



FACULTY OF SCIENCE
Charles University



USER MANUAL

for the map set of selected kebele in the Sidama Region and
Gedeo Zone

Landscape Management Plans

January 2023

Prepared by:

Dominika Cermakova

Michaela Hrabalikova

Tomas Hroch

Vilem Spalovsky

Jan Svoboda

Katerina Zelenkova



FACULTY OF SCIENCE
Charles University



Table of Contents

1. Map documentation part of LMP's	3
2. Main maps	4
2.1. Potential water erosion risk map	4
2.2. Potential water erosion risk zones map	5
2.3. Surface runoff and watershed delineation map	6
2.4. Geological hazard map	7
2.5. Step by step instructions:	9
3. Additional maps.....	10
3.1. Slope map.....	10
3.2. Land Use / Land Cover	11
3.3. Blank map.....	12
3.4. Blank map with background satellite image	13
3.5. Geomorphological map	14

1. Map documentation part of LMP's

LMP map documentation is a set of thematic maps that serve as background material for the design of erosion control, water harvesting measures in the landscape. This map documentation was created for selected kebeles in the Sidama region and 3 kebeles in the Gedeo Zone.

Base maps represent the entire kebele administrative area. They contain data from both field mapping as well as data obtained from GIS analysis. The maps and recommendations based on them works with the main aspects of effective landscape management and erosion control. They respect the boundaries of the watershed, contour lines and the direction of concentrated surface runoff.

The LMP's map documentation consists of eight individual maps, which are divided into two separate groups:

- Main maps:
 - Potential water erosion risk
 - Potential water erosion risk zones
 - Surface runoff and watershed delineation
 - Geological hazard
- Additional base maps:
 - Slope
 - Land use/Land cover
 - Blank map (hillshade background)
 - Blank map background satellite image
 - Geomorphological

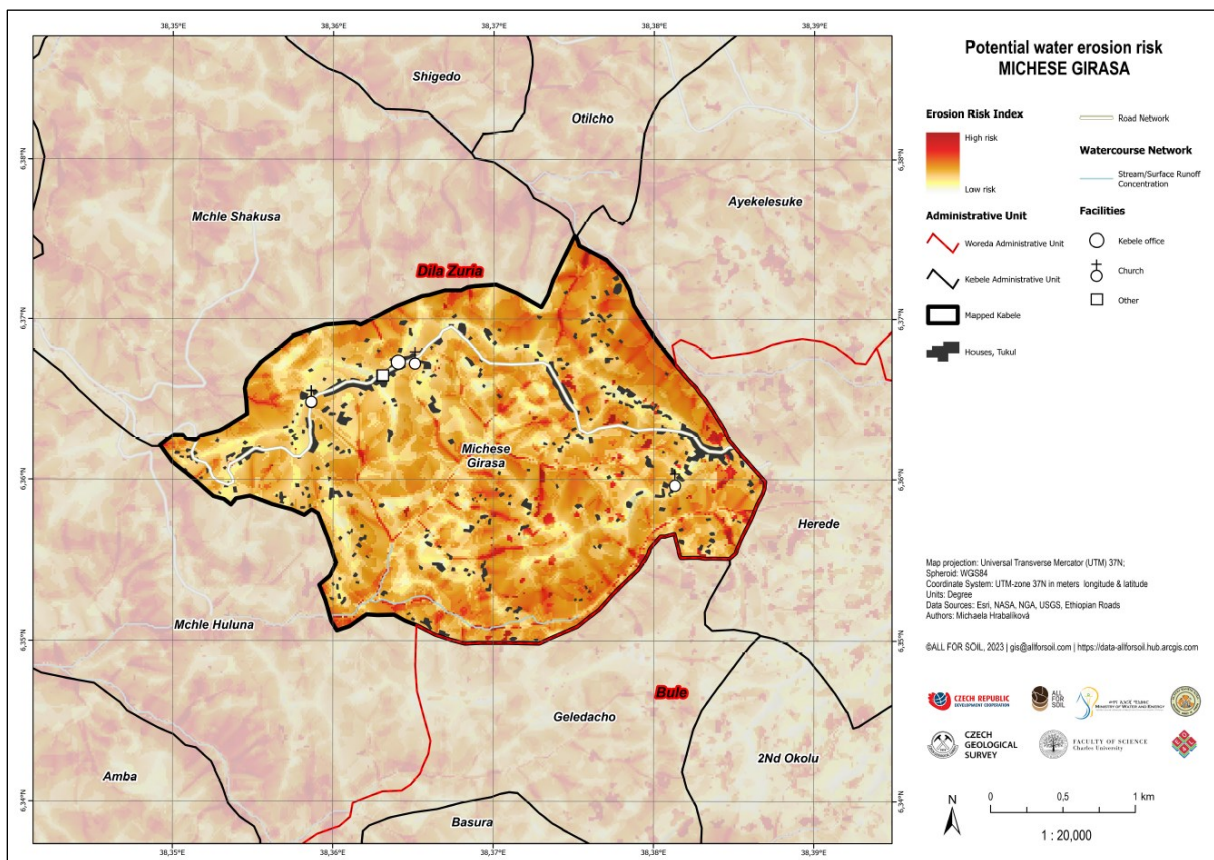
Main maps are designed to work at the region / zone / woreda level and partly at the kebele level. Additional base maps are designed to work at woreda, kebele and community level.

