

# Climate-smart Solutions for Tropical Mountain Environments: Research, Innovation and Policy for Building Inclusive and Resilient Societies

25-29 July 2022

MOSHI - KILIMANJARO, TANZANIA

## Excursion Guide

27 July 2022



Prepared

By

Oforo D. Kimaro, Dr. Gileard S. Minja, Didas N. Kimaro

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## **FOREWORD**

This excursion guide leads you to the key stop places of interest of the 4<sup>th</sup> MWECAU International Conference, Moshi, Kilimanjaro, Tanzania. The excursion route is carried out in the landscapes of the Kilimanjaro region starting from the foot slopes of the mountain (800 m asl) to the evergreen moist/rainforest (2800 m asl) of the Kilimanjaro Landscapes.

The excursion intends to cover various inter and intra-related disciplines; geography, environment, socio-cultural knowledge, natural resources management and land use/cover dynamics in relation to ecosystem services provisioning. Some of the key features within the landscapes such as geosites, natural and semi-natural vegetation, land use practices (i.e., agroforestry ecosystems), human actions and activity spaces will be explored.

The excursion will capture different climate-smart socio-cultural land-management practices & indigenous knowledge that are practiced by smallholder agroforestry farmers in providing resilience for sustainable landscapes. However, different elements of mother nature such as changes within the protected ecosystem (Kilimanjaro Natural Rainforest in Kilimanjaro National Park), the soils and fauna will be explored at key stop places along the routes.

This excursion will be coordinated by the MWECAU Team comprising of Oforo D. Kimaro, Dr. Gileard S. Minja and Didas N. Kimaro and the other MWECAU staff who will join the excursion.

This team will guide you during the day of the excursion through a section of the fascinating Kilimanjaro landscapes and show you the different environmental and land use features, which are linked to the concept of ecosystem management and provision of multiple ecosystem services.

Enjoy the excursion!

*Prof. Dr. Henry Laswai  
Deputy Vice Chancellor  
Mwenge Catholic University*

## **1.0 Introduction**

There will be two excursion routes as outlined below

### **Route One (27 July 2022 starting at 07:00 a.m.)**

One day trip excursion to Mount Kilimanjaro National Park (Mandara Hut) will be organised. Participants will be picked up in the morning from the accommodation centres in Moshi Municipal with a one-hour drive to the Kilimanjaro National Park main entrance Gate (Marangu Gate, 1860 m asl). On the way, participants will see different land uses and biodiversity, a typical characteristic of multi-storey agro-forestry farming system (Chagga Homegardens). At the Kilimanjaro National Park main Gate, participants will be introduced to the history of the area, tropical mountain climate, ecology and biodiversity (flora and fauna). Soon after the introductions, participants will start hiking through the dense Kilimanjaro rainforest. Alongside the impressive tropical vegetation, participants will have the chance to catch a glimpse of Mt. Kilimanjaro, animals and bird species. After a 3-4-hour hike in tropical rain forest, participants will reach Mandara Hut (2700 masl), where they will have a well-earned rest and lunch. After lunch they will have a chance to visit Maundi Crater (15 minutes walk), where they can see and enjoy wonderful views of Mount Kilimanjaro, Northern Tanzania and Kenya. More details on the tour will be given in the tour guide book.

### **Route two (27 July 2022 starting at 08:00 a.m.)**

A one-day trip excursion that will involve visiting Living Lab (LiveLabLink) project site at Mwenge Catholic University and appreciate the soils and biodiversity conservation in the adapted Kihamba System adjacent to an old historical Coffee Estate. Later on, the participants will visit community Chagga homegardens at Marangu-Kilema villages on the slopes of Mount Kilimanjaro. The participants will be able to see the original set-up of the Kihamba farming system in real time and space, cultural heritage (ancient church, beautiful scenery water falls, and the first coffee tree species (Arabica) in East Africa). Participants will also have an opportunity to see the panoramic view of the glaciers of Mount Kilimanjaro. This option will enable participants to experience and learn heritage conservation, agroforestry, community-based climate adaptation strategies and ecotourism

