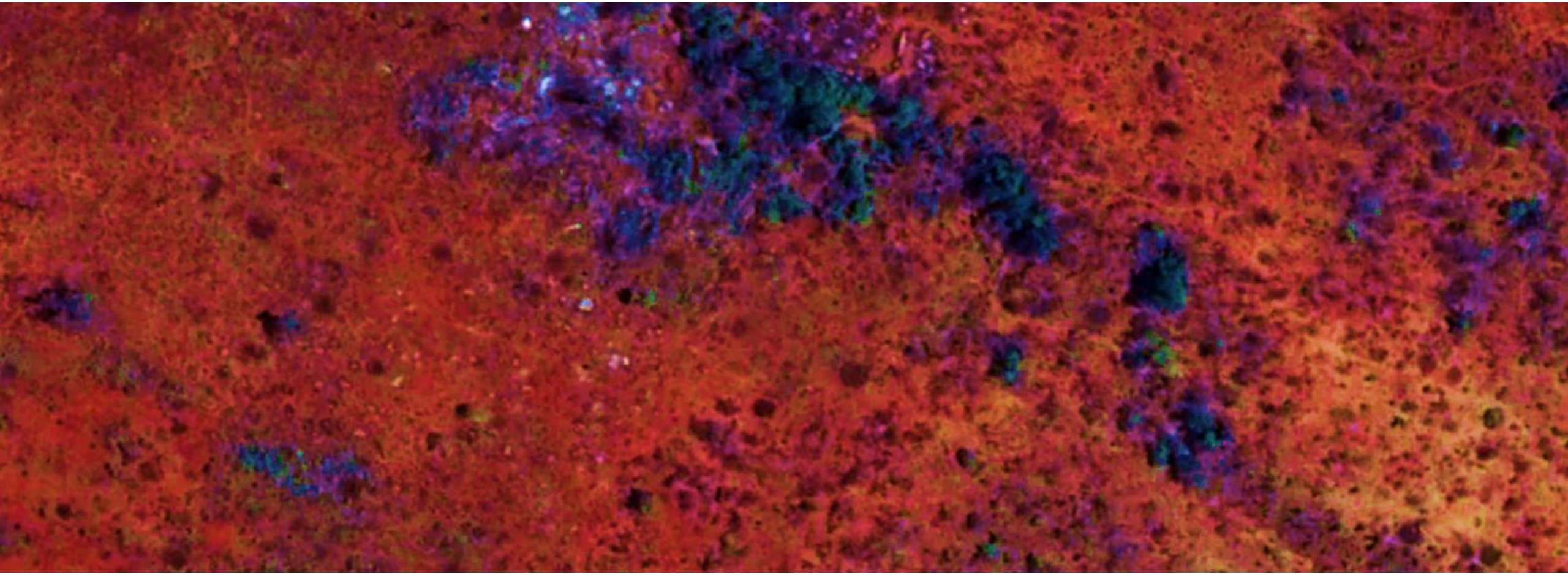
Detecting charcoal production sites using a combined remote sensing approach with Landsat-8, Sentinel-2 and VHR data



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Advantages of using remote sensing to detect charcoal sites

