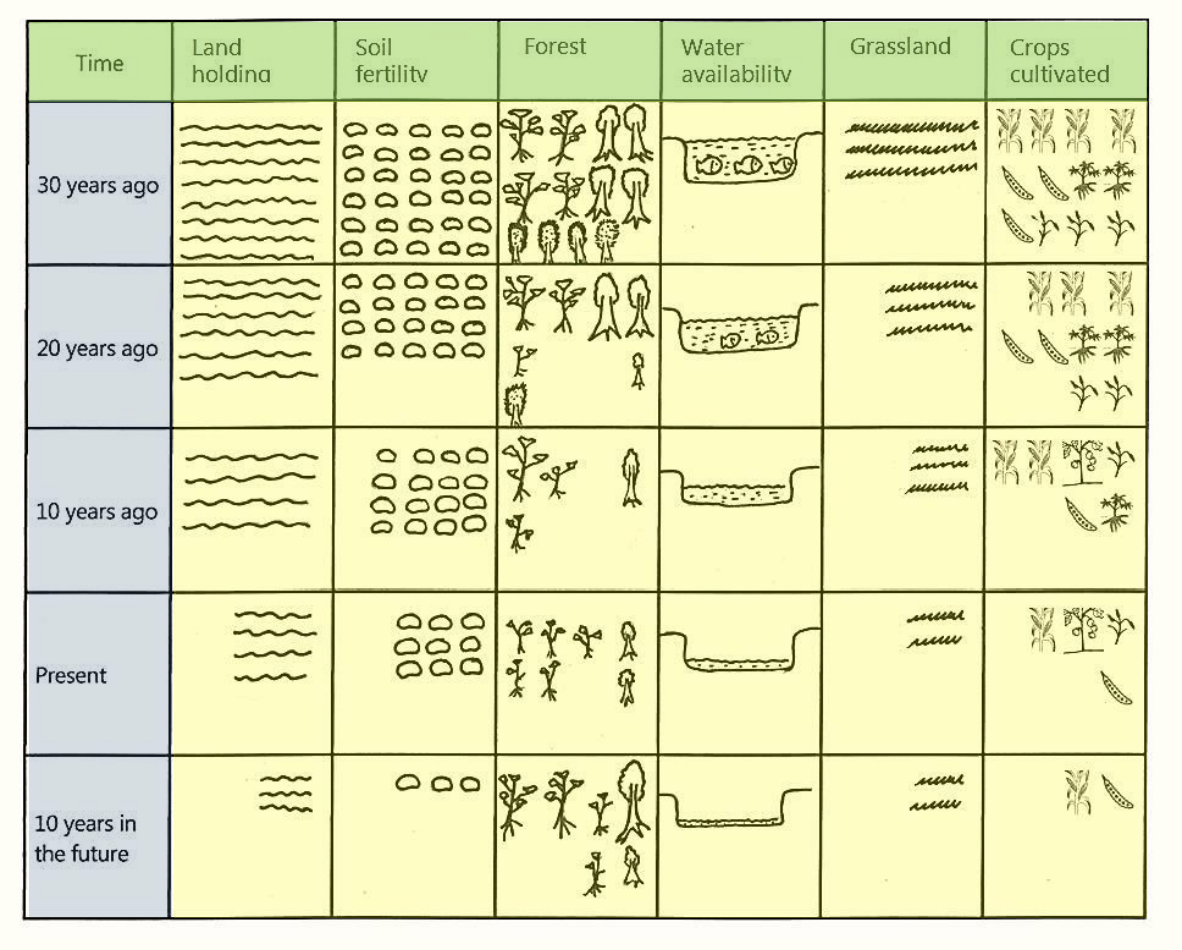
7. After the past periods have been covered, ask participants what they think the state of this aspect will be in 10 years.

8. Repeat this process for each aspect listed until the matrix is filled.

9. Do not try to simply quantify changes (i.e., if things increased or decreased). Instead encourage participants to use symbols and drawings to provide rich depictions of a particular period (e.g., changes in the types of crops, trees or wildlife predominant at a time).

10. Give the participants the time to review its content and make any amendments necessary.

Example of trend analysis using symbols



11. Discuss the diagram with participants. Some key questions for the discussion could include:

Changes in land and (ground)water use

a) Ask participants to describe the drawings over the time periods mentioned for each of the forms of land and (ground)water use discussed.
b) What patterns or trends do participants perceive?

c) What factors do they think caused these changes? Which ones emerged locally (from the community or other local areas) and which ones were due to external processes (natural, such as climate change, or man-made, such as new laws, new roads, bridges, or changes in market transactions)?
d) How have changes affected the condition of groundwater resources in the area (in both quality and quantity)?

Groundwater's contributions to livelihoods and well-being

e) Have the observed trends and changes affected the sustainability of local livelihoods? How?
f) Have these trends in land use affected residents' capacity to access food throughout the year? How?

Responses / Adaptations to trends

g) Have people changed their livelihood strategies to deal with these trends? How?
h) Have residents modified their strategies to obtain water or deal with water shortages? How?
i) Have there been any external interventions (from NGOs or the government) or policy restrictions to manage or reverse these trends? Were they successful? Why?
j) Have there been any local initiatives (either from the community or other local organisations) aimed at managing or reversing these trends? Were they successful? Why?
k) Do participants consider that the community could do more to control or reverse these trends? What and why?

Views of the future and potential responses

l) Ask participants to explain their depictions of the future. What factors did they consider?
m) Of all the negative changes identified, do they believe that some of them are now irreversible? Why?
n) What kinds of external interventions (from NGOs or the government) do they believe would be necessary to reverse the negative trends identified?

12. Thank the participants and ask them if they have any questions or comments to add.

13. Copy the diagram onto a piece of paper and take photo of it and record the date, location and participants involved.

EXERCISE L: SEASONAL CALENDARS

What for?

- To identify seasonal variations in livelihood strategies.
- To identify seasonal variations in access to food and (ground)water resources.
- To identify seasonal variations in income availability.
- To identify seasonal variations in (in)direct contributions of GW.
- To identify seasonal variations in health issues.

Who with?

- Work with a small group of informants (typically no more than 10).
- It is suggested that this exercise is conducted with at least with two groups: men and women.
- It may also be useful to work with different socioeconomic groups or groups with very distinctive livelihood strategies (e.g., herders or fishers), as long as they constitute a significant part of the community).

What with?

- A large space or a spacious room.
- Writing/drawing materials of various colours.
- A flipchart, board or the ground.
- A camera to register all the material produced during the meeting.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following:

☑ *How do residents perceive a "year" and how do they divide it?*
☑ *How do people's economic activities and access to food vary across the year?*
☑ *What health problems occur regularly at certain times of the year?*

2. Start by discussing the different seasons of the year that residents typically distinguish. Establish whether participants are happy talking about months or whether they prefer to talk about seasons or particular 'marker' activities (e.g., harvest season).

3. Once you have agreed on the local season, ask them to identify when they consider that the year 'begins' and why.

4. Draw a table with the seasons/ months in the top row, starting with the 'beginning' of the year as specified by the participants.

5. Ask participants to list the main crops they cultivate. Include both cash crops and those grown for own consumption. Draw a separate row on the table for each crop. Use symbols to represent them (as agreed by the participants).

6. For each crop, ask participants to indicate during which part of the year they perform the different stages of agricultural production (e.g., when is the harvest and planting season).

7. Use lines or bars to indicate the time interval in which these (and subsequent) activities are performed. Make sure to use some indicators of intensity (e.g., draw a bigger/taller bar, a peak in the line trajectory, or a circle in the peak season to show when the activity is more intense).

8. Next, ask participants to list the main income-generation activities they conduct (try to focus on the most important). Explain that we are interested in farm and non-farm income-generation activities as well as any subsistence activities that residents conduct on a regular basis (e.g., seasonal work as farm labourer, seasonal migration to cities to work).

9. For each of the income-generation activities listed, ask the participants to indicate the time of the year in which they are engaged in these activities. Remember to use indicators of intensity to signal when they dedicate most of their time to these activities.

10. Ask participants to indicate the labour involved in each activity during the year for both farm and non-farm based income generation activities. Ask who does which activity (men, women, children, hired labour).

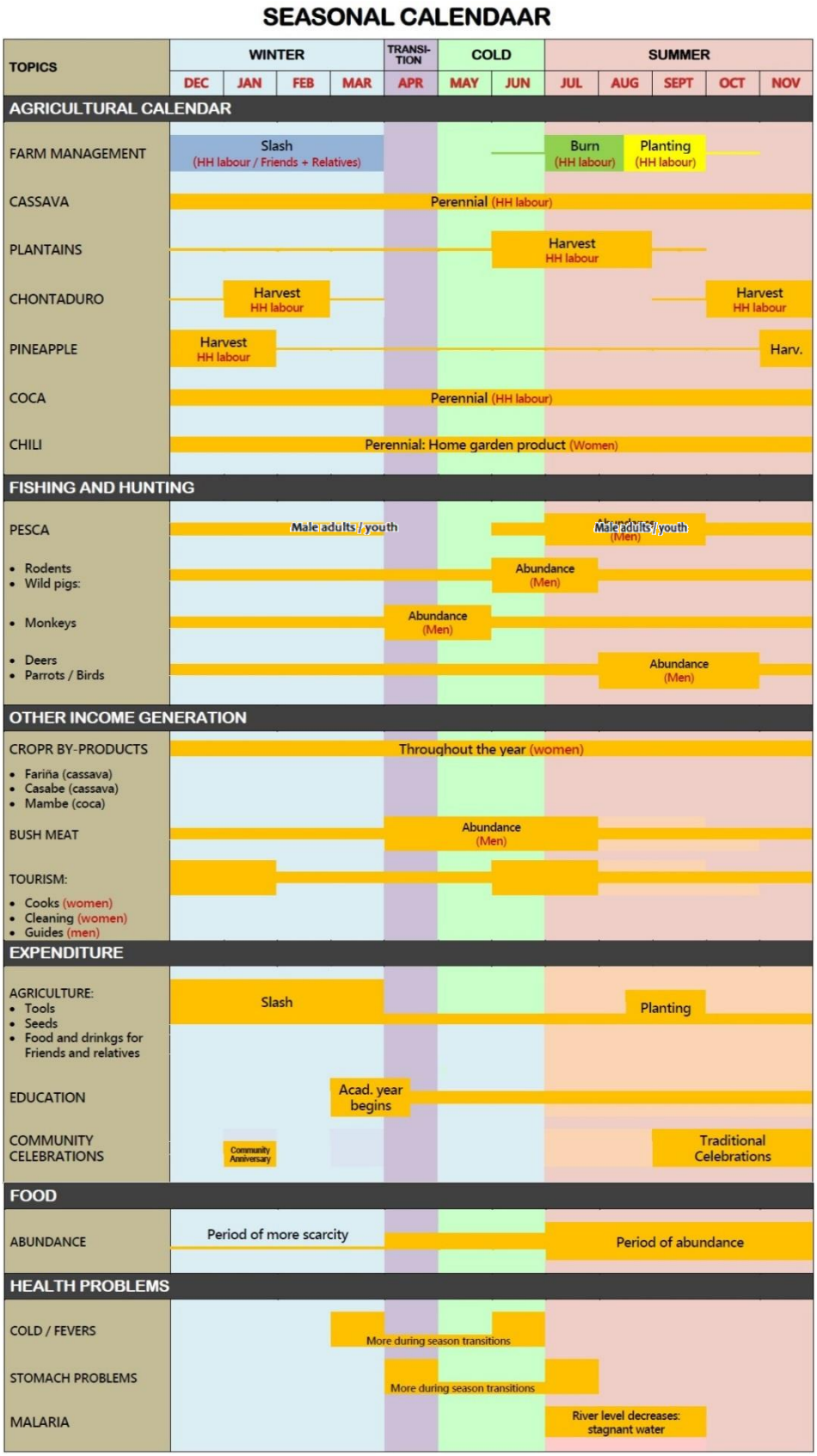
11. If, as part of seasonal work, HH members migrate to other areas, distinguish between migration to cities and to other rural towns or plantations.

