



Temporal trend analysis of vegetation cover response to environmental factors and residential development Har-HaNegev, Israel



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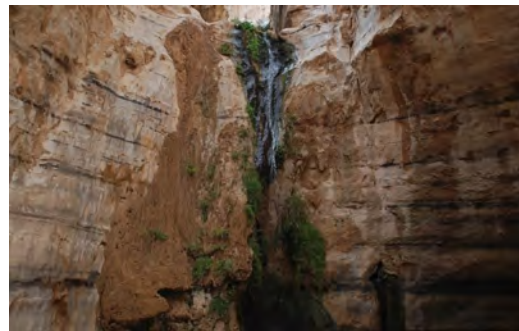
IV ECOPOTENTIAL General Meeting, Rome,
Italy 20-24 May 2019

Why was Har-HaNegev selected?

This area includes a national park, the UNESCO World Heritage Incense Route, and national reserves.

Negev Desert -
Israel's largest land
resource.

Government
policy encourages
redirecting
population growth
to this region.



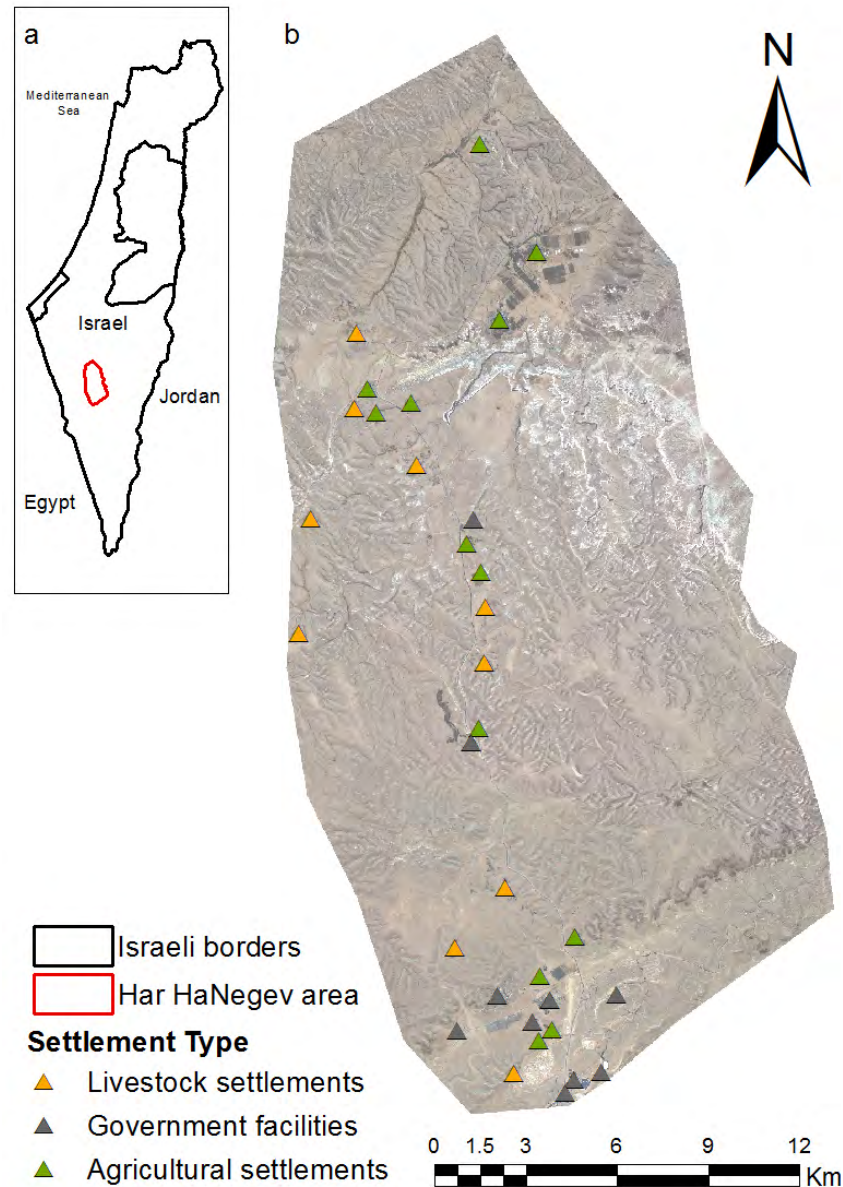
Objective - to assess the impacts of environmental factors and populated areas on vegetation cover change through a multi-decadal time period in a dryland area that includes protected nature reserves.

Har-HaNegev research site

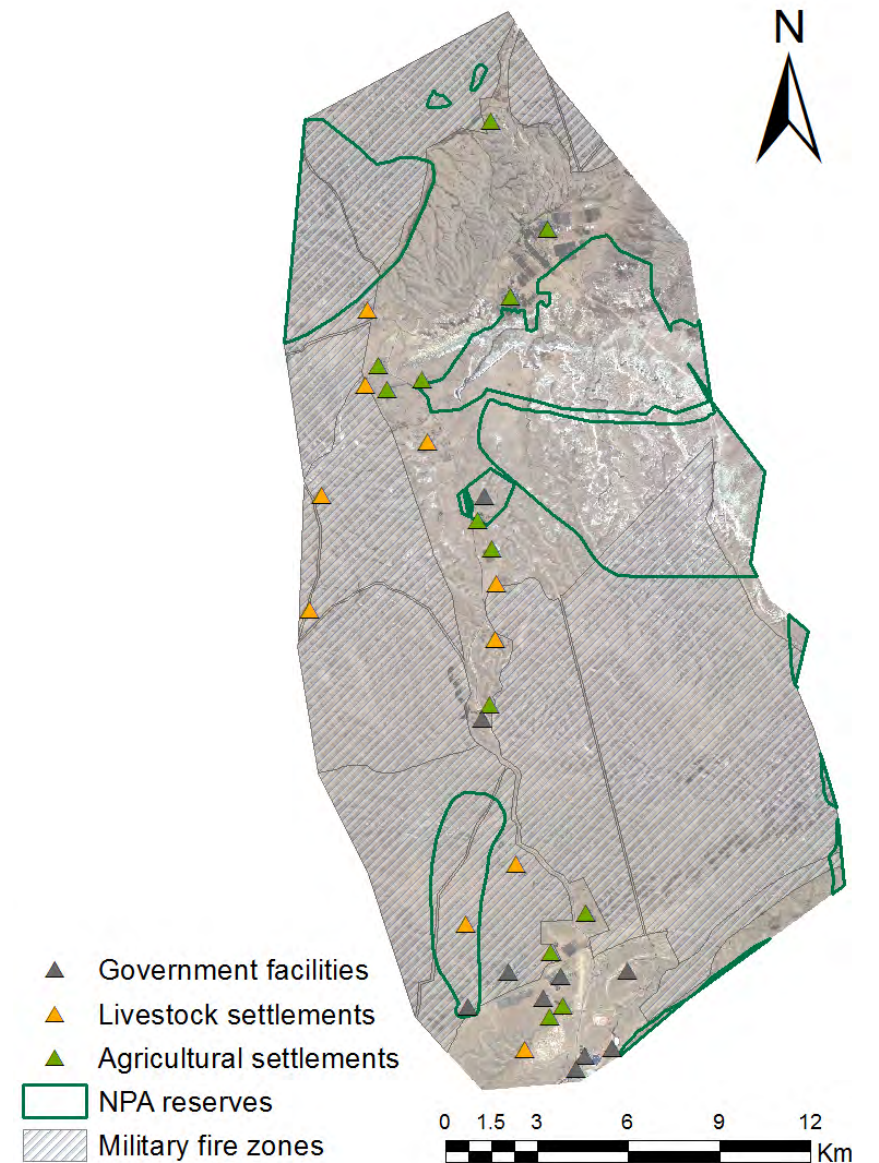
- Covers an area of 445 km²
- Average annual rainfall – 80-100 mm

