

ECOSYSTEM PRESSURES:

Ecklonia maxima and *Laminaria pallida*

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Background

- Kelp forests constitute some of the most productive habitats on earth. They support fisheries, aquaculture and human health, are exploited for economic benefits and constitute coastal ecological infrastructure, delivering key ecosystem services.
- Mapping of kelp forests is fundamental to the assessment of their ecosystem condition and is important for their spatial management, particularly in the face of changing climates (Figure 3a&b&c).
- In South Africa *Ecklonia maxima* and *Laminaria pallida* constitute the dominant forest forming taxa extending along the west and south-west coasts.
- Both species depict complex biogeographic distribution along the South African coastline, from coexistence in some areas to completely replacing each other in some.
- The results of this study will provide the most up to date map of surface kelp forest ecosystems and work towards determining the likely condition of these ecosystems, based on current stressors

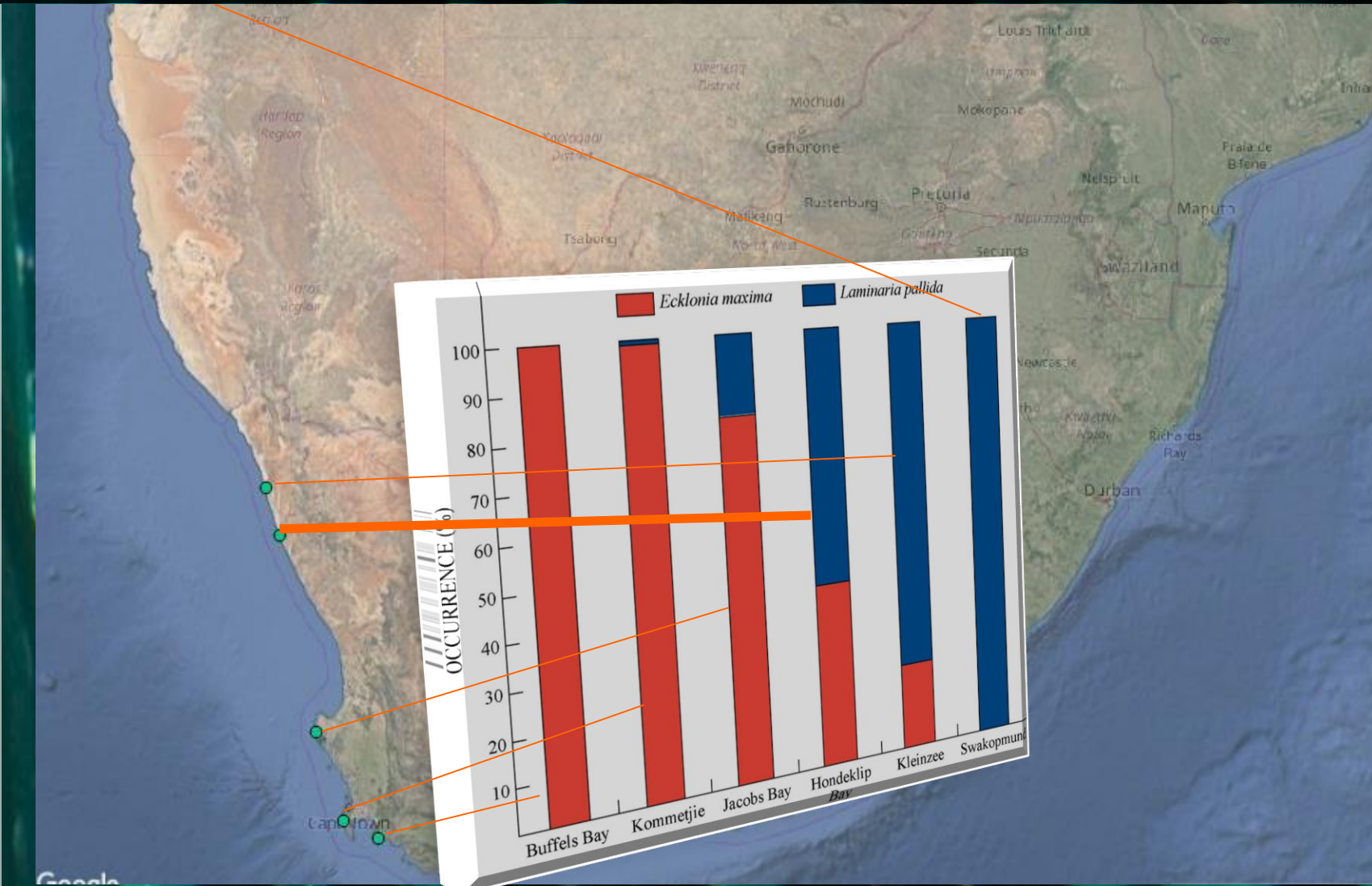