12. Next, ask participants about household expenditure in a year. What are the seasons / months in which they spend most of their money and resources? List briefly the main reasons.

13. Draw a separate calendar or add a line to the existing one and ask about water security. Ask participants to identify the periods when they have greater access to quality food and when they face severe food shortages (or have to resort to low-quality food to survive). Note the main reasons.

14. Draw a separate calendar or add a line to the existing one and ask about local health issues. Ask participants what kinds of diseases are present in the area and during what periods of the year most people become ill with these. Identify which HH members are more likely to fall ill (children, adults, the elderly). Ask briefly about the main reasons.

Example of a comprehensive seasonal calendar



☞ The proposed exercise will generate a long calendar with many rows. It is useful to repeat the headings marking the calendar's seasons after every few rows of information so as to keep the different sections of the graph adequately aligned.

15. Analyse the calendars with the participants, using the following checklist:

Agricultural calendar

a) Do all farmers cultivate the same crops? Why do some cultivate other crops?
b) Are the main planting and harvesting seasons the same for all the villagers (you can use any other agricultural "markers" that were highlighted in the group)? Why?
c) Ask about the balance between consumption and sale for local crops. How much is usually destined for the market? How do residents decide the amounts to be sold/consumed?

Income generation activities

d) Is the calendar of income-generation activities the same for all villagers? Are there any activities that are more important to other residents? Why?
e) Ask about the contribution of these different activities to local households' income:
   i. How much of the total income families get comes from the commercialisation of farm products (e.g., crops, livestock, etc.).
   ii. How much of the total income families get comes from waged labour work (farm or non-farm)?
   iii. How much of the total income families' get comes from the commercialisation of other local natural resources (e.g., fishing, hunting)?
   iv. Who keeps or decide what to do with the income generated from each of these activities?
f) Do prices of crops and other natural resources that are sold fluctuate constantly? Why? Is it possible to negotiate a good price? How are prices settled?
g) In terms of wages and salaries, do they fluctuate constantly? Why? Is it possible to negotiate obtaining a good payment? How are wages established?
h) How do people manage at those times of the year when there is high expenditure but low income?
i) Where do people usually migrate to find work? Do migrants come to the area at particular times of year? What is the main work they do over there /here?

Food and water security calendar

j) What factors do people think cause food and/or water shortages at particular times of the year?
k) How do people manage at those times of the year when there are food and/or water shortages?

Changes in seasonality

l) From your personal experience, would you say that this seasonal distribution of crops, income generation activities, and water security and health has changed in the past 10-20 years (use local knowledge to select reference period)? What aspects? Why?

16. Thank the participants. Copy the diagram and take pictures of it.

EXERCISE M: WATER SECURITY FOCUS GROUPS

What for?

- To outline local understandings of 'water security' and relevant indicators.
- To identify seasonal variations in water (in)security.
- To identify and assess GW's resources contributions to local water security.
- To identify changes in GW's resources contributions to water security over time.
- To identify drivers of change in the GW's contributions to water security.
- To identify within household differences in terms of water security.
- To describe the coping strategies used to deal with seasonal and inter-annual water insecurity.

Who with?

- Work with a small group of informants (typically 10 at most).
- It is recommended that this exercise is conducted with two different groups of informants: the better-off and the worse-off, given that their experiences of water security may differ substantively.
- If women and men have substantively different domestic roles it may also be useful to conduct separate groups with them (e.g., if there is seasonal migration, women may stay at home looking after their children for a lengthy period of time).

What with?

- A spacious area/room.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following:

   ☑ *Are people from this community able to obtain more water than others throughout the year? If so, who is water 'secure' and who is not? What are the factors behind these differences?*
   ☑ *What do people do when facing water shortages? Are there any local or external support services to address these shortages?*
   ☑ *To what extent do changes in access and control of local water resources affect residents' livelihood security, either directly or indirectly (e.g., by generating income-generation activities)?*

2. Start by discussing how residents understand water 'security' and 'insecurity'. You may use the following prompts:

   ☑ *Is it just about having enough water for domestic or productive purposes? What other factors matter?*
   ☑ *What do they consider to be a sufficient amount of water – per person or household? Why?*

3. Ask participants to establish local indicators of water insecurity at the household level. You can use the following prompts:

   ☑ *At what moment do they consider that their families are not water 'insecure'?*
   ☑ *Are these conditions persistent throughout the year or are they mainly seasonal?*

4. Ask participants to establish local indicators of water insecurity at the community level. You can use the following prompts:

   ☑ *What elements tell them that the community as a whole is facing water insecurity?*
   ☑ *What changes in water availability and/or us indicate that the situation is worsening in the area?*
   ☑ *How do they know that water insecurity is affecting most children in the community?*

5. Taking into consideration the information reviewed, discuss the following issues:

   a. Availability:

      i. Is there enough water available throughout the year? Can you opt for a different source if they are not available in the one most used?
      ii. In general, how much of the water that is consumed each year is obtained from groundwater sources? Are there any periods when groundwater sources becomes more or less important? Do participants collect water from unprotected sources (e.g., open wells, river, etc.)?
      iii. Is this a common practice throughout the year or only during dry seasons? Are there any periods when they cannot count on those sources? What proportion of water comes from unprotected sources?

   b. Affordability:

      i. Do participants always need money in order to obtain food for their family? Are there any periods in the year when they do not need to get food from the market? Why?
      ii. Are there any periods when residents cannot afford to purchase water? What are the main reasons (e.g., lack of income or increase in prices)?
      iii. Is there more than one place to go to purchase water? Which ones are used most? Why? Is it possible to save some money by visiting different markets?
      iv. Do water prices fluctuate a lot across the year? Are there any efforts to control the price of water by either local organisations or the government?

   c. Access:

      i. Are there any formal or informal norms that prevent people from accessing water resources for either consumptive or productive purposes? Which groups are affected?
      ii. Are there any formal or informal norms that prevent people from accessing groundwater resources? Which groups are affected by these rules?
      iii. Are there any formal or informal norms that prevent people from earning enough money to purchase water (e.g., hiring practices of wage labour may exclude women or men from certain ethnic minorities)? Which groups are most affected?
      iv. What happens within households? Do all family members eat the same food or do parents have certain preferences? Is it the same when there are food shortages?

   d. Stability:

      i. Throughout the year, do participants have enough water to prepare food the way they would like to? Are there any other shortages that affect the way meals are prepared (e.g., seasons when access is limited)?
      ii. When there are water shortages do people eat things they would not eat normally (use a local example); are there any health problems that arise from these dietary changes?
      iii. In the long term, what health problems result from people facing repeated water shortages year after year? Which ones are most prevalent in the village?

   e. Explore other dimensions that may have emerged from the discussion in question 3. (e.g., if water security is associated with issues of social order, such as conflicts over water between sedentary farmers and pastoralists):

      i. How do these factors affect families' access to water?
      ii. Are they present throughout the year?
      iii. How do they affect residents' relations within the community? And with their neighbours from other communities?

6. Discuss if participants believe that the levels of water (in)security are similar across the community. Explore differences related to geographic, social, economic, or cultural characteristics (i.e., if there are significant differences between men and women; youth, adults, and the elderly; the poor as compared with the well-off; people living in other areas; or between ethnic / religious minorities).

7. Discuss whether participants believe that the levels of food and water security in the area have increased or decreased over time (e.g., as compared to 10-20 years ago). In particular, explore the following:

a) Have they noticed changes in water availability over time? Is this the case for both surface and groundwater sources or do they show different patterns?
b) Has their capacity to produce food in their farms decreased or increased over time? Why?
c) Does the hungry season(s) last longer today than in the past? How much longer?
d) Do local markets offer more alternatives for acquiring cheap food than in the past? Are they adequate/healthy options?
e) Do they consider that the quality of water they consume has improved or worsened in the past decades?

8. Ask participants if there have been any external interventions, either from NGOs or the government, that have significantly affected the levels of water security in the area. Were the effects positive or negative? Why?

9. Ask participants to suggest what kind of external interventions or forms of support (from the government or NGOs) would help them to improve the levels of water security in the area. Ask for reasons.

10. Ask participants if they consider that the community can do something to improve their levels of water security in the area. Enquire about reasons.

11. Discuss the coping strategies people implement during periods of water shortages:

☑ Ask people to describe what kind of things they do in order to obtain water for their families in periods of water shortages. Generate a list of coping strategies.
☑ Discuss which coping strategies participants believe to be the most effective and why.

12. Ask participants if they have any questions or additional comments to make.

EXERCISE N: WATER INSECURITY CAUSE-EFFECT DIAGRAM

What for?

- To identify changes in water (in)direct contributions to livelihood security.
- To identify the effects of changes in ground(water) availability, access and use on livelihood security, local livelihoods and well-being.
- To describe current adaptations and responses to water insecurity.
  - To identify potential future scenarios on land use, GW availability, access and use, and community's water security requirements.
- To identify potential future responses to manage or reverse trends in land and water use affecting residents' water security.

Who with?

Make sure that this exercise is relevant to the study-site. Unless the communities face regular periods of food scarcity, this kind of exercise may not be relevant since residents cannot establish adequate links between drivers and pressures.

- You can conduct this exercise with a cross-section of the community (e.g., poor and better-off residents, neighbours from different areas, men and women, etc.) if water insecurity is present across all social groups in the area.
- If hunger is experienced by certain sectors in particular, it may be useful to undertake this exercise with separate groups according to whether their experience with this issue is direct or indirect.

What with?

- A large space / room.
- Coloured paper or cardboard cards.
- Writing/drawing materials of various colours.
- Flipcharts, a board, wall or the ground.
- A camera to register all the material produced during the meeting.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise to participants. In general, you want to learn about:

   ☑ *What factors do participants perceive to be the causes of water shortages in the area?*
   ☑ *What are the consequences of water insecurity in the area?*

2. Briefly present the definition of 'water (in)security' developed in the previous exercise (Exercise M). Make sure most participants understand the topic and agree on a general definition.

3. Write the title WATER INSECURITY in bold letters and place it at the centre of the flipchart, black board, ground, etc.

4. Ask participants to discuss / brainstorm about the multiple causes of the phenomenon. Make a list of them in no particular order.

5. Write the causes identified on cards (or draw them). Place them on the lower half of the diagram (their specific location may be adapted according to space available).

6. Ask participants to specify if they believe the relationship with food insecurity / hunger is direct (e.g., food theft or rustling -> food insecurity) or indirect (e.g., diminishing rains -> poor crops -> food insecurity). Connect them using arrows.

7. Discuss with participants if the causes identified, in turn, have some other processes or factors generating them, (e.g., limited water availability for irrigation -> poor crops -> food insecurity; but 'limited water availability' may, in turn, be caused by 'erratic rains' or 'increasing water consumption upstream by other villages').

