

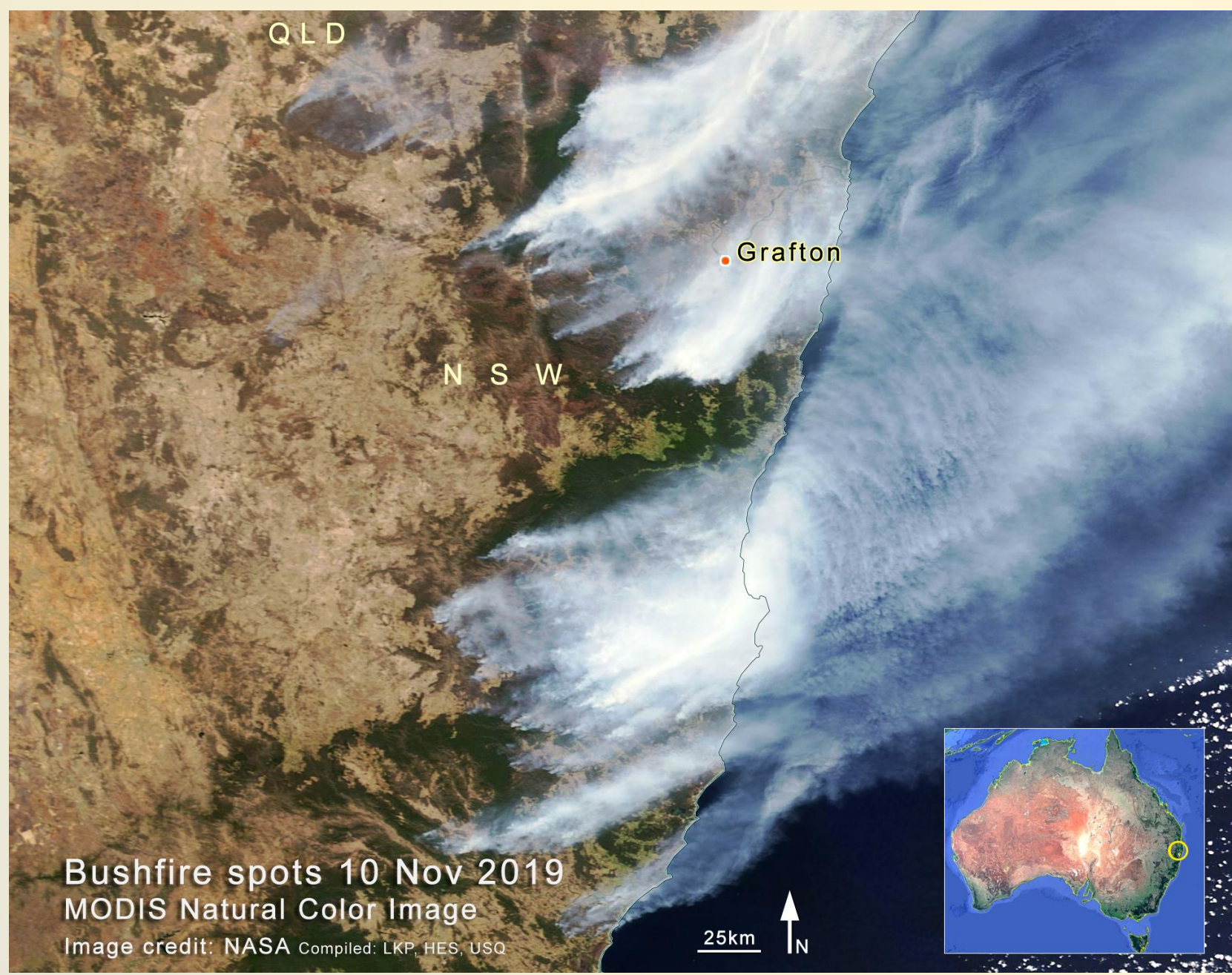
# Promoting Open Source Resources Based Spatial Science Education in Developing Countries

Kithsiri Perera<sup>1</sup>, Ryutaro Tateishi<sup>2</sup>, Thakshila D Gunawansa<sup>1,3</sup>

<sup>1</sup>School of Surveying and Build Environment, University of Southern Queensland, Australia, [perera@usq.edu.au](mailto:perera@usq.edu.au)

