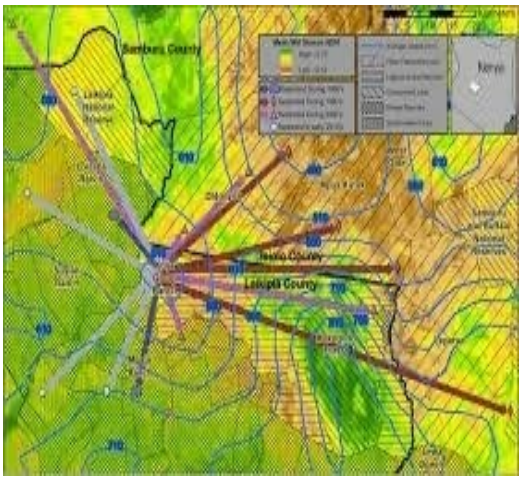
NATIONAL MUSEUMS OF KENYA
WHERE HERITAGE LIVES ON

Modelling landscape to reframe our understanding of past socioecological changes




3rd-7th June 2026

Course Contact: endiema@museums.or.ke or endiema@gmail.com

Course facilitators: Dr Rahab Kinyanjui (NMK), Dr Johnathan Reeves (Portugal) Ms. Slyvia Wemanya (Rice University)

Brief course introduction:

Over the past twenty years, the landscape approach has deeply influenced disciplines such as archaeology, anthropology and ecology by enabling the emergence of research frameworks focused on the socio-ecological dynamics, especially in East Africa. These approaches, or landscape approaches, are based on a strong interdisciplinarity and a collective work deployed within the theoretical framework of STS (Science-Techniques- Society). They result in the establishment of "critical zones" or "workshop zones" calling on diverse disciplinary skills. They are based on new tools ranging from GIS to modelling and 3D virtual model. Based on interdisciplinary research carried out on the "water places" of Northern Kenya, the panel proposes to present the STS framework and to show how the specific contribution of GIS and data modelling within a disciplinary anchorage can renew our understanding of socio-ecological dynamics.

"This two-hour course introduces R for data manipulation, analysis, and visualization. The course is designed for beginners with little to no prior experience in R, aiming to provide a solid foundation for future learning and application. Participants will be given a brief overview of R, how it differs from the statistical software, and its advantages. This overview will be followed by a practical component that will acquaint attendees with R syntax, and basic operations, focusing on vectors and data frames. Participants will also learn to import data

from Excel spreadsheets and sub-set and summarize data. This will allow us to delve into conducting basic statistical tests. The last half an hour of the course will be spent plotting and visualizing data using ggplot2. Participants should expect to leave the course with a fully reproducible script that is transferable to a range of analytical problems across multiple discipline."

AIMS OF THE COURSE: To equip students and early-career scientists with interdisciplinary skills and tools in landscape approaches, focusing on socio-ecological dynamics within the theoretical framework of Science-Techniques-Society (STS).

Target Audience: Early-career scientists and researchers in archaeology, anthropology, ecology, and related fields.

PROVISIONAL COURSE OUTLINE:

Data Modeling and Visualization for Heritage and Environmental Research

3th –7th June 2026

Course Contact: endiema@museums.or.ke | endiema@gmail.com

Brief Course Introduction

Over the past two decades, advances in digital technology have transformed how we collect, interpret, and visualize data in archaeology, anthropology, and environmental sciences. The rise of open-source tools for data modeling, 3D reconstruction, and spatial visualization now allows researchers to create integrated models that link natural and cultural landscapes in new ways.

This 5-day training introduces participants to interdisciplinary data modeling and visualization approaches using open-source software. Participants will learn how to construct, analyze, and visualize datasets using 3D and GIS-based technologies. The course builds upon the Science–Technology–Society (STS) framework to explore how digital modeling can reshape our understanding of past and present socio-ecological systems in Kenya and East Africa.

Participants must have a personal computer to install and run the required open-source software (e.g., QGIS, Blender, MeshLab, R, or Python-based visualization tools).

Aims of the Course

- Equip early-career scientists with interdisciplinary skills in data modeling, digital mapping, and visualization.
- Promote the use of open-source technologies for research, documentation, and communication of socio-ecological change.
- Strengthen participants' ability to produce reproducible, data-driven analyses and visual narratives for publication and presentation.

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ASSOCIATION OF KENYAN ENTOMOLOGISTS
AKE
Empowering The Society With Insect Science

Target Audience

Early-career scientists, students, and researchers in archaeology, anthropology, environmental science, ecology, and digital heritage fields.