2. Main maps

- 2.1. Potential water erosion risk
- 2.2. Potential water erosion risk zones
- 2.3. Surface runoff and watershed delineation
- 2.4. Geological hazard

2.1. Potential water erosion risk

Potential water erosion risk map layout defines the areas that should be taken into account as early as possible when planning the watershed activities. Red to orange areas are priority areas, where watershed campaign activities should be carried out. In most cases these reddish parts represent the upper parts of the watershed or steep slope areas where erosion control, retention and accumulation measures should be implemented as a priority.

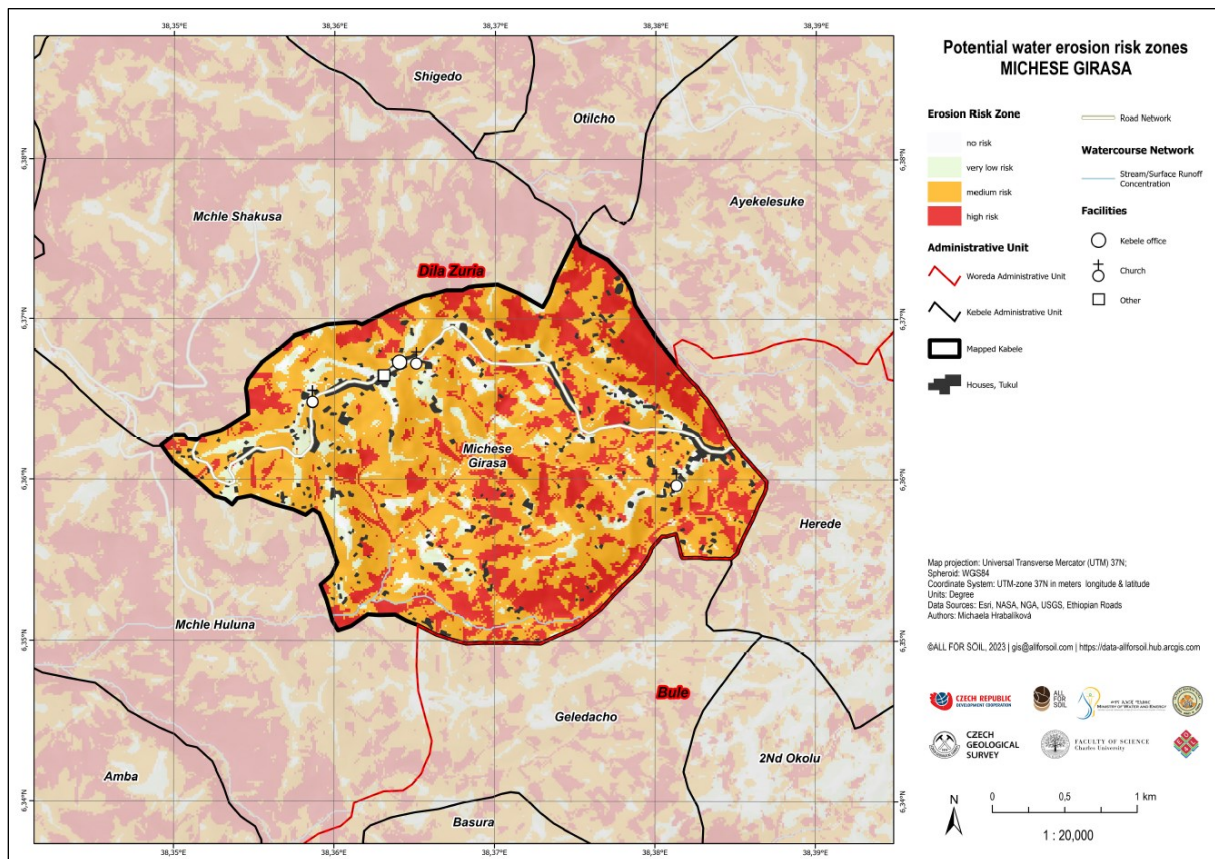


2.2. Potential water erosion risk zones

The base map of water erosion zones follows the Potential water erosion risk map, which means that it redistributes the preliminary areas (red to orange areas) into the four (or three) more specific categories:

- High risk zone
- Medium risk zone
- Low risk zone
- Little to no risk zone

Areas labeled “High Risk Zone” are to be selected for the activities of the nearest watershed campaign in 2024. The area labeled “Medium risk zone” could be included in the campaign basin activities in 2025 and the area labeled “Low risk zone” could be rehabilitated in 2026 during the watershed campaign. The recommendations on this map can be used to supplement / refine action plans. In some kebeles the “No Risk Zone” is not represented at all, in that case we only work with three categories.

