PANDA MITI
KIBIASHARA
PRIVATE FORESTRY PROGRAMME

PRIVATE FORESTRY PROGRAMME

PARTICIPATORY MAPPING AND PLANNING TOOLS DEVELOPED FOR VILLAGE LAND USE PLANNING PRACTICE

United Republic of Tanzania
MINISTRY OF NATURAL RESOURCES AND TOURISM
Forestry and Beekeeping

FORMIN.FINLAND.FI

MINISTRY FOR FOREIGN AFFAIRS OF FINLAND

Participatory mapping and planning tools developed for village land use planning practice

_____

November 2018

United Republic of Tanzania
**MINISTRY OF NATURAL RESOURCES
AND TOURISM
Forestry and Beekeeping Division**

**EMBASSY OF FINLAND
DAR ES SALAAM**

Participatory mapping and planning tools developed for village land use planning practice

Report authors:

Salla Eilola	University of Turku
Andrew Ferdinands	Private Forestry Programme
Niina Käyhkö	University of Turku
Kelvin Mveyange	RLabs
Yusuf Ssessanga	RLabs

Other contributors:
Drawings by Ephraim Maregesi

Consultant logo

UNIVERSITY OF TURKU

Cover photo: Satellite image as a background for mapping. The villagers use the satellite image to map their existing land uses and to discuss future land use allocations. (Photo by Salla Eilola)

ABOUT THE AUTHORS

Salla Eilola is a Ph.D. candidate at the Department of Geography and Geology of the University of Turku. Her interests are in participatory spatial technologies, deliberative decision-making, and community and individual empowerment. Her research has focused on participatory land use planning and community forestry arrangements in Tanzania and Zanzibar Islands. She has also experience in the spatial and environmental impacts of agriculture and has worked at the World Agroforestry Centre in Nairobi as an associate researcher.

Andrew Ferdinands works at Private Forestry Programme as Land use, GIS and IT expert. He holds an M.Sc. in Geospatial Technologies from a joint programme between Jaume I University, University of Münster and New University of Lisbon, as well as a B.Sc. in Wildlife Management from Sokoine University of Agriculture. He is interested in geospatial solutions for land use planning. He has trained members of district PLUM teams responsible for GIS in the topics of using aerial images, digitization and map making related to the VLUP processes.

Niina Käyhkö is an Associate Professor in Geospatial Research at the Department of Geography and Geology, University of Turku. She has 15 years of research, education and development cooperation experience in Tanzania on the issues of natural resource mapping and development of participatory land use planning practices

Kelvin Mveyange is an emerging social development expert with several years of experience of adopting, developing and contextualizing tools and approaches which potentially enhance community participation in development and accentuate inside-out based development process. He has successfully used some of the tools in awareness creation in participatory land use planning of over 20 villages and in eliciting public opinion from three regions (Mwanza, Mbeya and Zanzibar) to support the government in drafting the ICT policy implementation strategy.

Yusuf Ssessanga works at RLabs Iringa as the Team Leader. He has been involved in the development of living labs and innovation ecosystem in Tanzania. He has experience in using participatory methods and the asset-based community development (ABCD) philosophy as the cornerstone of community development initiatives. He studied Horticulture and entrepreneurship at Sokoine University and University of Dar es Salaam. He also volunteers in the University of Iringa Team Academy program as a coach.

About the Private Forestry Programme (PFP)

The Private Forestry Programme (PFP) supports private forest ownership, particularly the establishment and management of plantations by smallholders, as well as the wood industry and the development of mature timber markets that benefit all stakeholders. The programme operates in four regions: Iringa, Njombe, Morogoro and Ruvuma. It is supported by the Ministry for Foreign Affairs of Finland and the Ministry of Natural Resources and Tourism of Tanzania.

About the Tanzania research team from the University of Turku

This multidisciplinary research team has been working in Tanzania since 2003. Its research focuses on livelihood strategies, environmental change, and participatory geographical information systems (GIS) solutions to planning and monitoring. The team consists of researchers from the Department of Geography and Geology and the Department of Future Technologies. Close collaboration with several universities, administrative and private sector partners, and different NGOs in Tanzania is an integral part of the team's applied research approach, which includes higher education development.

About the RLabs Iringa

RLabs Iringa (Tanzania) is a living lab that creates an ecosystem for social innovation. RLabs provides a platform for collaborative community design, creation, dissemination and application of knowledge for empowerment, uplifting and development of people and communities through social innovation. RLabs uses participatory and asset-based community development (ABCD) philosophy to address different community challenges.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

ABCD	Asset-based community development
GIS	Geographic information systems
GPS	Global Positioning System
MFA	Ministry for Foreign Affairs of Finland
MLHHSD	Ministry of Lands, Housing and Human Settlements Development
MNRT	Ministry of Natural Resources and Tourism
NGO	Non-governmental organisation
NLUPC	National Land Use Planning Commission
PLUM	Participatory land use management
PFP	Private Forestry Programme
TZS	Tanzanian shilling
UTU	University of Turku
VLUMC	Village land use management committee
VLUP	Village land use plan

1.   IMPROVED TOOLS ADDRESSING THE LIMITATIONS OF EXISTING VLUP PRACTICE

This report introduces and provides instructions for using 17 participatory and spatial tools developed and adopted by the Private Forestry Programme (PFP) to inform its village land use planning practice. In Tanzania, village land use plans (VLUPs) are established to direct land use and village development for the next ten years in a village. Such decentralised planning and management of village level land is legislated in Land Use Planning Act No. 6 of 2007 and the Village Land Act of 1999. Planning practice is guided by "The Guidelines for Participatory Village Land Use Planning, Administration and Management of 2018", referred to in this document as "The PLUM Guidelines (3rd edition)". VLUPs are essential for rural development and set the framework within which the PFP can contribute to the socioeconomic wellbeing in programme-area villages. Establishment of community and individual tree plantations requires suitable land allocation and secure land tenure in order to be sustainable and achieve its objectives in the long run. The VLUP process is a way of ensuring that, when decisions about land use allocation are made, environmental protection, biodiversity conservation, and the land rights of the vulnerable social groups are ensured. Active community participation and ownership during the VLUP process might also increase trust in the PFP. Modern plantation forestry requires well-planned infrastructure and coordinated investments, both inputs which can be directed through a VLUP. Since VLUP is recognised as a crucial prerequisite for sustainable plantation forestry development in the Southern Highlands, the PFP has focused its efforts on developing standardised VLUP practices which create high-quality planning outputs.

Today, free spatial technologies are widely used to support participatory information-sharing and data collection and analysis in a multitude of societal applications. The rapid evolution of mobile technology, open-source software, and open-access global datasets has enabled this development. Tanzania envisions itself as a knowledge-based society in its National Strategy for Growth and Reduction of Poverty (MKUKUTA II published in 2010) and its renewed ICT policy of 2016. The National Five-Year Development Plan for 2016/17 to 2020/21 recognises information and communication technology as a crucial enabler of socioeconomic transformation in the country. Since spatial technologies offer new opportunities to enhance cost-efficiency and stakeholder participation in the VLUP process, they were the starting point for developing improved tools for the PFP's VLUP practice.

The newly developed tools and practices included in this report were designed to address several common challenges to the planning process. First, participatory mapping with freely available high-resolution satellite or aerial images was developed to enable villagers to collect, analyse, and discuss location-based information even from areas that are inaccessible to field tracking with the global positioning system (GPS) (Textbox 1). Second, the use of satellite image was opted to create more detailed, accurate and standardised VLUP maps without increasing the costs of the VLUP process. Third, spatial data produced using satellite images can reliably be matched with other spatial data, such as data on vegetation and soils. Fourth, the mapping and group-work tools developed were designed to increase the active participation of villagers, especially women and other disadvantaged groups, and to encourage them to share their views and to discuss and learn about their village land and its resources. Finally, the participatory tools were designed to address the villagers' lack of commitment toward implementing the VLUP by enhancing their sense of self-efficacy and ownership. Some of the numerous benefits of the use of satellite imagery for participatory spatial planning are listed in Textbox 2.

The development of the improved tools and practices described below was a joint effort by the PFP and the Tanzania research team of the University of Turku (UTU) in Finland. This team specialises in applied research on affordable bottom-up spatial tools for informed decision-making. The development of the tools started in 2015 through a study of the current VLUP process and its limitations in five districts: Njombe town and Makete, Mufindi, Ludewa and Kilolo district councils. The research team conducted interviews and workshops with the district and regional planning officers and the participatory land use management (PLUM) team members of the respective districts. After the study, the PFP and the researchers began to develop tools to address the identified limitations. An Iringa-based NGO, RLabs Iringa, joined the team, bringing with it its extensive experience in community facilitation, in order to innovate on ways to raise awareness and promote active villager participation. In 2016, the PFP, together with the

district PLUM teams, started experimenting with the use of satellite images with villagers in the programme area. In June 2016, the researchers carried out a pilot study in one village to study the usability of satellite imagery and its implications for the quality of spatial data, environmental understanding and deliberative decision-making. (The results of this study will be published soon in Eilola et al. forthcoming).

After gaining experience on the use of the tools, the National Land Use Planning Commission (NLUPC) became interested in the tools' potential. In May 2017 a stakeholder workshop was organised by the PFP, the UTU and the NLUPC to demonstrate the use of satellite imagery in the VLUP process. At the workshop, 35 representatives from 21 organisations, among them academic institutions, government organisations, and NGOs shared their experiences and gave feedback on the tools. At the time this report was written, the tools and practices had been used by the PLUM teams in more than 30 villages in the Southern Highlands. Furthermore, the PFP had organised training to teach PLUM team members from the programme area how to use the tools and to build their skill in using geographical information systems (GIS). Experience is accumulating, and the practice is evolving as more and more actors in Tanzania become aware of participatory spatial tools and practices developed by PFP. Later in 2018, the NLUPC will publish a national practitioners' manual on VLUP which features these tools and practices.

Textbox 1   What is a satellite image and how can such an image be accessed?

Satellite images are remote-sensing images of the Earth's surface taken from the space by instruments located on Earth-observation satellite platforms in space. Images are taken approximately 600 km─800 km above the Earth's surface. The most common satellite images which allow for the mapping of the land's surface are Landsat OLI and Sentinel-2 images. These are free-of charge environmental satellite data sets with medium-scale spatial resolution (10─30 m). Commercial satellite images, such as Worldview or Pleiades, are able to capture details of the earth at a spatial resolution of around 0.5 m to 1 m. These high-resolution satellite images are the most suitable for use in local-scale mapping projects such as those used in VLUP process.

Satellite images can be either purchased or accessed from the Internet without cost. You can search for the most recent images and open them for free on QGIS, ArcGIS or Google Earth, work with them online and make a village satellite image map. You can also download the images using image-downloading software and work with them offline on your computer. This free software allows you to extract geo-coded satellite images with coordinates attached from repositories such as Google Maps, Bing Maps, and Here Maps. You can then use free GIS software like QGIS to prepare a satellite image map which can be printed and used with villagers. With free software and free satellite images, the main cost of using satellite images is the cost of printing. The total printing costs depend on the prices of printing services or the cost of maintaining a plotter (printer), the number of satellite image printouts needed to cover an entire village, and the paper size and paper type used for printouts. The price of printing in Tanzania has been steadily decreasing and is likely to continue to decrease, thereby making printouts even more affordable than they are now.

Textbox 2   What benefits do satellite images offer for the VLUP process?

Using satellite or aerial images instead of the conventional method, blank flipchart paper, for mapping village land uses with villagers has numerous advantages, including the ability to produce better quality land-use maps and to support active villager participation and discussion. Satellite and aerial images accomplish the following:

● Provide a bird's eye view of a village and thus more comprehensive view of the village landscape and land uses and their spatial distribution and extent.

● Enable villagers to accurately and in detail identify, map and verify land uses, village boundaries, and locally important assets on geo-referenced image maps, all outcomes which a sketch map on flipchart paper does not allow.

● Enable detailed discussions of a village area and the different resources in it, thus helping villagers and facilitators to establish a shared understanding of the locations under discussion.

● Reduce the time for GPS tracking as only those sites and areas which are not visible on the image need to be GPS tracked in the field.

● Provide a relatively low-cost way of getting more recent spatial land use information (regarding roads, settlements, agriculture, water bodies, and the like) compared to the information in the topographic standard sheets of 1976 available in Tanzania.

● Support learning and argumentation about the village landscape and land uses via visual means.

● Show everyone area delineations in relation to the features in the landscape, thus increasing the transparency of decisions.

● Allow for the production of accurate land use maps which can be combined with other spatial datasets available at the district, regional, and national levels.

2. INSTRUCTIONS OF THE IMPROVED TOOLS AND PRACTICES

The following sections consist of detailed instructions for 17 improved tools and practices, first spatial tools and practices which require GIS expertise and then tools which do not require any particular technical expertise, just good facilitation skills (Table 1). The tools and practices are each related to a particular step in the VLUP process described in "The PLUM Guidelines (3rd edition)". Figure 1 shows the workflow of the various activities in the VLUP process based on the PLUM Guidelines and the proposed practices and tools and use of spatial data in each step of the process. The figure suggests the order in which the tools and practices should be used in the VLUP process.

Each of the instructed tools and practices is accompanied by three regular textboxes: "Basic details", "Addressing possible challenges" and "Ways to modify." The "Basic details" textbox indicates 1) the time which using the tool takes in hours, 2) the suggested participants to involve, 3) the outcomes of the tool, and 4) the preparations and materials which the tool requires. These textboxes will help you to consider and compare the tools. The information on how much time a tool takes in hours will help you to plan which activities you can carry out in a single day. You may, for example, opt to conduct two or three exercises in one day if they take only 30 minutes to 2 hours each. Together with the "Addressing possible challenges" textbox, the "Basic details" textbox will help you choose the most appropriate tools and practices given the time and resources you have. This report describes the ideal way to use each tool. Tips on how to modify tools are given in the "Ways to modify" textbox so that you can adjust the tool or practice to suit your resources and your VLUP process activities. Finally, additional textboxes with additional information are provided for some of the tools and practices.

This report was written to guide and inspire facilitators of the VLUP process and enable them to adopt a genuinely participatory approach. It can also be used to monitor the quality of VLUP work when the tools of this report have been agreed to be adopted. The tools introduced are all suggestions, so, when necessary, you can modify them to fit each unique village context and the resources and skills available to you.

We hope you will find the tools useful and get inspired to apply them!

Table 1   The practices and tools instructed in this report

The tools are optional, and you can choose the ones which best fit to your resources and needs.

Practice or tool (Step in PLUM Guidelines, 3rd edition)	Outcomes	Benefits of the practice or tool	Time used	Preparations and material needed
Participatory geospatial tools and practices				
Preparation of village satellite or aerial image map (Step 1)	Village satellite image map for use with villagers	Helps familiarization of and orientation to the village landscape characteristics before village visit Enables georeferenced land use mapping and detailed digitization of areas with less GPS tracking	1 to 6 hours; should be made one week before going to the village	Computer, GIS software, village boundary shapefile, softcopy of the satellite image, transparent tape, scissors. Printing: printing service or a plotter, printing papers and cartridges.
Village boundary verification (Step 1)	Village boundary verified and any boundary issues identified and resolution started	Boundary problems and inconsistencies in the official boundary are resolved before efforts on VLUP planning are started	1 to 5 hours; preferably done at early stages of VLUP process. The verification will take up longer time if a boundary conflict is discovered.	Whiteboard marker pens and something to erase the markings off the plastic sheet, clear wide tape, scissors, village satellite image map and 4-5 meters of transparent plastic sheet, notebooks, pens, report template and camera.
Mapping existing land uses on a satellite image map (Step 3)	Sketch map of the village land uses on satellite image map	Village land uses and village boundaries are mapped in more detail with villagers onto a georeferenced map Areas which cannot be accessed on foot or car can be mapped and GPS tracking time is reduced Participants use satellite image to discuss land use areas and gain shared understanding of the locations under discussion	3.5 to 6 hours; advised to be done some days before the proposed land use mapping is conducted in order to have time to calculate future area needs (projections)	Whiteboard marker pens and something to erase the markings off the plastic sheet, clear wide tape, scissors, village satellite image map and 4-5 meters of transparent plastic sheet, flipchart paper, masking tape, marker pens, notebooks, pens, report template and camera.
Mapping proposed land uses on a satellite image map (Step 4)	Sketch map of the proposed village land uses on satellite image map	Same benefits as in mapping existing land uses on satellite image map Land allocations can be discussed with detail and by considering land use rights of more people Area delineations are visible on the image for all to see increasing transparency of decisions	2 to 4 hours	Whiteboard marker pens and something to erase the markings off the plastic sheet, clear wide tape, scissors, village satellite image map and 4-5 meters of transparent plastic sheet, flipchart paper, masking tape, marker pens, notebooks, pens, report template and camera.

Practice or tool (Step in PLUM Guidelines, 3rd edition)	Outcomes	Benefits of the practice or tool	Time used	Preparations and material needed
Presenting the proposed land use plan and maps in the village assembly (Step 4)	The VLUP maps, and plan are presented to the assembly for their commenting Any modifications and changes are recorded down and addressed in the final VLUP	When the sketch maps are presented on top of the satellite image map, the assembly attendees see exactly where resources, services and boundaries of each land use area are located in the village Shared understanding can be created on the area delineations and implications of land use allocations Assembly is better informed on the proposed land use allocations in order to comment on them	3 to 6 hours	Hand drawn sketch maps on top of the satellite image map, VLUP report draft and if already printed the draft versions of the digital maps, flipchart paper, masking tape, marker pens, notebooks, pens and camera (optional).
Digitization of satellite image sketch maps (Step 3 and 4)	Digital versions of the VLUP sketch maps Systematically stored spatial data of the VLUP process	Careful digitization and systematic storage of the data ensure combining of the data with other spatial data sets and future use by various stakeholders	3 to 4 hours	GIS software, computer, photographs of the environmental risk, existing and proposed land use sketch maps, DEM data of the area, notebook with grid readings (coordinates) and GPS data from field tracking (GPS coordinate collection forms).
Production of the digital VLUP maps (Step 3 and 4)	High quality digital VLUP maps	Reliable representation of the land uses on the ground in a map form Readability and usability of the maps is increased with clear visual map layout	2 to 3 hours per each map	GIS software, computer and VLUP GIS data (shapefiles).
Other participatory planning tools				
Participatory stakeholder analysis (Step 1)	Various stakeholders of VLUP process identified and prioritized	All VLUP stakeholders are identified and included in the planning if necessary People who have power in the village decision-making and those who have not are considered	30 mins to 2 hours	Flipchart paper, marker pens and masking tape or blackboard and chalk.
Knowledge gap tool (Step 2)	Awareness raising topics identified and targeted to the audience	Special attention given to the needs and knowledge gaps of the participants Motivates people to learn while they realize they already know something that it is worth sharing	30 min to 1 hour depending on the topics and time available	Optionally flipchart paper and marker pens.
Group work, dialogue and learning cafe tools (general participatory tools)	Diverse opinions captured Participants are actively participating	Encourages participants to express their opinions and knowledge Motivates and keeps the participants active Gives more people opportunity to speak	30 mins to 2 hours	Note taking material and alternatively chairs and tables or other things to sit and write on.

Practice or tool (Step in PLUM Guidelines, 3rd edition)	Outcomes	Benefits of the practice or tool	Time used	Preparations and material needed
Village history timeline tool (Step 2)	A timeline of events and conditions in the village from past to present	Increases understanding of the past achievements and conditions in the village thus encouraging local agency in development Indicates the future developments in the village and helps to plan actions towards future goals	2 hours	Flipchart paper, masking tape and marker pens or blackboard and chalk.
River of life tool (Step 2)	A timeline in a form of a river with events and conditions in the village from past to present	Increases understanding of the past achievements and conditions in the village thus encouraging local agency in development Indicates the direction the village might be taking so as to plan actions for the future Is more inspiring presentation of the history than timeline thus invoking stories and imagination	2 to 3 hours	Flipchart paper, masking tape and marker pens or blackboard and chalk.
Trip to the future tool (Step 2)	A list of desired future developments in the village	Encourages villagers to think broadly and outside the box what developments they want to have in the village Creates shared goals for future developments Better understanding of what it takes to achieve what they want	2 to 3 hours	Flipchart paper, masking tape and marker pens or blackboard and chalk.
Problem tree analysis (Step 2)	Problems and their causes and effects in different sectors of village life are identified	Problems are broken down into smaller and definable parts which can be prioritized and focused on Better understanding of interlinked and sometimes contradictory causes of problems	2 to 3 hours	Flipchart paper, masking tape and marker pens or blackboard and chalk.
Community leaky bucket tool (Step 2)	Information on components and state of village economy Potential income sources and saving opportunities identified in the village	Assists in understanding local economy and how different activities contribute or undermine it Helps participants to see how economy works and how it can be influenced	1 to 2 hours	Flipchart paper, masking tape and marker pens or blackboard and chalk.

Figure 1 *Recommended order of steps and activities in the VLUP process described in the PLUM Guidelines (3rd edition), and the use of practices, tools, spatial data sets and maps instructed in this report*

Note: The spatial data sets refer to existing location-based information on e.g. water sources, soil and vegetation, infrastructure and land ownership, which can be combined with the spatial data produced during the VLUP process.

2.1 Participatory geospatial tools and practices

2.1.1 Preparation of village satellite or aerial image map for village land use mapping

Overview and aim

Remote-sensing data, such as aerial and satellite images, provide valuable background for the village land use planning, when they can be obtained at sufficient spatial scale, such as 1:7500 or larger. Having a large enough scale enables users to identify individual objects such as houses, roads, land use patterns and large trees (Figure 2), in the image. Such images are called high-resolution satellite images. The remote-sensing images of a village help the facilitators of the planning process to familiarise themselves with the village landscape and land features before and during their visits to villages. Moreover, the images are valuable background for the villagers to refer to as they map land uses and can be used instead of blank flipchart paper to sketch current village land uses and future plans. As it is possible to obtain a bird's eye perspective of the village landscape with these images, their use provides village inhabitants a richer opportunity to learn and communicate about village land-use practices, related values, and future needs (Figure 3).

Figure 2   Real-size example of a satellite image in scale of 1:7500

The houses, roads, paths, trees and a river can be identified in the image.