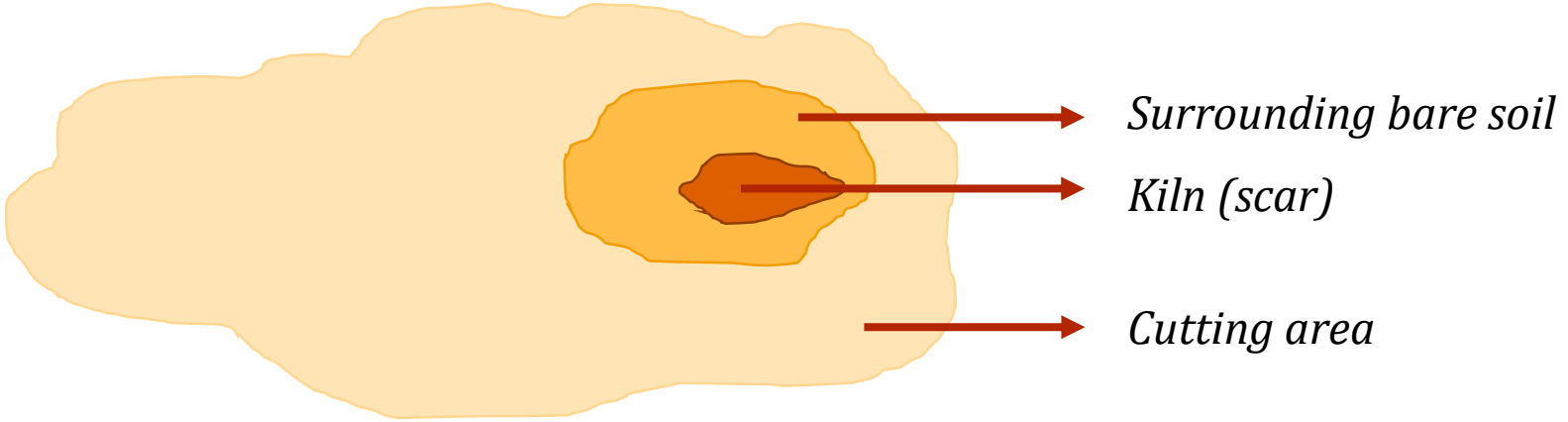
Remote sensing allows us to acquire spatial information over large continuous areas

Monitoring and evaluation of charcoal production

Understanding charcoal **producer behaviour** (drivers)

Forest regeneration and biodiversity **impacts**

Challenges in charcoal site detection using remote sensing



1. Variations in cutting area and kiln size

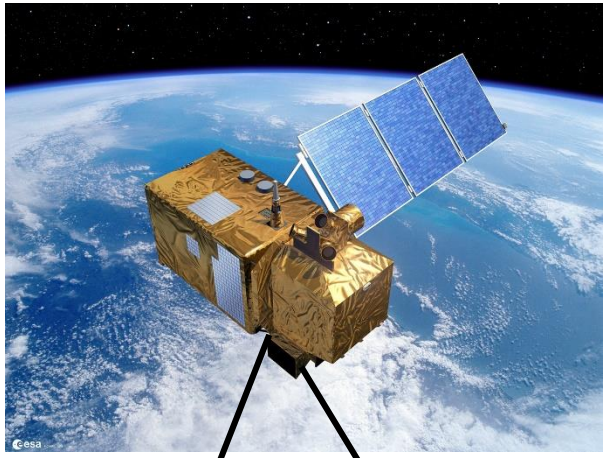
2. Scattering over space and time

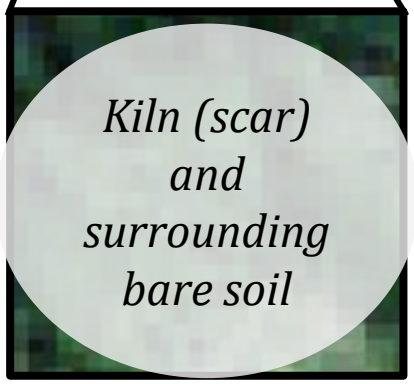
3. Canopy coverage of charcoal kiln (scar)

Different satellites produce images with different properties

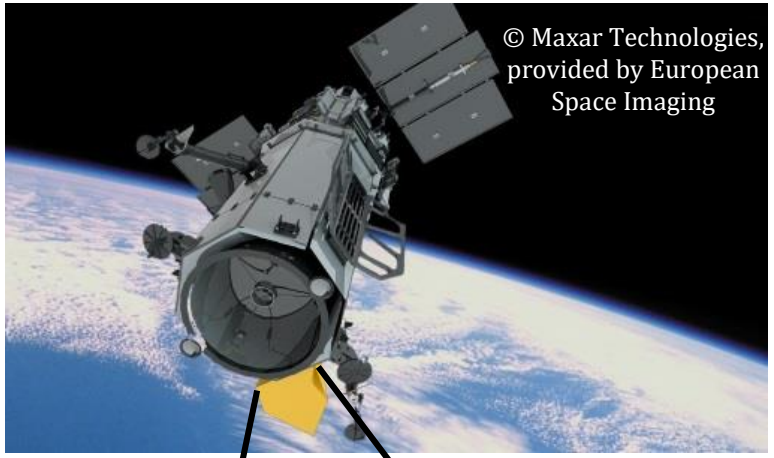
Landsat-8

Sentinel-2





Worldview-2/Planet (VHR)