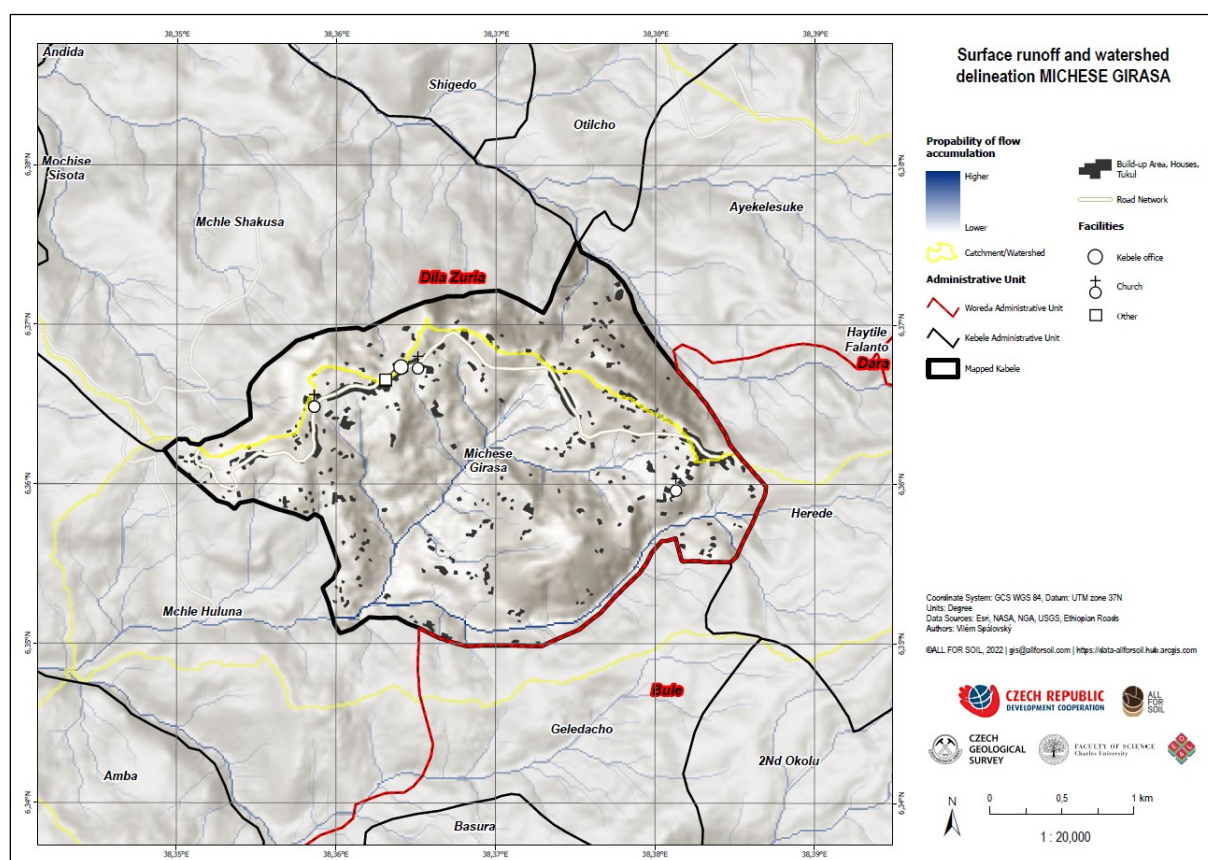


2.3. Surface runoff and watershed delineation

Surface runoff and watershed delineation maps represent the hydrology regime of the area. The area is divided into individual watersheds and point out the necessary cooperation between kebeles in activities during watershed campaigns. It is important to note that the boundaries between watersheds are not the same as the boundaries between kebeles. In order to achieve maximum landscape and erosion protection of the areas of interest the boundaries between watersheds (not kebeles) have to be respected.

Concentrated surface runoff is drawn as blue and represent natural drainage of site (natural waterways). The darker blue colour represents sites of highly concentrated surface runoff, gullies, rivers, or temporary streams. After rainfall, concentrated runoff has significant dynamic, and can deepen and widen runoff waterways. Especially the gully formation and expansion are very dangerous during the rainy season.