Figure 1: Depicts biogeographic distribution of (red = *E. maxima*) and (blue = *L. pallida*) at various sites around the coast

Research Project Aims

- To synthesize a national occurrence map of the South African kelp forest, improving on that generated by Anderson et al. (2007)
- Measure the spectral signature of the surface-emerging kelp forest species
- To provide an initial assessment on the condition of kelp forest ecosystems by weighting key pressures on these systems

Proposed Methods

1. Mapping surface kelp forests

- Measure kelp spectral reflectance signature using a Spectro radiometer
- Use a Remote Sensing imager (Sentinel 2a) to map the kelp along coastlines where kelp reaches the surface
- Use Geographic Information Systems for spatial analysis of remotely sensed images (see Figure 1 below)

2. Ecosystem condition assessment

- Identify key pressures impacting South African kelp forest ecosystems
- Weighting of the pressures to identify likely condition of kelp forest ecosystems around the coast
- Overlay of the pressures onto the kelp forest map

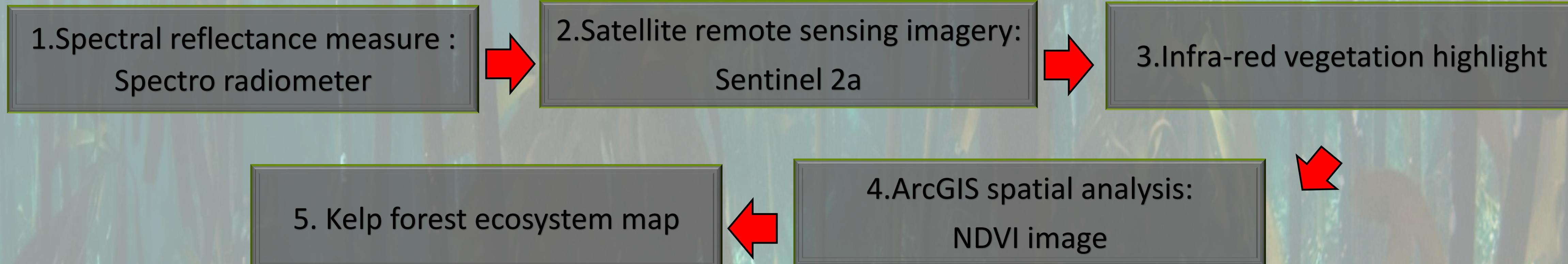


Figure 2: Conceptual frame work of image acquisition using remote sensing and Geographic Information Systems.