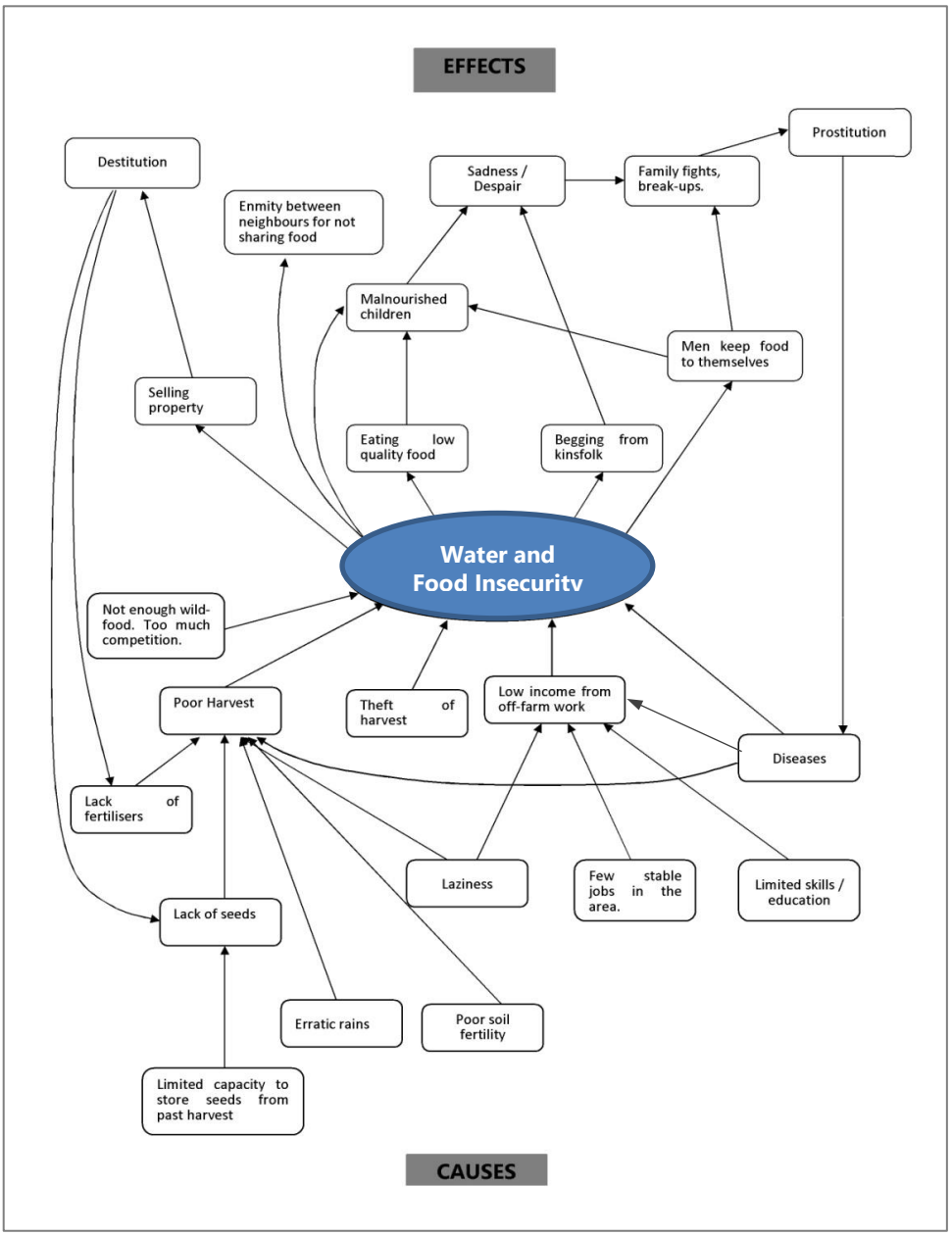
8. Read all identified causes to the participants and ask for any confirmation or additions.

9. Repeat the same process for the effects, placing them on the top half of the chart. Make sure that effects include people's reactions to cope or deal with food insecurity (e.g., seasonal migration).

10. Ask participants if there are any links between causes and effects. To avoid excessive circularity, focus only on the most important ones.

11. Ask the participants to review the diagram and check for corrections or additions.

Example of cause-effect diagram



12. Analyse the diagram with participants:

Local water insecurity: drivers / pressures

a) What causes do informants consider the most important? Why?
b) Which of the effects listed do they consider to have the greatest impacts in their well-being? Why?
c) To what extent have the causes identified increased or decreased (improved or worsened) in the last 10-20 years? What about the effects?
d) What causes of water insecurity do participants believe are beyond the community's capacity to intervene? Why?

Responses / Adaptations

e) Have there been any initiatives from the community to improve any of these factors (either causes or effects)? What were the results? Why? (If none were organised, why?)

f) Have there been any initiatives from the government, NGOs or other external agencies to improve any of these factors? What were the results?

Potential future responses

g) What kind of community initiatives do participants believe could be organised to improve water security in the area?
h) What kind of interventions – either from NGOs, international agencies, or the government – do participants believe would be useful to address some of the causes of food insecurity in the area or their effects? Why?

13. Review your notes with the participants. Ask if they have any questions or comments.

14. Take pictures and reproduce the matrix.

EXERCISE O: COMMUNITY TIMELINE ON WATER SECURITY

What for?

- To outline changes in local livelihoods and living conditions in the recent past.
- To depict perceived inter-annual changes in water security.
- To outline key changes in local forms of land and water use in recent decades.
- To identify key drivers leading to changes in local livelihoods and living conditions.
- To identify key drivers leading to changes in water security.
- To identify key drivers leading to changes in local forms of land and use.
- To describe current responses and adaptations aimed at addressing water security issues.

Who with?

- Work with a small group of key informants who are knowledgeable on the history of the community. This should include community leaders and elders. We recommend that you include one or two respected younger members of the community as well.
- For communities with 'large' populations (e.g., over 100 households), it may be useful to carry out this exercise with different groups, according to the likelihood of their having experienced different historical trajectories with livelihoods and food-security (e.g., residents of different well-being status).

☞ Be aware that local customs may prevent young residents from participating freely in discussions where figures of authority are present. In such cases, you may need to work with separate groups.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following:

   ☑ *The history of the community.*
   ☑ *The main events that have affected the capacity of residents to access and use (ground)water resources or to obtain enough income to acquire them.*

2. Start by discussing the general history of the community. When was it founded and when were key landmarks built (e.g., school, road, irrigation canals, boreholes)?

3. Ask one person who has lived in this area the longest to identify the major events in the history of the community that changed people's living conditions and livelihoods in the area (e.g., when was maize first introduced in the area or a new access road built).

   Establish the date when these events took place (a rough estimate is OK). Ideally, identify events at 10 year intervals, and distinguish between national and local events. Other participants may help to complete the list after the initial list of events is developed by the key informant.

4. Ask participants to identify any key external interventions that have affected their livelihoods and living conditions (e.g., when the government introduced a system of subsidies for seeds and fertilizers).

5. Ask participants to identify any key events in the community's history that affected people's access to food either temporarily (e.g., a severe drought) or permanently (e.g., drying up of a local river). Include both negative (e.g., famines, droughts, pests) and positive events (e.g., development projects either by the government or NGOs).

6. Review the list of events and confirm with the group their chronological order and estimated dates. Order them in a column.

7. Ask the informants to describe the main changes generated by the events identified in terms of livelihoods and living conditions (e.g., with new road it was easier to sell local produce in the market so that access to cash increased in the community). Make sure to obtain a description of local material conditions <u>before</u> the event. Write a summary of these changes in a new column next to the timeline of events.

8. Next, ask participants to describe the effects of these changes over the community's access to food and general well-being. Enquire about how these processes took place (e.g., greater access to cash among residents prompted them to rely more on products from the market, leading to a change in diets).

☞ Make sure that, in your chart, you have enough space after each event so that others can be inserted if they come later in the discussion.

Example of community timeline output

DATE	EVENT	GENERAL IMPACTS ON LIVELIHOODS AND LIVING CONDITIONS.	EFFECTS ON WATER SECURITY

9. After the table has been generated, ask participants to identify which of the events listed they consider to be the most important to explain their current situation in terms of living conditions and water security. Ask them why.

10. Ask participants if they consider that the different external interventions, either from NGOs or the government, have helped them in the long-run to improve their living conditions and water security. Ask them why.

11. Review your summary of events with participants and ask for any additions or amendments.

EXERCISE P: COPING STRATEGY FOCUS GROUP

What for?

- To describe the coping strategies (CS) used locally to deal with water scarcity.
- To rank the coping strategies used according to their severity.
- To outline the main social, economic, spatial or environmental factors affecting households' capacity to adopt CS.
- To identify a list of water sources (piped/unpiped, surface/GW) used in times of scarcity.
- To describe historical changes in the adoption of CS.
- To outline the main drivers of historical change in the adoption of CS.

Who with?

- You need to conduct this exercise with different groups according to key variables affecting households' water security status (e.g., landholding, ethnicity, sex, etc.). We recommend that, as a minimum, you contrast better-off and worse-off residents.

☞ Be aware that in contexts of significant temporary migration you may need to contrast groups of residents who stay put during periods of scarcity (usually women) with those who migrate seasonally.

What with?

- A large space / room.
- Writing/drawing materials of various colours.
- A flipchart, board or the ground.
- A camera to register the material produced during the meeting
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following:

☑ *What measures do people take in order to deal with water shortages?*
☑ *How do people cope with water shortages under extreme circumstances?*

2. Review with participants the main definition of 'water (in)security' developed in previous exercises as well as the main water security issues the local population face at present (Exercise M: Water Security FG and Exercise O: Community Timeline on Water Security). Ask them if they agree with these key findings.

3. Begin a brainstorming session about the different strategies residents adopt in order to cope when they have no access to adequate water or lack the means to acquire it. Explore local variations on the following general coping strategies (CS):

☑ Changes in type and quality of water consumed).
☑ Rationing strategies (e.g., reducing volume consumed, serving children instead of adults, serving working members at the expense of dependents, etc.).
☑ Short-term increases in water access (e.g., borrowing, selling assets, etc.).
☑ Changes in the number of household members to serve (e.g., sending children to stay with relatives or forced temporary migration).

4. People may generate an extensive list of strategies; make sure you explain the following inclusion criteria to participants:

☑ CS refer to practices adopted specifically during times of scarcity, not to practices used routinely for acquiring water (e.g., purchasing water supplies on credit may be a practice performed customarily throughout the year).

☑ Strategies adopted during extreme one-off events should not be included (e.g., stealing water during a severe drought a decade ago but it is not a regular practice).
☑ Participants should be able to adopt and reverse CS as their water requirements demand it

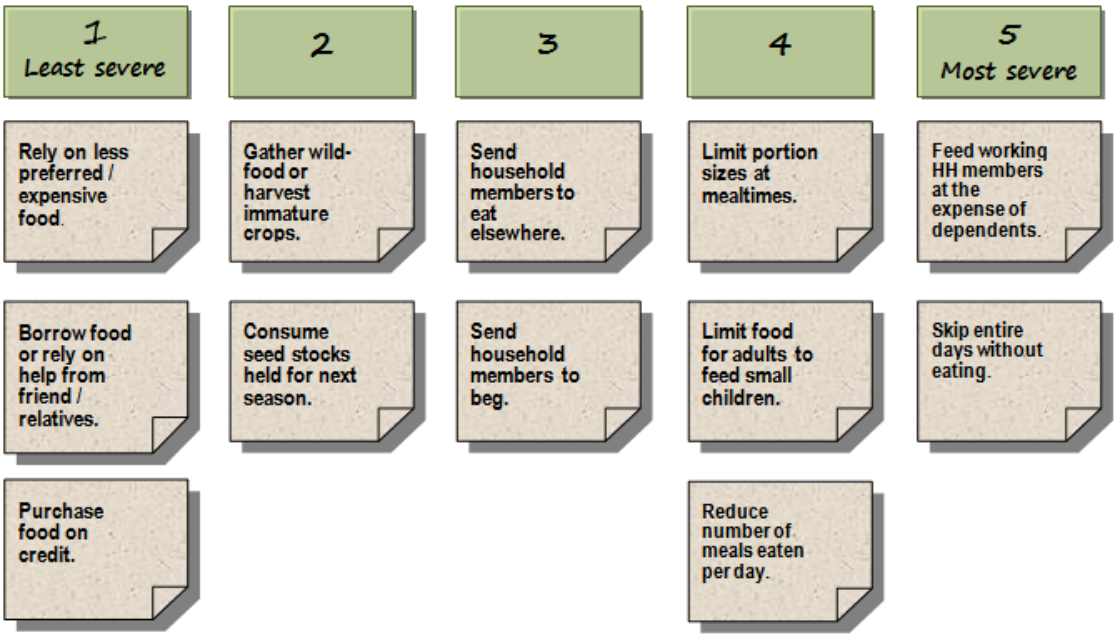
5. If the list of CS is too extensive (e.g., over 15), ask participants to identify those CS that have been more commonly used in the past decade.

6. Write each of these CS on a card. Use symbols to represent them if necessary.

7. Sort and group the CS cards according to their 'severity' (i.e., the most severe are used under the most extreme circumstances whilst the least severe are the ones used when water shortage is mild):

- Try to group the CS into 4 to 5 different categories of severity.
- Identify first the most and least severe of the strategies listed. Number '1' will represent the least severe CS and '5' the ones used under the most extreme circumstances.
- Proceed to ask if the others are similar in terms of severity or are placed in an intermediate category.
- Once all CS have been grouped, review the results with participants and ask if they want to make any modifications.