Vegetation pattern – patchy and more abundant closer to the streams.

150 documented vegetation species, 32 of which are classified as endangered species.



Nature reserves – 24%
Firing zones – 60%

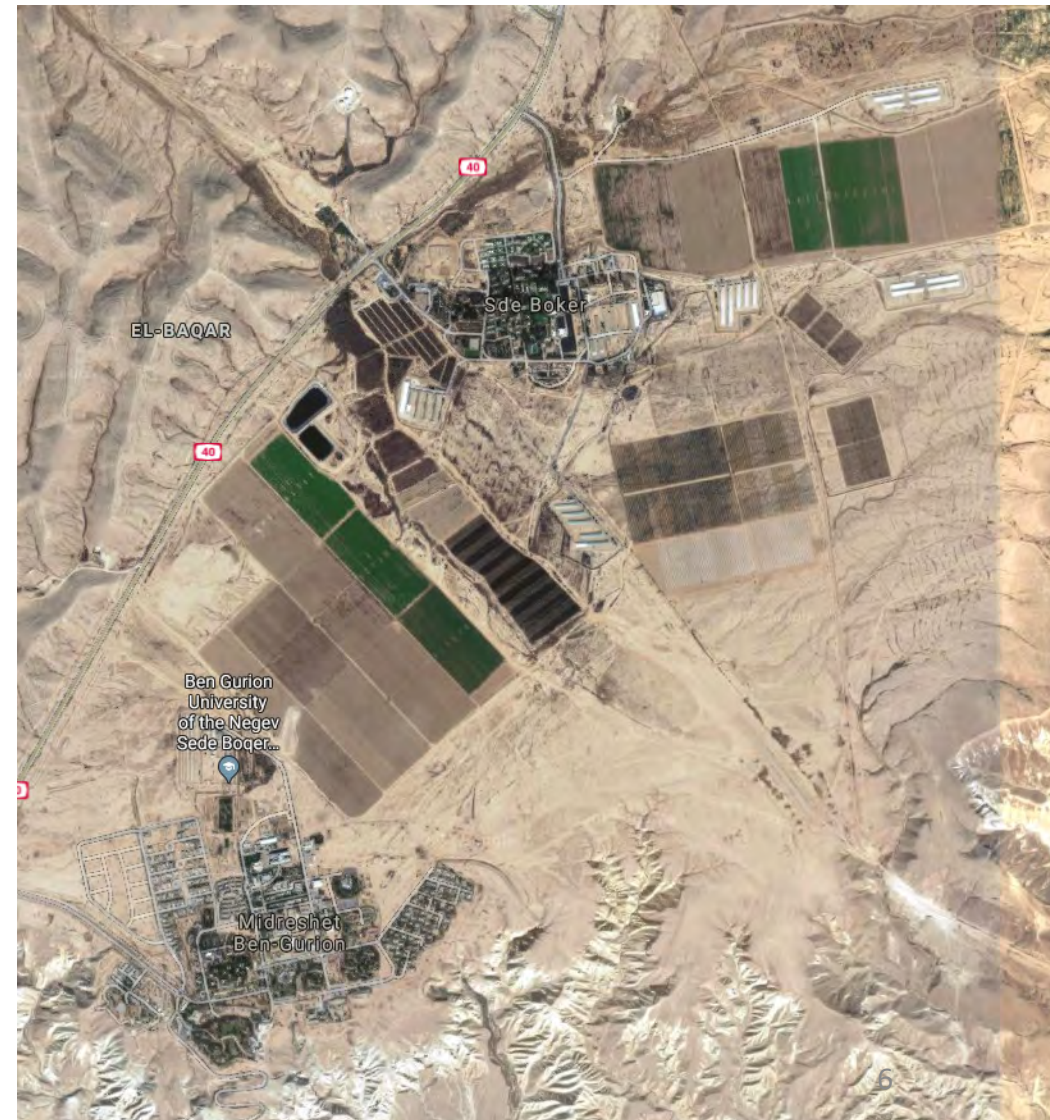


13 Agricultural settlements

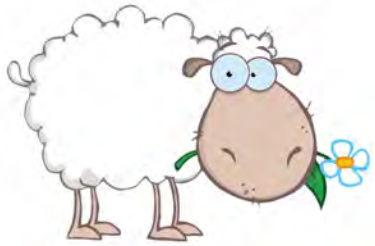
Individual family farm



Kibbutz and Community Settlement



10 villages with intensive grazing activity





Military facilities



Avdat archeological site



Jailing facility

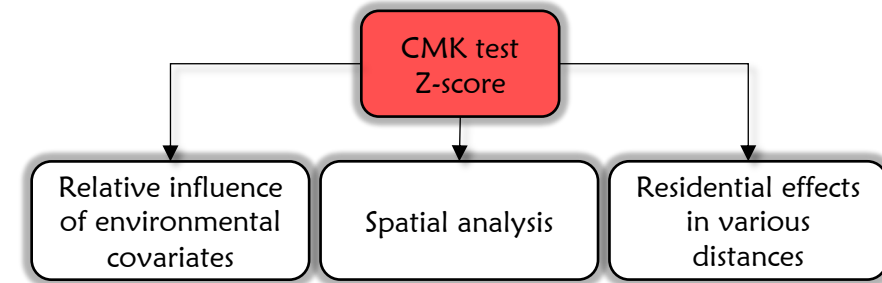
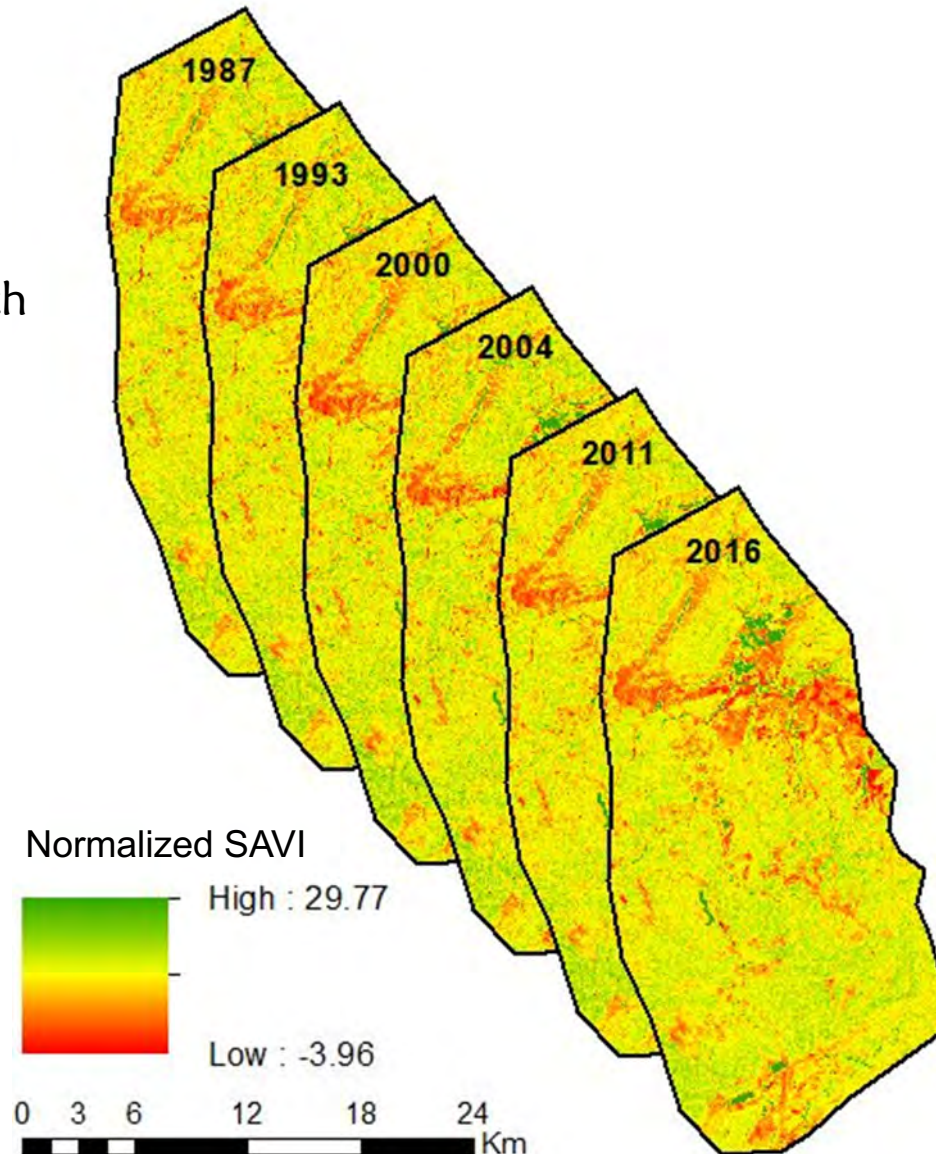
10 government facilities



Dataset

27 summer Landsat images (1987-2016)

Normalized SAVI for each year



Temporal trend analysis of vegetation cover change using the contextual Mann-Kendall significance test
One map with a Z-score for each pixel, representing trend.