Preliminary Results

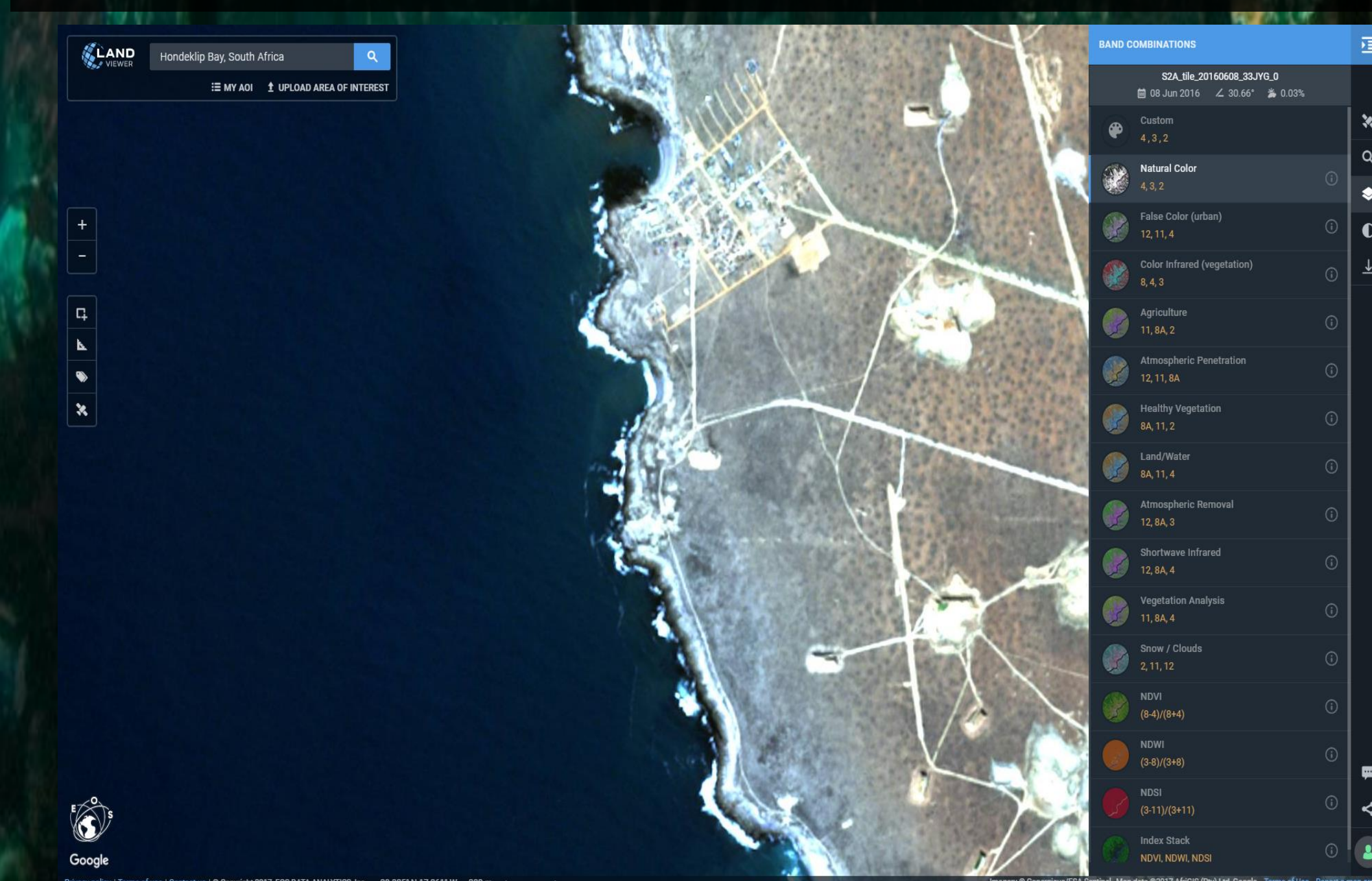


Figure 3a: Sentinel raw unprocessed color image of Hondeklip Bay (30°19'35.78"S 17°16'20.86"E), seaweed vegetation appear black (Step2, see Fig. 1)