Example of sorting CS according to severity using cards



Derived from Maxwell & Caldwell 2008

8. On a flipchart, write each CS in a row and add five columns titled: (i) conditions needed, (ii) triggers, (iii) examples, (iv) time, and (v) consequences.

9. Ask the following questions <u>for each of the CS</u>, starting with the least severe one and fill in the corresponding cell (go through all five topics before moving to another CS):

a) <u>CONDITIONS</u>: What resources and conditions are necessary to make a CS work? What factors determine whether you can adopt a CS successfully or not? Explore both material and non-material factors (e.g., credit to buy food may be obtained only by homeowners; obtaining enough wild-food to feed a family may demand considerable help from family members; sending children eating elsewhere may work only if better-off relatives live nearby, etc.).

b) <u>TRIGGERS</u>: What factors make people decide that is necessary to adopt a particular CS? Explore material (e.g., lack of cash or assets to sell) and social factors (e.g., no relatives in town) as well as environmental issues (could be big events, like a 2-year drought, or small consecutive ones, such as brief periods of shallow rains during the rainy season, which ruined water-demanding crops).

c) <u>EXAMPLES</u>: Can participants provide any historical examples of when villagers adopted these CS? What were the environmental and socio-economic circumstances of the time (e.g., people resorted

to begging after two years of droughts, when government´s food donations were suspended and inflation increased food prices). If possible, specify the year when events occurred.

d) TIME: For how long can people usually get by using a given CS? Why? (General estimates are ok).

e) CONSEQUENCES: Are there any negative effects that result from implementing a CS either in terms of health, social standing, or economic obligations? (e.g., repayment of credits and loans may imply selling next harvest at very low prices or working for free; prostitution risk, HIV, etc.).

Example of Output

Coping strategies	Severity Group	Conditions / Resources needed	Triggers	Examples	Time family can get by	Negative consequences
Rely on less preferred / expensive food.	1	– Local markets have variety of cheap foods. – Family has some cash savings. – Family members are healthy. – Wild-foods are still possible to obtain from forest, rivers and lake.	– Food stocks will not last more than a month. – Usually when there was less rain than expected (shallow rains during most rainy season). Crop yields are not enough. – Little work around due to poor crops.	– Almost every year. – In 2011 families that have only rain-fed farmland had little water for main agricultural campaign. – Seasonal rains were not enough. Shallow rains for three months.	– 3/4 weeks (depending on family size and savings or food stocks)	– Sometimes the cheap food is not well-preserved. Children get stomach problems. – Children don't like it. – Requires more time to cook and more firewood.
Borrow food from friends or relatives.	1	– You need good friends and dose relatives nearby. Newcomers (tenants) have more problems. – You need to have a few well-off relatives. – Based on reciprocity, you need to be able to return the favour (some savings or assets are needed).	– Food stocks are dose to empty. – Income does not compensate for the lack of food. – Poor crop yields to lack of irrigation and rain.	– Almost every year. – Last year (2011), same period as described before.	– 2 or 3 weeks, depending on wealth and extension of connections / relatives.	– Conflicts with relatives if cannot return favour. – On occasions one has to repay in labour. May receive no or little payment for a lot of work.
Gather wild-food or harvest immature crops.	2	– You need help from many family members to gather enough food. – It takes time. – You need to be healthy since you have to walk far and spend time under sun. – Wild-foods have not yet been depleted by residents.	– Food stocks are empty. – There is no work available. Almost no money to buy in market. – When droughts or floods ruin most local crops (district / valley level).	– Three years ago (2009) during a drought. The rainy season lasted less than 1 month. Most crops failed.	– 2 or 3 weeks of food, depending on competition and season.	– Food is mostly low quality. – People become thinner and have stomach problems. – Due to competition, neighbours sometimes are in conflict. Fights may occur. – People don't talk to each other.
Restrict consumption by adults in order to feed small children.	4	– Adults and teenagers need to be rather healthy. – Family still has some forms of access to some food.	– Food stocks empty. – Children are getting ill. – No support from friends / relatives. – Food shortages have been going on for more than 6 months. – No rains for two years (crop failures for two consecutive years).	– 9/10 years ago (2001-2002). Severe droughts affected the region for two years. Most crops failed and there was no work in the area (general crisis). – Adults and eldest sons migrated temporarily or permanently. – Some aid was given but poor distribution (only a few benefitted).	– 1 or 2 weeks at most, depending on number of children and health of adults.	– Adults get sick. – Children are still eating low-quality food, getting sick and not eating enough. – Family break-up, members move away. – Adults may become thieves.
...	...	...	...	...	...	...
...	...	...	...	...	...	...

10. Ask the following for those CS that involve changes in diet or the consumption of wild-foods:

a) What products do people normally collect, harvest or hunt from local natural resources during periods of scarcity (e.g., mushrooms, nuts, etc.)?

b) Are these products collected within the village boundaries or in other parts of the district?

c) How far do people need to travel in order to access these areas (specify the time required)?

d) Do people face any problems when trying to access these areas in periods of scarcity? Do they have any conflicts with neighbouring villages or local authorities?

11. Review the list of CS with the group of participants. Discuss the following general questions:

a) How did they decide that one strategy is more severe than another? What factors did they consider?

b) Are there any groups of residents that are unable to implement some of the CS listed (e.g., men, women, elderly couples, the very poor, some who live in specific parts of the village)? Why?

c) Are there any differences in the CS that people use nowadays compared with those used 2 decades ago (use your local knowledge to choose a suitable time-frame)? What are the main differences?

d) Why do participants believe these changes in CS happened? Do they think that such changes were caused by variations in the condition of water resources (resulting from land use changes, shifts in government policy, other)?

12. Review your notes with participants. Ask them if they have any questions or comments to add.

13. Copy the table and take pictures of it.

EXERCISE Q: FOCUS GROUP AND TREND ANALYSIS ON GROUNDWATER RESOURCE MANAGEMENT

What for?

- To identify the (in)direct contributions of GW benefits to local livelihoods.
- To identify any negative effects from nature.
- To describe intra-household differences in terms of access to and use of GW benefits.
- To describe existing rights of access to and ownership of local GW resources.
- To identify any existing forms of competition or struggles over access to and use of GW benefits.
- To outline key changes on GW (in)direct contributions to livelihoods in recent decades.
- To describe current adaptations and responses to changes in GW relevant to local livelihoods.
- To identify potential future responses to manage or reverse trends in land use and GW affecting residents' livelihoods.

Who with?

- We recommend conducting this exercise with a cross-section of the community. Include residents that have been living in the area for a long time, men and women, and from different geographical areas.
- If the study area is very large, it may be practical to conduct this exercise with different groups of informants, each from different geographical areas.

What with?

- A spacious area/room.
- A flipchart, board or the ground.
- Writing/drawing materials of different colours.
- Coloured papers or cards.
- Local materials that can be used as markers (seeds, stones, etc).
- A camera to register all the material produced.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following:

☑ *How do the GW resources present in the community contribute to local livelihoods?*
☑ *Are all members of the community able to access and use these resources?*
☑ *What is the current condition of these resources and their main trend: are they decreasing or increasing?*

2. Begin by discussing the idea of GW as benefits from nature that support people's livelihoods and daily practices through the provision of diverse resources (irrigation, domestic use, livestock watering, etc.).

3. Ask people to brainstorm their dependence on surface and GW to conduct their main productive activities and domestic practices (e.g. agriculture, industry, health, education, cultural activities). Generate an initial list of GW sources and priorities.

4. Farming:

a) Given the importance of agriculture to local livelihoods and its high use of water resources, ask rural participants to identify the most important benefits they obtain from nature that are useful for their farming activities. Include both agriculture and livestock rearing (e.g., water sources used for irrigation, agro-processing, livestock watering, etc.). Prompt them to identify any final GW that have not been listed in the initial discussion (question 3).

b) Ask participants during which months of the year they usually make the greatest use of these GW resources and why.

5. Health. Ask participants to identify those GW resources that are considered important to protect or improve residents' health either by enhancing their health and well-being. Then ask about the periods of time when demand is higher and why.

6. Daily practices. Ask participants to think about other GW that might be relevant to their daily lives. Include both those resources relevant for material living conditions (e.g., sources of drinking water) and for socio-cultural activities (e.g., sacred sources for rituals or traditional celebrations). Then follow the same steps from the previous questions.

7. Update the initial list of GW benefits (step 3) with the information from the last discussions. Read it to the participants and ask them to select which ones have the greatest effects on their lives. Do the same with the list of negative impacts from nature. If participants' choices are too many, ask them to select the 10 most important.

8. Conduct a **TREND ANALYSIS** exercise for GW availability, access and use:

- Select time landmarks. You can use time intervals (e.g., decades) or identify certain years that had a significant effect on access or provision of final GW.
- Outline a matrix with the list of final GW sources in columns and the time periods in rows.
- Take up **one** GW source and ask participants to depict the situation today and then go backwards through each time-period.
- After discussing the present and past, ask participants what they think will be the state of this service / disservice in 10-year time.
- Repeat this process for each aspect listed until the matrix is filled.
- You may quantify changes using symbols, drawings, or markers (seeds, stones, etc.)

Example of trend analysis

TIME PERIODS	ES BENEFITS				
	Irrigation water (river)	Fish from the lake	Firewood (forest)	Mushrooms (forest)	Fruits (forest)
30 years ago	●●●●● ●●●	●●●●● ●●●	●●●●●	●●●●● ●●	●●●●
20 years ago	●●●●● ●	●●●●●	●●●●●	●●●●●	●●●●
10 years ago	●●●●	●●●	●●	●●●	●●●●
PRESENT	●●●	●	●●●	●●	●●
10 years future	●●		●●●●	●	●●

9. Discuss the chart with participants:

GW's contributions to livelihoods and well-being

a) How have these changes affected residents' economic activities? Why?
b) To what extent have these changes affected residents' water security and health? Why?

Responses / Adaptations to trends

c) How have residents adapted their daily practices (e.g., cooking, building, etc.) to these changes?
d) Have people changed their livelihood strategies to deal with these changes / trends? How?
e) Have there been any external interventions (from NGOs or the government) or policy restrictions (e.g., certain forms of GW use are now illegal) to manage or reverse those trends? Were they successful? Why?

f) Have there been any local initiatives (either from the community or other local organisations) aimed at managing or reversing these trends? Were they successful? Why?
g) Do participants consider that the community can do something else to control or reverse these trends? What and why?

Future scenarios

h) Ask participants to explain their depictions of the future. What factors did they consider?
i) Ask participants if they believe any of the trends identified is irreversible and why.
j) Ask participants if they believe that the community can organise any initiatives to control or reverse those trends? What aspects do they believe are beyond their capacity to intervene?
k) Ask participants to suggest what kind of external interventions (from NGOs or government) would be necessary to improve the condition of those aspects listed.

10. Review your notes with participants. Ask them if they have any questions or comments to add.

11. Copy the chart / graph and take pictures of it.

EXERCISE R: CAUSE-EFFECT DIAGRAMS FOR CHANGES IN GROUNDWATER RESOURCES

What for?

- To identify the effects of changes in groundwater availability, access and use on local livelihoods and well-being.
- To identify direct and indirect drivers that affect GW availability, access and use
- To assess the relative contribution of (in)direct drivers on observed trends in GW availability, access and use.
- To describe current adaptations and responses to changes in GW availability, access and use.
- To depict potential future scenarios on GW availability, access and use.
- To identify potential future responses to manage or reverse changes in GW availability and access that negatively affect local livelihoods.

Who with?

- Identify two or three different topics of discussion according to the main trends identified in Exercises H (Land and Water Use Focus Group) the participants consider relevant. You should conduct a different cause-effect diagram per topic.
- Participants should include community specialists on the use and management of key GW benefits (i.e., a group of water users and leaders of water users' associations).

What with?