## 2.0 General Excursion Map

### 2.1 Route One

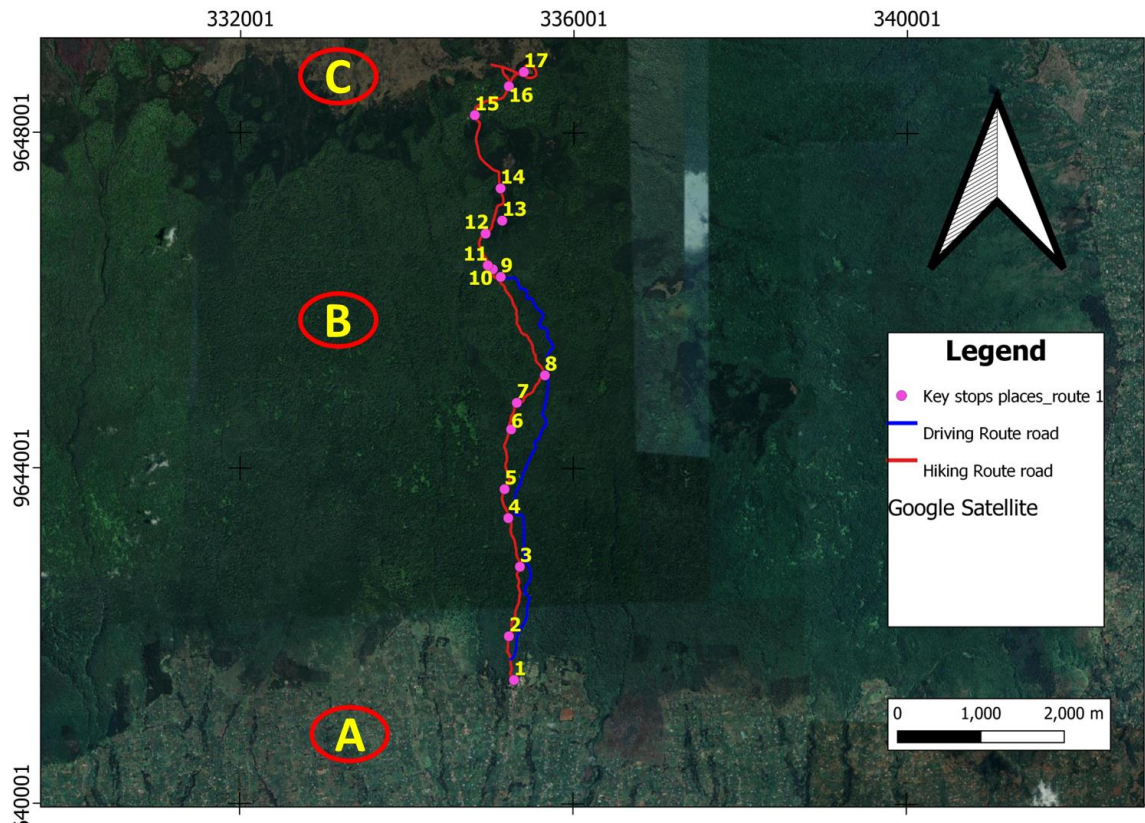


Figure 1: Key Stops for Route One (see description in Table 1)



Figure 2: Zoomed End Stop Points for Route One (see description in Table 1)

**Table 1: Description of Route One**

ID	EASTINGS	NORTHINGS	ELEVATION	DESCRIPTION
1	335291	9641478	1892	KINAPA HQ, Entrance Gate, Souvenir shops, Information Centre
2	335229	9642000	1924	Bluish River of the Lush Montane forests (Experience endemic Indigenous tree species <i>Newtonia buchananii</i> , <i>Macaranga kilimandscharica</i> highly exploited by the surrounding communities
3	335360	9642829	2025	Indigenous tree species <i>Antiaris usambarensis</i> , <i>Neoboutonia macrocalyx</i> (timber, medicinal, firewood, etc)
4	335220	9643408	2079	Old trees nursing the young wildlings plants; the insufficient amount of light seeming to suppress the wildlings
5	335174	9643753	2112	An open unit within the rain forest dominated by <i>Mawindi</i> (local name) shrubs Carpet looking below the rain forest, which attract sting bees. Participants will get the background history relating KINAPA and the surrounding communities.
6	335252	9644466	2187	Beehives hanged in the KINAPA nearby the rivers (history of old beekeepers before the change of ownership from forest reserve to national park. <i>Dracaena afromontana</i> patch (an indication of ancient settlements)
7	335320	9644783	2221	Bridge, and Junction point to Kisambioni Picnic (Kisambioni means cleansing after a long safari); Old ferns tree species (Historically used by <i>Chagga</i> community to construct houses and stables for livestock
8	335656	9645111	2267	Resting site; <i>Kisambioni</i> Picnic site (1/2 route between Marangu gate and Mandara Hut (a place where you take bath after a long hiking (Meaning of <i>Kisambioni</i> )). Junction to resting site and hiking trail.



Table 1 contd.....