Provisional Course Outline

1. **Introduction to the STS and Landscape Framework**

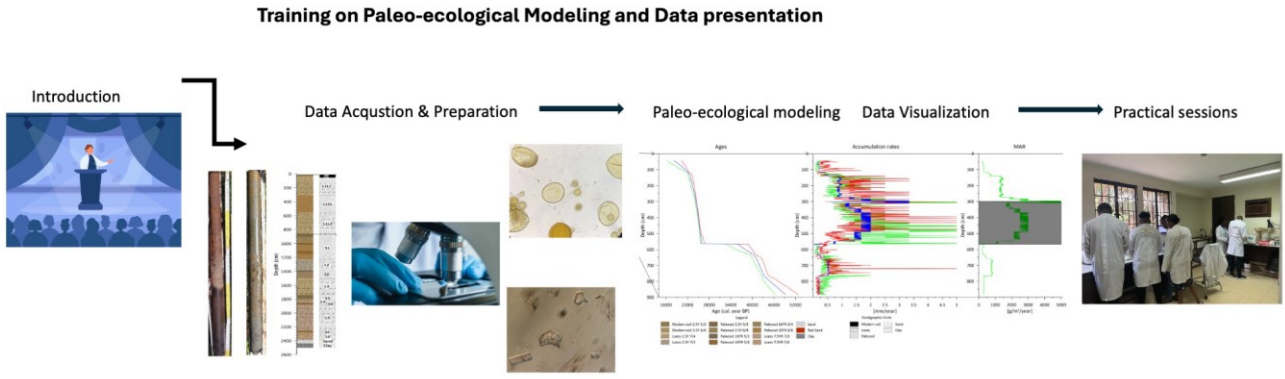
Presenter: Dr. Emmanuel Ndiema (Department of Earth Sciences, NMK)
• Overview of the landscape approach in East African research
• Understanding socio-ecological dynamics through Science–Technology–Society (STS) perspectives

2. **Data Modeling and Visualization Using Open-Source Software**

Presenter: Dr. Johnathan Reeves (NMK)
• Data import, manipulation, and visualization using R and Python
• Building interactive dashboards and maps using open data tools
• Integrating 3D and GIS models for advanced visual storytelling

3. **Paleo-ecological modeling and Data presentation**

Presenter: Dr. Rahab Kinyanjui



4. **Writing for scientific publications and the general public**

Special Notes

• A photo session will be organized to document the training activities.
• The training environment will be designed to be interactive and visually engaging.
• Five scholarships are provided by the AFRI-CAN Project for interested students.

What to Bring

• Personal computers (mandatory) with capacity to install open-source GIS and 3D modeling software

Students will:

1. Complete a short post-training survey.
2. Submit a brief training reflection report at the end of the session.

Facilitator profiles

Dr. Emmanuel Kimuma Ndiema
Head, Department of Earth Sciences | National Museums of Kenya

Dr. Emmanuel Ndiema is a leading Kenyan archaeologist and heritage scientist serving as the Head of the Department of Earth Sciences at the National Museums of Kenya (NMK). His work integrates archaeology, paleontology, and environmental science to explore how human societies have adapted to changing landscapes across East Africa. Over the past two decades, Dr. Ndiema has spearheaded interdisciplinary research and training programs that apply Science–Technology–Society (STS) frameworks and digital tools—including GIS, 3D modeling, and data visualization—to reframe understanding of socio-ecological dynamics in Kenya's past. He has designed and led numerous field and capacity-building programs, such as the Data Modeling and Visualization for Heritage and Environmental Researchcourse, aimed at equipping early-career scientists with skills in open-source digital technologies for heritage research. Dr. Ndiema's broader research interests span human-environment interactions, landscape archaeology, and cultural resilience. His work emphasizes the value of integrating scientific and community perspectives in conserving Kenya's rich natural and cultural heritage.
Email: endiema@museums.or.ke | **Alternate:** endiema@gmail.com

Dr. Rahab Kinyanjui
Senior research scientist

Dr. Kinyanjui is a senior research scientist at Palynology and paloebotany section, Earth sciences department at NMK. Her research focuses on reconstructing past vegetation, ecosystems and paleoenvironments to understand their responses to climate change and human activities. She is particularly interested in the role of Human-environment interactions in shaping the ecosystems over time. The palaeoecological proxies she studies fossil pollen, spores, phytoliths, diatoms, charcoal and other plants-macro-remains. Understanding past ecosystems dynamics provides valuable insights for predicting the future environmental changes and developing mitigation strategies, especially when predicted scenarios threaten natural and cultural heritage.
Email address: rkinyanjui@museums.or.ke; rkinyanji@gmail.com

Dr. Jonathan Scott Reeves
Research Fellow | Portugal

Dr. Jonathan Scott Reeves is a researcher and data scientist specializing in digital heritage, environmental modeling, and open-source data visualization. Based in Portugal, he collaborates closely with the National Museums of Kenya (NMK) on interdisciplinary research and training programs integrating data science with archaeology, anthropology, and ecology. Dr. Reeves's work focuses on using computational and open-source tools—such as R, Python, and GIS platforms—to analyze and visualize complex environmental and cultural datasets. He is particularly interested in developing reproducible, data-driven workflows that connect natural and cultural landscapes through 3D and spatial modeling. As a course facilitator for the Data Modeling and Visualization for Heritage and Environmental Research program, Dr. Reeves trains early-career scientists in applying digital and analytical methods to heritage and ecological research. His current research emphasizes the transformative role of digital technologies in advancing interdisciplinary understanding of socio-ecological systems in Africa and beyond.