Image capture date: 14 July 2017
Image source: © 2018 Google, © CNES/Airbus

Preparing satellite images to serve as a usable mapping background needs to be started early so that you will have time to digitally process, prepare, print, and interpret the images before village visits start. The satellite image requires all necessary information as in map products, such as north arrow and scale bar. **By inserting these map elements into the satellite image you create a village satellite image map.** The high-resolution satellite images you need to produce the image map can be obtained commercially from image vendors or be accessed free-of-charge from the Internet, such as from Google Maps, Bing Maps, or Here Maps. Image-downloading software is freely available in the Internet. This software allows you to extract image maps from the screen of a computer in geo-coded form with a map-coordinate system attached. Since this software may change over time, it is best to check its availability frequently. Novel remote-sensing data production options, such as drone images, are also becoming prominent, but drone images, like any aerial remote-sensing images, have to be acquired

separately. In addition, this type of image data-production campaigns are expensive and the spatial coverage of drones is more limited than that of satellites.

Figure 3   Introducing a satellite image

A satellite image is like a photograph of the Earth's surface taken hundreds of kilometres above the Earth. For villagers and facilitators they offer a bird's-eye view on almost everything seen on the village landscape.

Working tasks

Obtaining a satellite image:

1. Obtain a GIS layer (shapefile) with the boundaries of the village you are working in. Such a boundary layer will show you the location and the overall extent of the village while you look for a suitable satellite image for the village. The shapefiles can be obtained from the concerned district office or the Division of Survey and Mapping of the Ministry of Lands, Housing and Human Settlements Development (MLHHSD). If the boundary does not exist in digital form, you can digitize it from the village survey plan.

2. Look for the most recent suitable cloud-free satellite image of the village area from commercial satellite data repositories, Google Earth, QGIS or image downloading software. The image downloading software allows you to browse repositories of Bing maps, Google maps, Here maps etc.

3. After you have found a suitable satellite image, it is recommended that you download the satellite image into your computer instead of working with it online. This is because an unreliable internet connection may interrupt your work and affect the quality of the image.

4. In order to use downloading software to look for and download satellite images, download and install satellite image-downloading software onto your computer,

5. Convert the boundary shapefile or location data into a file format accepted by the image-downloading software you have chosen. For example, the KML file format.

6. Open the converted village boundary shapefile in the downloading software.

7. Check the date of the image to find the most recent. If the image-downloading software does not show the date when the satellite image was taken, you can find it on the webpage of the original image provider (see Textbox 6).

8. When you have found a suitable image, select the area of the image which you want to download. The selected area has to be larger than the village boundaries. This is because sometimes a village boundary shapefile does not show the up-to-date and correct boundary of a village and you will have to verify the actual boundary with the villagers later on and you may find that it is outside the shapefile boundary.

9. Select the resolution at which you want the image to be available after downloading. This resolution has to be high enough for you to be able to produce a satellite image printout at the recommended scale of 1:7500 or larger. The high resolution will allow you to identify different features and land use boundaries in detail on the image. Use for example zoom level 20.

10. Download or save the image in an appropriate image-file format and ensure that it has proper settings such as its coordinate-reference system and resolution or zoom level.

11. Some image downloading software download the image in pieces and mosaicing or stitching is then needed to produce one image of the area of interest. This functionality is provided by the software of your choice.

12. Ensure that you use the same image resolution during stitching as you used during image downloading. Common image file format for the resulting combined image is ECW (Enhanced Compression Wavelet).

13. Now you have downloaded a satellite image of the village area in a file format which you can open in GIS software.

Preparing the satellite image map for printing:

14. Open the downloaded satellite image in the GIS software which you have, such as ArcGIS or QGIS.

15. Project the image to your preferred datum. For Tanzania, use WGS1984 as the map datum and then set the correct zone (35–37) depending on the location of the village in Tanzania.

16. Set the scale of the satellite image to 1:7500 or larger so that villagers can see the features of their village features on the satellite image printout well during mapping activities (see Textbox 5). A scale of this size enables villagers to identify their houses, water sources, small paths, big trees, farms, and forests, all landmarks that aid them in locating other places on the satellite image and, as a result, make it easier for them to allocate land uses during the VLUP process.

17. Design the layout of the image map in the GIS software you are using and select a frame size for the map that fits the size of the paper which you plan to print, whether A0, A1, A2 or A3.

18. Generate thin grid lines on the satellite image and display the northings and eastings in the satellite image layout. It is recommended that you use a grid-cell size of 100 m x 100 m. These grid cells can be used to estimate the sizes of land use areas during proposed land use mapping (see Section 2.1.4.). They will also be used to geo-reference the sketch map the villagers produce (see Section 2.1.6.).

19. Overlay the village boundary shapefile on top of the satellite image using GIS software. Make the village boundary a thin black line on top of the satellite image (Figure 4). This line indicates to villagers where the official boundary is. They have to verify it later on (see village boundary verification in Section 2.1.2.).

20. If you wish to, you can superimpose contour lines on the image to describe the topography of the area since a satellite image has no topographic information. Ensure that the contour lines cover the whole satellite image layout not just the area inside the village boundary since they may help villagers verify the boundary.

21. Add other essential information into the satellite image layout, including a north arrow, scale bar, the date in which the image was taken, the datum used, and the source of the satellite image.

22. Now you have produced a satellite image map layout.

23. Because you cannot print the whole village area at the scale of 1:7500 on one piece of paper, you will have to produce several overlapping printouts which you will then have to join together. The maximum size of paper currently affordable for printing in Tanzania is A0. The number of printouts which you need to print will depend on the size of the village and the size of the paper which you can print. You can use the same layout to produce each printout.

24. Plan a combination of printouts which will allow you to print the entire village area at the scale of 1:7500 on separate printouts.

25. To make each printout, shift the satellite image to the right location in the data frame. For printouts of village boundary areas, ensure that the satellite image printout extends outside the village boundary in case you have to modify the boundary with the villagers later on. Also ensure that each printout is overlapping so that you will be able to join the printed hardcopy printouts together in the next phase of work.

26. Export each printout into the file format you prefer, PDF or JPEG format for example. PDF format is recommended because it produces a smaller file size than JPEG but still allows for good image quality. For both JPEG and PDF formats, set the image quality at a minimum of 200 dpi.

27. Print all the satellite image map printouts or look for a printing service provider in your area where you can print the size of paper you require.

Joining the printouts:

28. Arrange the printouts to see you that you have a printout set that covers the entire village. Arrange them on a clean and flat surface so that you have a good working area.

29. Plan where you will cut the printouts to create the joints between the separate printouts. Use the gridlines to help you cut accurately (Figure 5). Cut only the printout which is on top, overlapping the other one below.

30. Use clear wide tape to join the printouts together. Ensure you align the gridlines correctly because if they are not aligned correctly this will cause errors when you digitize the sketch map (see Section 2.1.6).

31. Since a large joined satellite image map is difficult to transport, it is recommended that you join the satellite image map printouts in the village.

Figure 4   Example of a village satellite image map

The black dashed line showing the official village boundary, the grid and the contour lines have been superimposed on the image.
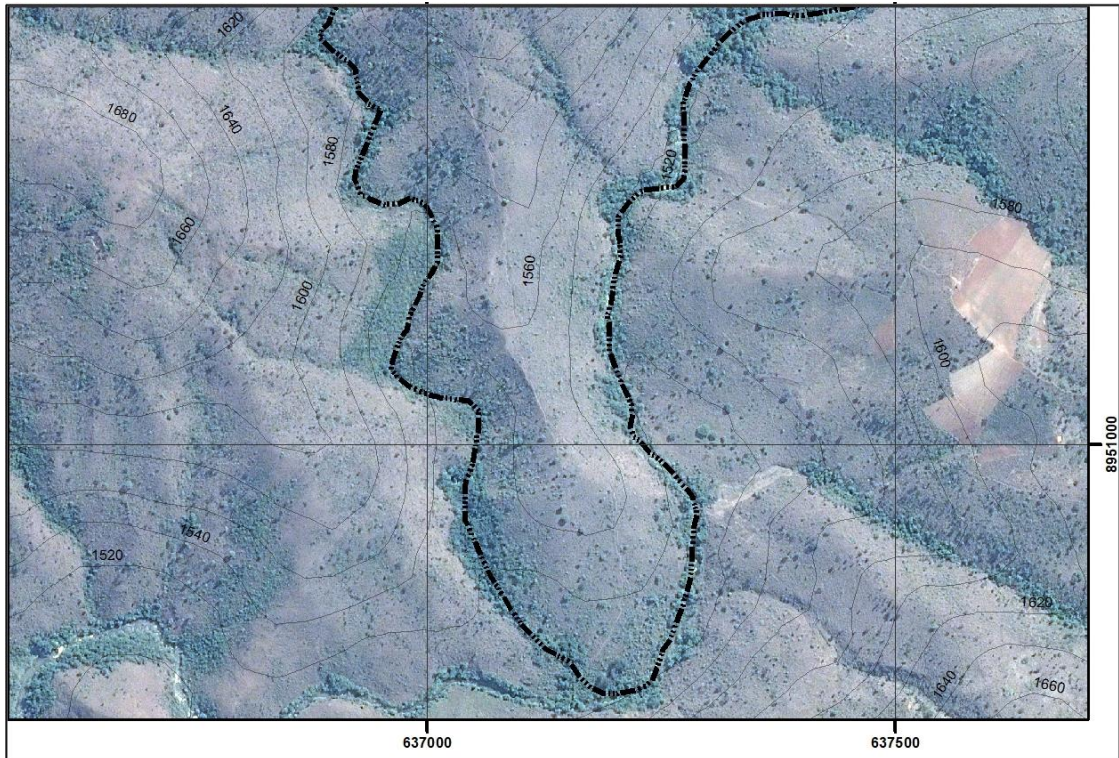
Further information sources

QGIS software:	www.qgis.org
QGIS tutorials:	www.qgistutorials.com
ArcGIS software:	www.esri.com/en-us/home
ArcGIS tutorials:	ArcGIS Help and https://mgimond.github.io/ArcGIS_tutorials/index.html

Figure 5   Joining the satellite image printouts together

A) To have a satellite image map which covers the entire village area, you will most likely need two or more separate satellite image printouts; B) Plan well where to cut the printouts in order to do the joining, and use the grid coordinates and lines to decide where the join is; C) Cut the printout following the grid line; D & E) Use the grid coordinates to correctly place the printouts precisely on top of each other; F) Use small pieces of clear tape first to keep the printouts in correct place; G) Finalise the join with one stretch of clear tape, best way to do this is to start taping outside the printout on the floor and move slowly with the tape to the other side of the of the join; H) Use your other hand to press the tape on the printout and the other hand to keep the tape roll tight so that there will be no folds in the tape; I) Finish taping again outside the printout on the floor, this ensures smooth finishing for the tape; J) Cut off the leftover ends of the tape and you have joint the satellite image printouts.
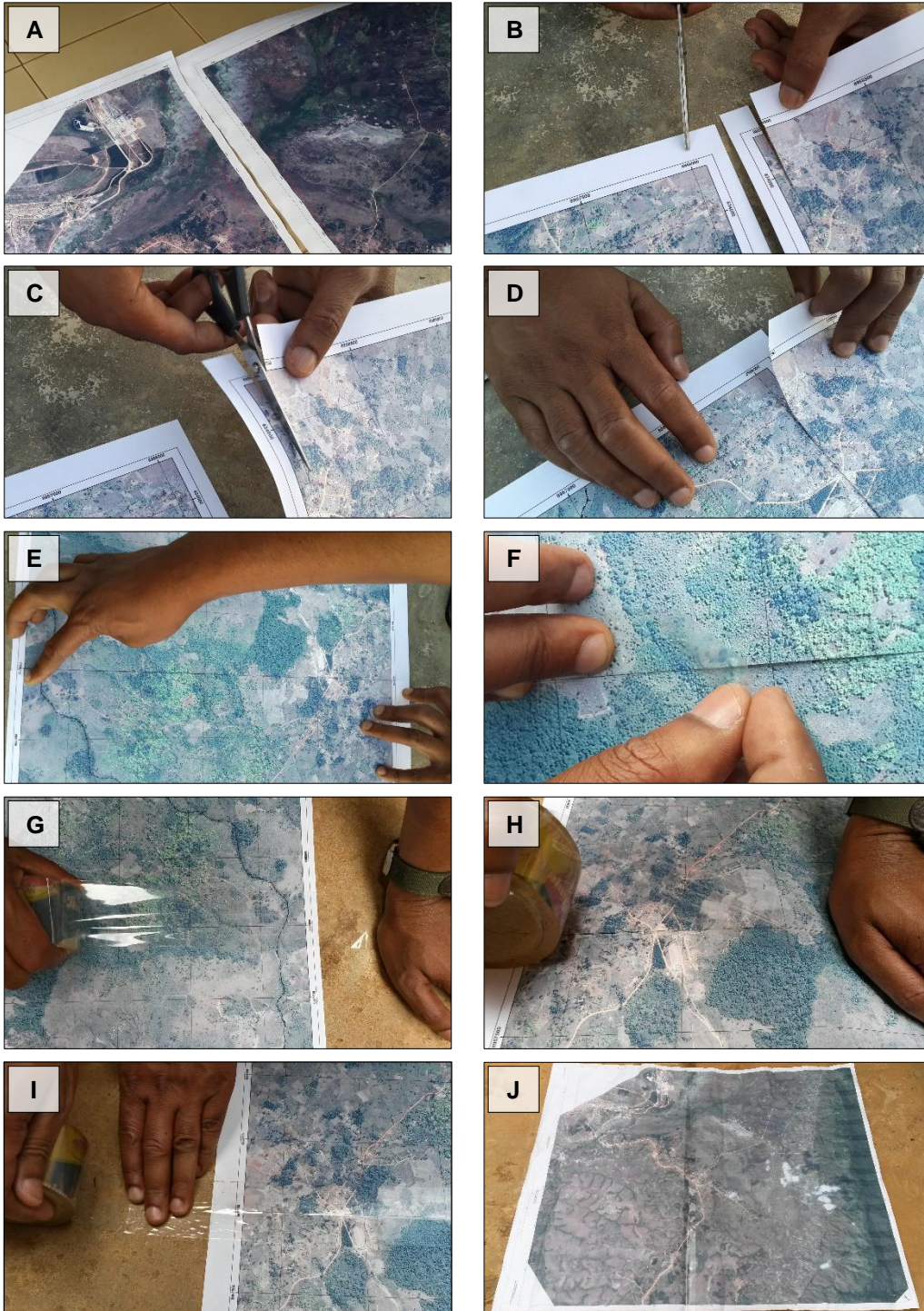
Textbox 3   Basic details

Time: 1 to 6 hours. Should be made one week before going to the village.

- Participants: Facilitation team member(s) with GIS skills.
- Outcomes: A satellite image map printout of the village area to be used for mapping and a digital version of it to be used in GIS software.
- Preparations and materials: Computer, GIS software, village boundary shapefile, soft copy of the satellite image, transparent tape, scissors. Printing: printing service or a plotter, printing papers, and cartridges

.

Textbox 4   Addressing possible challenges

Getting a very recent satellite image is not always possible, so it may be necessary to update it in the village. Most satellite images are available from 2010 onwards, and some changes might have happened in the village landscape since the image was taken. It is good practice to tell villagers the year in which the image you display was taken so that they can consider any changes that might have occurred after that time. Since another problem is that clouds reduce the visibility of the features in a satellite image, you should always try to find an image with few or no clouds. If no cloud-free image is available, you may need to resort to conventional mapping and GPS tracking and not use a satellite image map. Sometimes and in some places in Tanzania accessing satellite images through the Internet is difficult or even impossible due to a slow Internet connection. If you cannot download a satellite image, you will have to use conventional practices instead.

Textbox 5   Ways to modify

It is not always possible to use a scale of 1:7500 or larger to print a satellite image map of the whole village as some villages are enormous. For a very large village, such as with the size of 200,000 ha or more, covering the entire village area at the scale of 1:7500 is very challenging. One way to solve this issue is to produce a map of a smaller scale than 1:7500 to cover the whole village area and to use a scale of 1:7500 to cover areas which require more accurate planning decisions, such as intensively utilised areas in and around settlements. Use a small scale, for example, 1:10000 or even smaller, to cover the whole village.

Textbox 6   On what date was the satellite image taken?

The date of a satellite image can be obtained from the original source, namely the image vendor. Depending on which image vendor and which software you use to look at images, you will have to use different methods to see the date on which the image was taken. For example, for satellite images from Google Maps, you can find the date by opening the village boundary shapefile in Google Earth, zooming to the village location and looking at the date given for the satellite image at the bottom of the screen. For satellite images from ESRI ArcGIS Imagery, you can find the date of the image by viewing the online image on ArcMap software, selecting the information icon tool and clicking with the tool on the area that you want to know the image date. The information icon tool will open a table showing information about the image, including the date of image capture.

2.1.2 Village boundary verification

Overview and aim

Most of the villages in Tanzania have a village boundary which has been surveyed and approved by the Survey and Mapping Division of the Ministry of Lands, Housing and Human Settlements Development (MLHHSD). The village boundary may have changed and village boundary problems arisen since the survey was conducted in the village. Thus, it is crucial that the official village boundaries are verified and, if needed, updated at an early stage in the VLUP process. This verification has to be conducted by the district land department or by MLHHSD, so it will be necessary for you to involve the required representatives from the district or town council or the regional secretariat in the activity.

Instead of laborious and time-consuming field work, the printed village satellite image map (see subchapter 2.1.1.) allows more efficient way of mapping and verifying the village boundaries with the villagers (Figure 6). The aim of the activity is to verify the village boundary and to identify and correct any possible inconsistencies in the official village boundary map. This will also help in identifying any village boundary disputes or latent land conflicts which will require conflict resolution before the VLUP process can proceed. In order to further ensure that the boundaries are mapped correctly and that no conflicts exist, arrange to meet representatives from each neighbouring village. This gives them an opportunity to verify the boundary which they share with the village where VLUP process is ongoing and share any concerns they might have related to the boundary.

Figure 6   Village boundary verification on a satellite image map

The satellite image enables examination, discussion and agreement of the entire village boundary. The boundary delineation can be seen by everyone who can read the satellite image and the landscape features in it. Field tracking of the boundary is needed in those places where the boundary cannot be identified with certainty on the satellite image.

Working tasks

Preparations before the verification can be started:

1. Check at the district level to see if the boundary of the village of interest has been established, demarcated and surveyed. Look, too, for any evidence of a boundary conflict in that village.

2. During the introductory meeting in the village, inquire whether or not there is a village certificate and village boundary map and whether or not there are any village boundary disputes with neighbouring villages.

3. If there are no open disputes or any other reasons not to carry out the VLUP process, proceed to the village boundary verification exercise.

Preparing a mapping background on a flat surface in the village:

Make sure you have all the required material for the mapping exercise (see Textbox 7 and Figure 7).

1. Place the village satellite image map on **a flat surface**, preferably a cement floor, to be used as the background for mapping. In a village setting, such a floor can be found in village offices, schools, dispensaries, churches, and the like. Ensure that there is sufficient light in the place selected for the mapping exercise for villagers to see features on the satellite image clearly. Position the satellite image map so its north arrow faces north in the village.

2. Use clear wide tape to straighten the satellite image map to the surface or floor.

3. Place a transparent plastic sheet on top of the satellite or aerial image map and tape it to the surface using clear tape so that it will not move during the exercise.

Marking and verifying the village boundary on the satellite image map:

4. Describe the task to participants and orient them to on the satellite image map (see Textbox 9).

5. Tell participants that the black thin line on the satellite image represents the village boundary obtained from the official village certificate.

6. Ask participants to discuss the village boundary as they understand it and to check to see whether or not the official village boundary marked on the satellite image map is correct. Give them a black marker pen to mark the boundary as they understand it. While they are drawing the boundary, ask them also to explain its features as they draw it.

7. If you observe any discrepancies between the official boundary and the way participants understand the boundary, discuss the differences and try to establish what the problem is. Assess if the boundary inconsistency or problem is serious or manageable. Plan the next task based on the seriousness of the issue.

8. If required consult representatives from neighbouring village(s) which are affected by the problem and arrange for them to verify the boundary, too. Give each affected village an opportunity to verify its boundary separately before bringing representatives of all the involved villages together to jointly agree on the actual boundary. Use the satellite image map into facilitate the negotiations between these representatives so as to reduce time for field tracking. Visit and track with GPS only those boundary areas which are less visible on the image.

9. Ensure that any changes to the boundary delineations are marked on the sketch map of the village boundary.

10. If a boundary conflict is discovered, take appropriate measures to resolve it.

11. After any inconsistency or conflict over a boundary has been solved and the actual boundary agreed upon, take the required steps to follow official procedure to update the boundary.

12. If a village boundary is updated, the official village boundary shapefile will need to be modified accordingly. The sketch map with the new boundary will need to be photographed and digitized to produce a new boundary shapefile. This task should be carried out by a facilitation team member with GIS skills (e.g. a district land officer or an officer from MLHHSD).

Figure 7   The main materials needed for the mapping exercises

The transparent sheet is the surface on which the sketch map markings are drawn so that the satellite image map can be reused. Hardware stores in Tanzania sell this transparent plastic sheet. Whiteboard marker pens are erasable on the plastic sheet so that the markings can be redrawn if needed. A whiteboard eraser or a cloth can be used as the eraser. Transparent tape is used to tape the plastic sheet on top of the satellite image map.

Documenting the sketched boundary on the satellite image map *[requires GIS expertise]*:

13. Do not move the sketch map. Simply prepare it to be photographed. In order to geo-reference and digitize the sketch map, you need to take photographs of the sketch map from close enough that its content is clearly visible. Each photograph needs to have at least four reference points highlighted in it. This task is best carried out by a facilitation team member with GIS skills.

14. To take these photographs, highlight with marker pen four reference points at the intersections of the gridlines at the edges of the satellite image map (Figure 8). Label the reference points with letters (A, B, C, etc.).

15. Write the grid readings (coordinates) of these reference points in a notebook to use in geo-referencing.

16. Take photographs of the sketch map to be geo-referenced and then used to digitize the modified village boundary shapefile (see Section 2.1.6.). These photographs have to be taken directly above the sketch map in order to avoid distorting the map.

17. If the satellite image map used is large, take several photographs, each with at least four reference points, all of whose coordinates are recorded. All these photographs need to be geo-referenced in GIS software.

18. Make note of those areas and locations which require GPS tracking after the mapping exercise. These areas and locations are those which are not clearly visible on the satellite image and which therefore require more accurate boundary tracking.

19. Store the village boundary sketch map drawn on the plastic sheet and the satellite image map carefully so that they can be used again during later mapping exercises.