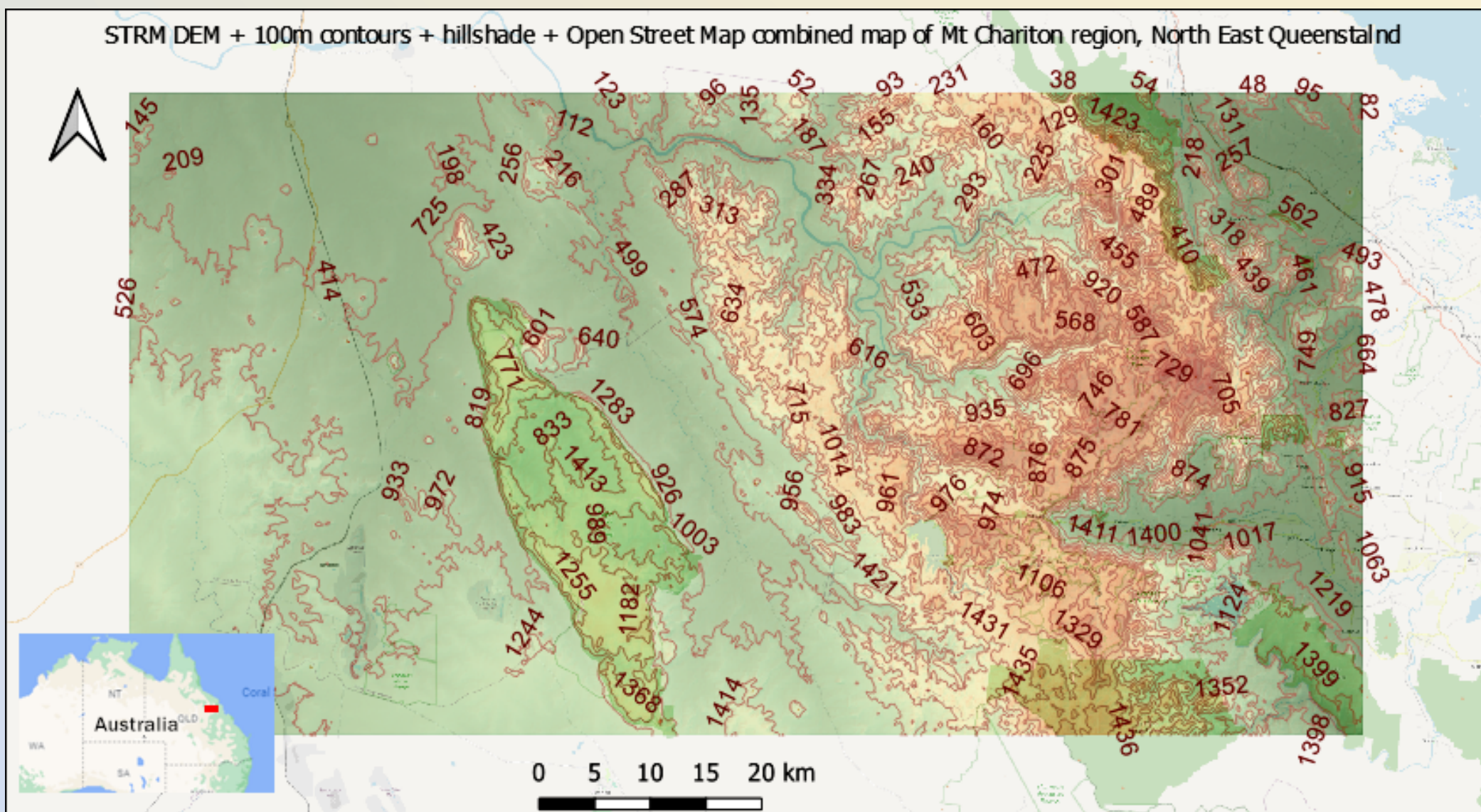
<sup>2</sup>Centre for Environmental Remote Sensing, Chiba University, Japan, [tateishi@faculty.chiba-u.jp](mailto:tateishi@faculty.chiba-u.jp)

<sup>3</sup>Department of Engineering Technology, Faculty of Technological Studies, Uva Wellassa University, Sri Lanka, [thakshila.gunawansa@usq.edu.au](mailto:thakshila.gunawansa@usq.edu.au)



Apart from the education sector, organisations related to natural disasters such as floods, bushfires, and storm damage, access open source data. This example shows 2019 bushfire monitored using MODIS satellite image for research and media use.