9	335124	9646283	2425	Bridge junction between hiking trail and endpoint of motor road accessibility. Two hours walking distance to Marangu gate; and 1 hour to Mandara Hut
10	335029	9646375	2451	Observe non-native tree species ( <i>Persea americana</i> (Avocado) in highly ecologically managed natural forest
11	334969	9646421	2470	The dominance of <i>Dracaena Afromontane</i> patches indication of the ancient settlements
12	334942	9646800	2504	The trail to Mandara Hut; Bridge crossing a River; transition zone to heath/moorland, Dominance of <i>Erica ariborea</i> (Tree heath) patches (Ornamental/wood/timber)
13	335142	9646955	2567	Cluster of communication towers (e.g., Vodacom, Safaricom, etc); Dominance of <i>Erica arborea</i> spp; <i>Persea americana</i> (non-native tree spp); probably influence of porters on vegetation; changes micro-climate
14	335121	9647339	2575	<i>Persea americana</i> (non-native tree spp); <i>Ensete ventricosum</i> (false banana) wildlings
15	334811	9648212	2720	Mandara Hut.
16	335219	9648556	2749	From Mandara Hut 10 minutes walk will bring you to the junction of the trail to Horombo Hut and Maundi Crater. Maundi Crater is 320 meters from the junction. On the way to Maundi Crater participants will cross a river with some geological features (turphites, Pumice)
17	335399	9648727	2790	<b>At Maundi Crater:</b> Observe very shallow soils, ferns; <i>Erica arborea</i> shrubs and serrated tussock grass type



Figure 3: Features of interest in Route One

## 2.2 Route Two

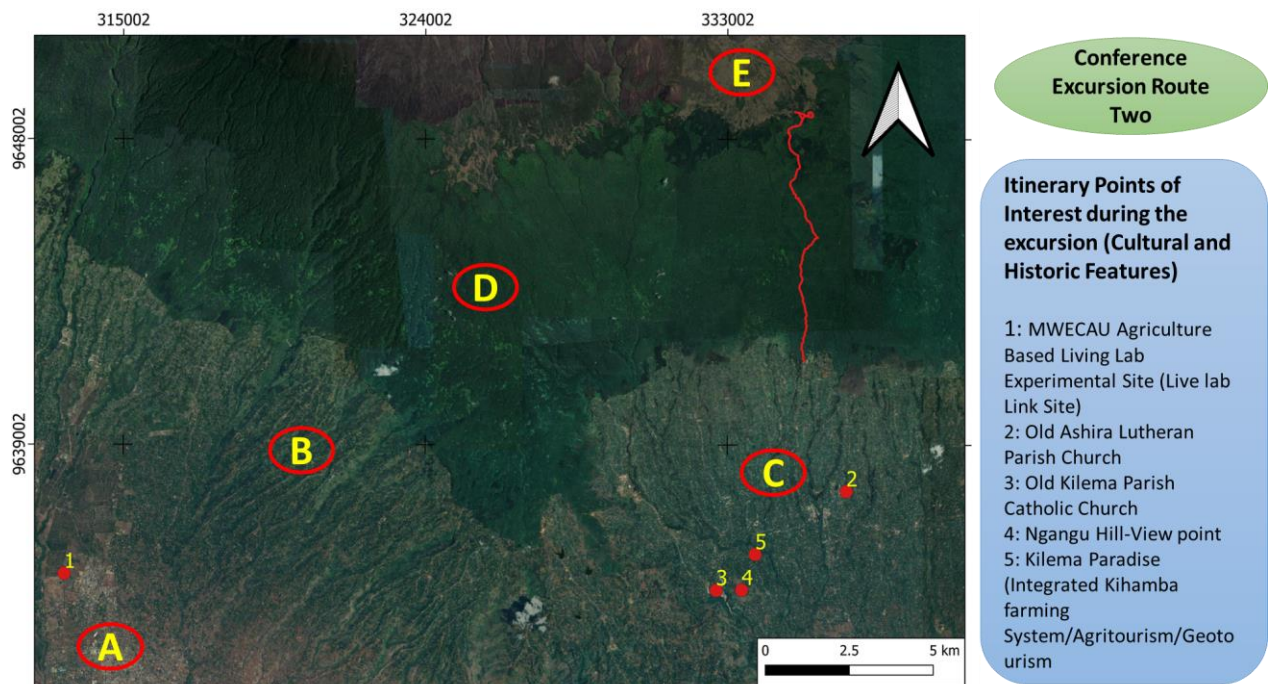


Figure 4: Key Stops for Route Two (see description in Table 2)