Visiting neighbouring villages for village boundary verification

It is recommended that even if no village boundary problem is observed in a given village, you should allow representatives of neighbouring villages to verify the boundary which they share with that village, too. Therefore, after you have verified the boundary of a village, arrange a short visit to the neighbouring villages. During these visits display the village satellite image map for representatives of the neighbouring villages and ask them to discuss and verify the shared boundary. Ensure that these representatives include women and members of disadvantaged groups. Consulting neighbours will ensure that they, too, agree with the boundary and that there are no hidden boundary disputes which were not revealed by the village making its VLUP.

Textbox 7   Basic details

● Time: 1 to 5 hours. Preferably done in the early stages of the VLUP process before any VLUP process activities begin. The verification will take a long time if a boundary conflict is discovered and requires that measures be taken to resolve it.

● Participants: Village council, elderly men and women and other village representatives familiar with the village boundary, and PLUM team members. When required, representatives of neighbouring villages and ward officials.

● Outcomes: The village boundaries are verified and any boundary conflicts resolved in a participatory way before carrying out the VLUP process. If needed a request for the updating of the boundary is send to the concerned high-level officials.

● Preparations and material: Whiteboard marker pens (the ink should be erasable but not too easily) and something with which to erase markings from a plastic sheet, clear wide tape, scissors, a village satellite image map (with a thin black line denoting the official village boundary obtained from the village certificate), 4-5 meters of transparent plastic sheet, notebooks, pens, a report template, and a camera.

Textbox 8   Challenges

In cases in which it is not possible to identify boundary locations on the satellite image map, field verification with GPS is important. Sometimes it is difficult to obtain a digital copy of the village boundaries and in that case survey plans can be used to digitize village boundaries into a shapefile in GIS software.

Figure 8   Marking the reference points on the sketch map

This helps georeferencing of the photograph later in the GIS. A) Mark several crossings of the gridlines on the satellite image, in this example reference points are named with letters A to I; B) The reference markings should be drawn with marker pen exactly on the crossing of the gridlines, they can be any crossing of gridlines on the map; C) Ensure that in in each photograph you take of the sketch map you have at least four of these reference points so that georeferencing of the photographs is possible. Because the photographs need to be taken close enough to the map to see and digitize the land use areas in detail, you may have to take several photographs at different parts of the map to photograph the whole map.
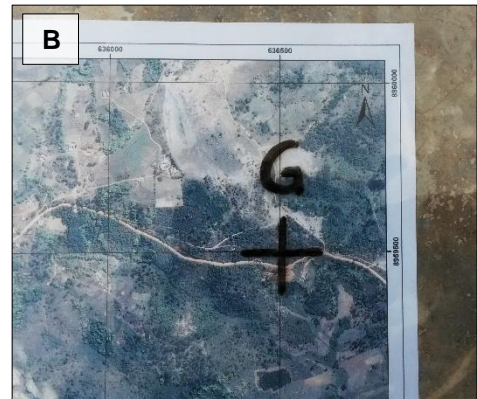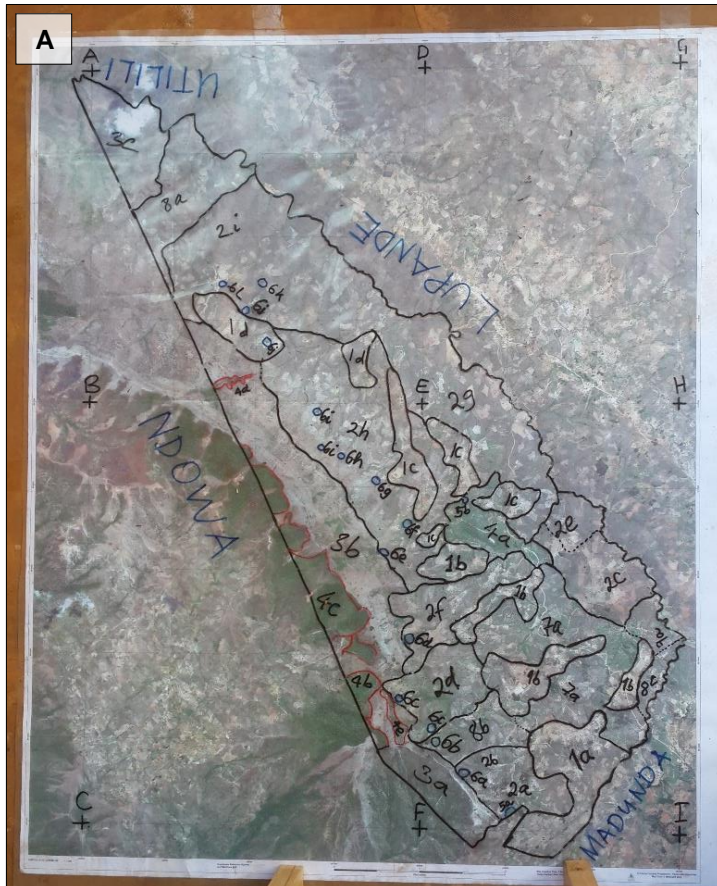
Textbox 9   How to help VLUP participants understand and use a satellite image?

When you introduce the satellite image map to participants in the VLUP process, it is important to make them feel comfortable with the image and help them to understand what can be seen on it.

- Explain that satellite images are obtained from space by instruments which resemble cameras and which can capture images of the earth over large geographical areas.

- Show participants that they can see, for example, roads, farms, settlements, forests and even individual trees, grasslands, and rivers on the image.

- If there are clouds in the images, explain what they are and use them as evidence that a satellite is an instrument in space, hundreds of kilometres above the ground.

- Orient participants to the image by showing them where some common features of their village – main roads, the village office and the place where you are gathered – are located. Ask them to show you where the primary school or a church or other feature is located to test whether or not they have understood the image. If possible, mark the important places villagers identify with something (a mark drawn with a marker pen, a wooden bead or a sticker, for example).

- Tell them that topographical features such as hills are not visible in the image but that they can be located if they know the area well.

- Tell participants when (month and year) the image was taken and suggest that things might have changed since the image was taken. For example, a brand-new dispensary will not be seen in the image. Remind them, too, that the village might look different in the image because of the season (dry or wet) during which the image was taken.

- Tell participants that satellite images are available all over the world, and that anyone with skill in interpreting what is seen on the images, can benefit from using them. Give an example of a neighbouring or other village where you have already used it to illustrate your point.

- Forget your role as an expert. Remember that the VLUP is their plan and let them lead the exercise. Steer them into owning the mapping process.

- Tell them to feel free to ask anything, including more instructions if needed.

2.1.3   Mapping existing land uses on a satellite image map

Overview and aim

One important part of the VLUP process is mapping existing village land uses with villagers. Since the existing village land use map depicts the current land uses and resources in a village, it helps villagers and stakeholders understand how land is used and how resources are distributed in their village (Figure 9). The existing village land use map is also useful for projecting future area needs and discussing and mapping proposed land use allocations.

This section explains how a village satellite or aerial image map (see section 2.1.1.) can be used as a background for mapping existing land uses. Participants draw a sketch map of the existing village land uses on a transparent plastic sheet which is placed on top of a satellite image map of their village. Since the background image is geo-referenced, the sketch map will also automatically be drawn in cartographic scale. Using this procedure has significant benefits that drawing a sketch map on a blank piece of paper does not (see Textbox 2). One major benefit is that the satellite image enables participants to relate what they see in the image to actual locations on the ground, thereby enabling them to develop a shared understanding of the locations under discussion. In addition, while mapping they can travel mentally on the image to explore different parts of their village and thus build understanding of the village landscape (Figure 10). Finally, delineating land use areas using a satellite image promotes a level of accuracy and detail which is difficult to achieve using GPS tracking of land use area boundaries in the field. A high standard of accuracy and detail is important since establishing detailed and jointly agreed land use area boundaries will mitigate land use disputes during the implementation of the VLUP.

Working tasks

Listing existing land uses and resources:

1. Either have participants gather in one group, or, after reading the situation and observing the power dynamics, divide them into small groups (see Textbox 12). Encourage everyone to participate and create an atmosphere in which members of disadvantaged groups, too, will feel comfortable enough to express their ideas.

2. Ask participants to write the existing land uses and resources in their village on a flipchart. So that they do not repeat working task, ask them to start with the ideas they generated during PRA activities.

3. Ask them to list at least the following: land uses (settlement, agriculture, grazing, forestry, wildlife and tourism, fishery, mining, and the like), infrastructure, social services, public places, and water sources (see "PLUM Guidelines (3rd edition)" and Textbox 13). If land uses and sites, for example different agricultural areas, have local names, these names should be used to help participants remember which areas are under discussion.

Preparing a mapping background on a flat surface:

4. Make sure you have all the materials required for the mapping exercise (see Textbox 10 and Figure 7).

5. Place the village satellite image map **on a flat surface**, preferably a cement floor, which can be used as the background for mapping. In a village setting, such a surface can be found in village offices, schools, dispensaries, churches, and the like. Ensure that there is enough light in the place selected for villagers to see features on the satellite image map clearly. Position the satellite image map so that its north arrow is oriented to the north of the village.

6. Use clear wide tape to straighten the satellite image map to the surface or floor.

7. Place a transparent plastic sheet on top of the satellite image map. Tape the sheet to the surface using clear tape so that it will not move during the exercise.

Mapping the existing land uses and resources:

8. Gather all the participants in one group or several smaller groups around the satellite image map(s). If you choose to work with several small groups, see Textbox 12 to find out how to modify the procedure described below.

9. Orient participants to the satellite image map and explain it to them (see Textbox 9).

10. Explain to participants how to carry out the mapping exercise. Take sufficient time in your instructions to ensure that everyone understands the procedure well.

11. Ask the participants to select one person from among them to draw on the image with a marker pen, but remind them that others can also draw, especially if they are more familiar with a particular area than the person selected.

12. Ask participants to first verify the village boundary and then write the names of neighbouring villages on the sketch map which they will draw on top of the plastic sheet.

13. Display the list of land uses and resources in the village near the satellite image map for participants to see.

14. Ask the participants to start locating the listed land uses (in the same order as in the list) on the satellite image map. Ask them to mark them on the transparent plastic sheet using a marker pen. Instruct them to mark boundaries of areas with lines and point information with points.

15. Tell participants to carefully use the features on the satellite image to mark boundaries and other locations on the sketch map as precise as possible (Figure 11). Observe the level of detail. If participants draw the boundary quickly, ask them which features on the satellite image map they used to delineate the boundary. Caution is needed because, if participants are not careful, they could easily draw a boundary line without basing it on any features on the satellite image map.

16. Tell participants that if they make a mistake they can erase and correct their drawing. Usually after participants get used to the exercise, they no longer need much facilitation and can draw the sketch map by themselves.

17. Name each mapped area and location with a unique code. The code should be short in order to save space on the sketch map. You can, for example, use a letter-number combination (see the example in Figure 12). Note the codes on a flipchart to serve as a map legend for all participants to see and explain well to them how the coding works.

18. A facilitation team member with GIS skills should note down the codes and their descriptions in a notebook, for use as entries in the attribute table made when creating GIS data (a shapefile) of existing land uses.

19. If seasonal changes like seasonal grazing are relevant in the village, ask participants to mark these changes using, for example, arrows or dashed lines.

20. After participants have marked all the things listed on the sketch, there will most likely still be areas which have not been assigned any land use. Ask participants what is done in these areas and what they would name the type of land use there. Oftentimes, such areas have mixed uses or are unutilised land reserves or participants have simply forgotten to mention some land use. Mark these areas with a code and update the legend to include them as well.

21. Ask participants whether they are satisfied with the sketch map or whether they still want to add or modify something.

Documenting and finalising the sketch map for use in producing a digital map:

22. Do not move the sketch map. Simply prepare it to be photographed. In order to geo-reference and digitize the sketch map, you need to take photographs of the sketch map from close enough that its content is clearly visible. Each photograph needs to have at least

four reference points highlighted in it. This task is best carried out by a facilitation team member with GIS skills.

23. To take these photographs, highlight with marker pen four reference points at the intersections of the gridlines at the edges of the satellite image map (Figure 8). Label the reference points with letters (A, B, C, etc.).

24. Write the grid readings (coordinates) of these reference points in a notebook for use in geo-referencing.

25. Take photographs of the sketch map so that the photographs can be used in digitizing the entire sketch map (see Section 2.1.6.). The photographs have to be taken directly above the sketch map in order to avoid distorting the map.

26. If the satellite image map used is large, take several photographs, each with at least four reference points, all of whose coordinates are recorded. All these photographs need to be geo-referenced in GIS software.

27. Make note of those areas and locations which require GPS tracking after the mapping exercise. These areas and locations are those which are not clearly visible on the satellite image and which therefore require more accurate boundary tracking.

28. Store the village boundary sketch map drawn on the plastic sheet and the satellite image map carefully so that they can be used again during proposed land use mapping.

Instead of using printouts of village satellite image maps, you may wish to consider several other mapping techniques which may suit the context better. For example, creating a resource map in the form of a mind-map works especially well in rangeland areas of Tanzania (see Textbox 14). Whereas, new mobile mapping applications which enable participants to map using smartphones and tablets in the field (see Textbox 15) can be used with participants who are familiar with these devices and capable of adopting the tools.

Further information sources

International Land Coalition (2016). Participatory Rangeland Resource Mapping in Tanzania: A Field Manual to support planning and management in rangelands including in Village Land Use Planning. 97 p. Available from: www.landcoalition.org/en/resources/manual-participatory-rangeland-resource-mapping

International Land Coalition (2013). Village land use planning in rangelands in Tanzania: good practice and lessons learned. Rangelands Issue Paper No. 3. 83 p. Available from: www.landcoalition.org/es/resources/village-land-use-planning-rangelands-tanzania

Figure 9   Example of an existing village land use map

Existing village land use map shows the land use areas and resources in the village. The colours and symbols used in the map are instructed in the PLUM Guidelines (3rd edition).

KIJIJI CHA KIWE - MATUMIZI YA ARDHI YA SASA

Legend:
- ⊗ Ghala
- ✚ Kanisa
- 💧 Kituo cha Maji
- Makaburi
- ● Ofisi ya Kijiji
- Shule ya Msingi
- ⊕ Zahanati
- Mstari wa Kontua
- Mto Mdogo
- Mto Mkubwa
- Mpaka wa Kijiji
- Barabara Kubwa
- Barabara Ndogo
- Ardhi Oevu (1.3 ha)
- Chanzo Cha Maji (6 ha)
- Eneo la Akiba (118 ha)
- Huduma ya Jamii (30.7 ha)
- Eneo la Kilimo (1,173.7 ha)
- Eneo la Mkazi (246.7 ha)
- Eneo la Makazi na Kilimo (125.4 ha)
- Eneo la Malisho (453.1 ha)
- Eneo la Matumizi Mchanganyiko - Kilimo na Misitu ya Kupandwa (272.9 ha)
- Msitu wa Asili (166.6 ha)

Chanzo: GPS data, Ramani ya Mipaka, CRS: Arc1960 Zone36S
1:40,000

Figure 10   Mapping existing land uses on the village satellite image map

One of the participants can draw on the sketch map while others instruct him or her to ensure the boundaries of land use areas are correct and everyone can agree on them. One facilitator or participant writes the legend for the map on a flipchart paper. The legend shows which code on the map means which land use area and location in the village.

Figure 11   Drawing the existing land use sketch map in a detailed way

The satellite image in scale 1:7500 enables very detailed land use area delineations and it allows everyone to see and agree where the land use area boundaries are located. The features seen on the image such as houses, forest patches, roads and rivers should be used to discuss, agree on and draw the land use areas on the map.

Figure 12 **Example of a map legend with unique codes for each land use area and location**

A) The legend with each code and its explanation; B) The same codes written on a sketch map. Codes need to be used because the full names of land use areas and locations would not fit into the sketch map.
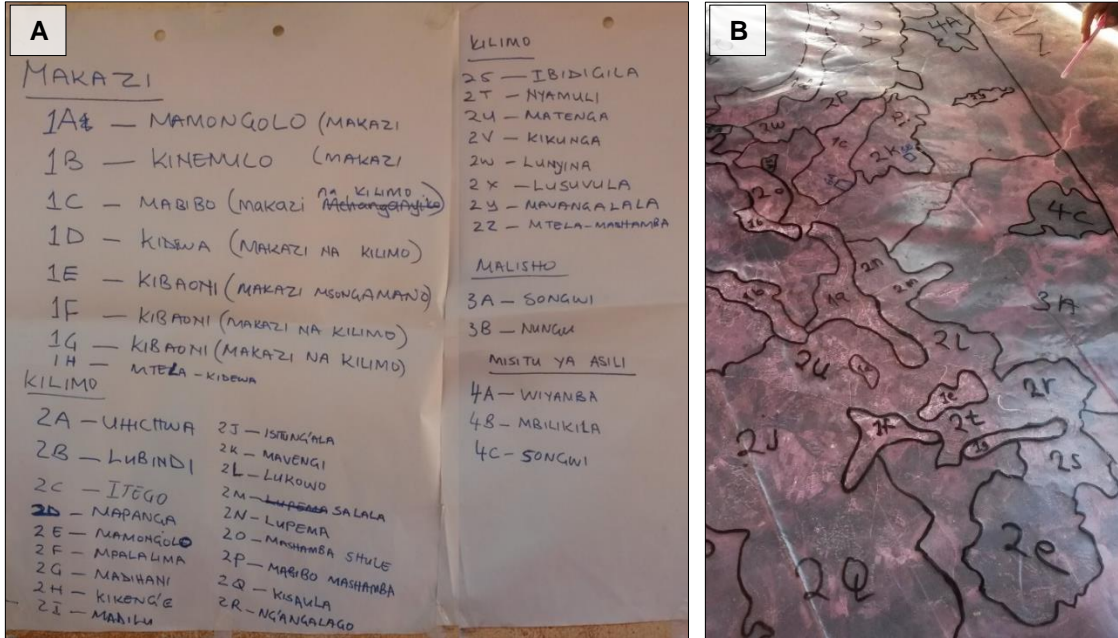
Figure 13 The exercise of combining the sketch maps of existing land use

The two sketch maps drawn by two different groups are placed on the ground next to each other so that the participants can compare them and agree how to combine the information on them. First the participants can choose which one of the sketch maps will be modified into a joint sketch map and then the information on the other map is used to modify it.

Textbox 10   Basic details

- Time: 3.5 to 7 hours, listing 1-2 hours and mapping 2.5 to 5 hours. It is advisable to conduct existing land use mapping some days before conducting proposed land use mapping in order to allow enough time for a facilitation team member with GIS skills to digitize the map and calculate and make projections of future area needs.

- Participants: VLUMC and village council members, hamlet leaders, and representatives of all other identified stakeholders.

- Outcomes: Sketch map of village land uses on a satellite image map background.

- Preparations and materials: Whiteboard marker pens (the ink should be erasable but not too easily) and something with which to erase markings from the plastic sheet, clear wide tape, scissors, a village satellite image map, 4–5 meters of transparent plastic sheet, flipchart paper, masking tape, marker pens, notebooks, pens, a report template and a camera.


Textbox 11   Addressing possible challenges

Finding a flat well-lit and large enough place for the mapping exercise can be challenging. Explaining a satellite image map and map legend so that all participants understand takes time and you must observe carefully to see if all have indeed understood. A facilitation team member with GIS skills has to be present during the mapping exercise to take notes on the mapped land uses and the codes assigned to each so that he or she will be able to digitize the sketch map markings correctly in a digital map.

Textbox 12   Ways to modify

Listing and mapping can be done as small-group work so that, for example, women and men or VLUMC members and representatives of disadvantaged groups work in separate groups where they are comfortable freely to express their opinions and needs. If you decide to have participants work in groups, either have several printouts of the village satellite image map so that all the groups can work simultaneously or have groups work turn by turn using a single printout. The hand-drawn sketch maps of each group can then be combined by having all the participants together to compare the maps, negotiate the markings and jointly create a single sketch map (Figure 13). Making comparisons is easy if the transparent plastic sheets with the sketch maps are overlaid on top of each other or placed next to each other on the ground. As a facilitator, you will have to ensure that the sketch maps and opinions of each group are respected and taken into account while producing a single map.

Textbox 13   Mapping environmental problems and conservation needs

"The PLUM Guidelines (3rd edition)" instructs VLUP facilitators to map the environmental problems of villages. Doing so is important as such problems are often related to unsustainable land and resource use which villagers might be able to mitigate by adopting better strategies for land-use planning and climate change adaptation. In addition to mapping problems, villagers should map areas and sites of conservation value since they contribute to community wellbeing and environmental resilience. Ask participants to map the following features on the sketch map with a satellite image map background:

● Environmental problems such as deforestation, land degradation, encroachment, and the depletion and pollution of water sources. These problems should be included in the community action plan. In addition, their impacts on people and livelihoods should be discussed and their solutions identified and mapped on the proposed land use map. To address the problem of degraded soil, for example, the proposed land use map should show measures to stop and reverse such degradation, like ensuring year-round vegetative cover or limiting tillage. To tackle deforestation, the rehabilitation of natural forests and the promotion of woodlots for firewood and timber could be considered.

● Culturally, historically and environmentally important sites and recreational and beautiful sites. Mapping these sites can help villagers start thinking about how to ensure that, in the future, there will be places for community wellbeing such as green areas, conserved natural habitats, and, sites with touristic and educational potential. Possible sites include wetlands, natural grasslands and forests, caves, and waterfalls.

● Areas where natural resources such as firewood, medicinal plants and construction materials are collected. These resources contribute to village wellbeing and subsistence. After identifying where natural resources are primarily collected, ask if they are abundant or declining in the village as knowing the trends will help you to identify both resources on which to base alternative income-generating activities on and resources that might not be readily available in the future. Collection areas do not have to be shown in the digitized existing village land use map but do mention them in the VLUP report as text.

Textbox 14   Resource mapping to capture resource utilisation outside village boundaries

Resource mapping is a way to capture and plan the use of resources which lie outside of the administrative boundaries of a village. The utilization of such resources is common in Tanzania when the resource is shared between villages and livelihood strategies are mobile. "The PLUM Guidelines (3rd edition)" and the "Rangeland management manual" (ILC 2016) provide instructions on how to conduct this exercise. Resource mapping relies on a mind-map done without geo-referencing and on a flipchart or on the ground. While a satellite image map could be used, it is better not to use one because its limited extent and recognisable boundary features may limit the imaginations of participants. The purpose of a mind-map is to allow participants to freely map the use of resources without fear of being accused of resource exploitation or of encroaching on neighbouring villages. Thus, the resource mapping exercise can be a good start for developing joint resource planning and management arrangements between villages that mitigate and even resolve land use conflicts.