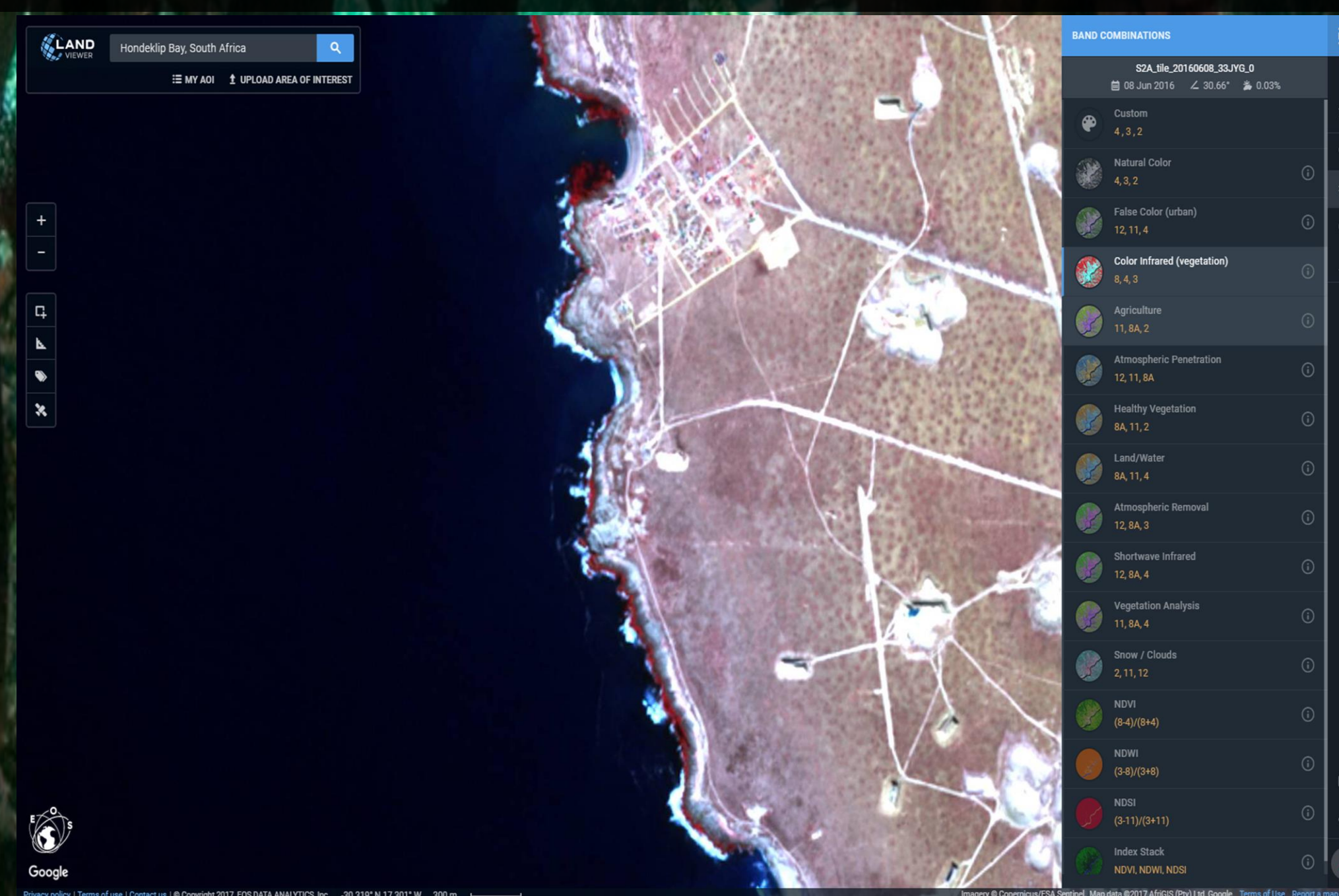


Figure 2a: Sentinel image of Hondeklip Bay (30°19'35.78"S 17°16'20.86"E) depicts vegetation in red (Step 3, see Fig. 1)

