# UNCONTROLLED SETTLEMENT DEVELOPMENT: IMPACTS ON SOCOTRA'S NATURE AND LANDSCAPE

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## INTRODUCTION

The Socotra Archipelago, located in the northwestern Indian Ocean and administered by Yemen, is renowned for its exceptional biodiversity and high degree of endemism. The archipelago comprises four islands, with Socotra being the largest, covering approximately 3.600 km² and accounting for around 95 % of the total land area [2,7]. Socotra harbours over 827 plant species, approximately 37 % of which are endemic [1]. This richness is attributed to the island's long-term geographic isolation, diverse topography, and arid climate influenced by seasonal monsoons [7].

Traditionally, locals practiced a semi-nomadic lifestyle, rotating between pastoralism and fishing. This strategy minimized continuous environmental pressure on any single area and enabled sustainable resource use over generations [7].

However, in recent decades, rapid socio-economic changes have occurred. The population now exceeds 100.000, accompanied by the permanent establishment of over 300 settlements across the island [4,6,7]. This has led to urban expansion and altered land use, accompanied by unregulated livestock breeding and increased livestock numbers, which together intensify anthropogenic pressures on the island's ecosystems [3,5,6,7].

## OBJECTIVES & HYPOTHESIS

**Hypothesis**
The project's hypothesis posits that uncontrolled settlement development, coupled with overgrazing, is negatively impacting Socotra's unique natural environment and local endemic species. In particular, the woodlands are directly destroyed by urban development, and the populations of woody plants are gradually declining.

**Main Objective**
To analyse the impact of uncontrolled settlement development on the natural environment and landscape of Socotra Island.

## MATERIALS AND METHODS

The study aims to assess the impact of settlement development on Socotra's environment, with a particular focus on woody vegetation. A multi-scale approach combines field vegetation surveys, drone imagery, and GIS-based spatial analysis.

Twenty villages were selected across four altitudinal vegetation zones (AVZs) and categorized by population size. In each, a single 2 km linear transect was established (1 km each direction from the village centre, 200 m wide) and surveyed using drone photogrammetry to analyse vegetation structure, spatial patterns, and land cover.

Along each transect, three circular plots (7 m radius) are placed at distances of 150 m, 300 m, and 450 m from the centre. Within each plot, all woody plants are recorded (species, height, coordinates) using Field-Map (IFER). In addition, each plot is also documented with a vertical drone photograph to support ground-based observations and estimate canopy cover. For comparative analysis, an equal number of control plots (n = 20) were established in uninhabited areas within the same AVZs.
Data are analysed using geospatial and statistical tools to identify vegetation patterns related to settlement proximity, comparing inhabited vs. uninhabited areas and distance gradients.

## RESULTS

Preliminary analysis suggests the hypothesis is likely valid: urban growth correlates with a decline in woody vegetation near settlements. A particularly evident case is the capital city of Hadibo, where settlement expansion between 2016 and 2025 is clearly visible (Figs. 1). The settlement area has increased by approximately 36 %, indicating significant land cover change over the past decade.

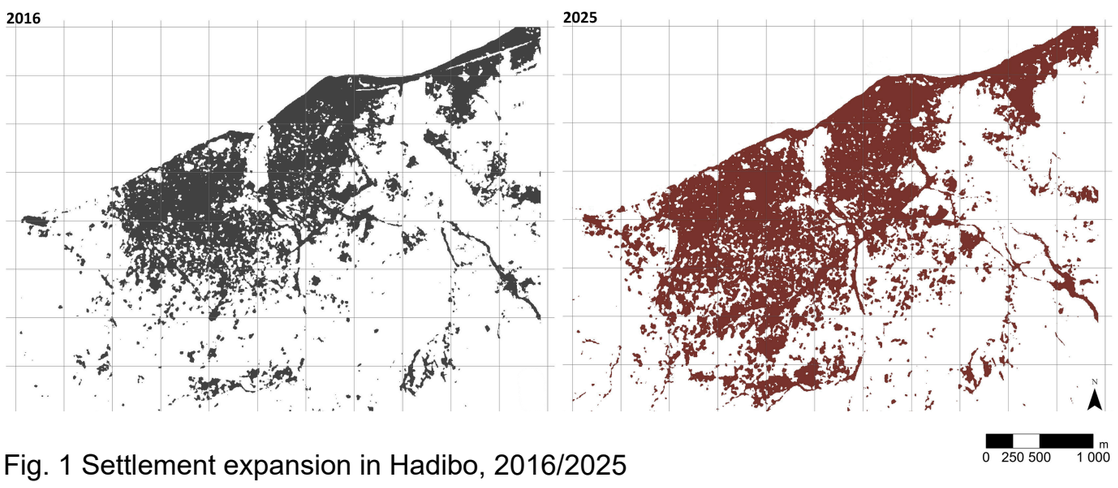


Fig. 1 Settlement expansion in Hadibo, 2016/2025

These findings are based on initial remote sensing data and field observations during the early stages of the research. However, the dataset is not yet complete, and the main data collection phase is currently ongoing (October–November 2025). Final results may vary as additional data are collected and further analysis is conducted.