- Watershed definition: **Watershed is any area of land where precipitation collects and drains off into a common outlet.** Such as into a river or other body of water. The watershed includes all the surface water from the rain runoff and nearby streams that run downslope towards the shared outlet, as well as the groundwater underneath the earth's surface. Watershed connect to other watershed at lower elevations in a hierarchical pattern, with smaller sub-watershed, which in turn drain to another common outlet.



2.4. Geological hazard

The Geological Hazards Map identifies areas that are or may be regularly threatened by surface geological hazards that have a negative impact on agriculture and local communities. These include surface erosion and land degradation, floods and hazards associated with landslides and rockfall. Many sites belong to a specific type of geological hazard and require the implementation of stabilisation measures, which must be designed taking into account local natural conditions.

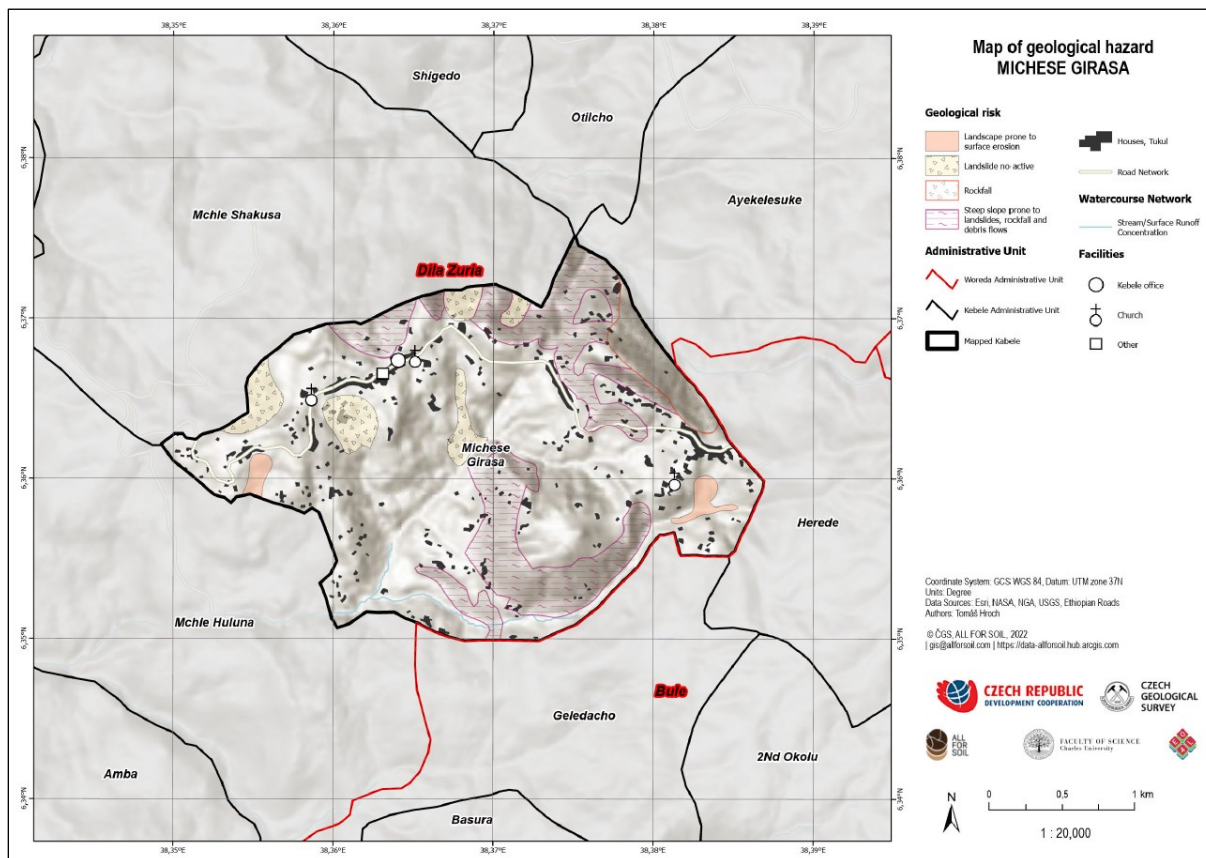
The main types of identified geological hazards:

- Surface erosion
- Slopes prone to erosion
- Landslides and rockfall
- Flooding zones
- Accumulation of sediment