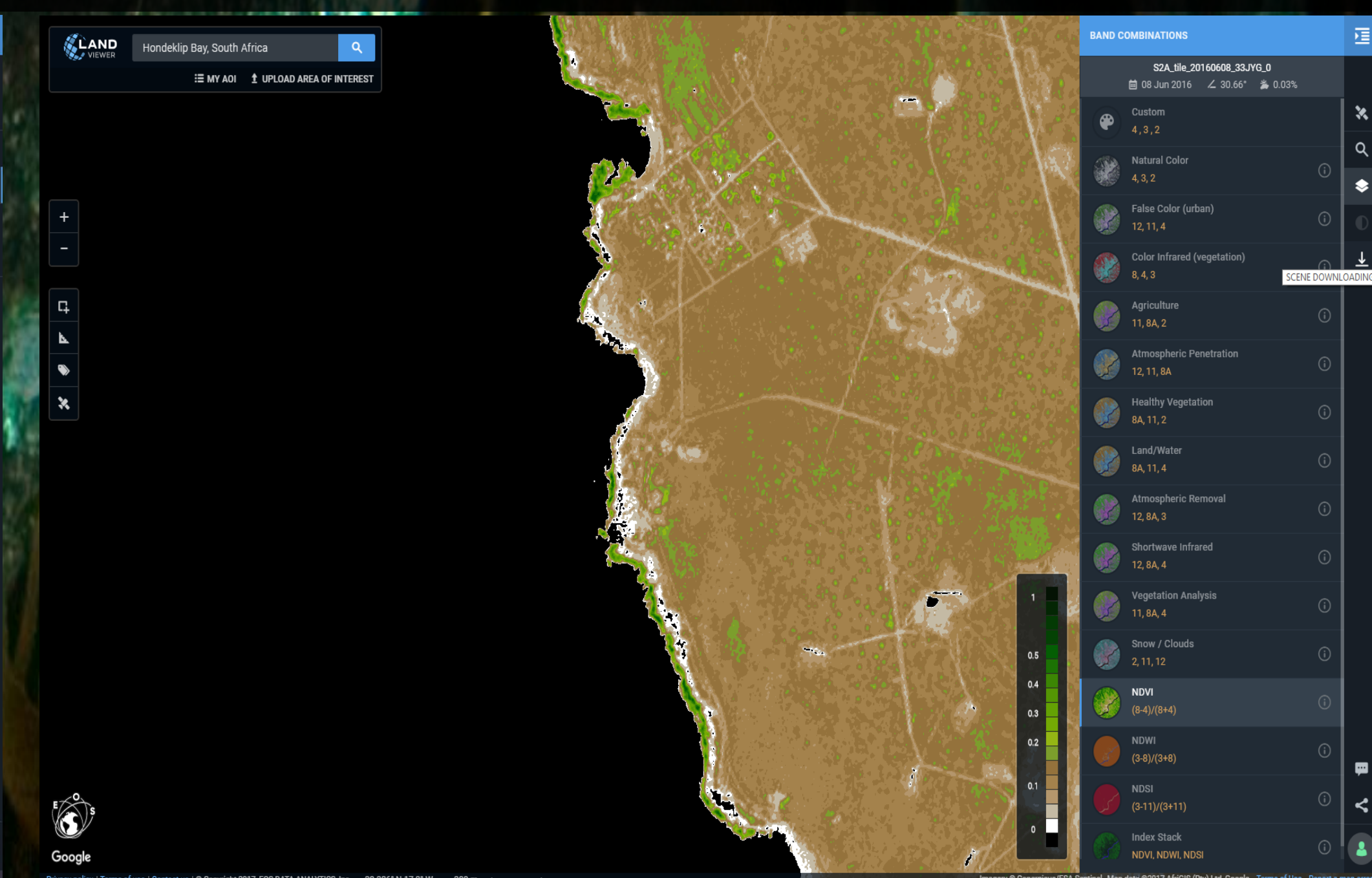


Figure 2b: NDVI Sentinel image of Hondeklip Bay (30°19'35.78"S 17°16'20.86"E) depicts vegetation in green (Step 4, see Fig. 1)

Discussion & Acknowledgements

- Preliminary results suggest this will be a useful method for mapping surface kelp forests around the South African coast
- Given the tidal range and wave exposure experienced along the South African coast, the remote sensing images need to be aligned with fair weather and low tides
- High resolution images will prove more successful than that used in Anderson et al. (2007)

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