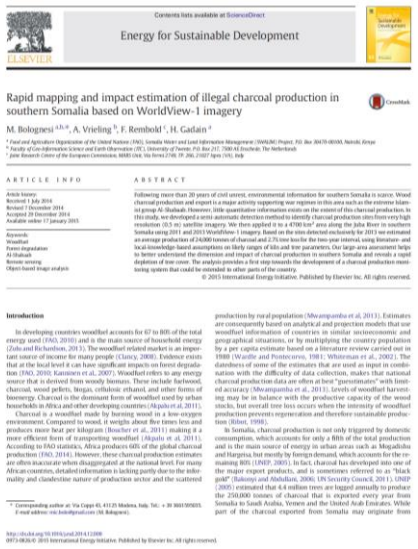
Need for automated approaches and uncertainty analyses

Multiple remote sensing approaches have been developed to differentiate charcoal production sites


ENVIRONMENTAL RESEARCH
LETTERS

LETTER

The connection between forest degradation and urban energy demand in sub-Saharan Africa: a characterization based on high-resolution remote sensing data


Energy for Sustainable Development

Rapid mapping and impact estimation of illegal charcoal production in southern Somalia based on WorldView-1 imagery


Environmental Research Letters

LETTER

The impact of charcoal production on forest degradation: a case study in Tete, Mozambique

(Wurster, 2009; Bolognesi et al., 2015; Dons et al., 2015; Sedano et al., 2016; Nakalema, 2019; Sedano et al., 2020a,b; Sedano et al., 2021)

Current needs

1. Understand the need for very-high resolution (VHR) imagery
2. Automated methods to reduce man power and biases
3. Uncertainty analyses to better understand the robustness of remote sensing approaches