Surface erosion areas (including gullies) are sites where land degradation has already occurred (mainly the lower part of the watershed). Areas identified as **slopes prone to erosion** are not currently affected by soil degradation in a significant level (predominantly upper and middle part of the watershed). These areas need to be focused on first during the watershed campaign because they are the places of the origin and concentration of surface runoff. **Sediment accumulation** is the result of material transportation (soil particles, sand, rocks) from the higher part of the watershed and their deposition in the lower part of the watershed. Material transportation is caused by water erosion. Therefore, to reduce the risk of water erosion and subsequent sediment accumulation, it is necessary to implement water harvesting and other SWCM measures in the upper part of the watershed. **The implementation of soil and water conservation measures must always start in the upper part of the watershed and then progress to lower parts of the watershed.**

Areas with active **landslides** and **rockfall** represent acutely dangerous sites where stabilization measures (stabilization with vegetation, sloping, slope drainage etc.) should be implemented. These areas are not suitable for building houses and infrastructure, as they can cause great material damage and in extreme cases even loss of life. Areas prone to rockfall and landslide are places where these processes have occurred in the past and now appear to be stable. In these places no inappropriate interventions should be carried out leading to a reduction in slope stability (deforestation, road building, mining, inappropriate landscaping etc.). If there are signs of slope movements in these places (discovery of cracks, appearance of new springs etc.), the woreda office should be informed.

Flooding zones are low-lying areas along streams and rivers (waterways) and drainless depressions whose surface is regularly flooded during the rainy season. These areas are also not suitable for house constructions.



2.5. Step by step instructions:

In order to select the correct area where the conservation measures will be implemented during the 2024 watershed campaign, it is necessary to understand and work with all of the main maps above.

1. Use Potential water erosion risk map
 - a. find the reddest areas in it -> this is the area of your interest
2. Use Potential water erosion risk zones map
 - a. search again for the reddest area -> this area is now more precisely specified, this is where the activities of the watershed campaign in 2024 should take place
3. Use Surface Runoff and Watershed Delineation Map
 - a. find out if the area of interest from the "Potential water erosion risk zones map" is situated within one watershed
 - i. if the chosen area is within one watershed -> the activities of the watershed campaign in 2024 should be implemented in this area
 - ii. if the chosen area is divided between more two or more watersheds -> select the 'red' area of the largest size adjacent to one defined watershed
 - iii. do not carry out watershed campaign activities only in certain parts of the individual watershed, on the contrary, try to cover the entire territory of the selected red area and its adjacent watersheds
4. Check geological hazard of locality.
 - a. identify the area of interest in map, and check whether it belongs to geological hazards
 - b. If yes, identify the geological hazard type according to the legend in the map
 - c. recommend appropriate measures according to the LMP
5. Use additional maps for further planning and for field orientation (more detailed planning at the level of kebele and community).

! Important note !

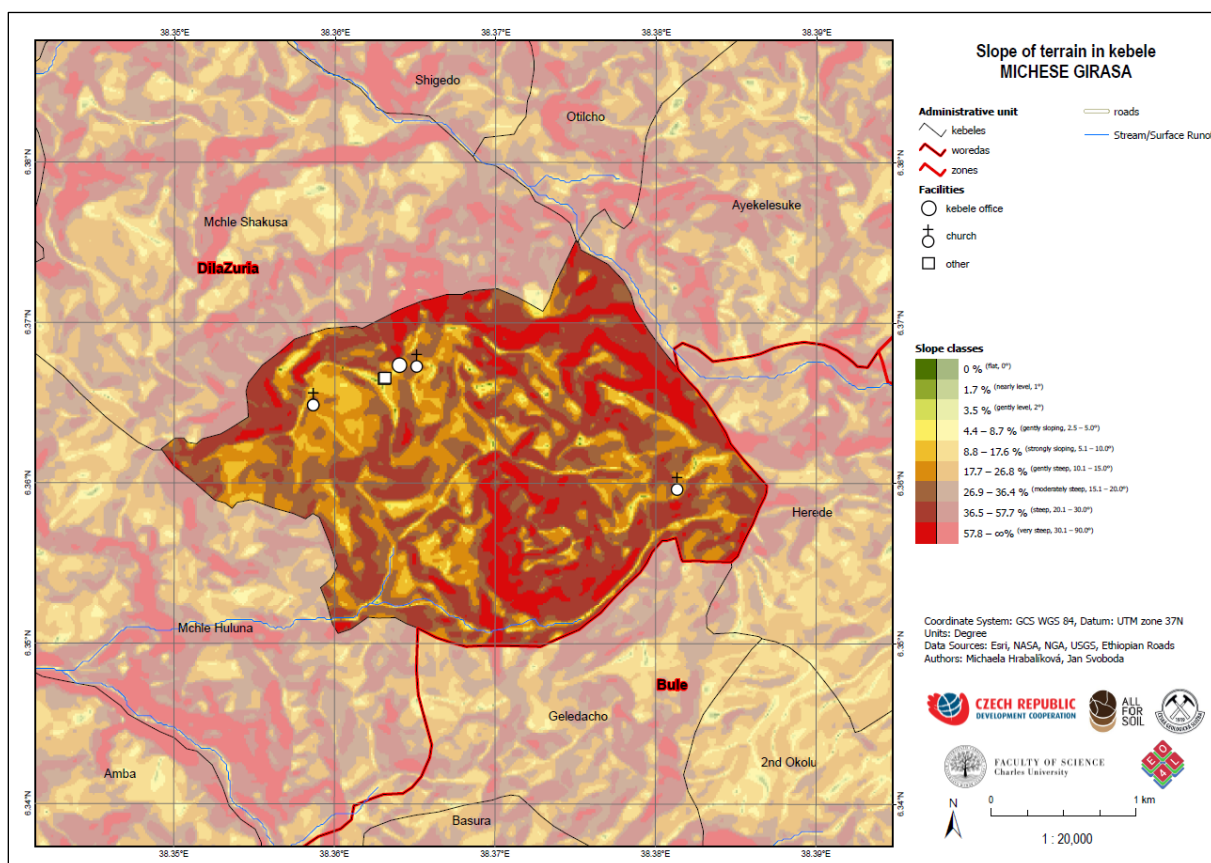
In case only one site has to be selected for the watershed activities or the possibilities (finance and/or capacity) are limited, it is **important to start implementation in the UPPER PART OF THE WATERSHED.**