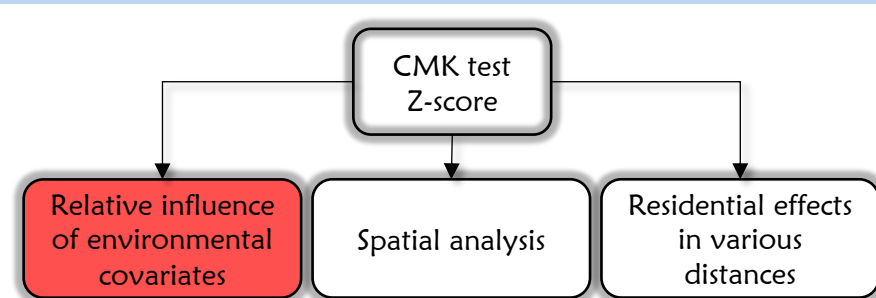
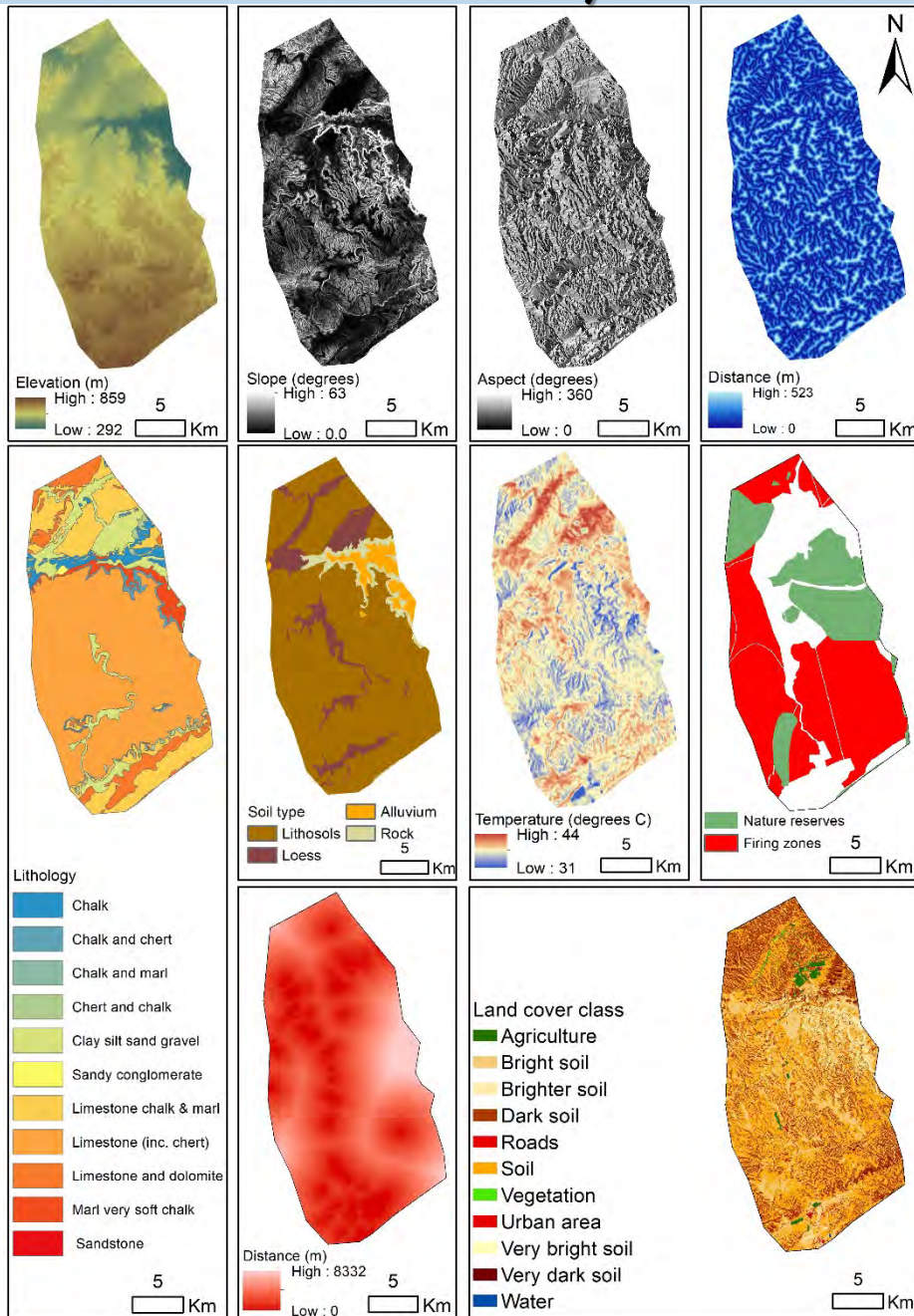
Significant change:

$z < -1.96$ and $z > 1.96 \rightarrow p < 0.05$

$z < -2.58$ and $z > 2.58 \rightarrow p < 0.01$

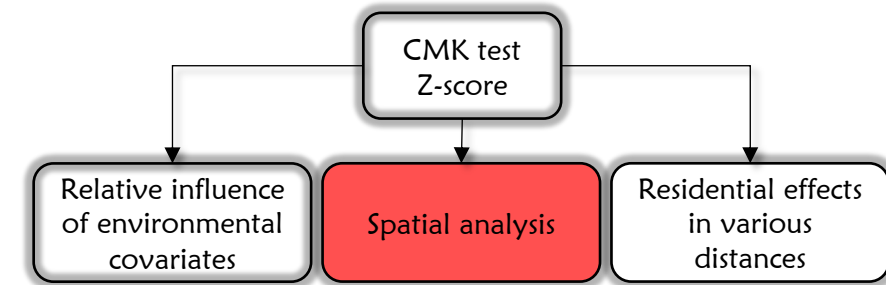
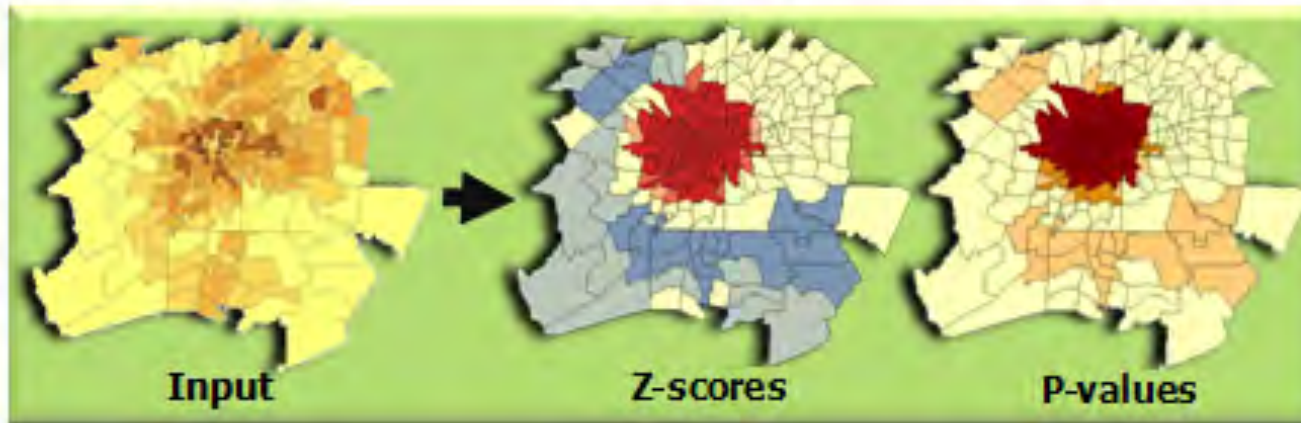
Analysis of
environmental and
human-derived
covariates effect
on vegetation
cover change