- A large space / room.
- Coloured paper or cardboard cards.
- Writing/drawing materials of different colours.
- A flip chart, board, easy-to-clean wall, or the ground.
- A camera to register all the material produced during the meeting.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purpose of the exercise. In general, you want to learn about the following:

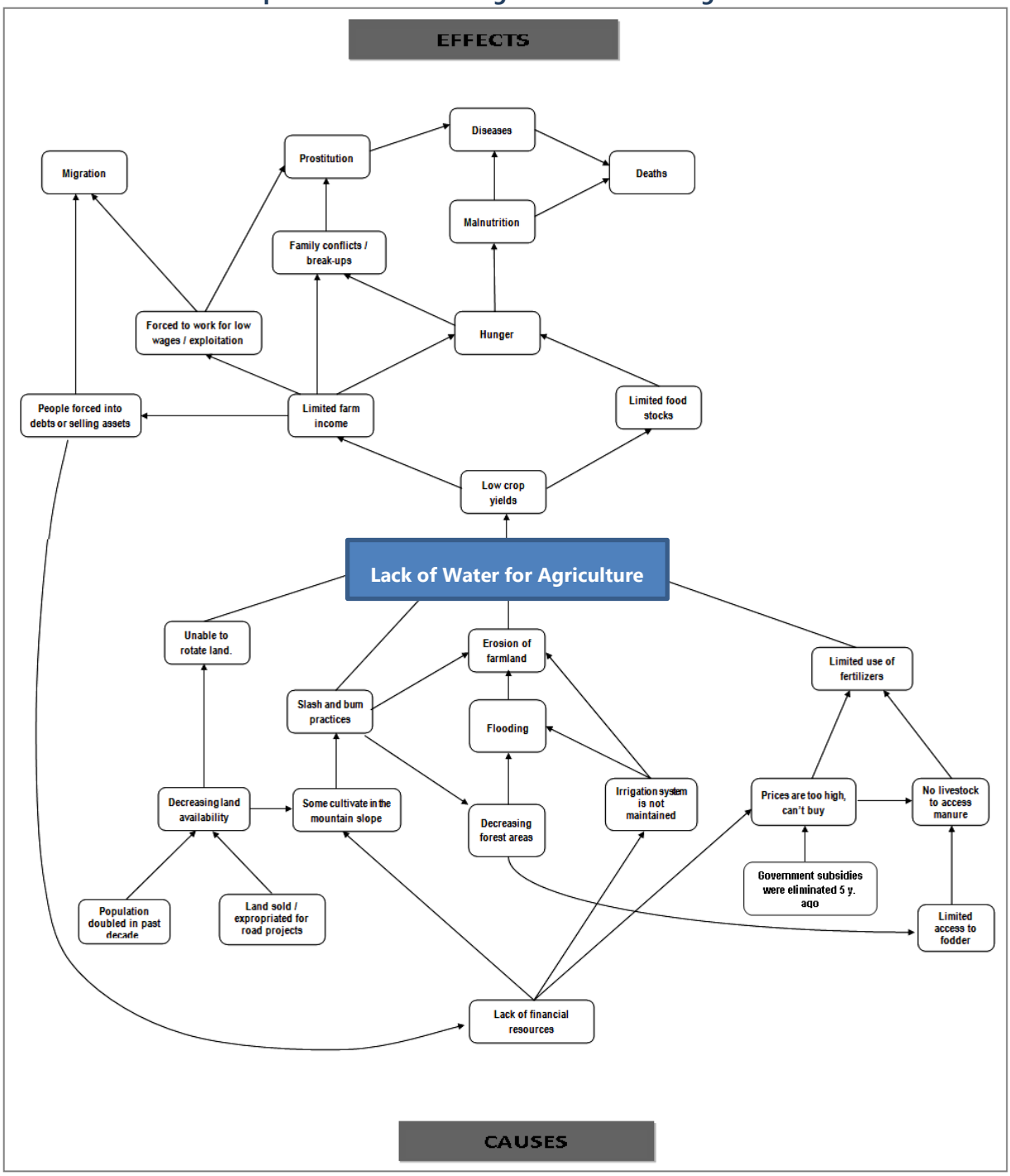
☑ *What do participants think are the causes of observed changes in the GW availability, access and use?*
☑ *What are the consequences of these changes for local livelihoods and water security?*

2. Present the topic of discussion based on the relevant findings from the previous exercise (e.g., observed changes in water for irrigation, etc.). Ask participants for their own views on this matter.

3. Generate a cause-effect diagram on the topic in discussion. Follow the same steps as in Exercise R: (Cause-Effect Diagram on Water Insecurity):

- Write the title of the discussion on a card. Make sure the topic refers to changes in a particular GW benefits / disservice (e.g., declining/increasing irrigation water availability).
- Ask participants to brainstorm the potential causes of the phenomenon.
- Sort all potential causes according to whether they are direct or indirect effects.
- Relate all causes using arrows.
- Repeat the same process with the effects of changes in the availability, quality or intensity of GW use.
- Make sure you also explore the potential links between changes in certain benefits from GW and others identified in previous exercises (e.g., an increase in the number of floods or droughts may be related to changes in GW availability).

Example of cause-effect diagram on water for agriculture



4. Analyse the diagram with participants:

Groundwater's contributions to livelihoods and well-being: drivers / pressures

a) What causes do informants consider the most important? Why?
b) Which of the effects listed do they consider to have the greatest impacts on their well-being? Why?
c) To what extent have the causes identified increased or decreased (improved or worsened) in the last 10-20 years? What about the effects?

Responses / Adaptations

d) Have there been any initiatives from the community to improve any of these factors (either causes or effects)? What were the results? Why? (If none were organised, why?)

e) Have there been any initiatives from the government, NGOs or other external agencies to improve any of these factors? What were the results?
f) What causes of changes in GW availability, access and use do participants believe are beyond the community's capacity to intervene? Why?

Potential future responses

g) What kind of community initiatives do participants believe could be organised to address the (ground)water changes identified in the area?
h) What kind of interventions – by NGOs, international agencies, or the government – do participants believe could help to address some of the changes GW availability, access and use? Why?

5. Review your findings with the participants. Ask them if they have any questions or additional comments.

6. Copy diagrams and take pictures of them.

EXERCISE S: MATRIX SCORING EXERCISE OF BENEFITS FROM GROUNDWATER RESOURCE USE

What for?

- To rank groundwater benefits according to their importance to address different social groups' needs.
- To identify intra-household differences in terms of access to and use of GW.
- To identify temporal and spatial effects over GW's (in)direct contributions to livelihood security and well-being.

Who with?

- It is best to conduct this exercise with various combinations of informants that have different livelihood strategies and assume different domestic roles (i.e. groups according to socioeconomic condition and gender). It is expected that these will value GW resources and their use in differently from each other.

What with?

- A spacious area/room.
- A flipchart, a board or the ground.
- Writing/drawing material of different colours.
- Seeds, coloured cards, or pebbles to signal scores.
- A camera to register the material produced.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

1. Explain the purposes of the exercise to participants. In general, you will enquire about:

   ☑ *Which benefits obtained from local GW resources are the most important for residents' livelihoods?*
   ☑ *Have there been any changes in residents' use and access to valuable GW resources?*

2. Review the information collected from the focus group on water (Exercise M) with participants. Present the list of surface and GW uses that were considered to have the greatest effects on local livelihoods, domestic activities and health. Ask them if they agree with those results. Take note of any additional key benefits mentioned.

3. Considering the list of final GW uses and any others added in steps 2 and 3, ask participants to select those that they consider to be the most essential for their livelihoods (15 at most).

4. Proceed to carry out a **matrix-scoring exercise** following the same steps as in Exercise M (group discussion on land and water):

   - Draw a matrix. Ask participants to place the final GW uses identified in the column section, in order of importance for local livelihoods and well-being.
   - Discuss with participants what criteria they used in order to decide which use was considered more essential than another. Make a list of all the criteria mentioned.
   - Write down these criteria and place them in rows (in order of importance).
   - Make sure the criteria are phrased in a positive direction (i.e., greater scores indicate a more positive feature).
   - Ask participants to work their way across each criterion and fill in the squares, giving each use a score (from a fixed amount, e.g. 10 beans, seeds or pebbles) and explaining why.

- Calculate the total score (down the column) for each use and discuss whether this is a true reflection of the prioritisation. [NB. Given that the criteria have not been weighted, the total scores are a useful trigger for discussion but should not be considered a quantitative 'fact'.]

Example of scoring matrix exercise

Criteria	Benefits				
	Firewood (forest)	Crab (river)	Fish (lake)	Wild spinaches (forest)	....
Contributes the most food or income for food	●●●●●●●●	●●●●●●●●	●●●●●●	●●	....
Easy to obtain / access	●●●●●●●●	●●●●●●	●●●●	●●●●●●●●	....
Little work required	●●●●●●●●●●	●●●●●●	●●●●	●●	....
Available all year	●●●●●●●●	●●●●●●	●●●●●●●●●	●●●●●●	
....	....	....	....	....	....

5. Compare the initial order presented in the column section with the results obtained from the matrix-scoring exercise. If there are any significant differences, ask participants to discuss why.
6. Check whether the rankings established would hold true in different years. Ask for reasons.
7. Check whether the rankings established would hold true for different groups of residents from the community (very poor or better-off, those living in different areas of the community or other kind of social groups). Ask for reasons.
8. Check whether the rankings established are equally important for all household members or not. That is, if there are different responsibilities for collecting / exploiting them (e.g., women may be in charge of collecting firewood but men or oldest sons are in charge of fishing from the river or lake).
9. Review your notes with participants. Ask participants if they have any questions or additional comments.
10. Make a copy of the matrix and take pictures of it.

EXERCISE T: VENN DIAGRAM AND GROUP DISCUSSION ON GROUNDWATER GOVERNANCE

What for?

- To describe land tenure and (ground)water governance arrangements at the community and household levels – both formal and informal.
- To describe rights of access and ownership over local land and water resources.
- To outline existing local community-based organisations that manage the local territory and ground(water) resources.
- To assess the extent to which existing management structures are accountable, transparent and inclusive.
- To identify local and external stakeholders influencing local GW governance and to describe the relationship between them.
- To identify main forms of conflict and competition over accessing or controlling GW resources.
- To identify potential future responses to manage or reverse changes in GW availability, access and use that affect local livelihoods and water security.

Who with?

If GW resources are managed in an integral manner by the community, the exercise only needs to be carried out once. If there are, for example, a number of organisations and committees with overlapping jurisdiction (e.g., if say a local water users' committee and a district water office both have some responsibility for GW management, then the exercise may need to be repeated).

Generally, it is best to work with at least two separate groups of informants:

- A small group of key informants who are members of the water committee(s). [The discussions with this group should provide information on how they think GW governance is supposed to work.]
- A small group of key informants who are NOT members of the resource management committee(s). [The discussions with this group are important to indicate how GW governance is perceived by those not involved in decision-making.]

☞ Given the sensitive nature of topics to be discussed in this meeting, be careful when selecting participants. Rely on your knowledge of the area to make sure no individuals or groups in conflict are included and that no close relations of authorities are present.

What with?

- A large space or room that can guarantee confidentiality to focus group participants.
- A flipchart, a board or the ground.
- Writing/drawing material and cards of various colours.
- A camera to register the material produced.
- A digital recorder to record people's interventions.
- A notebook to take notes.

How?