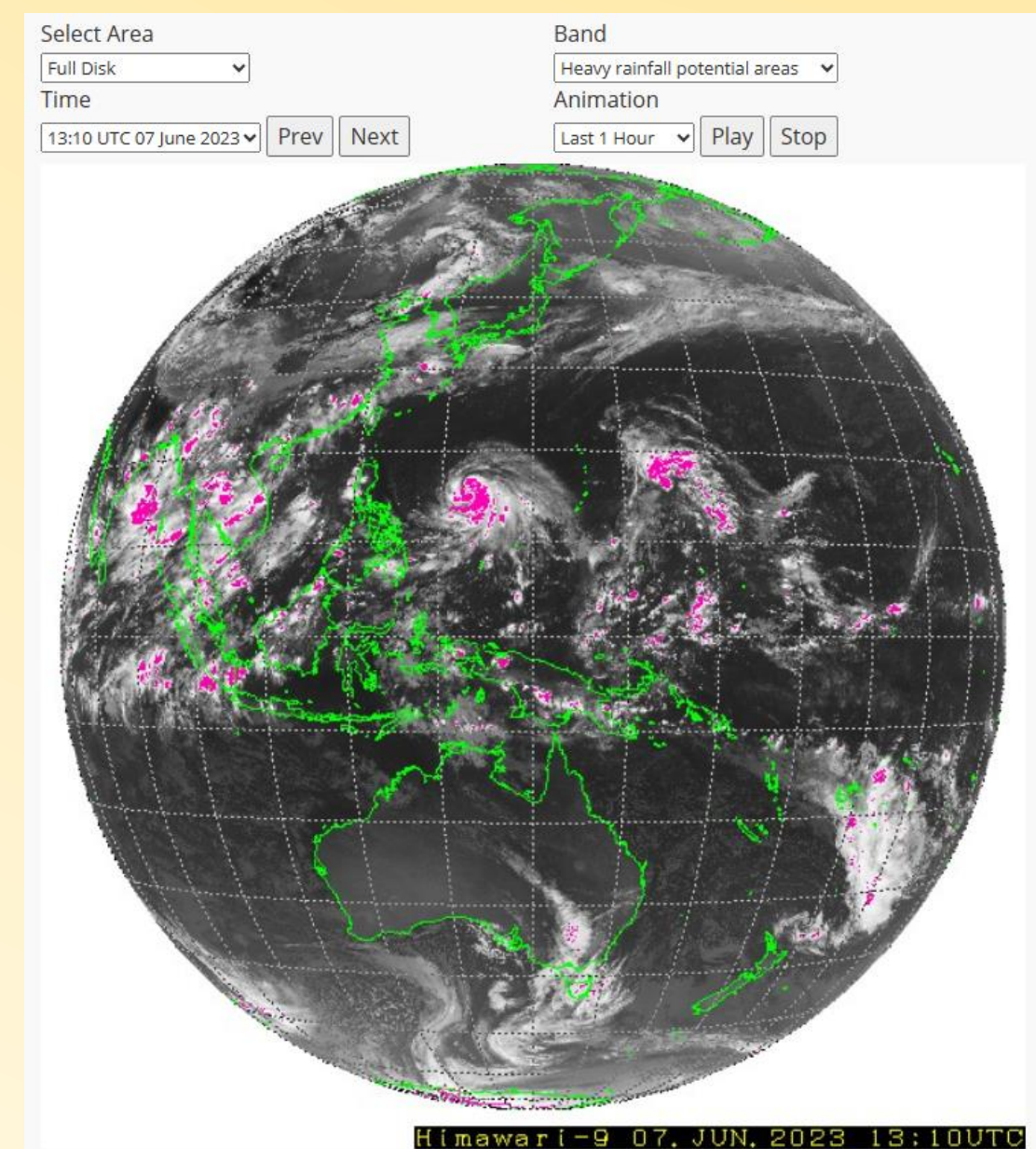
This map combines STRM DEM (Digital Elevation Model) data, OpenStreetMap, 100m contours, and the hillshade effect. Elevation ranges from red (high) to green (low).



Higher education and research in remote sensing and GIS applications were **limited in developing countries** until 2000. Since 2000, though the internet and electronic media expanded, an imbalance appeared in facilities for higher education between developed and developing nations.