Boosted regression
trees

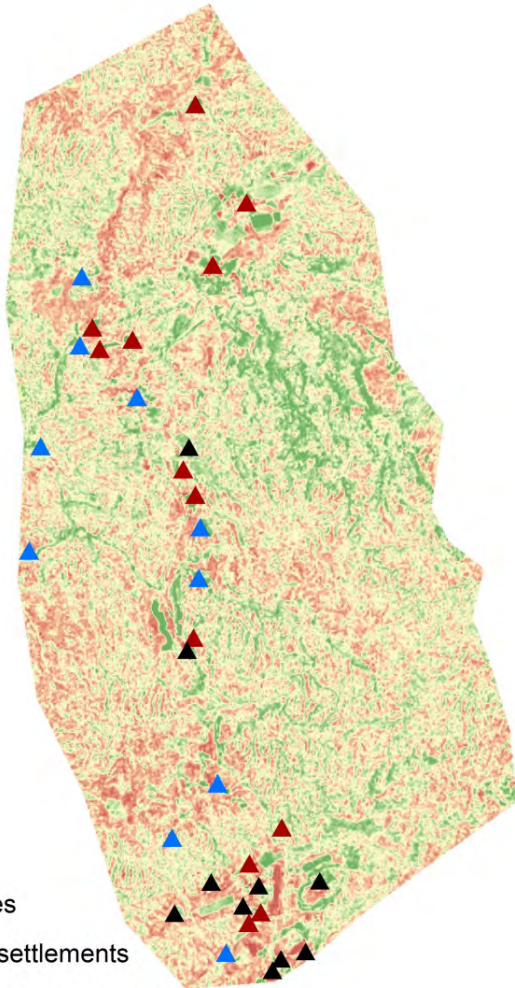


Spatial analysis

- 50,000 random points
- Only significant Z-score point considered (=12,788)
- Getis-Ord G_i^* for hotspot analysis
- Geographically weighted regression between the hotspots and elevation and distance from streams

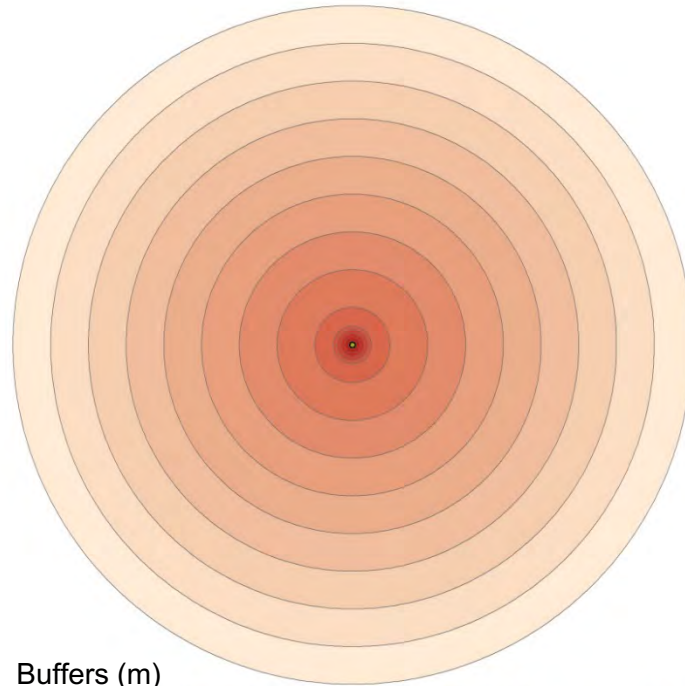


Effects of distance from populated areas on vegetation cover change

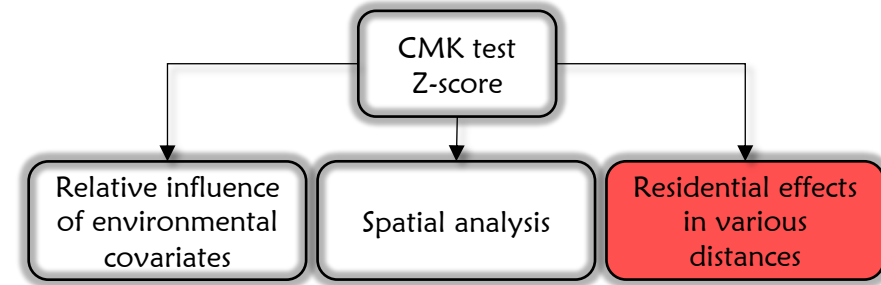


- ▲ IDF bases
- ▲ Grazing settlements
- ▲ Agriculturally settlements

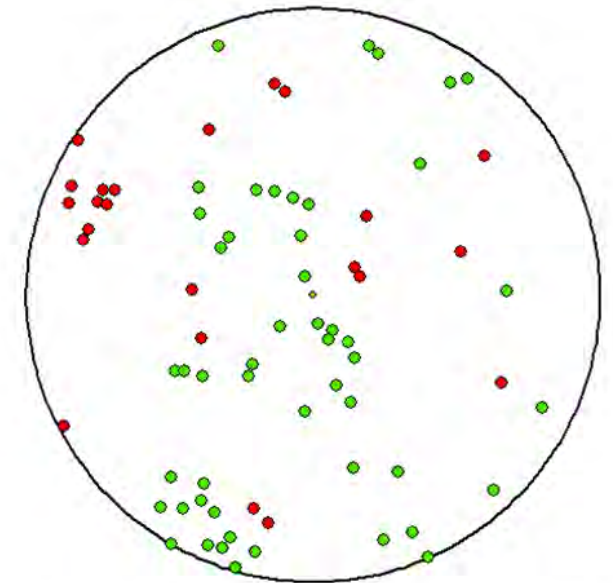
Buffers of different distances from settlements centroids



Buffers (m)