Textbox 15   Using web and mobile mapping applications

Web and mobile applications are future options for data collection and participation in the VLUP process. Access to the Internet is gradually improving in rural Tanzania and more and more inhabitants have smartphones and tablets, both of which allow for the digital collection of land use data. In some VLUP mapping tasks, the use of printed satellite or aerial images may, in the future, be substituted with online and stand-alone mapping applications. Some software and applications worth testing are described below.

OpenStreetMap (www.openstreetmap.org) is a map of the world created by registered users and free to use under an open license. It allows registered users to create thematic data based on the visual interpretation of and mapping on satellite images. OSM can be used offline with mobile applications. It has been used as a platform in several community mapping initiatives in Tanzania, such as Ramani Huria and Crowd2Map. Much of the basic mapping of villages could be done using OSM and could be used to substantially improve and facilitate further VLUP work.

Maptionnaire (www.maptionnaire.com) and **Harava** (www.dimenteq.fi/en/services/harava) are two similar commercial software programmes which allow collection of local information from the residents into a map form. The software works directly through the Internet and does not require installation on a device. Both programmes are designed to promote public participation in planning and local data collection by gathering location-based information from ordinary people. Both software programmes could be used in VLUP process to for example, facilitate the collection of location data on land use activities or ideas about the service and development needs of a village.

Mapillary (www.mapillary.com) is a software programme designed to capture street-level photographs with reference to locations. It works well on mobile phones and allows users to collect image data on the move as well as to upload data for sharing on different platforms. Mapillary could be used in VLUP process to collect field data from different sites in a form of photographs and sharing the data in this intuitive form among participants in the land use planning process.

Ushahidi (www.ushahidi.com) is crowd-sourcing software which enables the conduct of customised surveys and the collection of data from multiple sources, including social media and emails. It is designed to improve information flow from the grass-root level to decision-makers and has been used, for example, in crisis-response situations, where knowledge from the ground is needed immediately and efficiently. Ushahidi data can be presented on top of maps when the data harvested has a location link available. In VLUP process, Ushahidi could be used, for example, to collect villagers' opinions about development plans.

Open Data Kit (ODK) (www.opendatakit.org) and **Open Map Kit (OMK)** (www.openmapkit.org) are open-source software produced for collecting, managing, and using spatial and non-spatial data in resource-constrained environments. With OMK, for example, you can create mobile data collection surveys to collect field data. In the VLUP process, OMK and ODK could be used, for example, to track, collect and store information on individual parcels of land and buildings for the purposes of land adjudication and environmental monitoring.

In addition to these seven software applications, there are many more mapping- and planning-related participatory software tools offered on the Internet. Depending on the tasks which you are to do and the technology you have access to, you may wish to have a look at the increasing number of tools freely available in the internet and adopt them if they suit your needs.

2.1.4   Mapping proposed land uses on a satellite image map

Overview and aim

Once villagers have established a community action plan and developed a shared understanding of the future needs and wishes of their village, proposed land uses can be mapped (Figure 14). Mapping proposed land uses aims at ensuring that there is land allocated sustainably for the future needs of the village. These needs include addressing land productivity and land disputes as well as environmental problems and climate change effects through land use planning. You will need to facilitate villagers to discuss, agree on and map proposed land use areas which ensure the best possible allocation of land uses for community wellbeing and environmental conservation.

Proposed land use allocation has to consider the areas required both to achieve the community action plan and to accommodate any anticipated future needs for the sizes of land use areas, or, in other words, projections of future areas calculated based on the sizes of existing land use areas. These projections will include, for example, estimates of how much the total settlement area need to be extended in order to accommodate the housing needs of the growing population. The proposed land use map also must address existing and potential land use conflicts as well as areas of environmental risk in order not to perpetuate them in the future. PLUM team members should use their sectoral expertise, such as expertise in agriculture and environmental matters, to provide advice to villagers on sustainable land use allocation decisions like how to sustainably manage or protect areas identified as having environmental risks.

Working tasks

Discussing and listing proposed land uses:

1. Either have participants gather in one group, or, after reading the situation and observing the power dynamics, divide them into small groups (see Textbox 12). Encourage everyone to participate and create an atmosphere in which members of disadvantaged groups, too, will feel comfortable enough to express their ideas.

2. Ask participants to identify and list proposed land use needs in the village.

3. Display the community action plan and future vision of the village (trip to the future outcomes, see Section 2.2.4.) for participants to use to identify and list issues which need to be added into the proposed village land use map. For example, if the plan says a dispensary is needed, one future land use has to be land for a dispensary. Similarly, if the future vision says villagers aspire to have a crop-processing industry and a milk factory in the village, land needs to be allocated for these ambitions, too. In addition, display a summary of projected land requirements in order for the participants to discuss the sizes of land use areas they will need in the future.

4. Place the existing land use sketch map so participants can refer to it during their discussions.

5. Remind participants to discuss the need to allocate land for the following uses (see more examples in "The PLUM Guidelines (3rd edition)"):

    a. Sites for new business opportunities and land for investments in practices like horticulture and forest plantation.

    b. Forest, grassland, watershed, wetland, and soil conservation areas (e.g. buffer zones and green spaces).

    c. Land reserve areas for future use.

    d. Environmentally friendly land use alternatives such as small water reservoirs and sites for biogas production, composting, demonstrating sustainable agriculture, agroforestry, and beekeeping.

e. Other land uses considered relevant to coping with environmental problems and the effects of climate change.

Preparing a mapping background:

6. Gather all the material required for the mapping exercise (see Textbox 16 and Figure 7).

7. Position the satellite image map on a **flat surface** and place the transparent plastic sheet with the sketch of the existing land use map on top of it. The already made sketch map of the existing land uses and underneath it the satellite image map are used as the background for the proposed land use mapping.

8. Using the village boundaries as a guide, ensure that the transparent plastic sheet is placed in the same position on the satellite image map as it was during the existing land use mapping exercise.

9. Tape the plastic sheet on the surface using clear tape so that it will not move during the exercise.

Allocating and mapping proposed land uses:

10. If needed and if any new participants join the mapping exercise, orient the participants to the satellite image map and explain it to them again (see Textbox 9).

11. Explain to participants how to carry out the proposed land use mapping, spending enough time to ensure that everyone understands what to do.

12. Display the list of proposed land uses for the participants to see.

13. Ask participants to select one person among them to draw on the sketch map.

14. Ask participants to start mapping the proposed new land uses and proposed land use changes on top of the existing land use sketch map (Figure 15). Allocate areas for all the proposed land uses on the list. Instruct participants to use a dotted line to mark proposed land use areas to differentiate between these areas and existing land-use areas (Figure 16).

15. Advise participants to use both the existing land use sketch map markings and the features on the satellite image map carefully so that they can mark the boundaries and locations of proposed land uses on the map as precisely as possible. Observe the level of detail. If participants draw the boundary quickly, ask them what features they used to delineate the boundary. If the participants are not careful, they could easily draw a boundary line without basing it on any features on the satellite image map.

16. Tell participants that if they make a mistake they can erase and correct the drawing. Knowing that nothing they write is permanent will make participants more comfortable about drawing on the image map.

17. Update the map legend by naming each new proposed land use area with a unique code. Use the same coding that you used in the existing land use sketch map, for example a letter-number combination (see the example in Figure 12). Explain the coding clearly to new participants.

18. Make sure any changes in the sizes of land use areas, whether extensions or reductions, shown by the projections are marked accurately on the map. Use the area projections calculated using existing sizes of land use areas and information obtained during PRA exercises to do so (see "The PLUM Guidelines (3rd edition)").

19. You can use the 1 hectare (100 m x 100 m) grid cells to help allocate approximately the right amount of land for each area extension or reduction. To estimate the area sizes, you need to count the number of full grid cells within the area you are estimating and multiply that number by 1 hectare. Then count the number of cells only half covered, divide that number by two and multiply it by 1 ha. Add the two numbers to find an estimate of the total area of the proposed land use.

20. Take time to share with participants the advice of the district PLUM team experts on environmental conservation needs and land suitability and ask them to consider what to do with areas that are at environmental risk. In particular, they need to consider if those areas can be used sustainably or if they need to be converted into protection areas. Sustainable land uses of flood areas, for example, include fish farming and paddy cultivation and of steep slopes, fruit-tree and contour farming.

21. Ask participants whether they are satisfied with the sketch map and whether they still want to add or modify something.

Documenting the sketched boundary on the satellite image map *[requires GIS expertise]*:

22. Do not move the sketch map. Simply prepare it to be photographed. In order to geo-reference and digitize the sketch map, you need to take photographs of the sketch map from close enough that its content is clearly visible. Each photograph needs to have at least four reference points highlighted in it. This task is best carried out by a facilitation team member with GIS skills.

23. To take these photographs, highlight with marker pen four reference points at the intersections of the gridlines at the edges of the satellite image map (Figure 8). Label the reference points with letters (A, B, C, etc.).

24. Write the grid readings (coordinates) of these reference points in a notebook to use in geo-referencing.

25. Take photographs of the sketch map to be geo-referenced and then used to digitize the entire sketch map (see Section 2.1.6.). These photographs have to be taken directly above the sketch map in order to avoid distorting the map.

26. If the satellite image map used is large, take several photographs, each with at least four reference points, all of whose coordinates are recorded. All these photographs need to be geo-referenced in GIS software.

27. Make note of those areas and locations which require GPS tracking after the mapping exercise. These areas and locations are those which are not clearly visible on the satellite image and which therefore require more accurate boundary tracking.

28. After all required information and photographs are taken, you can leave the satellite image map and the sketch map with the village council so that they can utilize them in the future decision-making. The village council should be instructed to store the maps carefully for future use.

Figure 14 *Example of a proposed land use map*

In this village the villagers had decided to extend the settlement areas and allocate some land for tree planting and other investments in the future. You can see these changes by comparing this map to the existing village land use map (Figure 9).

KIJIJI CHA KIWE - MPANGO WA MATUMIZI YA ARDHI 2016 - 2026
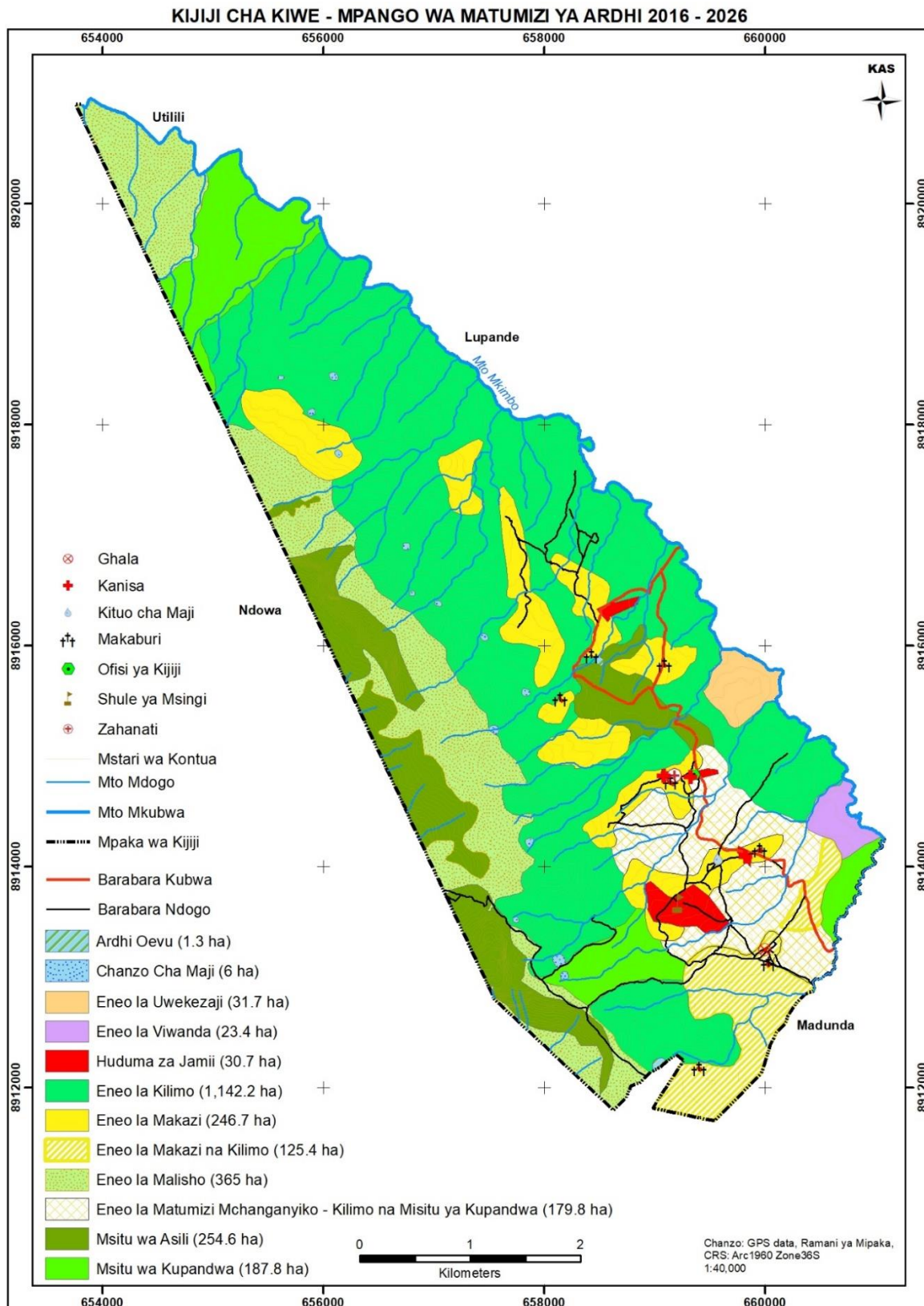
Figure 15 Mapping proposed land uses on the sketch map of existing land uses

The sketch map is displayed on top of the village satellite image map. Discussion, negotiation and agreement are crucial in allocation of proposed land use areas. Discussion using the satellite image map allows the land rights and interests of different community members and stakeholders to be considered before land allocation decisions are made.

Figure 16 Example of a proposed land use sketch map

Proposed land use areas are shown on the sketch map with a dotted line. The existing land use areas are shown as solid lines in black and red as well as blue for water sources.
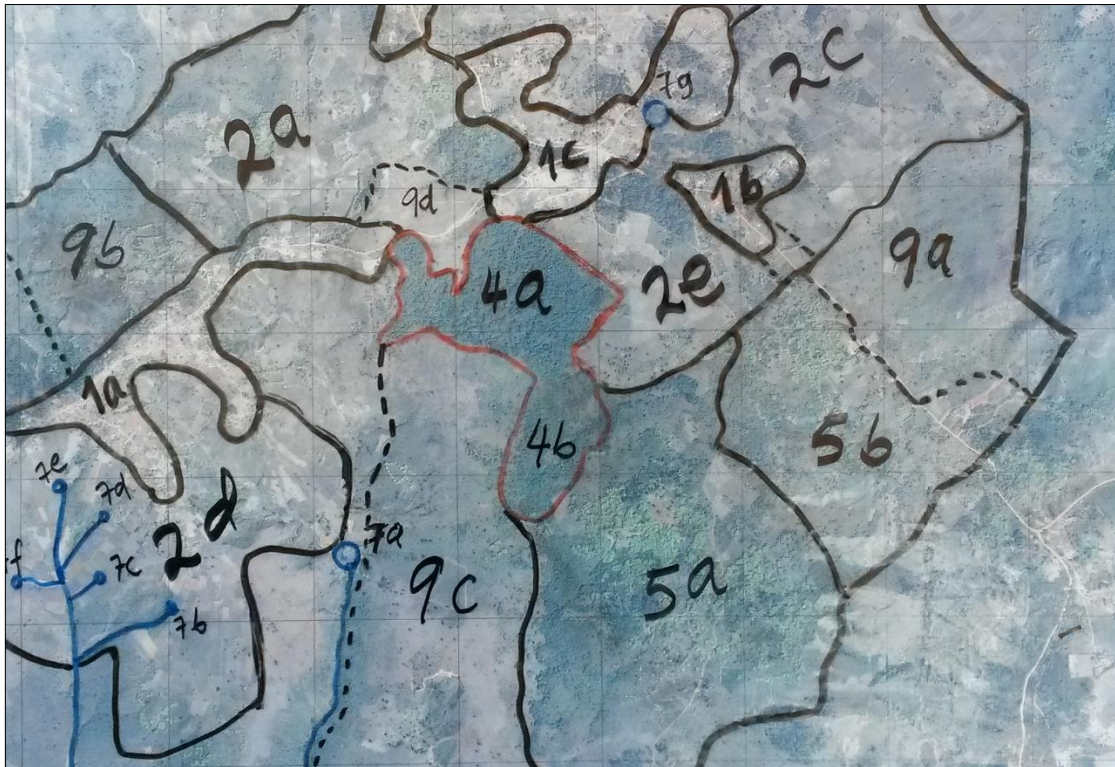
Textbox 16. Basic details

- Time: 2 to 4 hours, listing 1 hour and mapping 1 to 3 hours.

- Participants: VLUMC and village council members, hamlet leaders, and representatives of all other identified stakeholders.

- Outcomes: Sketch map of the proposed village land uses on a satellite image map background.

- Preparations and material: Whiteboard marker pens (the ink should be erasable but not too easily) and something with which to erase markings from the plastic sheet, clear wide tape, scissors, a village satellite image map, 4-5 meters of transparent plastic sheet, flipchart paper, masking tape, marker pens, notebooks, pens, a report template and a camera.

Textbox 17. Addressing possible challenges

Some villages may have very little land available for new land uses or area extensions. If this is the case, give participants time to discuss where more land can be found. This discussion might need to be continued in the village assembly meeting at which the VLUP is presented and those assembled given the opportunity to consider which land could be made available for use. They should also be encouraged to suggest alternatives to extending land use areas, like intensifying an existing land use or increasing the productivity of land per hectare. Zero-grazing and the densification of settlement areas are two examples of such alternatives.

Textbox 18. Ways to modify

The listing of proposed land uses can be done in small groups representing different social groups in order to better capture their preferences. If the plastic sheet from the existing land use mapping is too full you can try to copy it onto a new plastic sheet, leaving more space to draw and write proposed land use areas and markings.

2.1.5   Presentation of proposed land use plan and maps in a village assembly

Overview and aim

At the end of the VLUP process, organise a village assembly meeting at which the whole community has the opportunity to see and comment on the developed VLUP and land use maps. These maps, both the hand-drawn sketch map of proposed land uses with the satellite image map background and the printed digital VLUP maps, should be used in the village assembly to convey the VLUP and related decisions for the assembly to discuss and either approve or modify. The hand-drawn sketch map on the satellite image map will enable assembly attendees to see exactly where resources, services, and the boundaries of each land use area in their village are located (Figure 17). The sketch map of proposed land use with the satellite image map background allows the VLUMC and village council as well as assembly attendees to arrive at a shared understanding of the area delineations and the implications of the proposed land use allocations. They can, for example, ensure that individual land rights are respected in the VLUP because everyone can see (and question) where boundaries are drawn (Figure 18). Only when a village assembly has the chance to understand the delineations and their implications will villagers have a genuine opportunity to decide whether or not they agree with the VLUP maps or want to change them.

Working tasks

1. Organise the assembly in a place where you can display the sketch map and the VLUP maps on a wall or flat surface on the ground for the assembly to see.

2. Decide on the best way to enable attendees to see the maps, whether this is to have all view them at the same time or to have small groups view them in turn.

3. Explain the maps to attendees so that they will understand them as a whole and be able to interpret the individual markings on them (see Textbox 9). Give attendees time to familiarise themselves with and study and discuss the maps. Remind them that they can freely ask questions.

4. Ensure that the assembly is aware of and discusses all changes in the land uses and the land use area boundaries made on the proposed land use map.

5. If the assembly requests modifications, write them down and agree upon how the proposed VLUP will be changed in response to their suggestions. Make sure that the VLUP and the village land use plan map are finalised according to the comments the assembly makes and that all important information has been incorporated into the report.

Figure 17   Village assembly attendees discussing

The attendees are gathered around the proposed land use sketch map which is shown on the top of the village satellite image map. The assembly is able to see the details on the sketch map and discuss whether they agree with the information on the map or not.

Figure 18   A village assembly meeting

The community action plan with the sketch map of proposed land uses and the village satellite image map are shown to the assembly. This allows assembly attendees to see where the VLUMC and other community representatives have decided to delineate different land use areas in the village. They can see the detailed boundary delineations and they can ask for modifications if they do not agree with these boundaries.

Textbox 19   Basic details

- Time: 3 to 6 hours.

- Participants: VLUMC, village council, village assembly, and ward officials.

- Outcomes: The VLUP maps and bylaws and VLUP are presented to the assembly for their comments and approval. Any modifications requested by the assembly are recorded and incorporated into the final VLUP and village land use plan map.

- Preparations and materials needed: Hand-drawn sketch map of proposed land uses with the satellite image map as its background, the draft of the VLUP report, and, if already printed, the draft versions of the digital VLUP maps, flipchart paper, masking tape, marker pens, notebooks, pens and a camera (optional).

Textbox 20   Addressing possible challenges

Sometimes attendance at assembly meetings is low, and it takes time to get enough people to come so that the assembly is representative of the whole village. It is recommended that, well in advance, you raise awareness about and advertise the assembly meeting in the village as a whole and in individual hamlets. This will enable people to mobilise themselves to attend the assembly. Sometimes it is necessary to postpone an assembly meeting to another time in order for it to be representative.

Textbox 21   Ways to modify

In order to involve the whole assembly actively in commenting on the VLUP and the VLUP maps, consider using small-group discussions. Small-group discussions will allow individuals to more freely express their opinions than they would feel comfortable doing in the assembly as a whole. Group discussion might take more time because each group would have to report back to the assembly, but the quality of the participation and comments would increase. You can also consider organising hamlet meetings before the village assembly meeting (see Textbox 31).

