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| Collector: Danny Vandenbroucke  Revision Date: 10/11/2024.  Version: v1.0 |
| Title  Training packages for the course: “The use of EO and ML techniques for managing buildings to support climate change resilience” |
| Author/s  Evert Van Bever, Naomi Thiry and Danny Vandenbroucke |
| Subject  Earth Observation and Machine Learning, Image Processing, Buildings and Green Roofs. |
| Description  The resource is in practice a series of resources forming a training package to support the course. The course consist of 4 lectures, and a hands-on assignment including an introduction to the assignment. The resources relate to the topic of the use of Data Integration and Image Processing techniques for managing buildings in the context of climate change challenges. |
| Abstract  Buildings are an important part of our urban and rural fabric (built-up area). They are used as dwellings for citizens, or for activities such as education (schools), industrial production, offices, etc. They influence directly and indirectly our environment. Buildings might be heated, consuming energy, especially during cold winters. Hey might also need cooling in hot summers using air conditioners. At the same time, buildings are also generating CO² which contribute to the warming of our planet. The other way around, buildings can also play a role to adapt or mitigate climate change. Depending on how they are constructed, managed and maintained, they might play a positive role: with good isolation they will use less energy, or they will help cooling down during hot periods. In many parts of the world buildings are being ‘greened’. Buildings can play a role in supporting ecosystem services such as biodiversity and water retention.  The course is introducing how buildings can play a positive role in climate change resilience. It zooms in on several European initiatives such as Convenance of Mayors, the European 100 Smart and Climate Neutral Cities mission and the Built4People initiative. It then introduces in the basics of EO and Image Processing techniques to better manage buildings. Several types of data and techniques are discussed and demonstrated. Particular attention will be paid to particular data products and services from Copernicus, but also rich datasets such as hyperspectral and thermal images. The course also introduces basic Machine Learning techniques to automate the processing of such images, e.g. to derive suitability of roofs for becoming ‘green roofs’. The course includes demo’s and hands-on to visualize and query geospatial data, and to process images using existing algorithms. |
| Learning Outcomes   1. Identifying and explaining the major European initiatives related to buildings and their management 2. Discuss and illustrate the role of buildings in the context of climate change challenges 3. Understand and explain basic EO, RS and Image Processing techniques 4. Apply basic GIS techniques to integrate and visualize geospatial building data and images 5. Understand and explain the way Machine Learning is working and showcase how an existing ML algorithm runs 6. Illustrate and discuss the results of the data processing in the context of the suitability of buildings for installing green roofs. |
| Target audience  In the context of SpaceSUITE Reactive Response it is meant for Teachers and Tutors of VET Schools. However, the course and materials are suitable for any type of VET training, introductory level. |
| Date created  October & November 2024 |
| Type  Presentations (1 for each 1,5h session / lecture), a document describing the assignment, documentation for installing QGIS, datasets for the assignment, a ML algorithm |
| Format  PPT files, DOC files, images, SHP files |
| Publisher  KU Leuven |
| Contributor/s  Evert Van Bever, Naomi Thiry and Danny Vandenbroucke |
| Location (URL)  N/A since the course in given in-person; once finished the resources become available on the SpaceSUITE website |
| Language  English |
| Source/s  This is a new course, so source(s) |
| License  CC-BY-SA for all the materials developed by KU Leuven; QGIS is Open Source but has its own licensing mechanism |
| Duration  The total length is 2 days of 6h each, so 12h: 1,5h sessions for the lectures, more or less 6h for the assignment |
| EQF level  4 – 5 |
| Table Of Contents  LE-1 – Lecture 1 – Buildings in the context of climate change resilience  LE-2 – Lecture 2 – Introduction to geographic information and GIS (including some hand-on in QGIS)  LE-3 – Lecture 3 – Introduction to EO and Remote Sensing  LE-4 – Lecture 4 – Introduction to Image Processing and Machine Learning techniques  AS-1 – Assignment – Introduction to the assignment, the data and the tools  AS-2 – Assignment – How to use ML algorithms to identify suitability for green roofs (including the use of QGIS for data visualization) |
| Workload (in ECTS if possible)  TBD |
| Training Program  N/A |
| Prerequisites  No pre-requisites |
| Type of assessment  Questionnaire for the knowledge and individual evaluation for the assignment. |
| Certification  For the time being this will be an attendance certificate by KU Leuven |
| Title of the micro-credential  N/A for the time being. |
| Microcredential awarding body  N/A for the time being. |
| Relation/s (BoK)  To be checked / confirmed: EO, Remote Sensing, Machine Learning |
| BoK Links  To be done. |