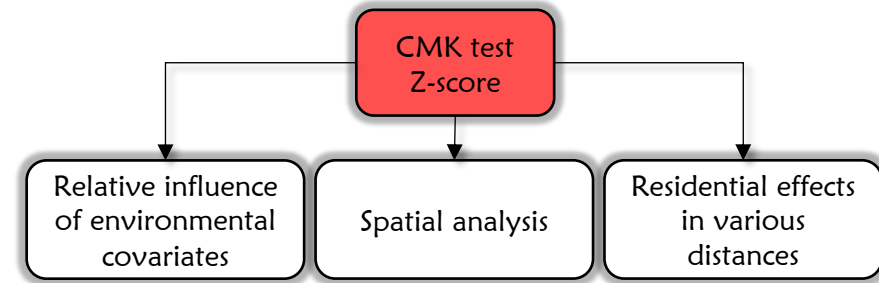
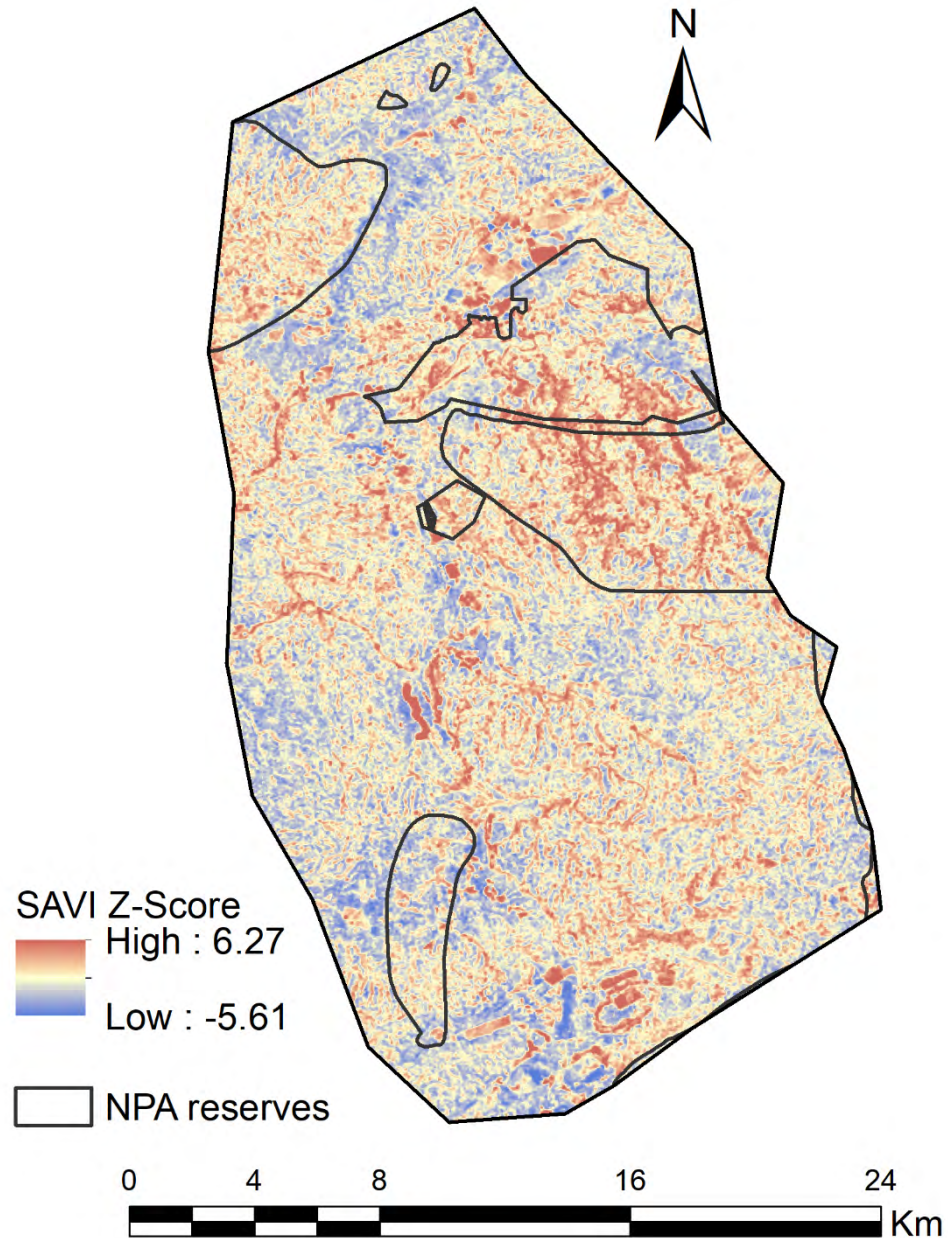
1000 m