2.1.6 Digitization of sketch maps on the satellite image map

Overview and aim

The sketch maps of existing and of proposed land uses have to be converted into digital geospatial information, which can then be used to produce digital maps. To do so requires using GIS software to digitize the sketch map information from the photographs taken of the sketch maps. The digitizing work requires basic knowledge of GIS and is best carried out by a facilitation team member with GIS skills. The digitization work has to be done carefully and in detail to achieve good quality spatial data. High quality spatial data will increase the accuracy of the calculations of area projections and thereby the reliability of the VLUP maps. Moreover, the GIS data has to be stored properly so that it can be shared and used in the future (Textbox 24). You should start the digitizing process in the village because you have to digitize the sketch map of existing land uses in order to be able to make the calculations of area projections that you need in order to map proposed land uses.

Working tasks

Digitizing an existing land use sketch map and other data to create an existing village land use map:

1. Import the photographs of the existing land use sketch map (Section 2.1.3.) into GIS software.

2. Geo-reference the photographs, and, when prompted by the software, specify the same datum you used to prepare the satellite image map. Use the grid readings (coordinates) of the four reference points you marked on the satellite image map to do the geo-referencing.

3. Create a polygon layer (a shapefile) for existing land uses and digitize into polygons all the land use area boundaries shown in the sketch map photographs. Digitize all the existing land use polygons into one layer.

4. Make sure all the polygons join correctly and that they do not overlap each other or create sliver polygons. It is recommended that you set the zoom level in the software to 1000─3000 while you digitize. GIS software tools for advanced digitization, such as the trace tool, can be used to bind land use polygons together exactly so there is are no overlapping or sliver polygons.

5. Import all the GPS data collected in the village and digitize into polygons all those GPS points which delineate area-based land uses. Incorporate these polygons into the same existing land use polygon layer.

6. Digitize all the other information, such as lakes and wetlands, and incorporate it into the same existing land use polygon layer.

7. Name each land use polygon in the attribute table of the layer according to the land use type.

8. Calculate the area sizes of the existing land use polygons. In order to calculate the area sizes, project the existing land use layer into WGS84 Zone 35─37 South.

9. Export the existing land use attribute table into an Excel or CSV file and sum all the individual areas of a particular land use to find the total area of that land use.

10. Write the total area sizes of each type of land use in VLUP report, display them on the digital maps, and use them to estimate future land use needs (projections).

11. Create a line layer (a shapefile) for all linear features. Digitize all linear features, including rivers, roads, pipelines, railway lines, and high voltage power lines, and classify them by their type.

12. Create a point layer (a shapefile) for all village facilities which will be illustrated as point information on the existing village land use map.

13. Label the map features with the local names the villagers provided during the sketch mapping exercise.

14. Create a contour layer (a shapefile) from Digital Elevation Model (DEM) using 20 m interval for contours as in the topographic standard sheet.

15. Now all the data you need to make an existing village land use map are ready and you can make the map.

Digitizing the proposed land use sketch map and other data to create a proposed land use map:

16. Import the photographs of the proposed land use sketch map (Section 2.1.4.) into GIS software.

17. Geo-reference the photographs and, when prompted by the software, specify the same datum you used to prepare the satellite image map.

18. Use the "save as" option to save the existing land use polygon layer as the proposed land use polygon layer. Using this already created existing land use layer will reduce your workload as you will only have to edit it to create the proposed land use layer, and not start from scratch.

19. Open the copied existing land use layer (now named as the proposed land use layer) on top of the geo-referenced photographs of the proposed land use sketch map.

20. Edit the proposed land use layer polygons based on the areas shown in the geo-referenced photographs of the proposed land use sketch map.

21. Import all the GPS data collected in the village for the proposed land use map, digitize them and incorporate them into the same proposed land use polygon layer.

22. Name each proposed land use polygon in the attribute table of the layer.

23. Calculate the area sizes of the proposed land use polygons. In order to calculate the area sizes, project the proposed land use layer into WGS84 Zone 35-37 South.

24. Export the proposed land use attribute table into an Excel or CSV file and sum all the individual areas of land with the same land use to find the total area of that land use.

25. Write the area sizes that you calculated in the VLUP report and display them on the digital proposed land use map.

26. Create a point layer (a shapefile) for all the proposed village facilities which will be illustrated as point information on the proposed village land use map.

27. Use the same layers as in the existing village land use map to display information about roads, rivers, and contours.

28. Now all the data you need are ready, and you can proceed to making the proposed land use map.

Textbox 22   Basic details

- Time: 3 to 4 hours.

- Participants: Facilitation team member(s) with GIS skills.

- Outcomes: GIS data produced for making existing and proposed land use maps. GIS data is well- stored and properly named and arranged.

- Preparations and materials: GIS software, computer, photographs of the existing and the proposed land use sketch maps, Digital Elevation Model (DEM) data of the area, the notebook with grid readings (coordinates) and GPS data from field tracking.

Textbox 23   Addressing possible challenges

Depending on the GIS software you choose, you may face challenges or limitations as you carry out the tasks. Thus, you are advised to use either common software or software whose tools and functions you are most familiar with.

Textbox 24   Organising and storing digitized VLUP GIS data

Digitized VLUP data, which includes not just information in the VLUP report but also the digital geospatial data produced during the VLUP process, have to be properly stored for future use because, in the future, you the facilitator or a member of your team may need the data. In addition, the geospatial data has to be available to government, civil society and private-sector actors so that it can be used to carry out steps 5 and 6 of the VLUP process as well as to revise the VLUP after some years. To ensure its availability and accessibility, the data has to be properly arranged, named and stored. The best way to accomplish this goal is to organise the data in folders labelled with the name of the village and date or year the VLUP was produced (see Figure 19 for an example). The data for the existing village land use map and for the proposed land use map should be stored in separate folders. The data within each folder should also be named properly, so that it reflects the content of the data. Ensure, in general, that each folder and file bears the name of the village and the type of the data. After arranging and naming the data properly, make sure you store it carefully and that you make up backup copies in another location. Remember also to send all the GIS data produced to the NLUPC together with the VLUP report. Tanzania is developing a database for VLUP spatial data. In the future you will be able to store the data to this national database which will be accessible to all relevant actors in Tanzania.

Figure 19   Example of a VLUP GIS data storage structure and naming of files and folders

A) The main folder is named with the village name, data type and year of production and the data inside it are separated to existing land use map folder and proposed land use map folder with corresponding folder and file naming. B) When the same folders and files are viewed through GIS software they will look like this. Remember that GIS software automatically stores each shapefile with other accompanying files in different file formats. Ensure you do not delete any of these accompanying files because if one of them is missing the shapefile will not work anymore.

A 📁 Mamongolo_VLUP_2016

📁 Mamongolo_Existing_LU_2016

- Mamongolo_boundary_line.shp
- Mamongolo_cattle_path.shp
- Mamongolo_contour_20m.shp
- Mamongolo_existing_LU.shp
- Mamongolo_existing_point.shp
- Mamongolo_local_names_point.shp
- Mamongolo_river.shp
- Mamongolo_road.shp

📁 Mamongolo_Proposed_LU_2016

- Mamongolo_boundary_line.shp
- Mamongolo_cattle_path.shp
- Mamongolo_contour_20m.shp
- Mamongolo_local_names_point.shp
- Mamongolo_proposed_LU.shp
- Mamongolo_proposed_point.shp
- Mamongolo_river.shp
- Mamongolo_road.shp

B 📁 Mamongolo_Existing_LU_2016

- Mamongolo_boundary_line.cpg
- Mamongolo_boundary_line.dbf
- Mamongolo_boundary_line.prj
- Mamongolo_boundary_line.qpj
- Mamongolo_boundary_line.shp
- Mamongolo_boundary_line.shx
- Mamongolo_cattle_path.cpg
- Mamongolo_cattle_path.dbf
- Mamongolo_cattle_path.prj
- Mamongolo_cattle_path.qpj
- Mamongolo_cattle_path.shp

📁 Mamongolo_Proposed_LU_2016

- Mamongolo_boundary_line.cpg
- Mamongolo_boundary_line.dbf
- Mamongolo_boundary_line.prj
- Mamongolo_boundary_line.qpj
- Mamongolo_boundary_line.shp
- Mamongolo_boundary_line.shx
- Mamongolo_cattle_path.cpg
- Mamongolo_cattle_path.dbf
- Mamongolo_cattle_path.prj
- Mamongolo_cattle_path.qpj
- Mamongolo_cattle_path.shp

2.1.7   Production of the digital VLUP maps

Overview and aim

The digital existing and proposed land use maps can be produced once the original sketch map information has been digitized. At this stage it is assumed that all the required GIS data has been created. When the digital maps are ready, they should be printed and included in the VLUP report. The maps will show all relevant village land use information in an easily understandable and standard way (Figure 20). Apart from the text of the VLUP report, these maps are best way to convey information about the village land use areas, guide land use decisions in a village and serve as a point of reference as a village community implements its VLUP. Besides informing villagers, the maps also inform people who visit a village, such as district authorities, NGOs and prospective investors. For this reason, the maps need to be user-friendly to a variety of stakeholders.

To be user-friendly, the components of the maps must be clearly visible and the map as a whole, understandable. Achieving this goal requires that you consider, among other things, paper size and labelling with local place names as well as standard land use categories, symbols and colours. Together with the maps shown in the VLUP report, if funds allow larger maps can be printed on durable material to display in a village office. It is recommended that such maps be delivered to villages as soon as possible after they complete the VLUP process to ensure that VLUP decisions are not forgotten and to avoid delays in the implementation of the VLUP.

Working tasks

**Producing maps using GIS software like ArcGIS and QGIS:**

1. Open all the data you want to show in existing or proposed land use map into the layout view of the GIS software which you are using. To produce a proposed land use map, utilise the existing village land use map saved as a new project which you can modify.

2. Decide on and set the paper size of the map layout to the desired size. Consider using A3 paper size, whose size allows for good visibility of map content and which can be printed to be included in the VLUP report. To find out more about map layouts, refer to "The PLUM Guidelines (3rd edition)" and the sample maps in this report (Figure 9 and Figure 14).

3. Position and balance the village area well in the layout frame, using the entire area available so that the village area is as big as possible in the frame. Depending on which suits the shape of the village area (village boundary) better, select either portrait or landscape paper orientation as the layout frame orientation.

4. Decide on and set a feasible scale for the village map. The scale will depend on the size of the village, which can vary from hundreds of hectares to hundreds of thousands of hectares.

5. Add the symbols you require and customise the colour of each land use as well as the roads, rivers, contours, and other features. Use the standard colours and symbols outlined in "The PLUM Guidelines (3rd edition)".

6. Add a grid, either in tick or box format, to the map layout. Display coordinates at each side of the layout frame.

7. Add all basic map elements, including a map legend, a north arrow, and a scale bar, the map title, the data source, the datum, the date of production, and the name of the person who produced the map.

8. When labelling the legend of land uses, consider displaying area sizes of each land use category in the village. The areas are those you calculated and saved in Excel or CSV area files during the sketch map digitization exercise (Section 2.1.6.).

9. If possible, print existing and proposed land use maps in a size larger than A3 (A1 or A0) to be distributed and displayed in the village office.

10. If you produce a large map for display, consider using local names to label places and social facilities as their use will help people orient themselves to the maps.

11. Save all the maps you produce in, for example, JPEG or PNG picture file formats at a high resolution (dpi 200) and ensure that you send copies of these picture files to the NLUPC as well.

Include all the maps you produce during the VLUP process in the VLUP report. The produced maps as well as the village satellite image map can continue to be utilised in the next steps of the VLUP process, namely in the step 5, Detailed village land use management planning and the step 6, Implementation of village land administration and enhancement of the security of land tenure. It is recommended that the village council be given and instructed to store the maps carefully so that they will be easily available for the implementation of the VLUP and subsequent steps. Having the maps well displayed in the village will inform any outside actors, such as investors or new development project staff, that the village has a VLUP and will help all actors adhere to the plan.

Figure 20   The phases of producing digital VLUP maps

A) In the first phase village participants jointly draw a sketch map. B) In the next phase the sketch map is georeferenced in GIS software and each map element is carefully digitized into GIS data. C) In the last phase the GIS data is used to produce the digital maps with easily understandable standard colours and symbols.
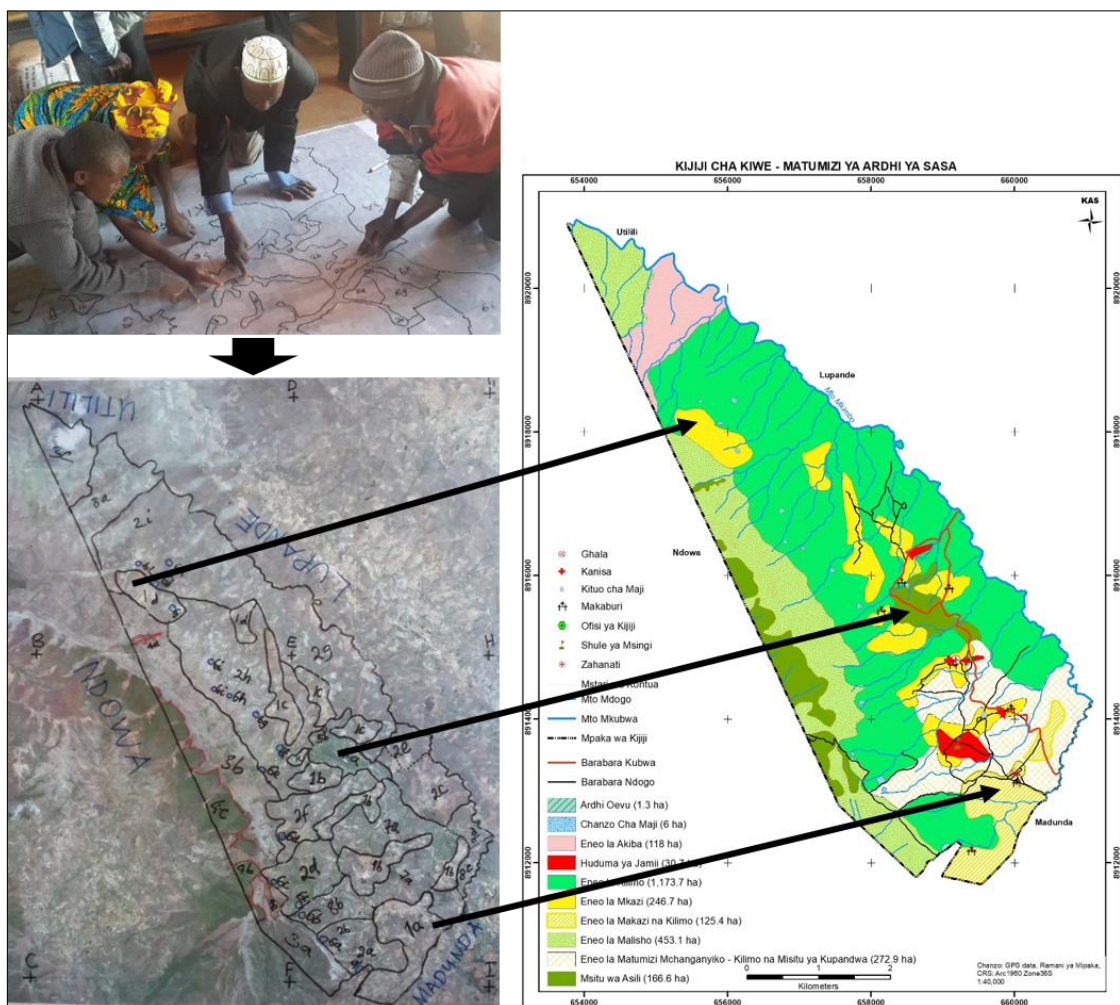
Textbox 25   Basic details

- Time: 2 to 3 hours for each map.

- Participants: Facilitation team member(s) with GIS skills.

- Outcomes: All the VLUP maps are ready to be included in the VLUP report and displayed in the village to promote the implementation of the VLUP.

- Preparations and material: GIS software, computer and VLUP GIS data (shapefiles).

Textbox 26   Addressing possible challenges

The standard colours and symbols provided by "The PLUM Guidelines (3rd edition)" are based on ArcMap GIS software, and this may cause difficulty in producing the VLUP maps in another software. The other software such as QGIS may not have exactly the same standard colours and symbols available.

2.2 Other participatory planning tools

2.2.1 Participatory stakeholder analysis

Overview and aim

Participatory approach in the VLUP process emphasizes the importance of seeing the village community as composed of different social groups with varying interests, needs and power to voice their opinions. This is recognized also in "The PLUM Guidelines (3rd edition)", that highlights the importance of involving different socio-economic groups in the VLUP process. To put this approach into practice and ensure that all stakeholders' opinions, needs and realities are represented in the decision-making, facilitators have to actively seek out and engage all the groups in a village. You should assume that different groups exist in all villages and not that their existence is a feature unique to some villages. Furthermore, you should involve, or at least inform, any people outside of the village who have a stake in the village land and the VLUP about the VLUP process. Such outside actors may have a lot of influence on village decision-making, so their role in VLU planning needs to be decided (see Textbox 29).

One effective way to ensure that all social groups and stakeholders are identified before the actual planning process begins is to carry out a participatory stakeholder analysis during the introductory meeting with the village council before VLUP process participants and VLUMC member candidates are selected. Doing so will ensure that all stakeholder groups are represented during selection. Also consult ward and district officials familiar with the sociodemographic characteristics of a village as they can help identify disadvantaged groups of the village.

The stakeholders in the VLUP process are all of those people who are affected by or who have an interest in the VLUP. It is crucial to include among stakeholders those who are disadvantaged and less engaged in village decision-making due to, for example, their low socioeconomic status. These marginalised groups include, for example, women, young women, young men, orphans, widows and widowers, HIV-positive persons, disabled persons, minority and indigenous people, livestock-keepers, hunter-gatherers, recent immigrants and future generations. All these groups in one way or another utilise village land. One challenge to village land use decision-making is the limited ability of village communities and especially of disadvantaged social groups, to secure and enforce their access to resources and their land rights in relation to more powerful national and private interests. Since a VLUP outlines restrictions on and opportunities for village land use, it can both negatively affect access to land and services but also help different social groups secure their land rights. To ensure that positive VLUP outcomes are indeed realised, all social groups must be involved as stakeholders in the VLUP process.

Working tasks

Identifying all stakeholders of the VLUP process:

1. Organise the participants in one or two groups. You can organise groups based on gender, for example.

2. Ask participants to list all the different stakeholders both in and outside the village who have an interest in and are going to be affected by the VLUP. Give them flipchart paper and pens to write the list.

3. Ask them to think about and list stakeholders (social groups) who have the power to influence decisions in the village, who are not always included or considered in decision-making situations, or who can disseminate information widely across the village.

4. Ensure that participants consider stakeholders among private business and civil society actors that operate in the village.

5. If you had participants work in groups, have them come together, present and discuss their individual lists, and combine the lists into one mutually agreed-upon list of VLUP stakeholders.

Prioritising stakeholders and establishing their roles in the VLUP process:

6. When a list of all the stakeholders and stakeholder groups has been developed, the next step is to decide whether or not all the stakeholders should be involved in the entire VLUP process and, if not, in which activities each group should be involved.

7. Ask participants to decide in which VLUP activities all stakeholders should be involved. Tell them that these activities are the ones where opinions and needs are collected from people, where no expert knowledge is required and where major decisions are made, for example in problem identification, envisioning the future, existing and proposed land use mapping, and community action plan development. If resources allow, no prioritization is required, and all stakeholder groups should be given an opportunity to participate in or send representative(s) to these important activities.

8. If all cannot participate, ask the participants to identify the most important stakeholders.

9. Ask the participants to decide which stakeholders do not have to participate in the VLUP process but need to be informed about the VLUP and invited to the village assembly where they can comment on it. These stakeholders may be, for example, people who do not live in a given village but who own land there and NGOs which provide certain services or run projects in that village.

10. Ask participants to decide which stakeholders should be involved in activities such as baseline data collection, GPS tracking, land suitability assessment, bylaw setting and land adjudication activities.

11. As much as possible, clearly identify barriers to the participation of different stakeholder groups and take measures to see that all stakeholders are encouraged to participate (or to send representatives) at critical steps in the VLUP process.

12. A variety of ways can be used to help participants to identify the stakeholders who should be involved in each activity. These include an interest-influence matrix, Venn diagrams and the 4Rs tool. You can find out more about each in the readings listed under further information sources and on the Internet.

13. Discuss how many representatives each stakeholder group should have. One may suffice, but some groups may need two or more, particularly if the low social status of a group will make it difficult for one representative on his or her own to comfortably express the group's opinions or if a representative is likely to be suddenly unable to attend activities. These considerations are valid for social groups like orphans, HIV-positive persons and other minority groups.

Supporting stakeholders to participate in planning

The capabilities and statuses of stakeholders affect the way in which they are able to participate in the VLUP process (Textbox 30). For example, people who have never before participated in village decision-making may find it hard to participate. The fact that some community members do not have experience in planning processes is one reason awareness-raising is part of the VLUP process. Awareness-raising and training is meant to increase the capacity of participants to participate and express their opinions. The PLUM team should also consider selecting tools and activities for the VLUP process which allow and help different social groups, especially women and disadvantaged groups, to participate. "The PLUM Guidelines (3rd edition)" suggests using focus group discussions to engage different groups of villagers. Other ways to boost participation include tools like group work, skilled facilitation, suitable timings and venues of activities, compensation for participation, asking stakeholders how they would like to participate, and providing a choice of tools and inviting at least two representatives for each social group to take part (Textbox 31). A key to active participation is making participants feel that they and their time and efforts are valued throughout the process.

Textbox 27   Basic details

- Time: 30 minutes to 2 hours.

- Participants: Village council members, teachers, extension officers and ward officials, women and members of disadvantaged groups, PLUM team or other facilitators.

- Outcomes: A list of stakeholders who are affected by or have an interest in the VLUP of a particular village and prioritization of stakeholders to be included in each VLUP process activity.

- Preparations and materials: Flipchart paper, marker pens and masking tape or blackboard and chalk.

Textbox 28   Addressing possible challenges

Sometimes participants might have very limited ideas about who to involve in the planning process. If this is the case, encourage them to think of people who have different abilities to access and utilise land. Most people in a village might be considered farmers or livestock-keepers but among them, people are still different in many other characteristics, including age, gender, disability, economic status, livelihood, and social status.

Textbox 29   Importance of involving stakeholders outside the village

The quality of a VLUP depends to a large extent how involved stakeholders are in providing input and support to the VLUP process. The list of potential stakeholders in the VLUP process should not be limited to those that live in the village or the ward but also include those that live outside the village but still have a stake in and influence on decisions made in the village. These may include people who originate from the village and still have strong ties with villagers though they have moved away and people who have land or projects in the village and remotely manage them from elsewhere. It is sometimes important to consider the participation of these outside stakeholders.