3. Additional maps

- 3.1. Slope Map
- 3.2. Land Use / Land Cover
- 3.3. Blank map (with hillshade background)
- 3.4. Blank map with background satellite image
- 3.5. Geomorphological map

3.1. Slope map

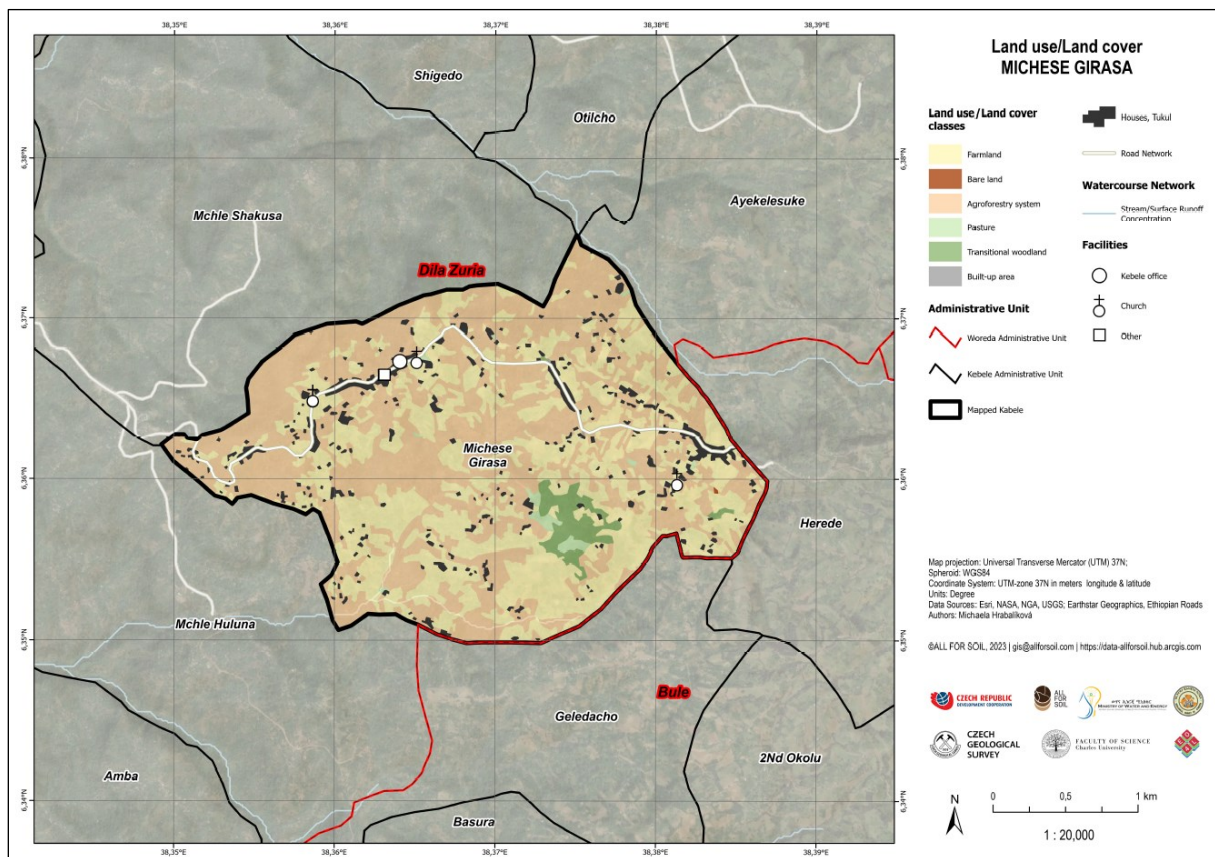
A slope map is a basic geomorphological map indicating changes in elevation on a highly detailed level. The steeper slope presents faster change in elevation. The steep slope areas are coloured in red shades, while low slope to flat areas is coloured in green shades. In high gradient areas, a number of geohazards may continue to be accelerated. These include landslides, water erosion, run off dynamics, etc. On the other hand, in flat areas, some processes may slow down, leading to sediment accumulation or the occurrence of waterlogged areas and floods.