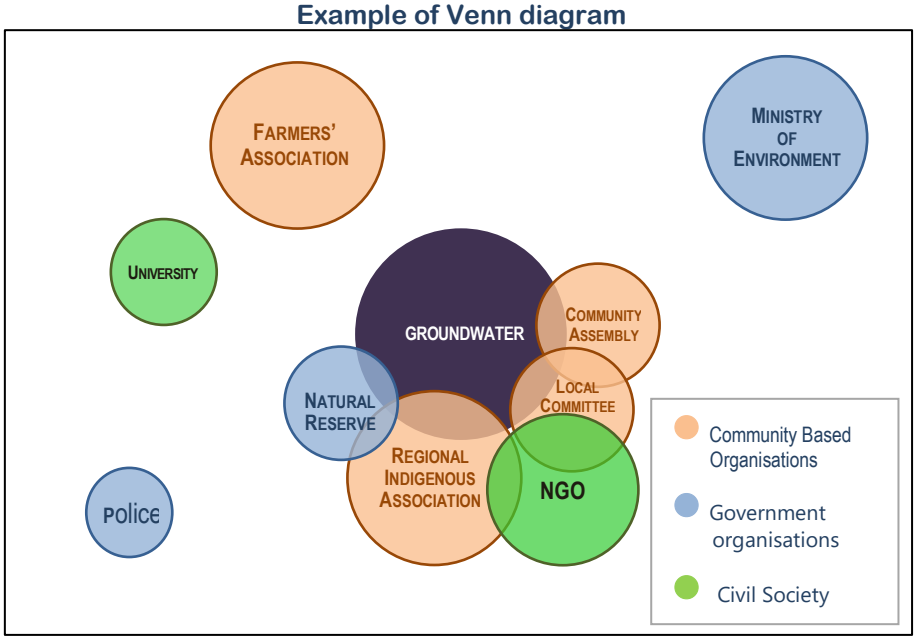
1. Explain the purpose of the exercise to participants. In general, you will enquire about:

☑ *What are the main organisations and institutions that manage existing local water resources?*
☑ *How do these organisations work and interact with each other?*
☑ *How do individual residents gain access to the (ground)water benefits managed by those organisations?*

2. Conduct a **VENN DIAGRAM** exercise to facilitate the discussion. This exercise is useful to: (i) identify those actors that influence how natural resources are managed, (ii) to identify which social groups are included in the functioning of these organisations, and (iii) to identify how these organisations relate to each other:

- Select a large open space where the diagram can be drawn.
- Explain the purpose of the Venn diagram.
- Ask participants to draw a big circle in the middle that represent the GW resource or use being analysed.
- Ask participants to draw different sized circles to represent each institution, organisation, group or key persons that has a say or influences how a given GW is managed. Use the following criteria to organise the circles being drawn:
  - Place circles near or far away from the central circle according to whether these actors have regular presence in the area where the GW is located or not.
  - Use different sizes to represent the importance or influence of the institution, organisation, group or person.
  - The contact between all actors is represented by the degree of overlap between circles:
    - Separated circles: No/ very little contact or co-operation
    - Circles close to each other: Loose contact or co-operation
    - Touching circles: Some co-operation
    - Overlapping circles: Close co-operation
  - If you have coloured drawing materials, you may use them to group organisations according to their nature (e.g., community organisations in red, government organisations in blue, academic institutions in green, etc.).

Example of Venn diagram



Taking into consideration the most important community-based organisations managing the resource in question (e.g., local forestry committee), as identified in the Venn diagram, discuss the following for each of these CBOs:

3. ***Formal decision making arrangements***

a) How are officers elected (or selected)?
b) What is the relationship between these organisations and the relevant government departments? Are they officially recognised, etc.?
c) How regularly do local committees meet? Who can call/attend meetings?
d) How do these organisations make decisions (e.g., by voting or consensual agreement)?
e) Do all opinions and interests seem to be equally considered during the decision-making process? If not, which groups are usually favoured? Why?

f) Are the decision-making process in these organisations / committees transparent (i.e. do people know why and how a decision was taken)?
g) How are decisions shared with the whole group and how do members submit issues for discussion?
h) Is there any form of political interference? What about local elites? Do they influence the local organisations' / committees' decisions? How?

4. *Accountability*

a) How accountable are committees / organisations? Explore the following:

- ☑ Democratic or political accountability (i.e., answering for following due process for decision-making and selection of officers)
- ☑ Financial accountability (i.e., answering for management of group's resources).
- ☑ Accountability for the performance of services (i.e., answering for the performance of the committee).

b) To whom are they accountable?
c) Is there legal recourse if the committees or an individual do not perform as they should? For example, how is abuse of funds dealt with?
d) What is the mechanism for resolving disputes between members and committee officials? Is there any form of political interference or from socioeconomic elites?
e) Is there any evidence of debate and dialogue around resource management issues?
f) Are committee members part of the local elite or 'average' residents of the community?
g) Has there been any rotation of committee officer posts recently or do they always tend to be the same people?
h) Do participants consider that committee officers are achieving their roles?

5. *Stakeholders involved*

a) What persons or organisations are involved in the functioning of the local committees? To what extent?
b) Are women / disadvantaged groups / ethnic minorities / immigrants actively included in the functioning of those groups?
c) Who has the power to negotiate rights in each of these organisations / committees?
d) What is the role of local people in selecting the form of management and allocation of rights?
e) How were these organisations / committees formed? Which sectors from the community were involved?
f) What is the role of local people in the management and planning of local natural resources (e.g., water, forest, communal farmland, etc.)?
g) Is there specific consideration of the needs of the poorest (or of disadvantaged groups)?
h) What is the knowledge of the management system amongst the general community?

6. *Potential future scenarios*

a) Review with participants your findings about trends in land and water use and GW benefit changes over time (Exercises H and O). Do they agree with them?
b) How have the relevant local committees acted in the face of these changes? Have they promoted, attempted to control, or reversed them? Why?
c) If these trends continue and the local committees do not act differently, what do participants think will happen to land and water use in the area and the condition of GW benefits?
d) Do they believe that any local efforts could be developed through local water users's associations to control or reverse the trends in land and (ground)water use? If not, why?
e) What circumstances do participants believe would convince local committees to act (more decisively) about these issues? Why?
f) Do they believe that local committees or authorities are able to convince external actors – either NGOs or government – to invest here so as to control or reverse these trends? Why?
g) What kind of external interventions, from NGOs / government would be preferable? Why?

☞ *The topics of this focus group are of a very sensitive nature. Make sure that participants are given all the guarantees necessary that all data will be kept confidential and their names will be modified in any report, article or dissemination material.*

EXERCISE U: COMMUNITY FEEDBACK MEETING

What for?

- To return the core research findings to the community.
- To discuss any future activities related to the research findings.

Who with?

It is recommended that this meeting includes the following community members:

- Chiefs and other formal community-level authorities.
- Residents who took part in the different PRA exercises.
- Representatives of various local associations relevant to natural resource management (water users associations, forestry committees, etc.).
- Members of the community who do not hold a formal leading position in the community but are influential: elders, heads of large families, healers, shop-owners, etc.

☞ It is not necessary to have a detailed complete analysis of the PRA data in order to organise this meeting. The latter can be organised after preliminary results and outputs are produced so as to avoid making the population wait for too long for some feedback. Full detailed findings and reports can be handed over to local authorities much later.

What with?

- A large print out of key PRA outputs that residents requested during data collection.
- A large poster containing a summary of key findings for the village.
- Dissemination material containing a summary of findings for the large population.

How?

1. Organise a large open meeting in coordination with local authorities. If open assemblies are not part of local custom, organise whatever meeting is considered appropriate. However, any dissemination material should be distributed across the entire community irrespectively of a resident's participation in the meeting or research.
2. Provide copies of the dissemination material to ALL participants before presenting your results.
3. Start by presenting, briefly, the nature of the research and its objectives. This will remind participants about what the project specifically intended to achieve.
4. Next, describe how the data-collection process took place. Describe the type of exercises produced, how participants were selected, the consent procedure followed as well as the compensation policy adopted. This will make transparent the inclusion criteria adopted and make explicit what kind of direct 'benefits' the project distributed among the population.
5. Before proceeding to present the research findings, ask participants if they have anything to add or comment on with regards to the procedure followed.
6. Present the research findings. The structure of the presentation may vary according to the interests of the population. However, it is recommended that the presentation includes the following key topics:
   a. Socioeconomic composition of the village:
      - Describe the socioeconomic groups identified in town.
      - Describe the socioeconomic composition of the village as perceived by residents.
   b. Land and Water Use:
      - Present the results of the PGIS map on land and water use, describing the main features of each major use identified.
      - Present the results of the trend analysis on land use, including visions of the future.

c. Water Security:
   - Present local definitions of water security and perceptions of resident's current conditions.
   - Present list of main surface and ground(water) sources and who uses them for what purpose.
   - Present the results of the trend analysis on changing availability, access and use identifying perceived key drivers of change.

d. GW's contributions for livelihoods:
   - Present list of final GW that residents identified as the most important for local livelihoods
   - Present list of GW development constraints that residents identified that affect their well-being the most.
   - Present the results of the PGIS map on GW resources, uses and users.
   - Present the results of the trend analysis on key GW resources, identifying perceived key drivers of change.

e. GW Governance:
   - Present the list of community-based, civil society and government organisations that residents perceive as key stakeholders in the management of local resources.
   - Present a general assessment of which organisations in particular residents consider the most influential.

☞ Discussions on inter-organisational relationships may be a sensitive matter. Be careful in presenting a consolidated review of findings (mixing leaders and non-leaders versions) so as to avoid identifying informants. Secondly, avoid detailing reported conflicts; emphasise collaboration rather than competition or opposition.

7. Present a general brief review of how village's trends fit into the regional-level findings for each of these topics. Do not focus on inter-village comparisons but on general commonalities or differences with overall trends. If comparisons are considered necessary, do not name village names so as to avoid any potential future competition.

8. After this presentation, ask participants again if they have any comments or observations.

9. Finally, present the future steps that the project will follow in the coming months. Explain how PRA data will serve to prepare for these new activities. Remind informants about the uses that the research team will make of the data generated and the confidentiality agreements that will guide any future publications.

10. If considered important by the local population discuss how they may make use of the information returned. Make sure, however, that you do not raise any expectations about imminent forms of support from external actors.

11. Provide the contact details for the local contact person who can provide more information after the meeting.

6

INFORMED CONSENT

6.1. Information Sheet: Key Informants

Use the form below to inform key informants about the nature of the project and his/her rights as informant. Be aware that this form is not a substitute for obtaining explicit consent from participants and key informants.

INFORMATION SHEET STRUCTURE

Project Title: **Groundwater Futures in Sub-Saharan Africa (GroFutures)**

Researcher: [Insert the names of the lead researcher supervising fieldwork]

Ethics number: [Add ethics committee number, if appropriate]

Please read this information carefully before deciding to take part in this research. If you are happy to participate you will be asked to sign a consent form.

What is the research about?

This research project aims to improve the scientific evidence base, tools and participatory processes by which groundwater resources can be used sustainably for poverty alleviation in Sub-Saharan Africa (SSA). It will improve understanding of the volume and renewability of groundwater in SSA and identify pathways toward more sustainable and equitable use of groundwater resources. It includes partners from Ethiopia, Niger, Tanzania, South Africa, France and UK. We would like to understand more about water security in this area and particularly how people's access and use of groundwater resources have changed over time. We also want to understand what community organisations and other government and non-governmental organisations make decisions about groundwater development and management. Finally, we are interested in understanding whether there are any opportunities for investing more in groundwater development that might benefit local people in this area, particularly poor people.

Why have I been chosen?

We would like to talk to you because you have specialist knowledge in a topic of interest to the project.

What will happen to me if I take part?

We would like to have an interview with you of no more than [Insert length of interview]. If you agree, we might come back at some point in the future to ask for clarifications or additional information.

Are there any benefits in my taking part?

We will provide feedback on the results of the research to participants. We hope that some of our research may help participants take more informed decisions. [Insert information about any other form of compensation adopted by the project].

Are there any risks involved?

We don't envisage any risks to your participation. We will ask questions about livelihood strategies. If you are at all uncomfortable with any of these questions, you are free to skip any question or to stop the interview at any time.

Will my participation be confidential?

We will keep all the information you give us confidential as far as the law allows. Any notes or recordings we make will be kept on a password-protected computer. We will only share your personal details or personal views with researchers in the project. Some of the information you

give us may be published, but your real name will not be used in relation to any of the information you have provided us, unless you tell us clearly that you want us to use your real name. You should know that even though we will avoid including identifying information in any publication, there is still a possibility that people will recognise you by the things you say. If at any time you feel concerned about what you are saying being disclosed, please feel free to stop and talk to us about it. If you say something that you later think should be deleted from our discussion notes, just let us know.

What happens if I change my mind?

You can stop this interview at any time, without giving a reason.

What happens if something goes wrong?

If you have any concerns about this research, you can contact… [Insert the contact details of the Principal Investigator for the local country partner]

Where can I get more information?

