# SEVEN YEARS OF FOSS4G RESEARCH AND EDUCATION AT THE FOOT OF THE UDZUNGWA MOUNTAINS, TANZANIA: RESULTS AND LESSON LEARNED.


*Marco Ciolli[1,2], Nathalie Cavada[1,3], Francesco Rovero[3,4], Silvia Ricci[5], Clara Tattoni[1]*

*1. Università degli Studi di Trento, Dipartimento di Ingegneria Civile, Ambientale, Meccanica, Via Mesiano 77, Trento, Italy*
*2. UNESCO Chair in Engineering for Human and Sustainable Development*
*3. MUSE – Museo delle Scienze, Trento, Italy*
*4. Udzungwa Ecological Monitoring Centre, Udzungwa Mountains National Park, Tanzania*
*5. Associazione Mazingira*


## Tropical Forests, GIS and Biodiversity loss

Tropical forests are facing unparalleled rates of deforestation and habitat degradation and in the last decades this phenomenon is leading to loss of species and populations that is occurring even inside protected areas.

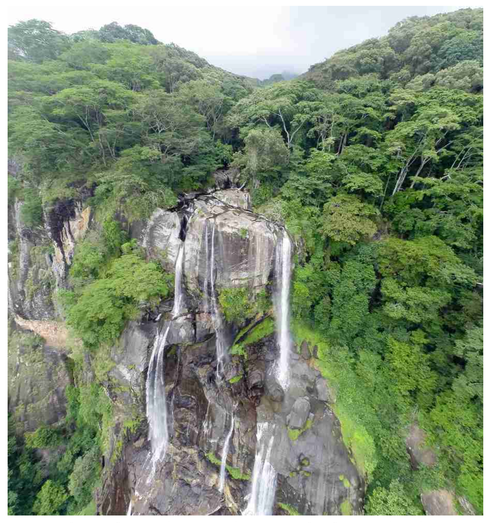
The limited amount and the heterogeneous nature of monitoring data available to assess habitat trends and hence design mitigation strategies represents one of the most serious challenge.

In the last years, remote sensing and GIS techniques and modeling have helped to monitor deforestation and to integrate field data at a local or global scale allowing to produce useful scenarios for planning.

Standardized Ecological monitoring in the field and an effective geospatial data processing are therefore indispensable to try put in place a strategy to reverse the trend especially in those countries where the situations are dramatically changing due to demographic explosion and rapid socioeconomic development.

Moreover, these rapid changes have a strong effect not only on biodiversity but also on human food security and other different ecosystem services that are indispensable for human societies.

## UDZUNGWA Mountains



The Udzungwa Mountains of southcentral Tanzania form the largest massif of the Eastern Arc Mountains and are one of the single, most important areas in Africa for biodiversity conservation.

The forests are home to thousands of endemic species, including two monkeys Udzungwa red colobus and Sanje mangabey and the recently discovered giant Sengi.

## Activities in Udzungwa mountains

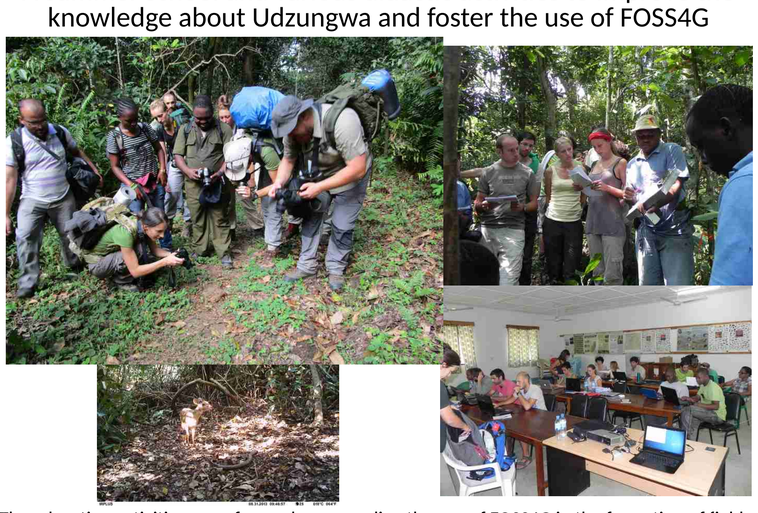
Since 2011 the DICAM of the University of Trento has collaborated with MUSE – Museo delle Scienze (Trento, Italy) on a number of research and education activities in the Kilombero valley, at the foot of the Udzungwa mountains, Tanzania, using FOSS4G.

In this area MUSE co-manages UEMC (Udzungwa Ecological Monitoring Centre of Udzungwa Mountains National Park, Tanzania) in partnership with TANAPA (Tanzania National Parks) and the Natural History Museum of Denmark, and has established since 2006 a long-term research and conservation programme.

The research activities in the forest were mainly focused on primate monitoring for conservation combining field work and processing of satellite data and ecological proxies.

FOSS4G proved to be extremely effective to investigate these aspects both during the planning of field activities and for the processing of the results.