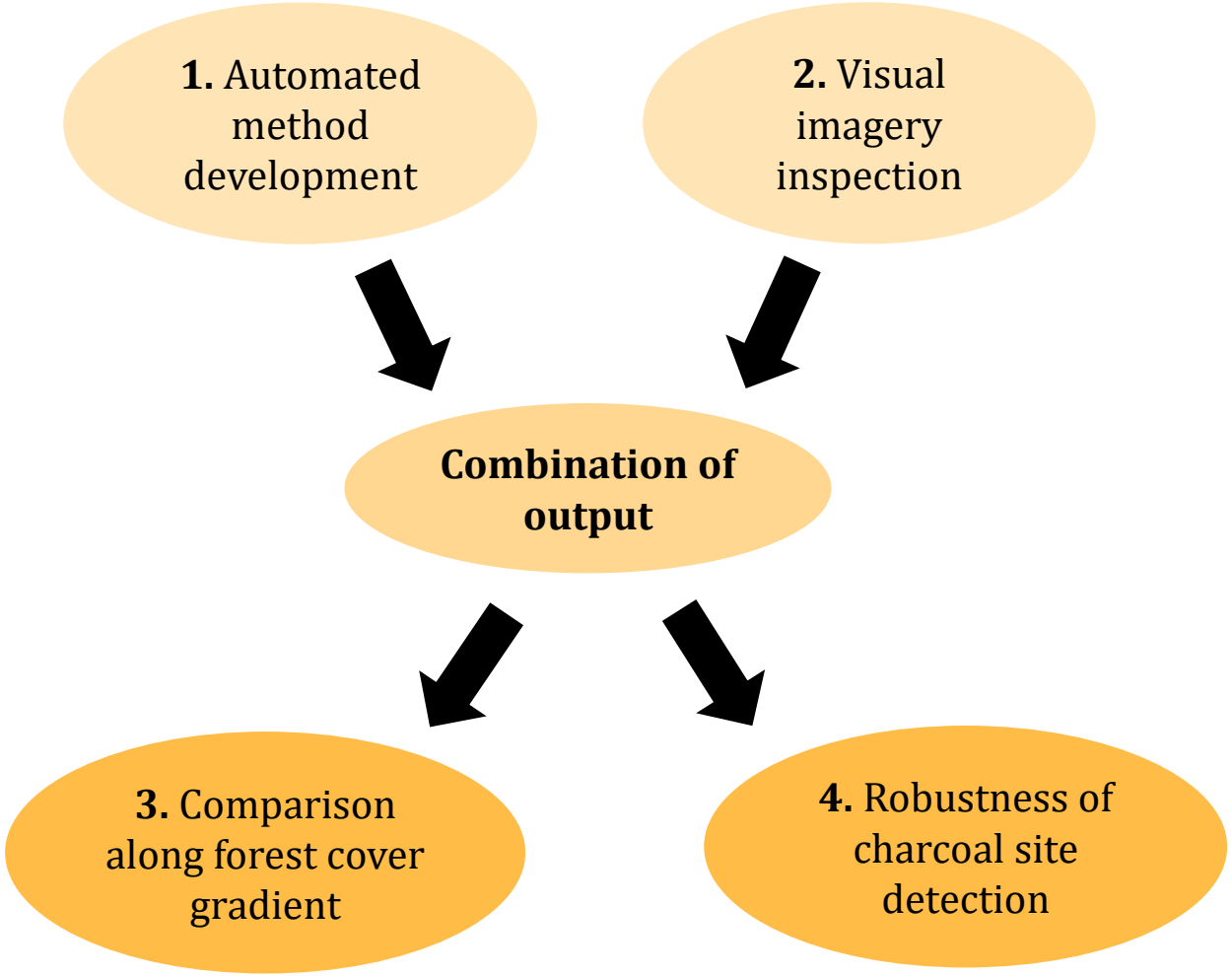
Research aims

1. Develop two automated classification methods using Landsat-8 and Sentinel-2 data

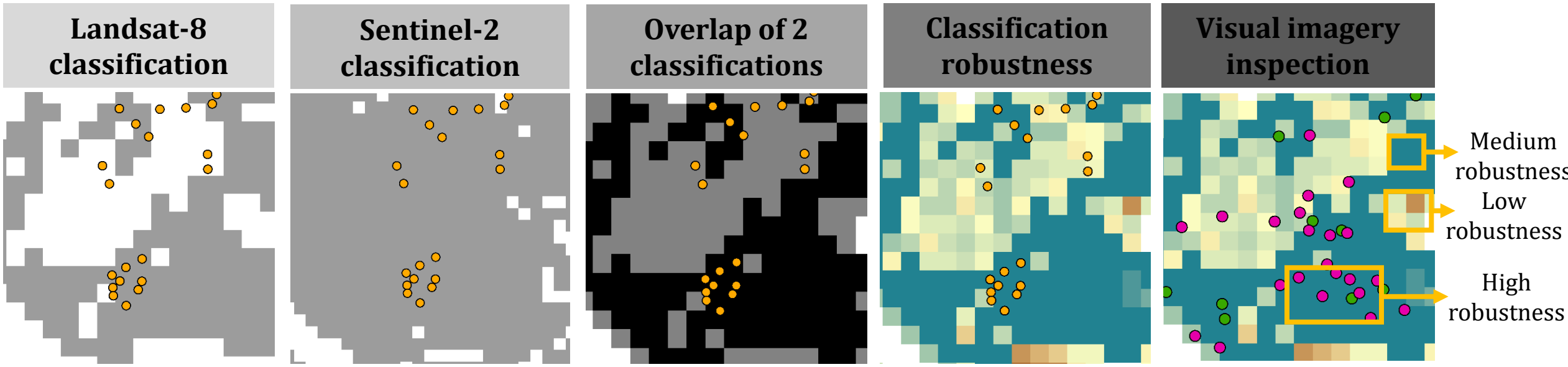
2. Use visual imagery inspection for charcoal kiln (scar) detection on VHR Worldview-2 and Planet imagery (Sedano et al. 2016)

3. Compare the performance of the methods along a gradient of forest cover

4. Derive a metric to assess the robustness of charcoal production site detection



Combining output from automated classification methods



1. Charcoal site **classification Landsat-8**
2. Charcoal site **classification Sentinel-2**
3. **Overlap** classification Landsat-8 and Sentinel-2
4. Adjustment for **spatial uncertainty** in classification
5. Identifying areas with **different** levels of **robustness**

Summary and outlook

- A **combined approach** can improve charcoal production site detection
- A combined classification approach **reduces the need** for VHR imagery
- Robust charcoal production site recognition provides information on **monitoring and evaluation**

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Thank you!