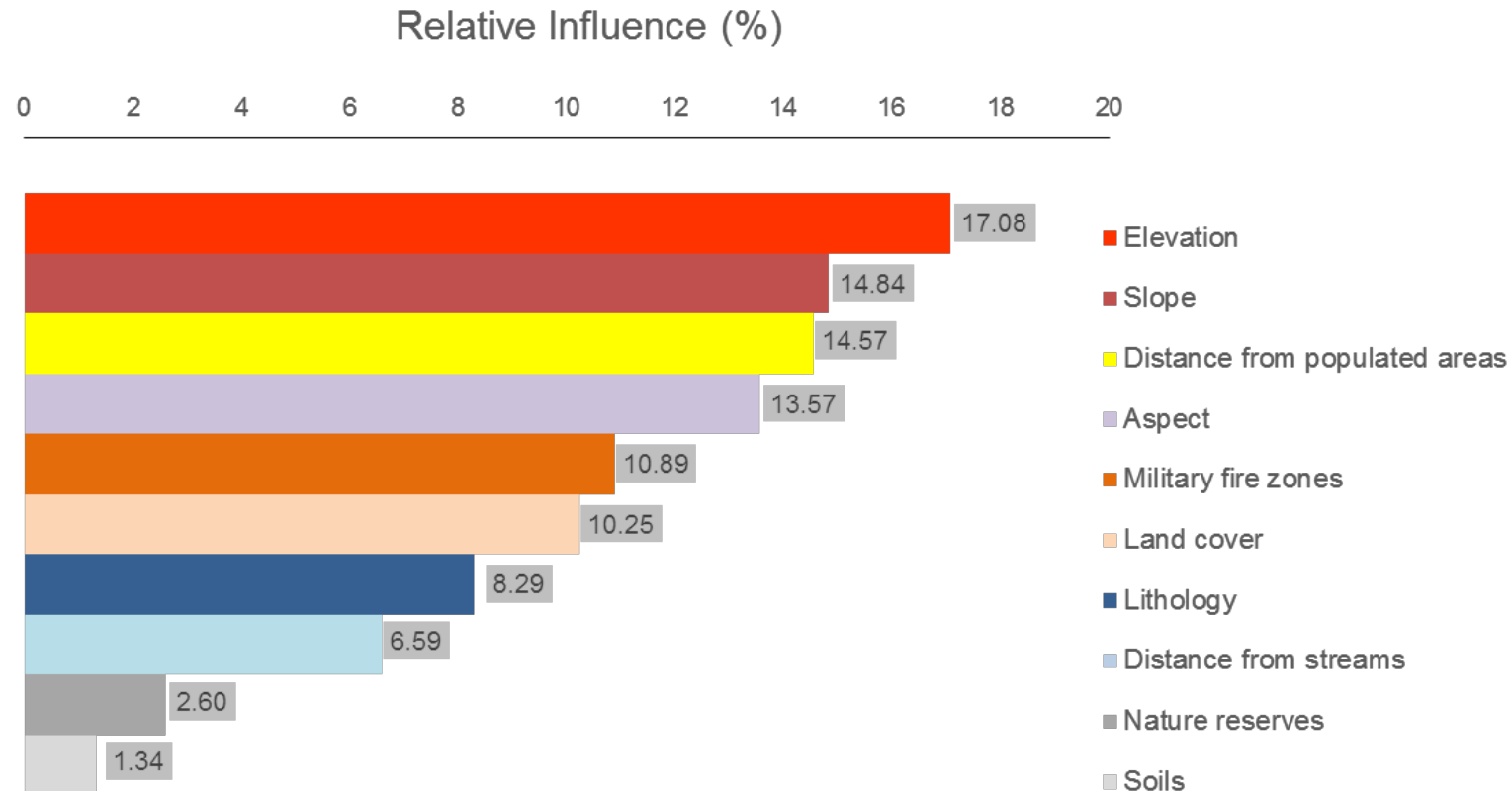
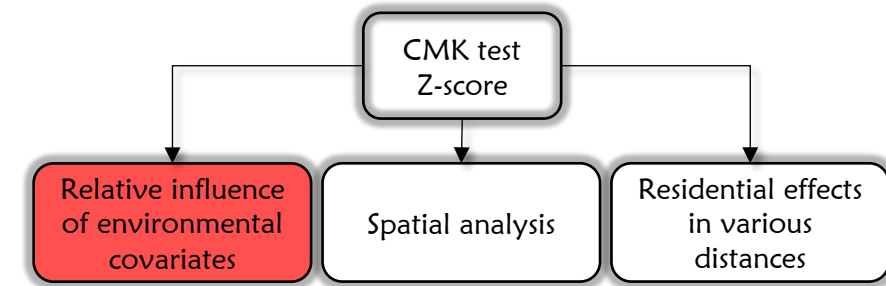
- positive Z-Scores
- Negative Z-Scores
- ◇ Centroid

What is the ratio between