Stakeholders who live outside the village may not necessarily be as active in the planning process as the villagers themselves, but they should at least be formally informed in advance about the VLUP process in the village and the organization financing the process. This will allow them the opportunity to participate or send their representative to do so. The involvement of outside stakeholders can be beneficial in various way: first, they can encourage villagers to cooperate in the planning and implementation of a VLUP, they can support and advise villagers to allocate land for uses beneficial for the development of the village, and third, their involvement may prevent conflicts during the issuance of certificates of customary right of occupancy and the implementation of the VLUP.

Textbox 30   Village land use management committee (VLUMC) and social groups

The VLUMC, together with the village council, is the main village-level institution in the VLUP process. Thus VLUMC, which, according to "The PLUM Guidelines (3rd edition)" should have 6–8 members set by the village assembly", can and should represent as many different social groups as possible. The VLUMC is responsible for assisting in problem resolution and monitoring violations of the VLUP. According to "The PLUM Guidelines (3rd edition)," monitoring requires patrolling, thereby potentially excluding social groups, like the disabled or elderly from membership in the VLUMC. Similarly, illiterate social groups may be excluded as one criterion for VLUMC members is that they be able to read and write. These social groups can and should still participate in the VLU planning not as VLUMC members, however, but as key stakeholders.

Textbox 31   Village assembly and hamlet meetings

Settlement patterns vary from village to village: in some villages all the hamlets are close to each other and form one large settlement area, but in other villages hamlets may be up to a day's walk apart. In the latter case, it is difficult to involve representatives from remote hamlets and organising hamlet meetings during the VLU planning should be considered. One option for hamlet meetings is to allocate time during the VLUP process when the PLUM team is attending to other duties for the villagers to organise hamlet meetings. This option works only if the VLUMC is well equipped to carry out hamlet meetings in which they inform inhabitants about the VLUP, hold discussions and collect information. After the hamlet meetings, each hamlet sends its chairperson and other representatives to take part in joint VLUP activities, which commonly are organised in the main hamlet, where the village office is located.

Further information sources

ELD Initiative (2015). Practitioner's Guide 'Pathways and Options for Action and Stakeholder Engagement'. Available from: www.eld-initiative.org

Geißler, G. and Löffler, G. (2007). Multi-stakeholder management: Tools for Stakeholder Analysis: 10 building blocks for designing participatory systems of cooperation. Available from: www.fsnnetwork.org/sites/default/files/en-svmp-instrumente-akteuersanalyse.pdf

IIED (2004). Power Tools of International Institute for Environment and Development for understanding policy influence; Stakeholder influence mapping, Stakeholder power analysis and the Four Rs tool. Available from: www.policy-powertools.org/Tools/Understanding

2.2.2   Knowledge-gap tool for awareness-raising and sensitisation

Overview and aim

Because many individual actors in Tanzania, from villagers to regional officials, are not yet familiar with village land use planning, awareness-raising and sensitisation on the objectives, benefits and procedures of the VLUP process is needed for different levels of administrative actors, including district officials, PLUM teams, village councils, ward officials, VLUMCs, and village land councils, as well as village communities as a whole. District officials need to be made aware of the participatory approach and the VLUP process and its objectives and benefits for district strategic planning, while village actors require more detailed awareness-raising on the VLUP, policies, various responsibilities related to them and inclusiveness in decision-making.

Village awareness-raising and sensitisation is an important early step in the VLUP process. If the awareness raising and training of villagers is done well and if adequate time is allocated to them, the rest of the VLUP process is likely to go smoothly and outcomes are likely to be reached in a participatory way. In order to extend the reach of your efforts, you should raise awareness first in hamlets and then at the village level. To be effective, awareness-raising must be continued over long periods of time. Thus, villagers should be equipped to continue raising awareness in the community even after the VLU planning is over (Textbox 34). Awareness-raising has the following objectives:

- Ensure that participants in the VLUP process and members of the community at large understand the objectives and benefits of a VLUP, the legislation that pertains to it, and their land rights.

- Motivate people to take part in the planning.

- Provide participants with the skills, knowledge and confidence they need to fully participate in planning activities and decision-making.

- Promote transparency and the recognition of the rights of women and disadvantaged groups in VLUP process.

- Inform the wider community that a VLUP is being developed in their village.

- Allow villagers to monitor and ensure the quality of the VLUP process and its outcomes once they know what to expect from them.

There are different ways to build awareness and sensitise others. Each PLUM team member or other facilitator will have his or her own style. Providing details on how to raise awareness is not within the scope of this report, so we will not go into detail. Instead, we will emphasise the participatory approach in VLUP process with reference to one simple tool which can be used when a new topic is introduced: the knowledge-gap tool. Its use is explained below.

Working tasks

1. Have participants work as one large group or divide them into groups depending on the number of questions or topics you have.

2. If there are several topics to cover, divide participants into groups. Give each group a topic to discuss and ask them to write down on flipchart paper all they know about it (Figure 21). Even if there is just one topic for discussion, it can also be discussed in groups if there is enough time to share and compile afterwards. Otherwise, simply have all participants sit in one group and ask them to raise their hands and share their ideas (Figure 22).

3. So, before you start explaining a topic during awareness-raising and sensitization, first ask participants what they already know about it.

4. If several topics were discussed in groups, have each group present what they discussed to the rest of the participants, who should then be allowed to add any further inputs they may have.

5. Facilitators should avoid making any comments on or correcting the views offered, because participants may feel less free to share their ideas if they are corrected. Facilitators should consider participants' answers to be the knowledge reality of the participants about the particular topics and respect that reality by not questioning it.

6. Note which issues participants know a lot about already and which they lack knowledge of. Also ask if there are particular issues they would like more information on and include them among your other awareness-raising and training topics.

Asking people what they already know will help you to give special attention to the needs and knowledge gaps of the participants and to correct any misunderstandings people might have. Using this approach will help participants unlearn informal practices and change existing misconceptions. For example, when asked how conflict resolution should be conducted, villagers might refer to traditional land transaction and conflict resolution procedures which contradict with formal procedures. Once both options are on the table, formal practices can be adjusted to accommodate aspects of traditional practices. The knowledge-gap tool helps participants to appreciate their existing knowledge and motivates them to learn more. Using flipcharts and handouts which are given to participants and to the village office after training assists participants in applying new information in future situations. People can refer to these materials when questions later arise and when situations in which the information is applicable arise.

Figure 21   Using knowledge-gap tool in group work setting

The participants are asked to share their understanding and opinions on the topics at the beginning of the awareness-raising event. The answers indicate what the participants already know about the topics and enable the facilitators to design the awareness-raising on the knowledge gaps and interests of the participants. The groups can discuss and write their ideas down first on a flipchart paper and then share the ideas with the whole group.

Figure 22   Using knowledge-gap tool in the village assembly

Textbox 32   Basic details

- Time: 30 minutes to 1 hour depending on the topics and time available.

- Participants: A variety of stakeholders depending on the targeted audience.

- Outcomes: Better understanding of the existing level of knowledge of the participants and increased motivation of participants to learn.

- Preparations and material: Optionally flipchart paper and marker pens.

Textbox 33   Addressing possible challenges

In some cases, village council members and villagers have very little knowledge about VLUP and land rights and will need more extensive awareness-raising and training than limited time and funding allows for. Attendance at village meetings and assembly meetings is sometimes low and difficult to boost. Emphasising the importance and benefits of a VLUP in your communications with villagers is one way to help increase attendance. Time constraints can also reduce the interactivity of awareness-raising meetings because fewer people than you intend will warm up to talk and have time to share their opinions.

Textbox 34   Using representatives of different social groups to carry out awareness-raising in a community

In many fields of extension services, particularly agriculture, lead farmers and community trainers have become common. To facilitate the VLUP process, the representatives of different social groups, together with VLUMC members, could be mobilised and trained to continue to carry out awareness-raising in the community. Each representative could also act as a focal point for the social group he or she represents and could raise the VLUP-related issues with the village council. If such representatives are to be successful, facilitators must advocate that the community recognise them as knowledgeable, legitimate, and able to train and raise awareness, especially if a representative does not already have considerable status in the community. These representatives should feel that they benefit from and enjoy being focal point and community trainer as these responsibilities may consume so much time and so many resources that they feel the reward is not worth the effort. If such dissatisfaction develops, a community trainer's motivation and commitment to raise awareness will decline.

2.2.3 General participatory tools and approach

Overview and aim

For many participants and even facilitators of the VLU planning process, group work and other participatory tools are not yet common practice. Indeed, there is still a tendency to use mainly top-down tools such as **a classroom setting** where the facilitator stands in front of a large group of participants to ask questions and allows for little interaction between participants. Using participatory tools requires participants to get used to being more active and vocal and facilitators to let go of their control of activities and step back to give participants more opportunities to discuss. Good facilitation skills are also required (see Textbox 37). This section introduces three participatory tools: group work, dialogue, and learning cafés, all general tools which can be applied to a variety of VLUP activities. You can compare the tools and choose that which is most appropriate for the situation and objectives you face in any given exercise.

2.2.3.1 Group work tool

Group work is a general term for various kinds of activities in which participants work or discuss together to reach to the objectives of the exercise. Groups can be established randomly or purposefully. For example, they can be based on gender, age, hamlet or vulnerability. Groups can also be formed purposefully as mixed groups, in which, for example older people are mixed with youths. The composition of each group will depend on the objectives of the exercise and the cultural habits of the community and can be decided by the facilitators or by the participants themselves. The size of any given group can vary from pairs to large groups but the optimum size for ensuring that all participants have an opportunity to contribute is between two and six people (Figure 23). The **advantages** of group work in the VLUP process are listed below:

- Group work allows participants to discuss their ideas freely in a secure environment with peers. For example, women might feel more comfortable speaking in a women's group than a mixed group and members of disadvantaged groups might feel similarly more empowered in their own group.

- Group work produces more information and more nuanced information on a topic.

- When participants feel free to express themselves, ideas flow fast, so small-group discussion is more time-efficient than one large-group discussion.

- Each individual group can be assigned with a unique topic and later on share its ideas with the group as a whole. This procedure can save time, especially if groups are selected to include members knowledgeable about the assigned topic.

What group work can be used for in the VLUP process: Almost any discussion in the VLUP process can be organised as a group-work activity. If you need to gather information from participants or get them to discuss a topic, group work is a good option. In particular, identifying and listing of village challenges and needs and existing and proposed land use are best done as group work. Group work is not, however, recommended for meetings, like introductory meetings in which facilitators are the ones providing information to participants.

Working tasks

1. Explain the exercise and provide instructions to participants.

2. Divide people into groups in a suitable way. If you have several topics that you want discussed, you may wish to divide participants into groups based on their familiarity with or interest in a topic.

3. Tell participants how much time each group has to complete the exercise and distribute any material you have for them to take notes on.

4. Remind them at the halfway point how much time they have left.

5. End the group exercise.

6. Ask each group to present its outcomes to the whole group or collect the notes they have taken and explain that you will later share the combined outputs of all the groups.

Figure 23   The group work tool

In a small group there is more time and lower threshold for each participant to talk, provided that the group has been formed amongst people who feel comfortable and free to discuss together about the topic.

Textbox 35   Basic details

● Time: Depends on how much time you have, say 30 minutes to 1 hour.

● Participants: Different VLUP stakeholders in or outside a village. The optimal size of one group is two to six people, and you can have as many groups as you need.

● Outcomes: Gather information from participants, facilitate participants to discuss an issue, give suggestions and feedback.

● Preparations and material: Alternatively, either no note taking material or flipchart paper and marker pens or blackboard and chalk.

Textbox 36   Addressing possible challenges

Since having small groups work individually and then the entire group jointly compile the outputs of each small group can take more time than working in a single large group, you may wish to save time by instructing groups to write their ideas on flipchart paper and then compiling those ideas yourself to present to participants later.

Textbox 37   Qualities and practices of a good facilitator

Good facilitation is key to getting people to participate actively, even when time is short. As a good facilitator you should do the following:

● Show respect to participants and fellow facilitators.

● Be tolerant, patient and flexible enough to make adjustments to find the best way to ensure that the objectives are met.

● Create a comfortable atmosphere in which participants feel encouraged to discuss their ideas freely.

● Give instructions in simple, easily understandable language.

● Do not rush participants but do ensure that activities are completed within the agreed upon time.

● Provide detailed instructions so that participants know exactly what to do and can carry out the activity well.

● Observe, listen and learn: a facilitator should keenly read individual participants and the assembly as a whole to assess whether participants understand what is being discussed or whether they have doubts, questions or mistrust on what is said to them.

● Be sensitive to participants' needs and manage power imbalances so that all have the opportunity to participate without feeling marginalised or forced.

● Encourage and respond to questions from participants. At the end of an exercise, participants should not be left with any doubt or confusion.

2.2.3.2   Dialogue tool

Dialogue is another useful tool similar to group work. Dialogue is an improved way of organizing a group conversation, one that increases the quality of participants' input by creating a comfortable and easy environment for discussing ideas. However, while a facilitator does not participate in group work, in dialogue, a facilitator is part of the conversation. The **advantages** of dialogue for the VLUP process are as follows:

• Having facilitators sit with participants in a circle puts all on the same level and breaks some common barriers that may prevent participants from sharing their opinions.

• In a dialogue conversation, participants do not need to agree with others. They only have to try to understand and to respect others' views.

• Dialogue can be used with different numbers of people, from 3 up to 25 people, depending on the space available.

• Unlike in group work, the facilitator can moderate the conversation, for example, to control people who dominate or to prevent the discussion from digressing from the given topic.

• Facilitator can ask questions about aspects of a topic that participants aren't touching upon. They can also ask individual participants to clarify an issue he or she has spoken about.

What dialogue can be used for in the VLUP process: The main difference between dialogue and classroom setting is that, in the former, chairs are arranged in a circle. Thus, as dialogue changes only the group dynamics, it can be used in any exercise in the VLUP process where a classroom setting is used. Dialogue is particularly good for facilitating discussions which require exploration of and negotiation of sensitive topics like in problem analysis, land conflicts resolution, and identification of future needs. You can also apply dialogue together with other tools in the VLUP process. For example, dialogue can be used with problem-tree analysis by assigning someone to write down the outcomes of the dialogue on a problem-tree matrix while

others sit in a circle and discuss problems and their effects and causes (see the problem-tree tool in Section 2.2.5.).

Working tasks

1. Arrange the chairs in a circle.

2. Ask participants to sit anywhere they wish, but, if possible, encourage women to sit among men (Figure 24).

3. In the role of a facilitator-participant, sit in the circle among the other participants.

4. If possible have two facilitators for dialogue. One should sit among the participants and moderate the discussion and the other should sit to the side and take notes on the discussion.

5. Start by setting rules of communication like listening to others, letting others speak, and respecting others' opinions.

6. In order to create a sense of equality, inform participants that they can talk without standing up and that they do not have to raise their hand when they want to say something. Instead, as soon as one person finishes sharing his or her views, another person can just start talking.

7. Introduce them to the topic and let them start the conversation. Alternatively, ask them what they would like to discuss.

8. As a facilitator, moderate the discussion gently. If someone doesn't give others the opportunity to talk, politely remind him or her of the rules of communication. If someone doesn't seem to be getting the opportunity to talk, help him or her by asking if he or she has something to say.

9. Remember that, in a dialogue, the most important skill required from a facilitator in dialogue is the ability to create a secure environment in which people feel comfortable to express their opinions. People are usually encouraged to air their views when they are assured that what they are going to say is going to be respected, so make sure you establish that respecting others is a basic rule.

10. When the time allocated for dialogue lapses, as a facilitator briefly highlight or summarise what has been discussed so that participants remember the main issues addressed.

Figure 24   The dialogue tool

In the dialogue the sitting arrangement plays a major role in supporting participants to actively engage and helping facilitators to manage participants who tend to dominate discussions. In a circle of chairs the sitting arrangement gives a sign to participant that all participants should be in an equal position to talk. By sitting in the circle also the facilitator is in the same position with the participants.

Textbox 38   Basic details

- Time: Depends on how much time you have, say 30 minutes to 2 hours.

- Participants: Different VLUP stakeholders in or outside a village. Preferably two facilitators, one to moderate the dialogue and one to take notes.

- Outcomes: Facilitate participants to discuss or solve an issue or to give feedback on some matter.

- Preparations and material: Chairs or other things to sit on, optionally notebooks and pens.

Textbox 39   Addressing possible challenges

Holding a dialogue does not guarantee that all people will talk or that some people will not dominate the discussion. The facilitator has a big role in ensuring that all have an opportunity to express their opinion. The setting discourages instant note taking while everyone is engaged in the discussion. In dialogues with participants from different social groups, it is not advisable to tackle difficult or sensitive topics because some people will feel too shy or too intimidated to speak in front of the others. For sensitive topics, dialogue tool can be used with groups of particular social group such as farmers with farmers and livestock-keepers with livestock-keepers.

2.2.3.3 Learning café tool

A learning café is a creative tool to host conversations on different matters. The facilitator should arrange chairs and tables in a café-style for participants to gather and have discussions in conversational clusters, just as happens in a café. At each table there will be a different set of questions or topics for the group sitting there to discuss. The groups will rotate so that they all have a chance to sit at each table and discuss each topic. At each table, the discussion will be written on flipchart paper, and each group adds on to what is already written. The **advantages** of a learning café for the VLUP process are as follows:

- A learning café is a good way to bring people from different backgrounds together to think about a complex issue and to find imaginative ways forward.

- In a short time, lots of ideas and views for several different topics or questions are generated.

- When well facilitated, a learning café makes an exercise fun.

What learning café can be used for in the VLUP process: Like group work, a learning café can be used when you need to receive information from the participants or wish to have them discuss a topic. The tool is an efficient way to deepen the discussion as each group discusses a topic only after reading what other groups have already discussed. It is good to use when you want to get a diverse set of views on several topics and to encourage participants to be ambitious in their thinking (Textbox 42). Activities to use it with include problem analysis, envisioning the future, preparing a community action plan, and getting feedback on a VLUP draft from the village council or at an assembly meeting. The tool works best with a mix of diverse people who can bring different experiences and views into the discussion.

Working tasks

1. Decide the questions or topics which will be at each table. Depending on the number of topics and how much time you have, decide how many tables you need. Each table should have one or two topics.

2. Assign a facilitator to each table to make sure the participants' ideas are clearly written on the flipchart paper. You can decide whether the facilitator will him or herself write or whether participants will write.

3. Create a special environment modelled after a café. In other words, set tables separate from each other and place a few chairs around each table. If you do not have tables or chairs, you can use, for example, logs or carpets on which people can sit comfortably. Provide each table with flipchart paper and pens.

4. Introduce the participants to the procedure for the learning café exercise and to the questions at each table.

5. Encourage participants to relax and divide them into the same number of groups as there are tables.

6. Agree with participants how much time they will have to discuss at each table. It is good to decrease the amount of time for each round, say, for example, allocating 20 minutes for the first round, 15 for the second, 10 for the third, and 5 for each round after that. Providing a constant amount of time for each round is not ideal because new ideas are normally generated during the first rounds and ideas in subsequent rounds tend to complement and refine what has already been mentioned.

7. Start the first round of conversations, ask each group to sit at one table and give them the agreed time to discuss the topic of that table. The facilitator at each table should ensure that the main points of the conversation are written down on the flipchart.

8. When the allocated time is up, ask each group to move to the next table and start the second round of conversations (Figure 25). The facilitator, the "table host," should remain at the same table and briefly explains to the new group what the main ideas of the previous

group were. Then the new group should discuss the topic of that table and the facilitator should ensure that any new ideas are written on the same flipchart paper.

9. Continue the rounds until each group has visited each table and discussed its topics. Thus, if there are four tables of topics, you should have four rounds of conversations.

10. After the last round, ask the participants to remain seated at the table where they are and invite a representative of each group to tell the whole group about the ideas raised at that table. The speaker can use the flipchart paper to help explain all the ideas. Alternatively, the facilitator hosting the table can share the ideas.

11. Have a general discussion about the outcomes and end the exercise.

You can either have mixed groups or groups defined by certain features (for, example, groups of women and men or groups of council members and non-members) carry out this exercise. Because participants get to see and hear what each group said through the flipchart and the table host, the ideas of different groups will naturally be shared.

Figure 25   The learning café tool

After each discussion round the groups move to the next table to discuss a different topic. The table host will brief the new group about the ideas which others have already raised. It is important to keep time so that all groups will have time to go and discuss each topic during the exercise.

Textbox 40   Basic details

- Time: Depends on how much time you have, say 1 to 2 hours for all rounds of group conversations and a discussion of the results.

- Participants: Different VLUP stakeholders in or outside a village.

- Outcomes: Facilitate participants to discuss or give feedback on different topics.

- Preparations and material: Flipchart paper and marker pens, chairs and tables or other things to sit and write on.

Textbox 41   Addressing possible challenges

The learning cafe tool requires several facilitators, the exact number depending on how many tables you have. Facilitators need to be skilled in and knowledgeable on the topics which they are hosting at their table. If ideas and outcomes are not shared and analysed immediately after the exercise, some of the emerging themes and imaginative solutions of the whole group may be lost.

Textbox 42   What types of questions are good to discuss using a learning café tool?

- Easy to understand, but not too simple: for example, what problems are facing livestock-keepers in the village?

- Inspiring or even provocative: for example, how could women's access and control over land be increased?

- Encouraging deep reflection: for example, why do inhabitants continue to cultivate along rivers and streams despite sanctions?

- Creating new questions and new possibilities: for example, what alternative livelihoods could be developed in the village?

Further information sources

World Cafe tool on Knowledge Sharing Toolkit: www.kstoolkit.org/The+World+Cafe

Chambers R. (2002). Participatory Workshops: a sourcebook of 21 sets of ideas and activities. London: Earthscan.

Participatory methods website of Institute of Development Studies: www.participatorymethods.org

Publications of Coady International Institute on Asset Based Community Development (ABCD) approach: http://coady.stfx.ca/knowledge/publications/

2.2.4 Tools for envisioning past and future village development

Overview and aim

One of the aims of the VLUP process is to gain understanding of the past and current village situation in order to plan for the future. In addition to considering the village history and current situation, villagers need time to think carefully about their vision of the future of their village. People will be more motivated to participate and implement their VLUP if they share a common vision of the kind of village and life they want to have in the future.