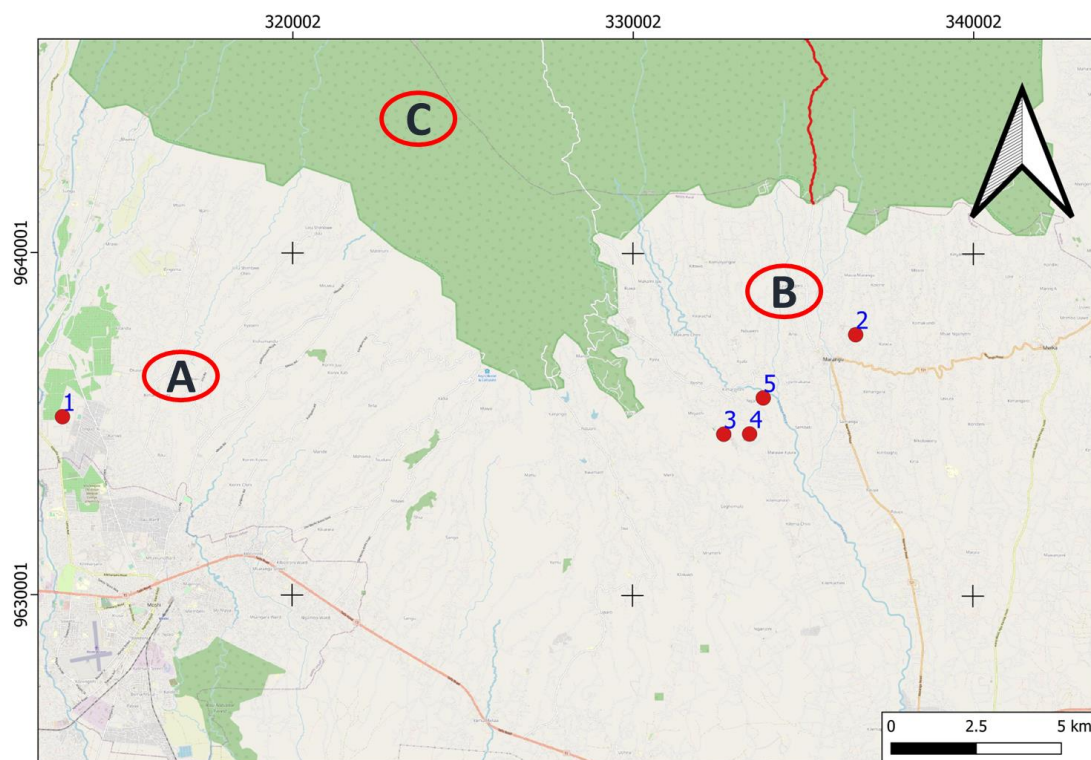


Figure 5: Zoomed Mapp of Stop Points for Route Two (see description in Table 2)

**Table 2: Description of Route Two**

ID	EASTINGS	NORTHINGS	ELEVATION	DESCRIPTION
1	313249	9635203	1032	MWECAU Agricultural-based Living Lab Experiment
2	336550	9637637	1548	Ashira Historical Site
3	332679	9634721	1445	Kilema Parish Site; 110-year-old 1 <sup>st</sup> coffee tree planted by the first Missionaries in 1898 (from <i>La Réunion</i> islands in the Indian Ocean)
4	333438	9634730		Visit Ngangu Hill (Pilgrimage Centre for socio-cultural beliefs & interactions); Viewpoint for Kibo and Mawenzi Peak of Mt. Kilimanjaro, Viewpoint to lowland landscape features such as <i>Lake Jipe</i> , <i>volcano parasitic cones</i> ; fault line separating Volcanic landscape (rift system) from block mountains ranges (Pare and Usambara Mountains); The site has other amenities e.g., sunset attractions etc
5	333838	9635785	1391	Kilema Paradise Ecology (agroforestry ( <i>kihamba</i> ) ecosystem (organic farming) integrated with Community-based tourism (CBT) e.g., agri tourism, geotourism (Kilema paradise, Kilasiya and Ndoro waterfalls)