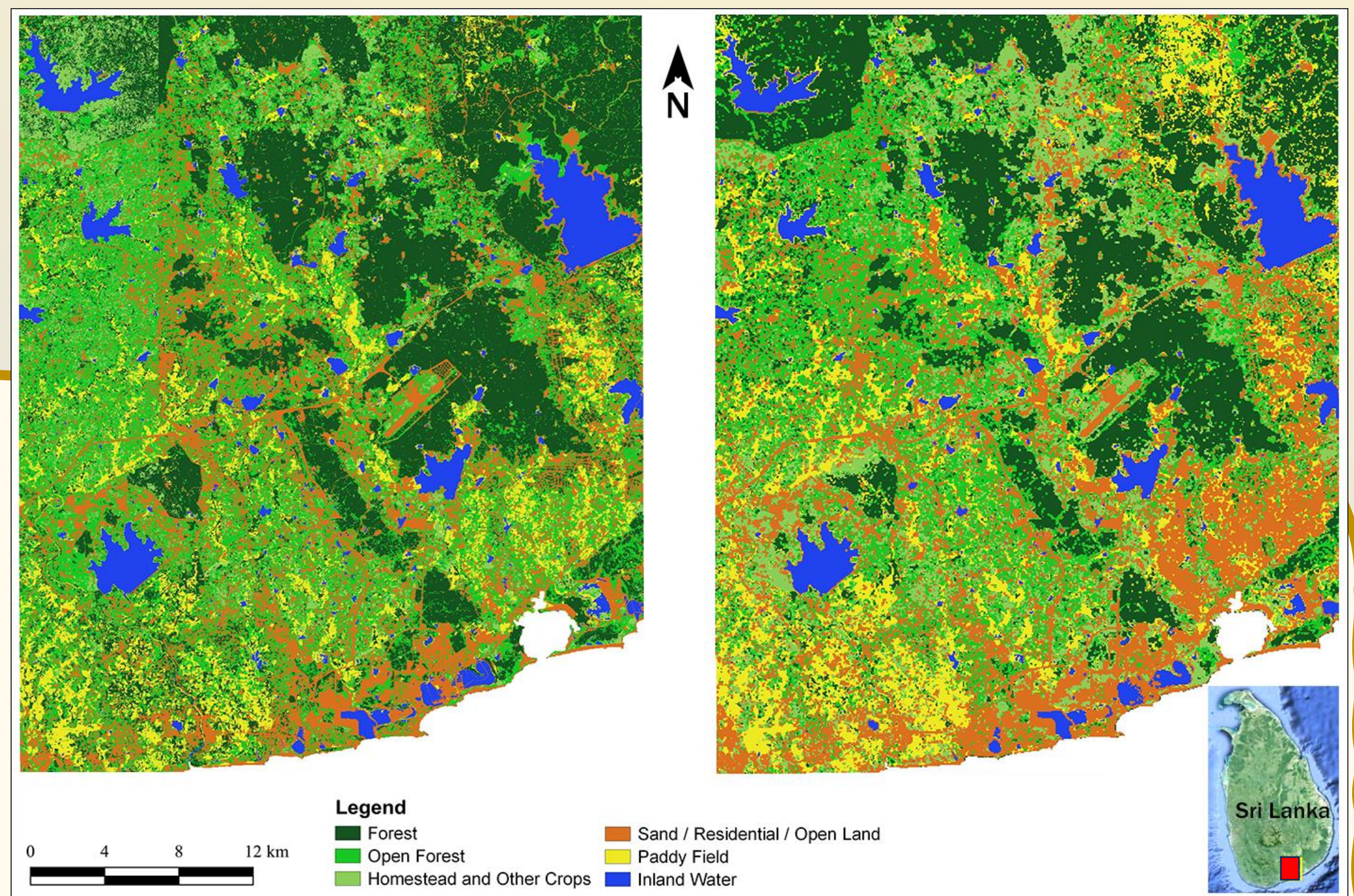
This situation has opened a new concept "**open source**" for software and data. Open source spatial data and GIS software are interlinked components and can be accessed by any user. Open source spatial data resources contain **raster** (pixel-based) and **vector** (points, lines, and polygons) data covering from local to global scale.