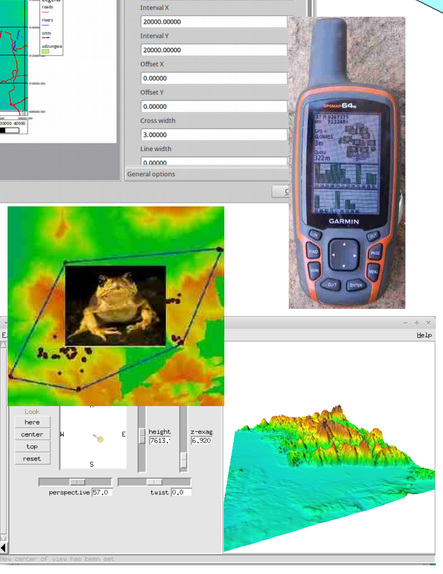
## A summer school and various didactic activities to improve the knowledge about Udzungwa and foster the use of FOSS4G

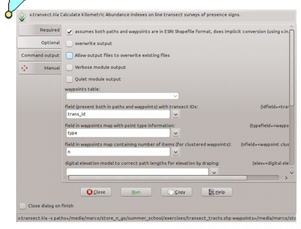


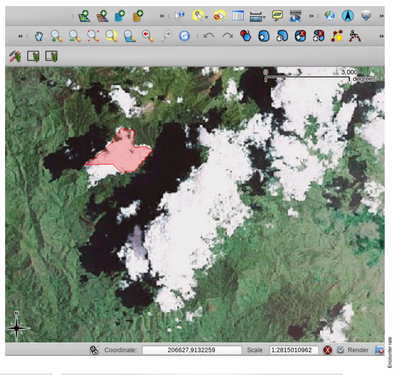
The education activities were focused on spreading the use of FOSS4G in the formation of field ecologists, master and PhD students and experienced researchers from all over the world. Special training sessions were carried out for Tanzanian ecologists.

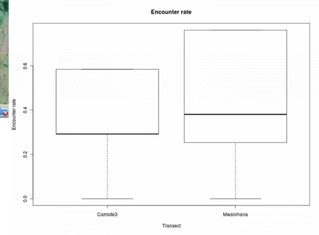
Five editions of the international summer school: Tropical rainforest biodiversity: field and GIS tools for assessing, monitoring and mapping were held at the UEMC facility.

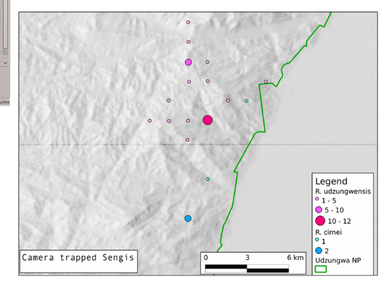
A practical course in GPS and GIS was held during August 2018 for local technicians.

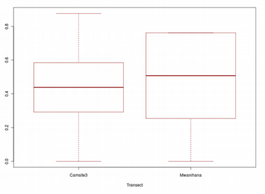












## Education Activities

The aim of the education activities was to offer new tools to manage environmental data regarding vegetation and animal populations and to widen the horizon of the learners opening a window on the variegated world of FOSS4G.

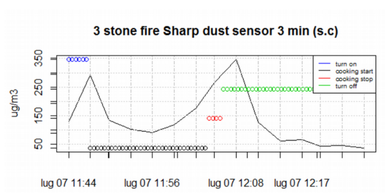
The long and varied experience of FOSS4G spreading and teaching all over the world gained by the researchers of DICAM helped to project and maintain different teaching initiatives aimed to different targets of learning groups.

Combining the experience in biodiversity monitoring of MUSE in the Udzungwa Mountains National Park (UMNP) and the consolidated FOSS4G teaching experience of DICAM, the training aim to provide ecologists with tools for data collection, data analysis and GIS-based mapping of key biodiversity components in forest parks with a special focus on arboreal primates through line-transect census, terrestrial medium-to-large mammals through camera-trapping and large mammals through counts of signs and tracks along defined routes.

Special courses were held to spread the use of FOSS4G among local technicians and ecologists.

A total of approximately 130 learners attended the summer schools and Tanzanian courses

## Environmental monitoring and cooperation activities




To monitor the exposition to domestic pollution (CO and PM) of local village population we carried out a sampling in Mangula village through a set of self built Arduino based sensors.

Many other activities like Agro-forestry monitoring are carried out in the villages to understand the local dynamics and help to find solutions to environmental problems that also affect the health and well being of local people.

## Conclusions

*Udzungwa Summer school allowed students coming from all the world to discover the possibilities that FOSS4G provides to study an extraordinary environment experiencing a full immersion in the forest;*

*Different didactic activities showed that FOSS4G can be a bridge to reach local technicians and local people;*

*The fact that FOSS4G is free of charge is minor, software quality and usability are much more important;*

*FOSS4G contributed to produce high level research results useful for biodiversity conservation;*

*Research activities and cooperation with local population allow the investigation of major environmental problems trying to find participated solutions in a complex and endangered environment.*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