## Soil Profile Description

**Profile number:** LLB<sub>2</sub>....

**Mapping unit:** MWECAU Agricultural-based Living Lab Experimental site

**Agroecological zone** N4: Northern Rift zone and Volcanic Highlands

**Region:** Kilimanjaro

**District:** Moshi Rural

**Map sheet no.:** 56

**Co-ordinates:** 313249 E 9635203 N

**Season/Weather conditions:** Dry season;

**Location:** Longuo Juu Street, MWECAU Agricultural-based Living Lab Experimental Site

**Elevation:** 1032 m asl

**Parent material:** Lahars Plain with typical Unsorted alkaline volcanic debris (stones, boulders and gravels)

**Geological formation:** Lower/Late Pleistocene

**Land use:** Established young experimental *Kihamba* agroforestry Living Lab; adjacent to maize and beans **cultivation**. In Northwest side is bordered by Tchibo Coffee Plantation with selected native trees

**Human influence:** Ploughing

**Landform:** Gently undulating lower slope (Footslope) of Mountain Kilimanjaro

**Slope:** 3%; Straight and >100m; gently Sloping (middle backslope)

**Erosion:** Slightly splash and sheet

**Runoff:** Slow (very low/gentle slope)

**Infiltration:** Moderate

**Cracking:** Common, fine and very closely spaced cracks

**Deposition:** None

**Natural drainage class:** Well drained

**Soil fauna:** Presence of termites and rodents, krotovina (Crotovina), mole rats (*Fuko*)

**Soil Temperature Regime:** Isohyperthermic

**Soil Moisture Regime:** Ustic

**Remarks:**

Described by S.B. Mwango, O. D. Kimaro and D. N. Kimaro on 31/08/2021

Soils are very deep, well-drained, dark reddish brown clays.

**Ap 0 - 20 cm:** Dark brown (10YR3/3) dry, dark brown (10YR3/3) moist; clay loam; Slightly hard dry, friable moist, sticky and plastic wet; moderate, fine and medium coarse subangular blocky; many fine, few medium and coarse pores; very few, medium, fresh or slightly weathered irregular shape gravels; many fine and medium roots; gradual wavy boundary to

Bt<sub>1</sub> 20 - 65 cm: Dark reddish brown (5YR3/3) dry and (5YR3/3) moist; clay; hard when dry, friable moist, sticky and plastic wet; strong, medium and coarse nutty (shiny) subangular blocky (wedge-shaped); many medium clay cutans; many common,

few coarse pores; very few, medium, fresh or slightly weathered irregular shape gravels; common, very fine and few fine and medium roots; presence of termite burrows, (crotovina); diffuse smooth boundary to;

Bt<sub>2</sub> 65 - 130+ cm: Dark reddish brown (5YR3/4) when moist; clay; friable moist, sticky and plastic wet; strong, fine and medium nutty (shiny) subangular blocky (wedge-shaped); common fine clay cutans; many few and common medium pores; more than five percent volcanic glass aggregates (vitric properties); very few and very fine roots.

SOIL CLASSIFICATION:

World Reference Base WRB (2015):

USDA Soil Taxonomy (Soil Survey Staff....):

Analytical data for Profile LLB<sub>2</sub>

Horizon	Ap	Bt <sub>1</sub>	Bt <sub>2</sub>
Depth (cm)	0-20	20-65	65-130 <sup>+</sup>
Clay (%)	66	74	76
Silt (%)	13.6	11	6.8
Sand (%)	7	4	10
Texture class	Cl	C	C
AWC (mm/m)			
Bulk density (g/cc)	1.0	0.9	1.2
pH H <sub>2</sub> O 1:2.5	6.3	6.6	6.8
pH KCl 1:2.5	4.9	5.1	5.4
EC 1:2.5 (mS/cm)	0.05	0.03	0.05
ESP			
Organic C (%)	2.55	1.05	0.68
Organic matter (%)			
Total N (%)	0.16	0.08	0.05
C/N	16	13	14
Avail. P BrayI (mg/kg)	13.59	8.95	6.84
Avail. P Olsen (mg/kg)	nd	nd	nd
CEC NH <sub>4</sub> OAc <sub>soil</sub> (cmol(+)/kg)			
CEC <sub>Clay</sub> (cmol(+)/kg)	29.12	21.92	28.72
Exch. Ca (cmol(+)/kg)	21.15	14.24	20.82
Exch. Mg (cmol(+)/kg)	2.32	2.32	3.07
Exch. K (cmol(+)/kg)	0.49	0.35	1.62
Exch. Na (cmol(+)/kg)	0.92	0.70	0.47
TEB (cmol(+)/kg)			
Base saturation (%)	85	80	90
ECEC <sub>soil</sub> (cmol(+)/kg)			
ECEC <sub>Clay</sub> (cmol(+)/kg)			
Exch. acidity (cmol(+)/kg)	0.6	0.56	0.6
Exch. Al (cmol(+)/kg)	0.000	0.000	0.000