Information about the past can be collected using the village-history timeline or the river-of-life tool. The timeline or river of life will then be the basis of the villagers' vision of the future of their village. With the trip-to-the-future tool, participants can combine the past and present to imaginatively envision the future. All three of these tools will create a visual chronology of events, both positive and negative. The display, which will emphasise changes already made in the village, will help participants believe in possibilities for the future and come up with new and innovative land uses and development projects they could strive to implement.

2.2.4.1 Village-history timeline tool

A village-history timeline is a simple way to collect and display information about the past of a given village. It requires only basic drawing skills and is an easy-to-understand documentation of village history. The tool captures significant events as well as changes in the condition of the village life and environment from past to present. The village satellite image map can be used to aid discussion of environmental changes that have occurred in different parts of the village (see Textbox 45).

Working tasks

1. Either have participants gather in one group, or, after reading the situation and observing the power dynamics, divide them into small groups (see Textbox 12). Encourage everyone to participate and create an atmosphere in which members of disadvantaged groups, too, will feel comfortable enough to express their ideas.

2. Draw a horizontal line in the center of a piece of flipchart paper or blackboard. Ask villagers when was the village established and write the year and the name of the event (the village was established) in the middle or first quarter of the line.

3. Ask participants about significant events which occurred in the area of the village before and after the village was established and record them chronologically on the timeline (Figure 26). Mark the time, usually a year, and the name of the event. You can also write a short description of the event if needed.

4. After you record all the significant events participants want to show on the timeline, ask them about conditions in the village in the past. Ask them, in particular, what the environment was like and what natural resources, such as forests or water, were available and how readily available they were at different times in the past. Ask, for example, about conditions in colonial times, before and during the establishment of the village, 20 years ago, and during a particular event. Record both the conditions and changes in those conditions on the timeline.

5. Ask participants whether or not they want to add more details of their village past and fill in any more details they come up with.

6. When participants are finished, ask them to reflect on the picture. Ask them questions about what they have learnt and what conclusions they can draw from the timeline to be used in developing the future vision of their village.

7. Ensure that participants take note of any recurring natural events, such as large floods or droughts, and remind participants that their future plan should try to address these events.

8. Once the timeline is finished, agree with villagers that you will photograph it and leave the original with them. If the timeline was drawn on a blackboard, discuss with the participants how they can conserve it by, for example, transferring it to paper.

9. Then use the timeline to start envisioning and planning the future of the village with the villagers in the next exercise.

Textbox 43   Basic details

● Time: 2 hours.

● Participants: VLUMC and other stakeholders, especially disadvantaged groups and elderly and middle-aged men and women though also young people might have things to contribute.

● Outcomes: A timeline of events and conditions in the village from past to present which reveals threats to the village and the direction in which it might be going.

● Preparations and material: Flipchart paper, masking tape and marker pens or blackboard and chalk.

---

Textbox 44   Addressing possible challenges

Participants might not be able to remember the timing of events and changes very well. It helps to ask who the village chairperson, VEO or school headmaster was at that particular time in the past and then check in the village records when that person was in charge to get an approximate date for the event. People also tend to remember past events and conditions differently, so it is important to remember that the timeline represents one view of the past, the way people remember it, not an absolute record of past events and conditions.

Textbox 45   Socio-ecological history mapping

Use the village satellite image map with the villagers to discuss the environmental and socio-cultural history of the village. Have them reflect on past vegetation (forests and grasslands), water sources and wetlands as well as their cultural history and traditional practices and beliefs. Often the environmental and cultural histories of a village go hand in hand and explain each other because village life has been and still is intertwined with nature and natural resources. You can combine the use of the satellite image map with the history timeline tool so that the satellite image map enriches timeline details with locations of the past changes. The timeline records those visible changes in words. The environmental changes mapped on the satellite image map allow identification of possible and needed rehabilitation areas of, for example, natural forests, primary grasslands and water sources as well as watersheds. Capturing the socio-cultural history of a village can lead to the revitalisation of traditional professions, a greater appreciation of the village past and tourism opportunities.

Figure 26   An example of a village history timeline

The important past events in the village are collected onto the timeline and remarks about the past village environment and socio-economic conditions can also be noted down. The timeline gives an overview of past changes in the village and is also a good documentation of village history for future generations.
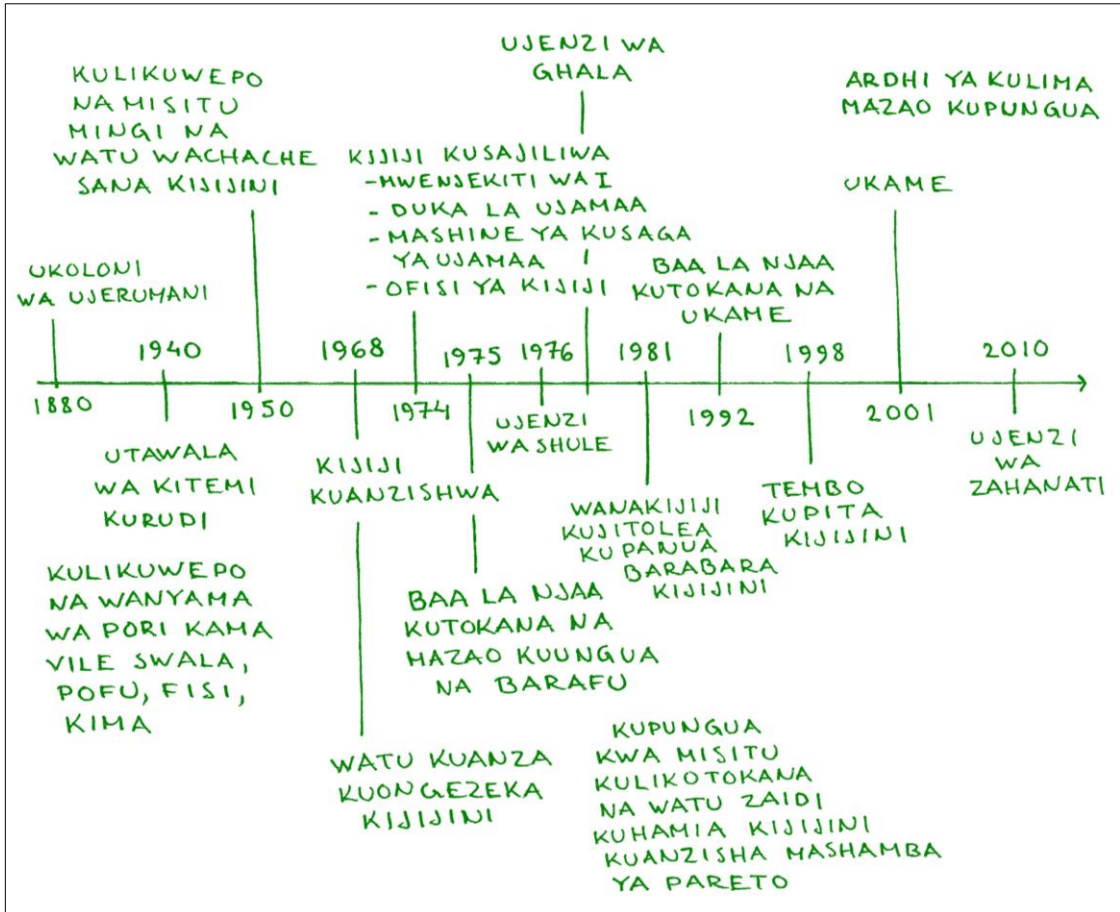
2.2.4.2   River-of-life tool

The river-of-life tool is another group facilitation tool which uses visual narrative to help people tell stories of the past, present and sometimes the future. A river of life is more complex than a timeline and requires more abstract thinking than a village history timeline to develop but it gives a clearer picture of the direction in which village development might be going. By imagining that the village or its people are a river, participants can depict the major events and milestones in the village using features of the landscape, water, boats, and the like as their symbols (Figure 27). The tool enables villagers to bring several stories together and immediately shows the big picture created by individual events and changes. Through visualisation the river of life indicates the future direction of the village. It serves as a guide because it captures the milestones, failures and successes over time. In the VLUP process the river-of-life tool is useful in highlighting the major events which have shaped village life and in planning the future. It also offers participants the possibility to identify their roles in and where they fit in the big picture of their village and where they have made and can make the most impact on events.

Working tasks

1. Either have participants gather in one group, or, after reading the situation and observing the power dynamics, divide them into small groups (see Textbox 12). Encourage everyone to participate and create an atmosphere in which members of disadvantaged groups, too, will feel comfortable enough to express their ideas.

2. Introduce the exercise and explain that a river is a metaphor for the life of a village and its inhabitants. Indicate that life, like a river, sometimes flows slow and sometimes fast and that just as a river has obstacles, life has challenges and causes for celebration.

3. Explain that in the exercise they will draw a river that represents the life of their village. Make participants understand that their task is to identify and draw the significant events and conditions that over time contributed to the shaping of the river of the village to make it what it is in the present.

4. Give participants time to think about what they would like to show on their river of life and to use their drawing skills to draw the river and its elements.

5. Tell them to feel free to ask if they do not understand the task.

6. Give them 30 minutes to 1 hour (or more) to create the picture.

7. When they are finished with their river of life, ask them to reflect upon it. Ask them questions about what they have learnt, what conclusions they can draw from the picture and what they could use the picture for in developing the future vision of their village.

8. Make sure villagers take note of any recurring natural events in the village such as large floods or droughts and address these events in their future plan.

9. Agree with the villagers that you will photograph the picture and leave the original with them.

10. Use the river of life next to start envisioning and planning the future of the village with the villagers.

Textbox 46   Basic details

● Time: 2 to 3 hours. For example, 2 hours for small-group work and 1 hour for the group as a whole.

● Participants: VLUMC and other stakeholders, especially disadvantaged groups, elderly and middle-aged men and women though young people might also have things to contribute.

● Outcomes: A timeline in the form of a river depicting events and conditions in the village from past to present which reveals threats to the village and forecasts the direction in which it might go.

● Preparations and material: Flipchart paper, masking tape and marker pens or blackboard and chalk.

**Textbox 47   Addressing possible challenges**

As is the case for creating a village-history timeline, participants might fail to remember the exact time that some events happened. A river-of-life picture is less detailed than a village history timeline because participants are told to draw the story of their village and not, as for the village-history timeline exercise, to include details on every significant event and change. The river motivates people to think of the village as their collective effort and as a place where challenges can be overcome and where things will change for the better. The metaphor of a river might not be easily understood in arid areas where rivers are seasonal or non-existent.

Textbox 48   Ways to modify

Instead of a river of life, you can ask villagers to make a village-history timeline, which is simpler to make and includes more details. You can have different social groups, for example men and women or disadvantaged groups, draw their own village rivers of life separately. The experiences of and significant events for different groups can be quite different. Having small groups draw separately will capture this diversity of experiences; drawing as a whole group may not. If you have small groups draw separate pictures, have them share their pictures with the whole group so that they can learn from each other and discuss each other's experiences.

Figure 27   An example of a river of life

The positive events can be depicted as wide well-flowing stretches of the river and the negative events can be depicted as obstacles like rocks and waterfalls along the river. The river will show the ups and downs of the village that the village and its inhabitants have lived through during the course of time.
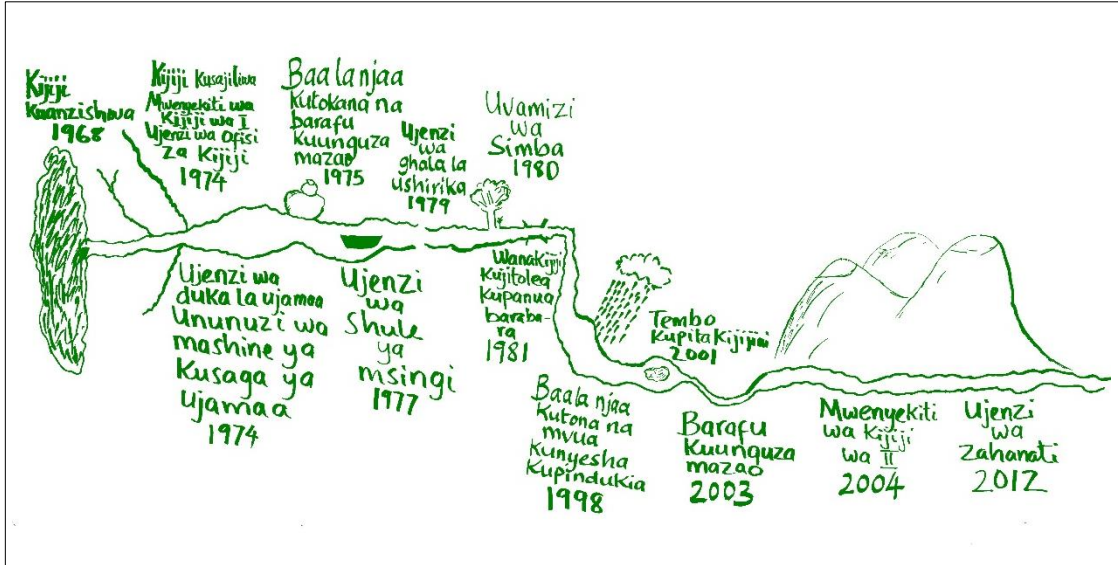
2.2.4.3   Trip-to-the-future tool – Continuation of the history timeline or the river of life

The trip-to-the-future tool helps participants to create the course of life events that they wish to have in the future. In the case of the VLUP process, participants create the course of events and developments they wish to happen in their village. The tool is helpful for the VLUP process, especially for encouraging villagers to come up with many potential new land use ideas which can be adopted as the proposed land uses in their VLUP. In the trip-to-the-future participants are asked to freely name events without considering their own ability to actualise them. Then, as participants estimate the years in which these events could occur, they can see what it takes to actualise what they wish for. The tool also allows participants to think about how they can influence the development direction of their village with their own actions. As a group exercise this tool creates joint understanding and shared goals for the future more vividly than a simple list of future needs.

The outcome of the trip-to-the-future tool is an extension of a river of life or a village-history timeline as it extends the present to the future. Thinking freely, participants generate a list of wishes about future events and village developments and estimate when they might happen. They present these events and developments in a drawing like a river of life or a village-history timeline. They can even continue drawing on the same flipcharts or blackboard on which they drew their river or timeline (Figure 28). The resulting sequence of future events written on a timeline or river in the trip-to-the-future drawing generates ideas which can then be used to analyse problems and develop a community action plan.

Working tasks

1. Either have participants gather in one group, or, after reading the situation and observing the power dynamics, divide them into small groups (see Textbox 12). Encourage everyone to participate and create an atmosphere in which members of disadvantaged groups, too, will feel comfortable enough to express their ideas.

2. Display the village-history timeline or river of life on a wall for participants to see.

3. Tell them that in this exercise they will extend the river of life or village-history timeline with what they wish to have in the village in the future.

4. Tell participants to think freely about what they wish to happen in the village in the future. It is important to remind participants that, at this stage in the exercise, the list is just **a wish list**. Encourage them to list events and developments without considering whether or not it is possible to actualise them. Ask them to think what they would need in the village to increase their wellbeing and to include solutions to recurring challenges such as large floods and droughts.

5. All the wishes which the participants name should be noted down. Alternatively, if you have participants work in small groups, have each group create its own list and then combine all the individual wish lists into a single wish list.

6. Tell the participants to consider everyone's wishes and combine them together. Discuss if any wished are not acceptable and discuss why. Make sure that the future wishes and needs of disadvantaged groups are also heard and addressed.

7. Ask them to assign to each future wish an estimate of the time they think is needed for the wish to be actualised. For example, they might predict constructing a village health centre will take 5 years; building two houses for teachers, 6 years; and establishing a village market, 2 years. The participants should consider the capacity of the village and its inhabitants to provide for themselves in development projects as well as possible future assistance from outsiders.

8. Convert each estimate in years to a likely date of achievement. For example, if a village health centre is estimated to be achievable in 5 years, it will be achieved in 2023 (2018 + 5 years).

9. Ask participants to arrange the events and development wishes they envision in order off their expected years of completion and to present them chronologically in a drawing similar to a river of life or a timeline. They should begin with those events that they hope will happen soonest and proceed to those they think will happen further in the future, moving, for example, from 2019 to 2020 to 2023 and so on.

10. Agree with the villagers that you will take photographs of the picture and leave the original with them.

11. Then use the trip-to-the future wish list and picture in making the community action plan and future VLUP sketch map later in the VLUP process.

Textbox 49   Basic details

● Time: 2 to 3 hours.

● Participants: VLUMC and different VLUP stakeholders in or outside a village.

● Outcomes: A wish list for future developments in the village and understanding of the capacity of the villagers, the need for outside assistance and the time needed to achieve each development. Villagers are encouraged to think broadly (outside the box) about what they want to have in their village in the future.

● Preparations and materials: Flipchart paper, masking tape and marker pens or blackboard and chalk.

**Textbox 50   Addressing possible challenges**

The trip-to-the-future tool works best if a history timeline or a river of life has already been prepared. This exercise takes quite a lot of time and captures only the positive side of development, though, in reality, downturns like disease outbreaks or abnormal rain distribution, will most likely also occur. Having the freedom to wish for anything will probably result in there being unrealistic wishes which will need to be discussed.

Textbox 51   Ways to modify

If you have limited time, you can ask participants simply to discuss and list their wishes and estimate the time they will take to achieve an not have them draw a picture of their trip to the future as drawing is the most time-consuming part of the exercise. As was the case with the river-of-life tool, you can have different social groups draw their own trip-to-the-future pictures and then combine them through whole-group discussion.

Figure 28   Example of a trip to the future

The village history timeline has been extended to include future wishes of the villagers. The villagers have imagined together what they wish to have in the village in the future and estimated when they could achieve these wishes.
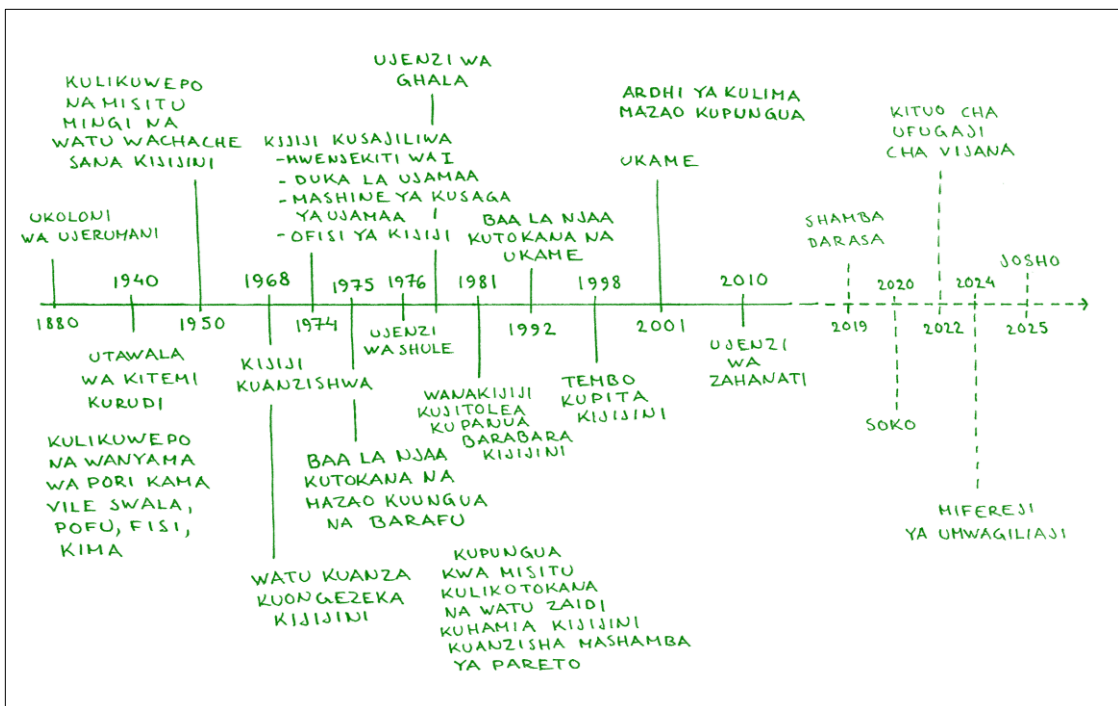
2.2.5 Tools for identifying problems and solutions

Overview and aim

By identifying the problems and challenges facing a village, villagers can plan their VLUP so that it addresses these issues and gives them tools to overcome them in the future. This identification can be accomplished using various ways. This section presents two such tools: problem-tree analysis and the community leaky bucket. Problem-tree analysis helps villagers see the cause-and-effect relationships between problems and a community leaky bucket identifies activities which will help a village to improve its economic performance. These two tools do not substitute each other and can be used to complement each other.

It is important to remember to identify village challenges in different sectors and to look at challenges and solutions beyond land because, oftentimes, problems and the opportunities to solve those problems are one way or another connected to land. For example, the plight of HIV-positive community members can be alleviated by arranging for their families or associations to get farm plots and agricultural training, so they can increase the incomes and improve the nutritional statuses of the HIV-positive. Furthermore, one way to address high youth unemployment rates is to set aside an area on which youth can start small projects. The identified challenges and opportunities will inform the development of the community action plan, at which point solutions will be discussed in more detail.

2.2.5.1 Problem-tree analysis

Problem-tree analysis is a tool which helps in the identification of problems and their causes and effects. Imagine that the major problem is the tree trunk, the causes of the problem are its roots and the effects of the problem are the branches of the tree (Figure 29). By identifying the cause-and-effect relationships of its problems, a village can address the root causes of and the linkages between the problems and recognise that sometimes a problem is only a symptom of a bigger issue. The problem-tree tool allows for a better understanding of village problems and their interlinked and sometimes contradictory causes. It can also reveal whether or not more information or evidence about the problems is needed in order to understand them fully. The problem-tree tool can also be used to identify ways to solve the problems by reversing the problems into objectives to be achieved (Textbox 55). The identified problems and objectives will form the basis for the development of a community action plan which identifies actions to solve problems.

Working tasks

1. Divide the participants into groups. Each group will discuss the challenges and problems related to a different sector, such as farming, social services, and livestock-keeping. It is important to remind participants that they need to consider the problems, needs and challenges of the community as a whole or of the social group they represent, not only their personal problems, needs or challenges.

2. Ask the participants in each group to start by discussing and writing on a flipchart paper all the problems which the sector is facing in the village. Ensure that all groups have one person who can write or help them by writing on their behalf.