**QGIS** (Quantum GIS), founded as a volunteer-driven project in 2002, leads the professional open source GIS software. NASA, European Space Agency (ESA, 2023), and JMA (Japan Meteorological Agency) introduced free data and software in **remote sensing**.



Freely available Himawari-9 images can be used in various environmental research, weather forecast, and media.

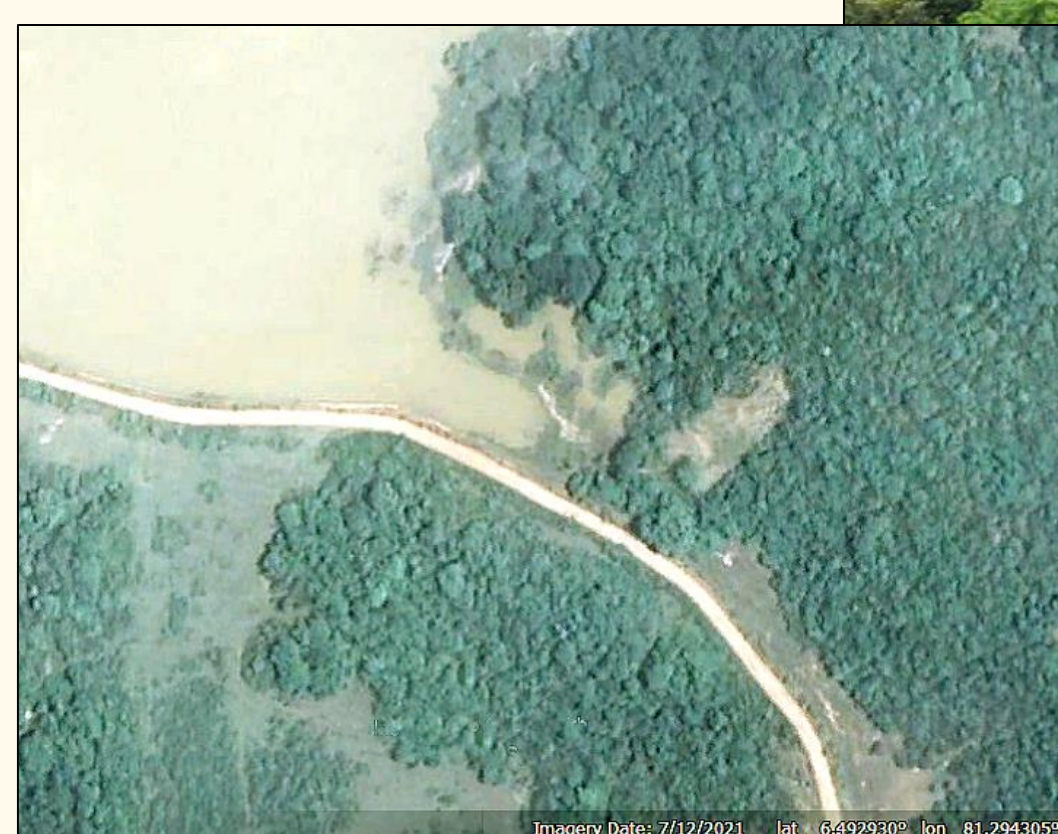
Among prominent spatial data providers, **Google** provides raster and vector data platforms for displaying theme-specific information. **OpenStreetMap** is another widely popular open source database that covers the entire world and provides data in GIS-friendly shapefiles format. Natural Earth data and DIVA are among other popular open source GIS data resources. Users also can access 1000s of free GIS and remote sensing tutorials and documents in the web.



## The Case Study

The open source data and software has opened doors for users in any country to attend mapping and GIS activities effectively. This case study demonstrates the application capability of freely available Sentinel 2 satellite data for intermediate to advanced GIS and remote sensing applications. This study used Sentinel 2 satellite data to classify land use land cover types in one of the **developing countries in Asia, Sri Lanka**.

**Sentinel 2 satellite** data set was classified using **SNAP free software** through the Support Vector Machine (SVM) and Random Forest classifier (RF) classification methods. Fieldwork was carried out virtually using Google Earth high-resolution imagery. The accuracy of the classification by both methods was above 88%. The case study found that an advanced-level land use/land cover mapping project can be conducted **only using open source software and data** and result can be used in further GIS analysis.



Google Earth is ideal for virtual fieldwork. This 2021 image shows a rural region within the case study area. The photo shows forest within the study area.