significant positive and negative Z-score?

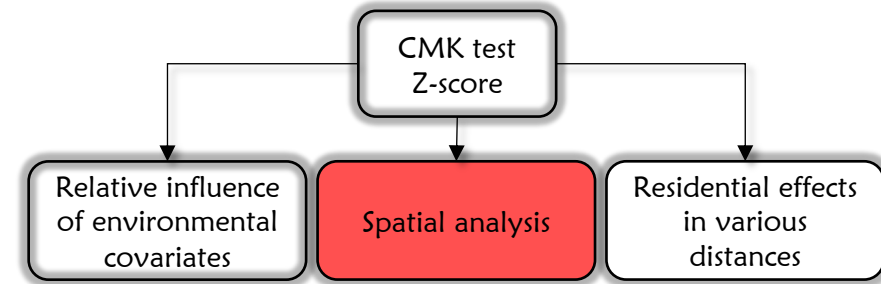
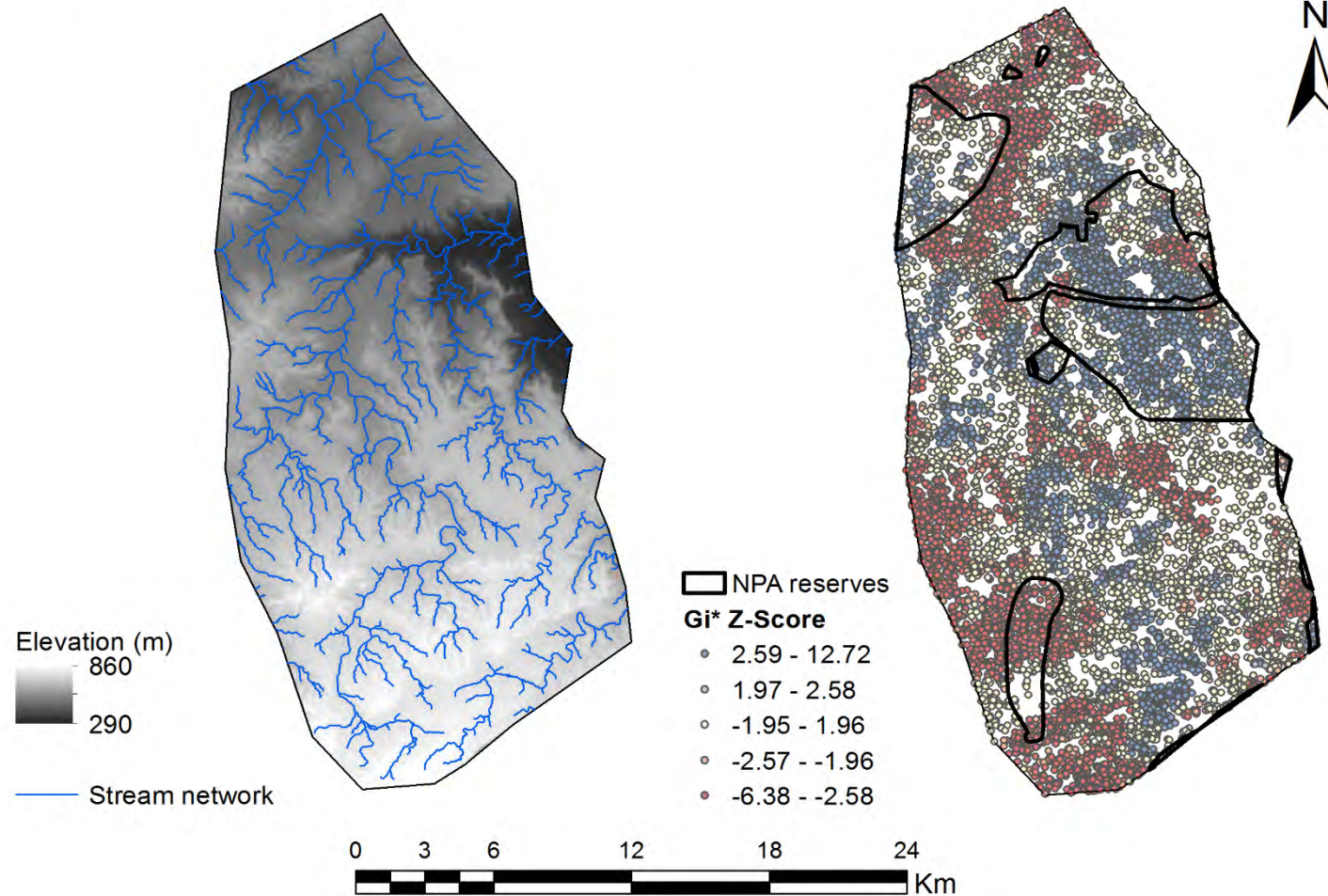
Contextual Mann-Kendall Z-score map