3.2. Land Use / Land Cover

Working with the LU/LC gives us supplementary information when planning the activities for the watershed campaign. The main strength of the analysis is that it gives the best idea of the natural conditions on site, while also showing the real human usage of the ground surface and influence on both the whole landscape and local community.

Land cover indicates the physical land type such as farmland, pasture, degraded area, water body build-up area etc. To see change over the time, land cover maps for several different years and their comparisons are needed. With this information, decisions made in the past can be evaluated. It also helps to see and predict the potential impact of future decisions before they are implemented.

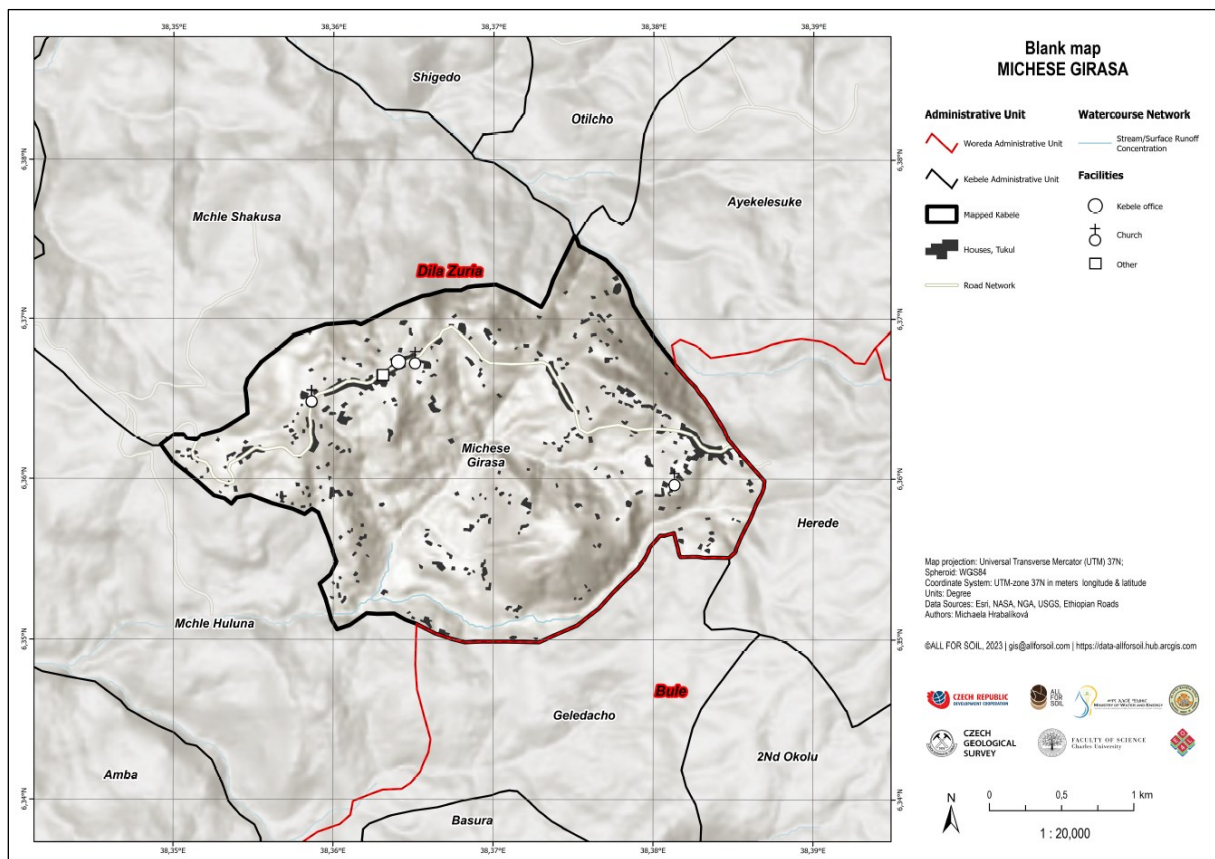


3.3. Blank map

A map that has hillshade background showing the terrain, contains basic landmarks and administrative borders. This map is suitable for drawing and writing additional information.