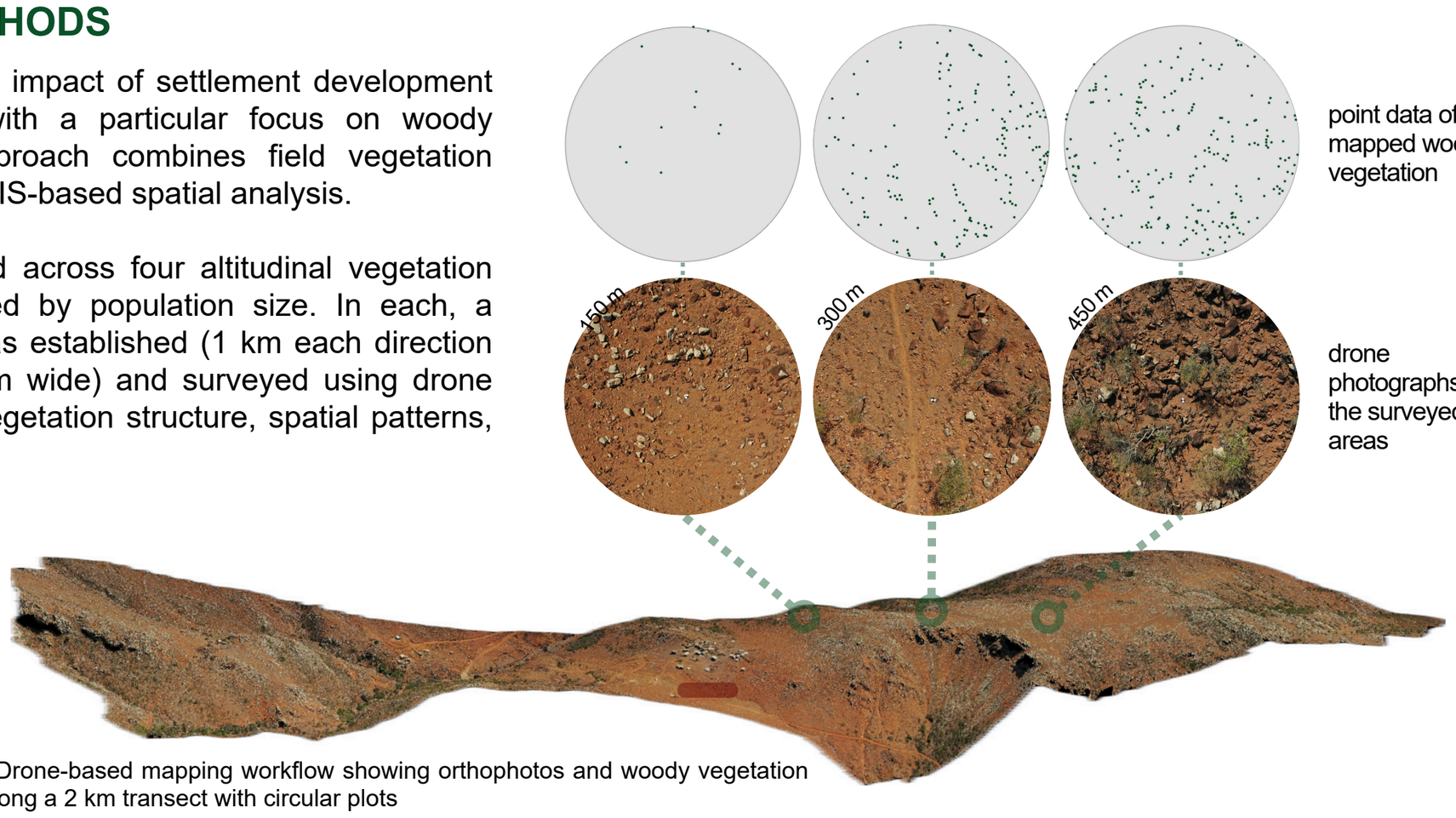


Fig. 2 Drone-based mapping workflow showing orthophotos and woody vegetation data along a 2 km transect with circular plots

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**ACKNOWLEDGEMENT**
This study was supported with funding provided by the Internal Grant Agency, Mendel University in Brno. Project number IGA25-FFWT-IP-012.
Fieldwork is supported by the Franklinia Foundation.
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