GeoTraining

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OER Planning Template

Instruction: Use this template to create your learning unit. The goal is to actually implement the learning unit based on this template as a OER learning unit or as a teaching concept in an OER repository. Therefore, please be careful about the formulation of input materials (e.g. slides, texts) and applications tasks as well as the selection of scientific literature, data sets and all other resources for hands-on activities and practical work. This template consists of five major sections: Introduction, Input, Application, Assessment & Wrap up, Appendix with Materials.

<u>**Section 1: Introduction to the learning unit**</u>

Title	Application of GIS and Remote sensing tools for land cover classification-a case study of Fogo Island, Cape Verde
Duration	*6 days*
Introduction	In the dynamic field of geospatial technology, the application of GIS (Geographic Information Systems) and remote sensing tools plays a pivotal role in land cover classification. This case study delves into the fascinating landscape of Fogo Island in Cape Verde, showcasing how these cutting-edge technologies enable precise mapping and analysis of its diverse land cover, offering valuable insights for sustainable land management and environmental conservation

The Application of Geographic Information Systems (GIS) and remote sensing tools has emerged as a powerful and indispensable approach in the field of environmental science and land management. This course focuses on the unique and captivating landscape of Fogo Island in Cape Verde, a volcanic island located in the Atlantic Ocean off the coast of West Africa. Fogo Island boasts a complex mosaic of land cover types, including volcanic landscapes, agricultural areas, coastal zones, and urban settlements. Understanding and accurately classifying these diverse land cover categories are essential for sustainable development, conservation, disaster management, and resource allocation. |

	GIS technology, with its ability to integrate spatial data from various sources, provides a comprehensive framework for mapping and analysing the land cover dynamics on Fogo Island. Additionally, remote sensing tools such as satellite imagery and aerial photography offer a bird's-eye view of the island's terrain, allowing for the collection of valuable data on land use changes over time. This course further explores the application of GIS and remote sensing tools to conduct a detailed land cover classification of Fogo Island. By doing so, it aims to shed light on the complex interactions between natural and human-induced factors that shape the island's landscape. The insights gained from this study will not only enhance our understanding of Fogo Island's ecology but also provide critical information for policymakers and land managers, enabling them to make informed decisions regarding land use planning, conservation efforts, and disaster preparedness in this unique and environmentally significant region.
Learning outcomes	At the end of the course, the learner should be able to: 1. Identify various GIS and remote sensing technologies. 2. Describe the applications of Land Cover Classification. 3. Discuss the importance of ground truth data and field surveys in validating and assessing the accuracy of land cover classification results. 4. Explain the role of satellite imagery and aerial photography as primary data sources in remote sensing. 5. Demonstrate the use of GIS software such as QGIS to digitize satellite image data in preparation for land cover classification. 6. Apply skills in using GIS and R programming language to integrate spatial data with attribute information, allowing for the creation and accurate land cover classification.

Material	*List all the material the learner needs for working:* ● ***GIS Software:*** *Access to Geographic Information Systems (GIS) software specifically QGIS..* ● ***Remote Sensing Data:*** *Acquisition of remote sensing data sources, including satellite imagery of the Fogo Island.* ● ***Computer and Hardware:*** *A computer or workstation with sufficient processing power and storage capacity to handle the software and data processing tasks involved in GIS and remote sensing work.* ● ***Internet Access:*** *A reliable internet connection for data download, software updates, and access to online resources and tutorials.* ● ***R and RStudio software version 4.3.1*** ●
Literature	**Books:** ● GIS and Remote Sensing Applications in Biogeography and Ecology edited by Andrew C. Millington, Stephen J. Walsh, and Patrick E. Osborne. ● Remote Sensing and GIS Integration: Theories, Methods, and Applications by Qihao Weng. ● "Cape Verde" by Richard H. Grove - This book explores the history, culture, and geography of Cape Verde, including information about Fogo Island. ● Applied Spatial Data Analysis with R by Roger S. Bivand, Edzer Pebesma, Virgilio Gómez-Rubio ● Introduction to the Analysis of Spatial Data Using R by Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani

	Peer reviewed papers: A Review of Remote Sensing Technologies for Mapping and Monitoring Vegetation Phenology by Jinwei Dong, Lian Zhang, et al. **published** in: Sensors, 2019.
Metadata	**Name:** The use of GIS and remote sensing tools for land cover classification **Learning Resource Type:** Open Educational material for Satellite Data Land Cover Classification **Description:**This educational resource provides comprehensive insights into the application of Geographic Information Systems (GIS) and remote sensing tools for land cover classification. It delves into the theoretical foundations, practical methodologies, and case study of Fogo Island, Cape Verde, showcasing the use of these technologies in environmental science, geospatial analysis, and sustainable land management. **Keyword(s):** GIS, Remote Sensing, Land Cover Classification, Fogo Island, Cape Verde, Geospatial Data Analysis, Geospatial Technology, Data Visualization **Author(s):** Damaris Waema (Kenya), Erick Otieno (Kenya), Emmanuel Oluwamuyiwa Oje (Nigeria) and Shadrack Akotey Mensah (Ghana) **Language:** English **License:** Creative commons **Creation Date:**07/09/2023

Section 2: Input

We have created lecture notes in the form of handouts, one for each of the above learning ouitcomes. These are in the files named below and can be downloaded from the Google Drive link given at the Appendix section at the end of this document.
- ➢ *ILO_ 1.pdf*
- ➢ *ILO_2.pdf*
- ➢ *ILO_3.pdf*
- ➢ *ILO_4.pdf*
- ➢ *ILO_5.pdf*
- ➢ *ILO_6.pdf*

Section 3: Application

The hands on work for this unit involves digitizing the Fogo island image with QGIS and doing land cover classification using R. The ILO_6.pdf document which can be accessed using the Google Drive link below has the steps required to be able to do this. There is also an R script in the same folder and the image data needed for this activity.

Section 4: Assessment and Wrap up

We have created a formal and summative assessment for measuring how the learner has been able to master the intended learning outcomes. This assessment is in a file named "assessment.pdf" which can be downloaded from the Google Drive link below.
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Section 5: Appendix

All the learning material for this unit incldue the satellite data for Fogo Island can be downloaded from the link below.
https://drive.google.com/drive/folders/104Fn5wKO6w8hSQilfQm21ItlA4m0mBpk?usp=sharing