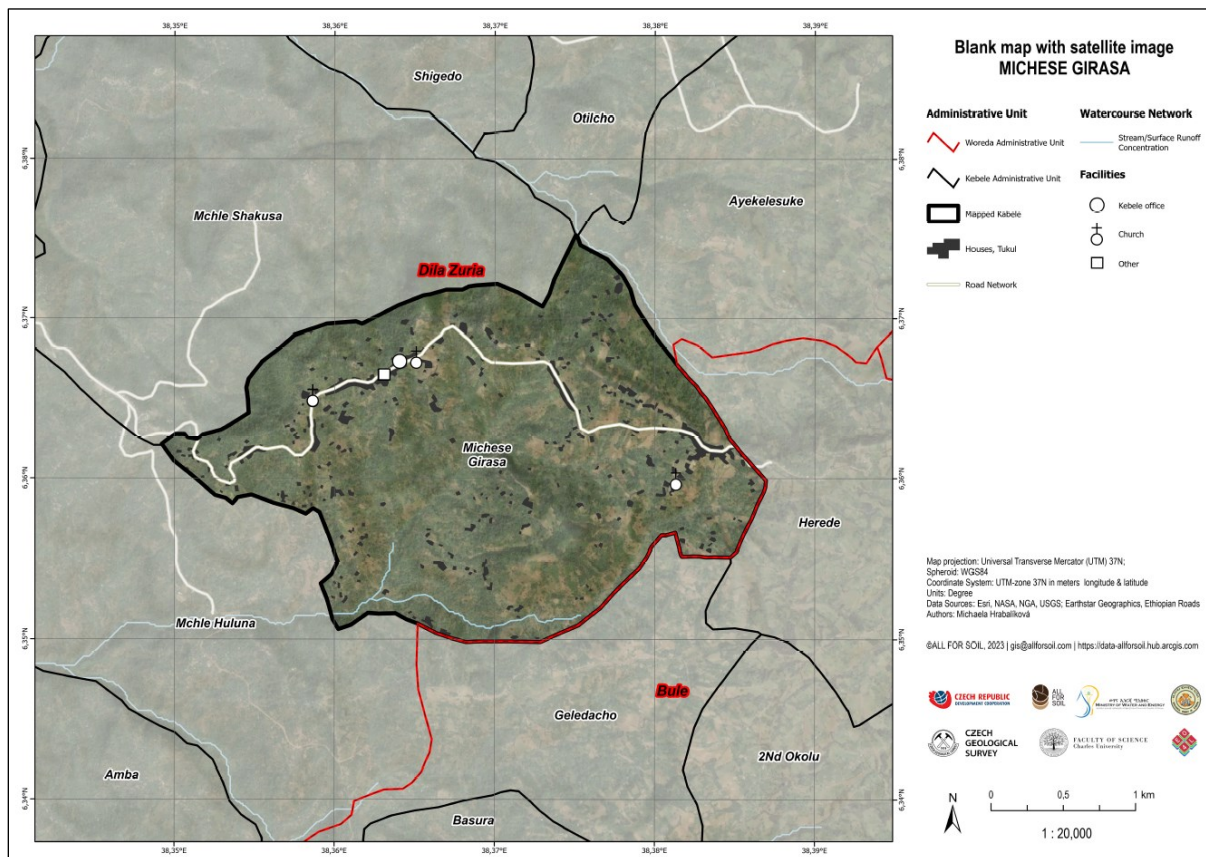
This map can be used for participatory mapping that encourages interaction and helps visualize the "mental map" of farmers and the community. In our case it can be a natural resource map. This map can also be used for many other topics: demography, social and residential stratification, community use of natural resources, individual fields and land use, soil types, watershed units, water resources and many more.

Blank map can also be used as a base map for planning at the community level - for example the annual plan of watershed campaign activities.



3.4. Blank map with background satellite image

This map is similar to blank map. For ease of reference this map is based on a satellite image. Basic elements of land cover can be recognized (farmland, degraded areas). It is a map that is meant to help with faster orientation in the kebele area.



3.5. Geomorphological map

The geomorphological map is the base map for the geological hazards map. The map defines the different types of landscape subdivided into geomorphological units. The geomorphological units are classified according to the types of processes that have formed the surface and thus allow the identification of areas with potential geological hazards.