If you would like more information about this research, you can contact… [Insert contact details of local researcher coordinating fieldwork].

6.2. Consent Form: Key Informants

The form below is to be used AFTER the key informant has read the corresponding information sheet provided in section 6.1. It is expected that the key informant will sign the consent form attached. If for any reason this is not possible, you can ask for a recorded verbal consent in the presence of another team member.

CONSENT FORM: KEY INFORMANTS

Project Title: **Groundwater Futures in Sub-Saharan Africa (GroFutures)**

Researcher: [Insert the names of the lead researcher supervising fieldwork]

Ethics number: [add ethics committee numbers, if appropriate]

Please initial the box(es) if you agree with the statement(s):

I have read and understood the information sheet provided and have had the opportunity to ask questions about the study.	
I agree to take part in this research project and agree that my data may be used for the purpose of this study	
I agree that my participation in this study may be tape-recorded	
I agree that photographs may be taken of my participation in this study	
I understand my participation is voluntary and I may withdraw at any time without my legal rights being affected	
I understand that my real name will NOT be used in any publications (paper-based and electronic) resulting from this study	
I understand that information collected about me will be stored on a password protected computer and that this information will only be used for the purpose of this study.	
Would you like your real name to be used in the publications resulting from this study?	**Yes** / **No**

Name of participant (print name).....

Signature of participant.....

Date.....

6.3. Consent Form: Group discussion participants

This form will be used only for group discussions. Before the exercise takes place you must read the content of the form to all participants. Make sure that everybody understood the content of the form before proceeding. If any participant does not want to sign the form, you can give them the option of providing an oral consent. The latter should be recorded and granted in front of another research team member.

If you are working with a native population, you must prepare a translation in advance and there should be only one version used by all team members. This translation should be reviewed by a local resident prior to data-collection.

CONSENT FORM: PRA INFORMANTS

Introduction to the Research

Our names are [Insert the names of the team members leading exercise]

We are from [Insert the name of the project and local partners]

This research project aims to improve the scientific evidence base, tools and participatory processes by which groundwater resources can be used sustainably for poverty alleviation in Sub-Saharan Africa (SSA). It will improve understanding of the volume and renewability of groundwater in SSA and identify pathways toward more sustainable and equitable use of groundwater resources. It includes partners from Ethiopia, Niger, Tanzania, South Africa, France and UK. We would like to understand more about water security in this area and particularly how people's access and use of groundwater resources have changed over time. We also want to understand what community organisations and other government and non-governmental organisations make decisions about groundwater development and management. Finally, we are interested in understanding whether there are any opportunities for investing more in groundwater development that might benefit local people in this area, particularly poor people.

To start the research we are doing a number of exercises with different groups of people to get a general understanding of these issues in this community. We will organise a feedback session to present the information back to the community. We will then continue with further research with individual households.

In this exercise [insert name], we are interested in finding out more about……

We have asked you to participate because…… [insert reason, e.g. village elders, men, women, particular livelihood or water users' association].

The exercise will take about 2 hours but you are free to leave at any time. Before we start we want to make sure that you understand the research we are doing and what we will do with the information we collect.

Oral Consent Script

1. We have given you some information about this research. Did we make things clear? Do you want to ask us any questions about the study?
2. We will keep all the information you give us confidential as far as the law allows. Any notes or recordings we make will be kept on a password-protected computer. We will not share your personal details or personal views with anyone else. Are you ok with this?
3. Some of the information you give us may be published but your real name will not be used, unless you tell us clearly that you want us to use your real name. Is that ok with you?
4. You should know that even though we will avoid including identifying information in any publication, there is still a possibility that people may recognise you by the things you say. If at any

time you feel concerned about what you are saying being disclosed, please feel free to stop and talk to us about it. If you say something that you later think should be deleted from our discussion notes, just let us know. Is that clear?

5. If you mention anything you do not want us to publish, please say so and we will follow your request.
6. Be aware that you can stop this discussion at any time, without giving us any reason. Is that ok?
7. We would like to record this discussion with a digital audio recorder. That way we can listen to the recording afterwards and catch things you say that we might not fully understand during the discussion, or might otherwise forget. Only people in our study team will be able to listen to the recording. Do you give us permission to record?
8. If you agree, we would like to take some photos. We might use these in presentations or publications about this project. Do you agree?
9. Do you have any further questions before we start with the exercise?

Community: ..... **Date**: .....

Exercise: .....

Team member's names	**Signature**
.....	.....
.....	.....

Participants' name(s):	**Signature**
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6.4. Project's Compensation Policy

This policy concerns how we compensate local participants who contribute their time and knowledge to the project. This policy outlines the underlying principles which apply across the whole project. Local project partners will adapt these to align them with national and local norms in the project's research areas.

Underlying principles

1. A fair and transparent compensation policy applied consistently by all researchers in the project is important to maintain a productive and mutually respectful relationship with local research participants.
2. Compensation should be in line with national and local norms and not undermine the willingness of people to participate in future research projects. In general, compensation should be seen as a *'Thank You!'* gesture rather than compensation directly proportional to time spent.
3. Where possible, research activities involving community members will be organised at a place and time that is convenient to the participants.
4. For activities that require participants to travel from their usual places of residence/work, the project will either organise transport or compensate the cost of the transport.
5. In general there will be no compensation for small, one-off activities. However, for community or group level meetings that are longer than two hours duration, light refreshments will be provided. A meal should be provided for meetings that span more than four hours.
6. For prolonged and multiple interactions between researchers and the community (e.g. PRA with different groups in a community), compensation will usually be targeted at community level benefits. Where possible, compensation will be in kind rather than monetary. Examples might include (i) networking community agencies with external service providers; (ii) development and sharing of educational materials; (iii) community days or fairs in which the project helps arrange and sponsor an event which most community members would enjoy (e.g. a sports tournament, a dance festival, a food fair); (iv)provision of infrastructure (e.g. development of a community garden at the school or clinic, a footbridge over a difficult stream); (v) maintenance of neglected community infrastructure (e.g. painting of the community hall).
7. For households visited repeatedly, it may be appropriate to provide a '*Thank You gift*'. This should generally be offered towards the end of the project or specific research activity to limit or avoid any respondents changing their responses in an attempt to ensure or increase the flow of benefits. Examples might include: common food items (tea, sugar, maize meal, dried beans), or stationery for school children and the household, child growth charts, tree seedlings, cellphone airtime vouchers.
8. Where individuals are employed by the project to provide research services (e.g. translation at meetings, guiding in the field), they should be compensated according to the local day-wage practices.
9. Key informants interviewed in their official capacity (extension officers, local government officials) will generally not be compensated for their time, though transport expenses (if appropriate) and light refreshments may be provided.

7 REPORTING

This section presents the potential structure of a final report (Figure 12) consolidating all exercises reported in previous sections of this manual. This proposal will identify the key exercises that feed information into a respective chapter / section as well as the key topics that need to be covered.

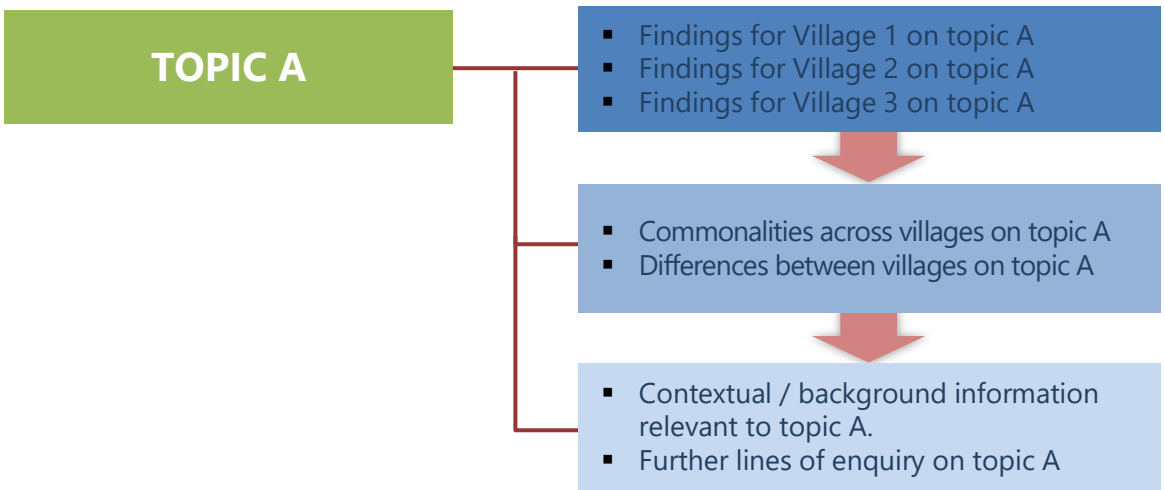
Authors should be aware that each item within the proposed structure needs to be further developed. The latter refers to following steps:

i. Each section should first present the data referring to each village studied.

ii. Next, authors need to consolidate the village-level information into a regional-level depiction of the topic in question. This should highlight the commonalities found across all sites as well as any key differences identified with relation to a given topic. The latter should be properly explained (if possible).

iii. Finally, each section should include a section in which relevant contextual information is provided so as to provide a potential explanation for overall findings or additional complementary information. This is the only section where you can include information from secondary sources (e.g., literature reviews, government reports, etc.). In addition, this section should highlight any findings that should be further investigated by the research team.

Figure 12. Presentation of findings per report section



1.1 Introduction

This section intends to provide background information to the reader in terms of the geographical location, infrastructure landscape features, and general history of the village.

a) Sources:

– Exercise G: Participatory land and water use mapping.

- Exercise J: Transect walks.
- Exercise O: Water security timeline.
- Exercise E: Well-being ranking

b) Structure:

1.1. Community's history: A brief narrative of the historical trajectories of the villages visited describing foundations dates, key changes in borders, form of local government, appearance of public services and overall historical periods as identified by locals.
1.2. Location: GPS coordinates per village.
1.3. Local landscape: A general description of boundaries and key geographical features (topography, types of land use, key water sources, etc.) per village.
1.4. Public services and infrastructure: A description of public services available in each village and details on local infrastructure investments (public and private).

<INTRODUCE HERE A REPRODUCTION OF THE PARTICIPATORY LAND AND WATER USE MAPS>

1.5. Population: Report the number of households identified per location and the key demographic characteristics of the heads of household (age, sex, and marital status).

1.2 Livelihoods and Well-being Analysis

This chapter intends to provide an overall depiction of local socioeconomic conditions. To achieve this objective, it will provide local definitions of wealth and well-being so as to present this topic using local terms. These definitions will lead to the establishment of key material and nonmaterial indicators of well-being that will serve to classify residents into socioeconomic groups. Once the latter have been defined, associated livelihood strategies will be described. This, in turn, will serve to identify, first, which GW resources are the most relevant to local livelihoods and well-being and, second, to assess their relative importance to different sectors of the community.

a) Sources:

- Exercise D: Group discussion on well-being and livelihoods.
- Exercise E: Well-being ranking.
- Exercise F: Household system diagram.
- Exercise H: Land and water use discussion [complementary source]

b) Structure:

2.1. Well-being: local definitions and socioeconomic composition

a. An outline of local understandings of 'well-being', 'wealth' and 'poverty' reported by residents.
b. A list of economic and non-economic indicators used locally to distinguish between socio-economic groups and an explanation of the rationale.
c. A description of the socio-economic composition of the study areas: (quantitative classification of households in different well-being groups).

<INTRODUCE HERE A PIE CHART THAT CONSOLIDATES THE SOCIOECONOMIC DISTRIBUTION OF HOUSEHOLDS ACROSS ALL VILLAGES TOGETHER (I.E., REGIONAL-LEVEL DISTRIBUTION>

d. An outline of key changes in local living conditions and inequality issues in the recent past
e. An outline of key factors driving the main changes in local living conditions for the recent past (according to whether they originated in the community or responded to external factors).

2.2. Livelihood strategies:

a. A description of local livelihood strategies (farm and non-farm activities) according to households' socio-economic condition.
b. A description of seasonal variations in livelihood strategies and productive practices.
c. A description of any significant historical changes (inter-annual) in local livelihood strategies.

d. An outline of key causes leading to inter-annual changes in local livelihoods (according to whether they originated in the community or responded to external factors).