Ms. Slyvia Wemanya
Researcher | Rice University

Ms. Slyvia Wemanya is a researcher and environmental scientist affiliated with Rice University. Her work bridges ecology, anthropology, and data science, focusing on the intersections between environmental change, cultural adaptation, and sustainable resource management. She has contributed to interdisciplinary projects that integrate modeling, GIS, and visualization tools to better understand socio-ecological systems, particularly in East Africa. As a facilitator for the Data Modeling and Visualization for Heritage and Environmental Research and Pre-Conference Training on Modelling Landscapes, Ms. Wemanya brings expertise in statistical analysis, data visualization, and the use of open-source tools such as R and Python to support research communication and evidence-based environmental policy. Her ongoing work emphasizes participatory and data-driven approaches to landscape research and the empowerment of early-career scientists in Africa through digital and analytical capacity-building.

The National Museums of Kenya

NMK is a State Cooperation established by the Museums and Heritage Act. It is a registered Multidisciplinary Research Institution and a center of excellence in heritage research, conservation and management. The Directorate of National Repository and Research (DNRR) coordinates research at NMK and manages the National Scientific Reference Collections. DNRR collaborates with National and International institutions in implementing its mandate, and has a mission to collect, preserve, study, document and present Kenya's past and present cultural and natural heritage. The vision of DNRR is to be a center of excellence in heritage management

and research for posterity. The directorate has various departments whose mandate is research dissemination through publications, exhibitions, industrial attachments and trainings.

Department of Earth Sciences

The Department of Earth Sciences at the National Museums of Kenya (NMK) is a core research division comprising four sections: Paleontology, Archaeology, Palynology/Paleobotany, and Geology. The department conducts extensive field and laboratory research to document and conserve paleontological, archaeological, and geological collections. Renowned for its contributions to prehistoric studies, it holds one of the largest fossil collections in the world. The department also plays a pivotal role in training local and international students, disseminating scientific findings, and supporting interdisciplinary research projects that span from the Precambrian to the present. Course Outline

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Course Outline

Day	Session Title	Presenter	Time	Content Overview
Day 1 – Tuesday, 3 June 2025	Introduction to the STS and Landscape Framework	Dr. Emmanuel Ndiema (NMK)	09:00 – 12:30	Overview of landscape approaches in East African research; understanding socio-ecological dynamics through the Science–Technology–Society (STS) perspective.
Day 1	Data Modeling and Visualization Using Open-Source Software (Part I)	Dr. Johnathan Reeves (NMK)	14:00 – 16:30	Introduction to R and Python environments; data import, manipulation, and visualization using open-source libraries.
Day 2 – Wednesday, 4 June 2025	Data Modeling and Visualization Using Open-Source Software (Part II)	Dr. Johnathan Reeves (NMK)	09:00 – 12:30	Building interactive dashboards and maps; integrating 3D and GIS models for advanced visual storytelling.
Day 2	Practical Lab: Integration of 3D and GIS Models	Facilitators: Reeves, Ndiema	14:00 – 16:30	Hands-on creation of integrated datasets; collaborative data visualization tasks.
Day 3 – Thursday, 5 June 2025 (Mid-Break Day)	Field Demonstration and Reflective Session	All Instructors	09:00 – 12:00	Field demonstration or case walk-through (e.g., landscape data capture, photogrammetry demo, or on-site data validation).
Day 3	Mentorship and Research Roundtable	NMK Scientists & Visiting Scholars	14:00 – 16:00	Interactive mentoring discussion; exploring research publishing, proposal design, and project collaboration pathways.
Day 4 – Friday, 6 June 2025	Paleo-Ecological Modeling and Data Presentation	Dr. Rahab Kinyanjui (NMK)	09:00 – 12:30	Modeling paleo-ecological and cultural landscape futures under climate stress; implications for conservation and heritage management.
Day 4	Advanced Visualization Techniques	Dr. Johnathan Reeves (NMK)	14:00 – 16:30	Integrating ecological and cultural datasets in multi-layered models; time-series visualization and story mapping.

Day 5 – Saturday, 7 June 2025	Writing for Scientific Publications and the General Public	Dr. Emmanuel Ndiema & Guest Editor (NMK Journal / Media Unit)	09:00 – 12:00	Turning research into publishable outputs; structuring scientific papers (IMRAD); visual storytelling for public audiences.
Day 5	Hands-on Writing Lab, Showcase & Closing	All Instructors	13:00 – 15:30	Participants prepare visual abstracts; peer review and presentation; closing ceremony and group photo.