3. After they have listed all the problems and challenges related to a particular sector, ask them to select one main problem to focus on.

4. Ask them to write that main problem in the middle of the flipchart paper to represent the trunk of the problem tree.

5. Ask them to consider which of the other problems they listed are linked to this main problem. Ask them to identify which problems are direct **causes** of the main problem and write them below the trunk on the paper to represent the roots of the problem tree.

6. Then ask them to identify problems which are direct **effects** of the main problem and tell them to write those at the top of the paper to represent the branches of the problem tree.

7. Sort all the problems in the same way. Use the guiding question "what causes what" to help participants to identify causes and effects.

8. After they have established all the possible links between the problems on their original list of problems, ask them to discuss whether or not the main problems has even more causes and effects and to add any that exist to the problem tree.

9. After all the problems have been written on the problem tree, connect the problems with cause-effect arrows showing the direction of the links.

10. Ask the group to review their problem tree and ensure they are satisfied with it (Figure 30).

11. Then have each group present its problem trees to the whole group as a whole so they get an overview of many problem trees concerning many different sectors.

12. Ask the group as a whole to identify whether or not some problems are common to all sectors. If there are, villagers can solve the problems of several sectors at once by focusing on these common problems.

13. Agree with the villagers that you will take photographs of the problem-tree pictures and leave the originals with them.

14. Use the problem trees for different sectors of village life to develop a community action plan.

Textbox 52   Basic details

● Time: 2 to 3 hours.

● Participants: VLUMC and different VLUP stakeholders from different social groups in a village.

● Outcomes: The problems facing different sectors of village life and the cause-and-effect linkages among them are identified on a picture. The picture helps to demonstrate the root causes of problems in the village and to suggest possible actions to address them in the community action plan.

● Preparations and material: Flipchart paper, masking tape and marker pens or blackboard and chalk.

Textbox 53   Addressing possible challenges

Sometimes some participants are slow to understand the tool and will require more instruction. It may be difficult to identify the effects and causes of a problem right from the start, so it is good to give participants ample time to think and discuss and not to rush them.

Textbox 54   Ways to modify

If there is not much time in the VLUP process the problem- and objectives-tree tool is a good substitute for the river-of-life and trip-to-the-future tools which still allow participants to discuss and decide upon village objectives for the future.

Textbox 55   Turning problems into objectives

The problem tree can be turned into an objectives tree by transforming problems into objectives. A problem and its causes and effects are restated to form problem-intervention targets to achieve to solve the problem. Stating objectives is especially rewarding when the root causes of problems are found because solving one root cause may simultaneously address many other problems as well. An objectives tree shows the means-and-end relationship for undoing the problem under analysis. Converting problems into objectives will help villagers to identify the future achievements they hope for and the kinds of activities they must carry out in order to achieve them. Having this knowledge will, in turn, assist participants in identifying actions to solve problems in the village which can then be incorporated into the community action plan.

Figure 29   Example of a problem tree

The main problem is the tree trunk, the causes of it are the roots and the effects of it are the branches. The problem tree picture will help to identify causes of problems. In the example low awareness of better farming techniques and land use allocation are causes of poor harvests. Awareness raising and training of farmers on these topics are thus important.
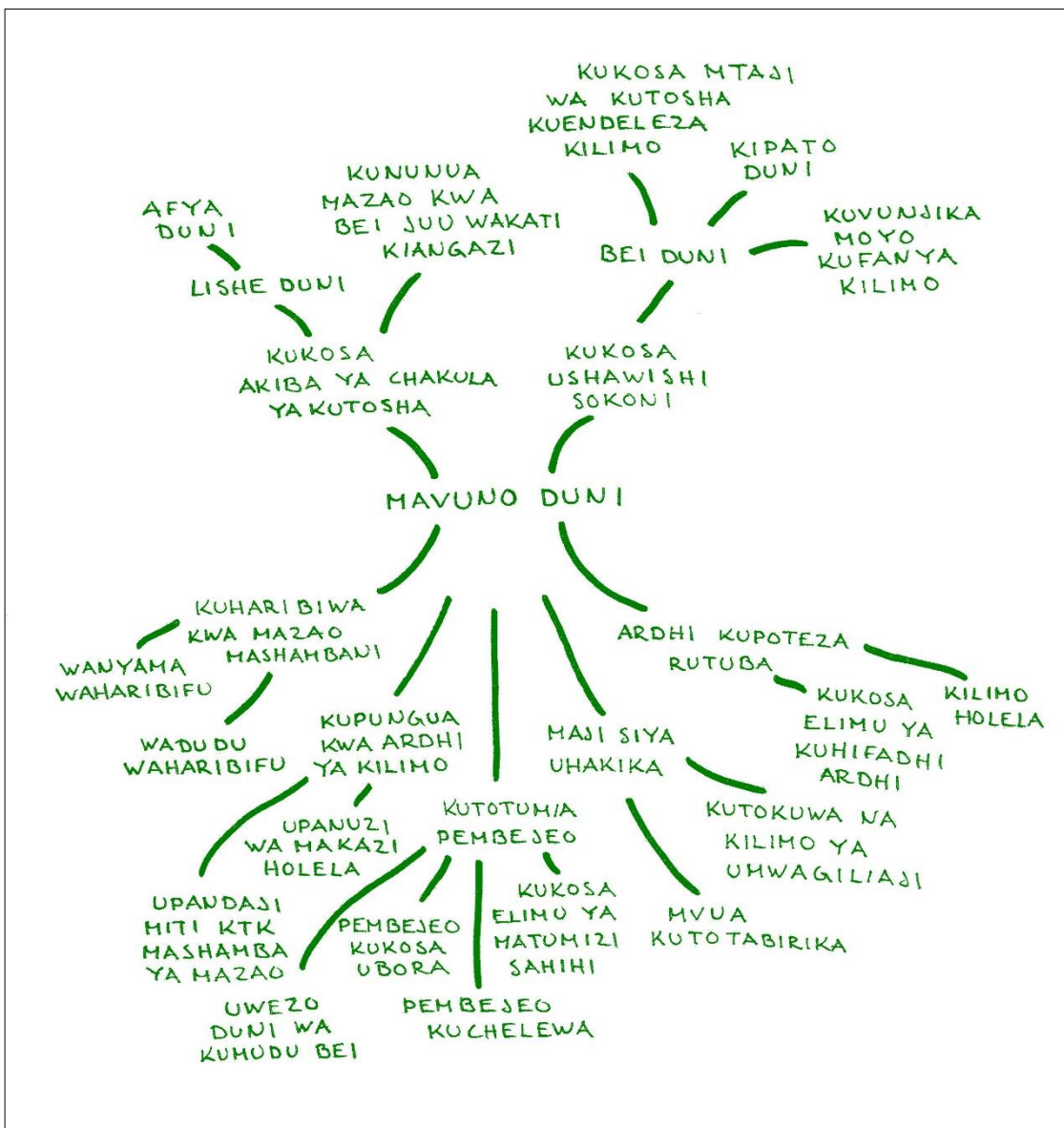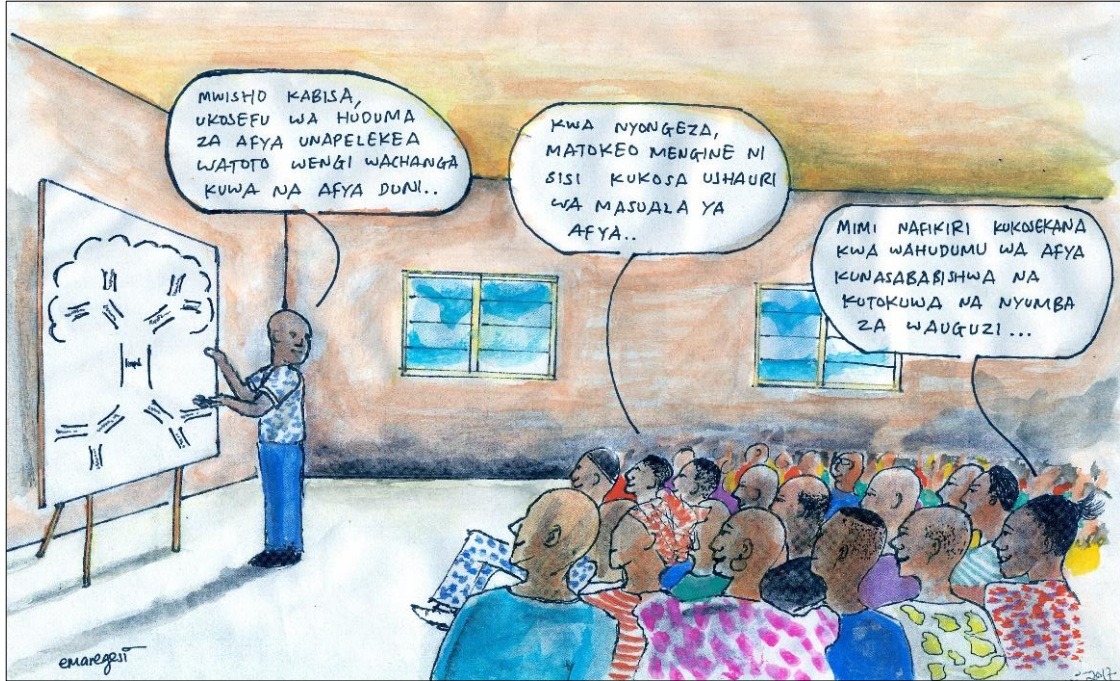
Figure 30   Problem tree analysis

Shared discussion on the problem tree will deepen the analysis while views of all participants are welcomed.

2.2.5.2   Community leaky-bucket tool

The community leaky-bucket tool helps communities to better understand their local economy and to consider how to achieve a healthy economy which supports village development (Cunningham 2011). The community leaky-bucket tool depicts the economy of a community as a bucket that has holes at its bottom. The fluid that flows into the bucket through its mouth and leaks out of the bucket through the holes symbolises the flow of money in and out of that community in a year. The bucket reflects the fact that any community is ultimately linked with the rest of the world through the inflow and outflow of income, goods and services, raw materials, jobs, investment profits, ideas, and the like. A community uses inflows as resources to produce the output it sells and to carry out development projects within the village. These resources can be available locally or obtained or purchased elsewhere.

The community's money is usually income from the sale of goods and services, employment or transfers from government or family members (see also Textbox 58). Money leaves the community, typically in the form of expenditures on goods and services purchased outside the community. The size of the economy of different communities varies depending on the relative sizes of the inflow of income from outside and the leakage of income out of the community. The level of fluid in the bucket represents the overall level of economic activity. The fuller the bucket, the more money is circulating in the community and the healthier is its economy and the greater the opportunities to support village wellbeing.

The leaky-bucket tool helps communities to identify ways to improve the local economy. There are three different deliberate strategies to do so: to increase inflows of income, to reduce the outflow and or to increase the circulation of money within the community. Ideally, both increasing inflows and reducing outflows directly increase the circulation of money within the community. In addition, the circulation of money can also be targeted deliberately. The community leaky bucket-tool exercise should always be ended with ample time for discussion about which strategies the community should choose and what kind of activities community members should do to carry them out.

Working tasks

1. Either have participants gather in one group, or, after reading the situation and observing the power dynamics, divide them into small groups (see Textbox 12). Encourage everyone to participate and create an atmosphere in which members of disadvantaged groups, too, will feel comfortable enough to express their ideas.

2. Explain to participants that a leaky bucket represents the economy of their village.

3. Ask the participants to choose one participant from among them to draw a bucket and depict the estimates of the income flows of different activities in the village as participants point them out during the discussion.

4. Ask participants to identify sources of income that bring money into the village such as sales of crops and livestock, salaries, government grants, and support from other organisations. Then ask them to estimate how much money (in TZS) comes in from each source each year. Display the estimated amounts at the top of the bucket with the arrows pointing into the mouth of the bucket. Instead of estimating the amount of money, they could show the relative importance of each income source (Figure 31) by using the thickness of the arrows to show the relative importance of each income source.

5. Ask participants to identify expenditures responsible for money flowing out of the village, such as household appliances, clothing, lighting, school fees, medical expenses, farm inputs, communication, transport, and TV subscriptions. Ask them to estimate how much money is spent on each expenditure item each year or the relative importance of each expenditure. Each estimated expenditure should be shown at the bottom of the bucket with arrows pointing out of the bucket to depict the outflow of income.

6. Ask participants to identify activities that involve money exchanging hands within the village. Ask them also to estimate how much money circulates internally in each activity each year. These activities, with their estimates of total amount or relative importance should be shown inside the bucket.

7. If you are estimating the inflows and outflows in terms of amount of money, ask the participants to sum the inflows and outflows separately and calculate the difference of their totals. The amount of surplus of inflow is the level of the village's economy in one year; it is, in other words, the amount of money which stays in a community each year.

8. Next, ask participants to discuss how to increase that surplus so that they will have more money for investing in the development of their village and their wellbeing. Ask participants to discuss which of the existing income-generating activities can be improved and how in order to increase village income inflow. For example, they can consider which activities can be expanded, either by increasing production or by enhancing quality and storage. Ask them also to consider new income-generating activities.

9. Ask them how they could change the expenditure pattern to reduce the unnecessary outflow of income. They can consider reducing expenditures, for example, on alcohol and tobacco or investing under-utilised savings into more productive activities.

10. Agree with the villagers that you will take photographs of the leaky-bucket picture and leave the original with them.

11. Ask participants to decide which of the activities they have identified to improve their village economy they think can be implemented and included in their community action plan. During the development of a community action plan, incorporate them into the plan.

Figure 31   Example of a community leaky bucket

In this example the income and expenditure are estimated in Tanzanian shillings and illustrated by the thickness of the arrows. Depending on the participants' ability to estimate the amount of income and expenditure in one year, you can either ask them to estimate in shillings or with arrow thickness. In this example village the total income is TZS 53.5 million and the total expenditure TZS 52.5 million, thus the money remaining in the village is only TZS 1 million. The leaky budget is then used to discuss with participants on how they can improve their village economy: for example, block some of the expenditure flows to keep more money within the village.
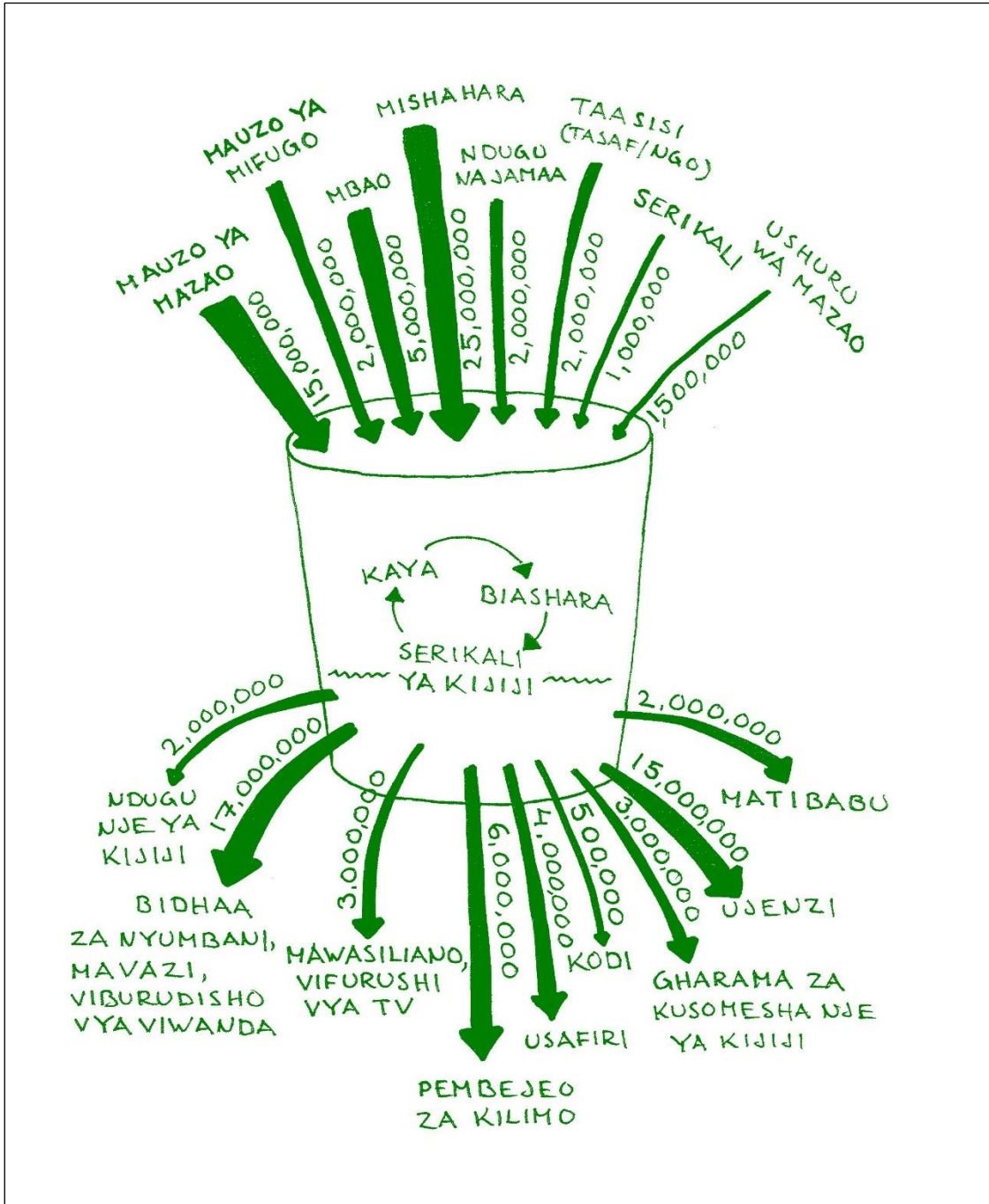
Textbox 56   Basic details

- Time: 1 to 2 hours.

- Participants: VLUMC and different VLUP stakeholders from different social groups in the village.

- Outcomes: Community leaky-bucket picture of the components and state of the village economy. Information on the actual and potential contributions of different economic activities to the village economy, including opportunities for income generation and savings.

- Preparations and material: Flipchart paper, masking tape and marker pens or blackboard and chalk.

Textbox 57   Addressing possible challenges

Sometimes understanding the idea of the leaky bucket may be difficult at first. Thus, it is a good idea to start by listing different economic activities in the village and then identifying what products and services people sell in the village. The village council should list the types of programs or services it delivers in order to identify its income. It may be difficult to estimate the amounts of money (in TZS) involved in different inflows of income and outflows of expenditure, so the prepared bucket may not reflect the real status of the village economy. One option is to estimate the proportions of different income sources and expenditures instead of exact amounts of money (see the example in Figure 31). However, this option does not reflect the exact status of economic surplus or deficit either.

Textbox 58   Unpaid work and subsistence activities in the local economy

Community members carry out a lot of unpaid work and work, such as subsistence agriculture, which does not generate any income. This work, which is often carried out by women, contributes substantially to the daily wellbeing of households and the community as a whole. The community leaky-bucket tool does not take this contribution into account because it does not generate any inflow of money. This work can, however, be considered in household leaky buckets, which have been used in countries like South Africa to help households increase their incomes. When creating a household leaky bucket, in addition to monetary income, household members calculate how much time women, men and children spend each day on unpaid work, assign a value to this work (what would it cost them to hire someone to do it?) and then calculate how much money that translates into monthly or annually. These figures for unpaid work are written and shown inside the bucket. By considering this work in their household leaky bucket, people begin to appreciate how much unpaid labour contributes to the household economy and therefore how much women contribute to household wellbeing.

3.   SOURCES OF FURTHER INFORMATION

Books and e-books:

Boedhihartono, A.K. (2012). Visualizing Sustainable Landscapes: Understanding and Negotiating Conservation and Development Trade-offs Using Visual Techniques. 56 p. Gland, Switzerland: IUCN. Available from: www.iucn.org/content/visualizing-sustainable-landscapes-understanding-and-negotiating-conservation-and-development-trade-offs-using-visual-techniques

Chambers R. (2002). Participatory Workshops: a sourcebook of 21 sets of ideas and activities. London: Earthscan.

Cunningham G. (2011). Community Economic Literacy and the "Leaky Bucket". Coady International Institute Occasional Paper Series, No. 9. Available from: http://coady.stfx.ca/knowledge/digital_tools/dlb/

ELD Initiative (2015). Practitioner's Guide 'Pathways and Options for Action and Stakeholder Engagement'. Available from: www.eld-initiative.org

Eilola S., Fagerholm N. Ferdinands A., and Käyhkö N. (forthcoming). Bird's eye view into my village: Use of participatory spatial technologies in local level land use planning in the Southern Highlands of Tanzania.

Geißler, G. and Löffler, G. (2007). Multi-stakeholder management: Tools for Stakeholder Analysis: 10 building blocks for designing participatory systems of cooperation. Available from: www.fsnnetwork.org/sites/default/files/en-svmp-instrumente-akteuersanalyse.pdf

IIED (2004). Power Tools of International Institute for Environment and Development for understanding policy influence; Stakeholder influence mapping, Stakeholder power analysis and the Four Rs tool. Available from: www.policy-powertools.org/Tools/Understanding

International Land Coalition (2016). Participatory Rangeland Resource Mapping in Tanzania: A Field Manual to support planning and management in rangelands including in Village Land Use Planning. 97 p. Available from: www.landcoalition.org/en/resources/manual-participatory-rangeland-resource-mapping

International Land Coalition (2013). Village land use planning in rangelands in Tanzania: good practice and lessons learned. Rangelands no. 3. 83 p. Available from: www.landcoalition.org/es/resources/village-land-use-planning-rangelands-tanzania

National Land Use Planning Commission (forthcoming). The PLUM Guidelines for Participatory Land Use Planning, Administration and Management. 3rd edition.

Ujamaa Community Resource Team (2010). Participatory Land Use Planning as a Tool for Community Empowerment in Northern Tanzania. IIED Gatekeeper Series 147.

Websites:

ArcGIS software: www.esri.com/en-us/home

ArcGIS tutorials: https://mgimond.github.io/ArcGIS_tutorials/index.html

Participatory methods website of Institute of Development Studies: www.participatorymethods.org

Publications of Coady International Institute on the Asset Based Community Development (ABCD) approach: http://coady.stfx.ca/knowledge/publications/

QGIS software: www.qgis.org

QGIS tutorials: www.qgistutorials.com

World Cafe tool on knowledge-sharing toolkit: www.kstoolkit.org/The+World+Cafe