2.3. Groundwater's contributions to livelihoods and well-being:

a. A brief (general) outline of the main (in)direct contributions of GW to livelihoods, water and food security and customary / traditional activities.

<INTRODUCE HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE HOUSEHOLD SYSTEM DIAGRAMS>

b. An outline of within-household distribution of domestic and economic roles as well as use of GW benefits.
c. An outline of geographical and seasonal factors affecting the contributions of GW towards local livelihood strategies and productive practices.
d. General depiction of the most recurrent local struggles over access and management of GW relevant to local livelihoods and forms of negotiation.
e. A general assessment of the effectiveness of livelihood strategies and use of GW resources in order to attain adequate levels of material well-being and livelihood security.

1.3 Land and Water Use Analysis

This chapter will discuss the overall features of the landscape that were observed across the study area. It will thus provide a rich description of the main ecological and topographic features of each type of water source, land use, etc. as identified by local informants. This depiction should include any key uses associated to these types of land. Next, the chapter should introduce the reader to the forms of access, ownership and management of land and water resources, particularly GW, that are predominant in the area making sure to highlight any substantial differences across different social groups, either because of socioeconomic (e.g., gender, age, ethnicity, etc.) or spatial considerations (i.e., location of dwelling). The chapter will close by identifying key changes in local forms of land and water use as well as their different impacts over the local population.

a) Main sources:

- Exercise G: Participatory GIS land and water use mapping.
- Exercise H: Land and water use discussion.
- Exercise I: Transect walks.
- Exercise J: Trend analysis on land and water use.
- Exercise F: Household system diagram [complementary source]

b) Structure:

3.1 Main forms of land-use:

a. A generic classification of main forms of land use observed in the study areas.
b. A generic classification of main forms of water use observed in the study areas.
c. A rich description of each land use area in terms of main water sources and uses and main sources and uses by local households (productive and non-productive).

<INTRODUCE HERE ILLUSTRATIVE PICTURES OBTAINED THROUGH TRANSECT WALKS FOR EACH LAND-USE AREA IDENTIFIED>

3.2 Land tenure and rights over GW resources:

a. A description of (formal and informal) land tenure arrangements, including any gender-based differences.
b. A description of rights of access and forms of ownership over surface water and GW resources.
c. A description of current challenges and threats to access and use of GW benefits (according to whether they originated in the community or responded to external factors).
d. A description of existing of mechanisms of negotiation and enforcement of water rights.

3.3 Trends in land and water use:

a. A description of key changes over time in land use.

<INTRODUCE HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE TREND ANALYSIS GENERATED>

b. An outline of perceived effects of changes in land and water use, particularly those essential to local livelihoods and food security.
c. An outline of key drivers (direct and indirect) leading to changes in land and water use. Distinguish between those originated in the community and those responding to external factors.

1.4 Seasonality Analysis

This chapter will provide a rich description of seasonal variations in livelihoods, water security and economic well-being across the villages studied. Each section should provide a brief depiction of driving factors leading to seasonal changes.

a) Sources:

- Exercise L: Seasonal calendar
- Exercise D: Well-being discussion
- Exercise F: Household system diagram [complementary source]
- Exercise M: Focus group discussion on water [complementary source]

b) Structure

4.1 Seasons: A description of the main seasons identified in the area. Detail which months are covered and describe key climatological features.

4.2 Agricultural calendar: Detail periods of planting, harvesting and any other crop-management activities (e.g., burning) for each key crop identified. Distinguish the description for perennial and annual crops.

4.3 Other income-generation activities: Detail periods of activity in which other income generation activities are performed. Include any common household business activities and sales of by-products from farm and non-farm areas (e.g., handicrafts).

4.4 Income and expenditure: A description of seasonal variation in households' income and expenditure. Make sure to describe the key factors driving peak periods in income and expenditure as well as those moments when income is very limited to cover average household expenditure.

4.5 Access to (ground)water: Provide a description of periods of water scarcity and availability from surface and GW sources faced by the local population (if any).

4.6 Health issues: Describe the main seasonal health problems faced by the local population and the key factors driving their emergence (e.g., the seasonal reduction water availability / access / use).

<INTRODUCE HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE SEASONAL CALENDARS GENERATED>

1.5 Water Security Analysis

This chapter aims to provide a detailed description of current water security conditions in the study sites, as perceived by residents, as well as of changes on this subject long time and subsequent impacts on local well-being. Emphasis will be placed on the GW's contributions to local livelihoods during normal times and periods of scarcity.

a) Sources:

- Exercise P: Coping strategy focus group
- Exercise O: Water security timeline
- Exercise F: Household system diagram [complementary source]

b) Structure

5.1. GW's contributions:

a. A ranking of surface and GW sources and explanation of rationale for classification.
b. A description of seasonal variations in water availability, access and use and reliance on GW resources in particular.
c. A description of any spatial effects on access to water.

<INTRODUCE HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE MAPS ON WATER SOURCES>

d. A description of any differences in access to GW sources across local social groups.

5.2. Wate Security

a. An outline of local definitions of 'water security' and relevant indicators at the household and community levels.
b. An outline of local definitions of water insecurity and scarcity (household and community levels).
c. A detailed discussion on the local features of the following dimensions of water security:
   – Availability
   – Affordability
   – Access
   – Health and Quality
d. A description of within household differences in terms of water security.

5.3. Changes and trends in water security:

a. An outline of key changes over time in terms of availability of surface vs. GW resources :

<INSERT HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE TREND ANALYSES ON WATER SOURCES>

b. A depiction of perceived changes over time in terms of overall water security.
c. A description of perceived effects of changes in land use on GW resources.
d. A description of key factors identified as driving these historical changes (according to whether they originated in the community or came from external sources).

<INSERT HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE CAUSE-EFFECT DIAGRAMS ON WATER INSECURITY>

e. A description of the main initiatives / forms of intervention conducted in the area to address water security issues and their final outcome (according to whether they are local initiatives or external).

1.6 Coping Strategies and Resilience Analysis

The chapter will close with a section on the coping strategies (CS) that residents adopt in order to deal with water scarcity, sorted according to severity. Each of these CS will be described in detail, including information on their dependence on (ground)water resources.

a) Sources:

– Exercise M: Group discussion on water security
– Exercise O: Community timeline on water security
– Exercise P: Group discussion on coping strategies

b) Structure:

6.1 Coping Strategies:

a. A description of all coping strategies used locally to deal with water scarcity (grouped according to similarity). This description should include :
   – Type of activities conducted by the household
   – Main conditions for its implementation
   – Drivers that lead to the adoption of a given CS
   – Effectiveness of the CS in terms of time that people can cope with water scarcity and presence of any negative consequences / costs associated with a CS.
b. Ranking of CS according to their severity and explanation of rationale to differentiate between levels of severity.
c. An outline of spatial and social factors affecting households' capacity to adopt CS.
d. A description of historical changes in the CS conducted locally.

e. An outline of the main factors (internal and external) affecting changes in the adoption of CS over time.

6.2 Groundwater's contributions to Coping Strategies:

a. A list of GW sources in times of water scarcity and their main sources in the local landscape.
b. An outline of the main factors environmental or geographical considerations limiting households' capacity to access sources of GW sources used for CS.
c. An outline of social, economic, or cultural considerations limiting households' capacity to access GW resources used for CS.

1.7 Groundwater Resources for Livelihoods

This chapter will provide a detailed description of all groundwater's contributions to local well-being. All GW resources that are used for productive and income-generating activities as well as those that contribute to daily basic needs will be identified. These different GW sources and uses will be ranked by local informants according to their relative importance for domestic roles. In addition, this chapter will describe any changes in GW availability, access and use as perceived by residents, as well as the different drivers and pressures leading to these trends, their effects on local well-being and any local forms of adaptation and response.

a) Sources:

- Exercise M: Group discussion on GW benefits
- Exercise G: Participatory mapping of GW benefits
- Exercise R: Cause-effect diagram on changes in GW resources
- Exercise S: Ranking of GW benefits
- Exercise F: Household system diagram [secondary source]
- Exercise I: Transect walks [secondary source]

b) Structure:

7.1 Ranking of GW benefits:

a. A general ranking of GW benefits identified by local residents and explanation of rationale.

<INSERT HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE RANKING MATRICES ON GW>

b. An outline of perceived differences in GW benefits importance over time.
c. An outline of perceived differences in the importance of GW across local social groups
d. An outline of perceived differences in the importance of GW benefits for different household members.

7.2 Key changes and drivers of change

a. An outline the current condition and trends in the supply and demand of GW resources.

<INSERT HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE TREND ANALYSES PRODUCED ON GW>

b. A description of the perceived effects of trends in GW availability, access and use on livelihoods security and well-being.
c. A description of the direct and indirect drivers that affect GW availability, access and use, according to whether they originated in the community or responded to external factors.

<INSERT HERE A REPRODUCTION OF THE MOST ILLUSTRATIVE CAUSE-EFFECT DIAGRAMS FOR CHANGES ON GW>

d. A description of previous initiatives to manage or redress perceived changes in GW availability, access and use, either from the community or from external actors.

1.8 Groundwater Governance

This chapter will provide a comprehensive description of the organisational structures and normative frameworks that regulate local access to and ownership of different groups of GW. It is recommended that this chapter is thematically divided according to the key sectors that are regulated in the study area.

If resources are managed by different organisational / normative structures, then you will need as many sections as sectors are present the community (e.g., one sub-section on agriculture, another on forest management and a third one on water for human consumption).

a) Sources:

- Exercise T: Venn diagram and focus group on groundwater governance.
- Exercise E: Well-being discussion [secondary source]]
- Exercise H: Land and water use discussion [secondary source]
- Exercise M: Group discussion on water security [secondary source]

b) Structure:

8.1 Rights:

a. Summary of households' and individual land tenure and water rights.
b. Summary of households and individual rights to access and ownership of (ground)water.
c. Summary of any limitations or restrictions to certain social groups in terms of ownership or access to key (ground)water resources.

8.2 Organisational landscape:

a. Description of community-based organisations for local management of land and (ground)water resources.
b. Description of influential governmental organisations shaping local management of land and surface and GW resources.
c. Description of civil-society organisations influencing their management and use.
d. General depiction of relationship / effects between listed organisations and general impact on the current state of local resources, particularly water.

<INSERT HERE THE MOST ILLUSTRATIVE VENN DIAGRAMS ON GW GOVERNANCE>

8.3 Operational structures and features of key local organisations:

a. Formal mechanisms of decision-making
   - Instances
   - Meetings
   - Cohesion / participation
   - Transparency
b. Accountability
   - Responsibilities and obligations
   - Supervision
   - Rotation of authorities
c. Stakeholders
   - Key stakeholders
   - Information / participation of population
   - Interests and objectives
   - Conflicts and negotiations

1.9 Potential Groundwater Development Pathways

This chapter will provide a rich depiction of residents' visions of the future in terms of well-being and access to groundwater under current trends in land use, population increases, and local livelihoods. In face of these potential scenarios, the final section will present potential future initiatives for managing or reversing trends in the loss or degradation of key GW resources. Potential interventions include those relying on community organisation / mobilisation and those depending on external support.

a) Sources:

- Exercise T: Venn diagram and focus group on GW governance
- Exercise K: Trend analysis on land and water use
- Exercise M: Group discussion on water [complementary source]
- Exercise L: Trend analysis on land and water use [complementary source]
- Exercise R: Cause-effect diagram on changes in GW [complementary source]

b) Sources:

3.1 Visions of the future

a. Description of visions of the future (10 years) on land and GW use and rationale.
b. Description of visions of the future (10 years) on GW availability, access and use and recurrence of negative effects from human or environmental changes (climate change) and rationale.

3.2 Scenarios and future responses:

a. Overall depictions of the future at the community level and rationale used in terms of key changes observed in GW availability, access and use.
b. A description of the main responses and forms of adaptation currently implemented by local communities (according to whether they are local initiatives or the result of external interventions).
c. A description of potential future responses from organised communities and forms of support required.
d. An outline of potential external interventions that the communities need to address / redress the reported changes in GW management.

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