Relative influence of environmental and human-induced covariates on vegetation cover change



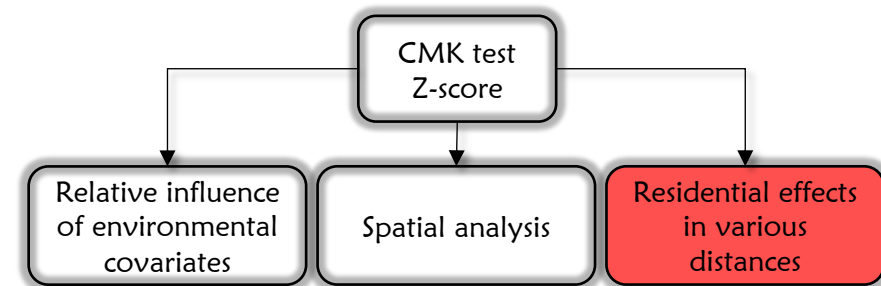
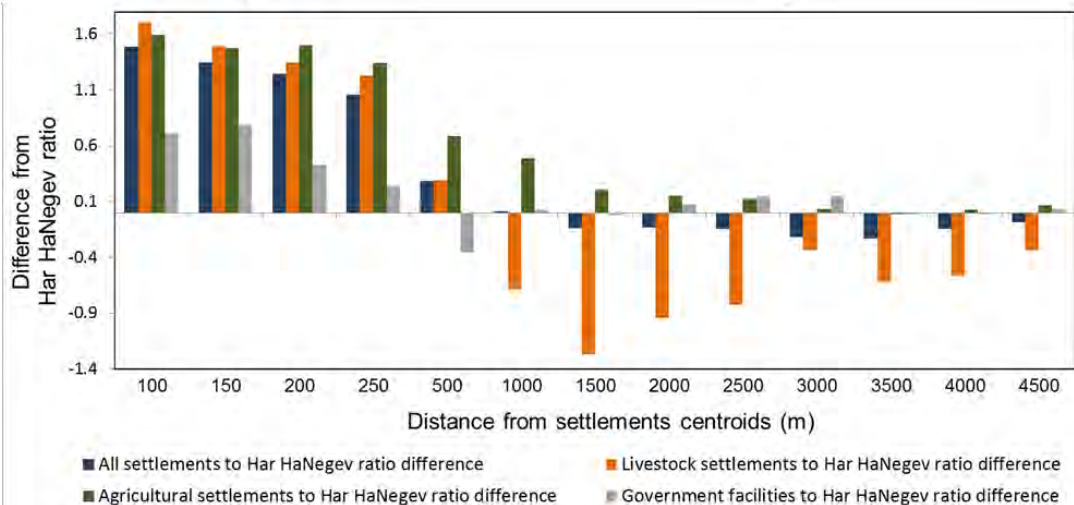
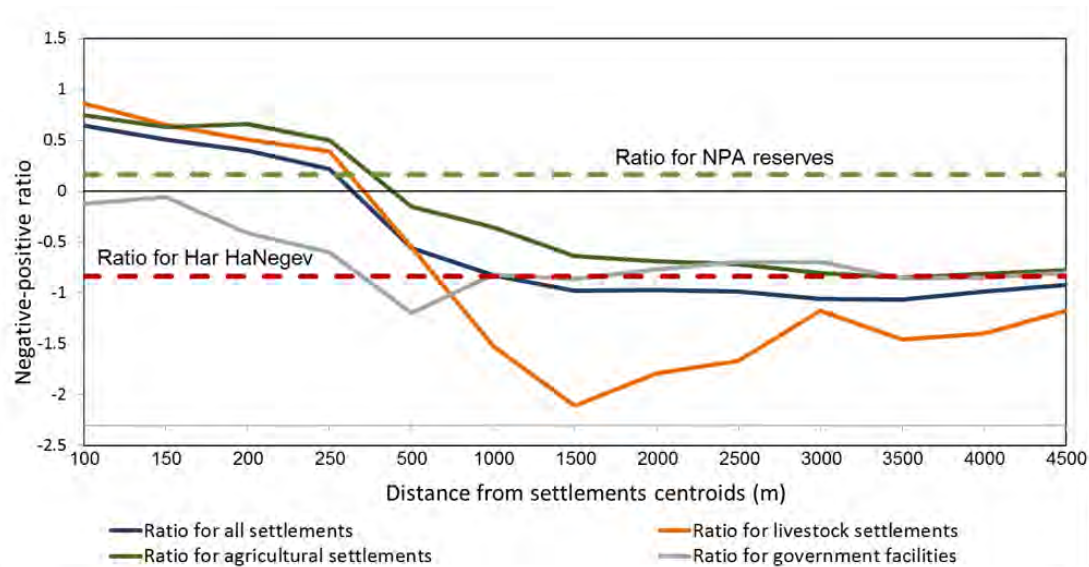
Spatial trends of vegetation cover change



GWR VCC ~ elevation: $R^2 = 0.98$

GWR VCC ~ distance from streams $R^2 = 0.93$

Effects of distance from populated areas on vegetation cover change

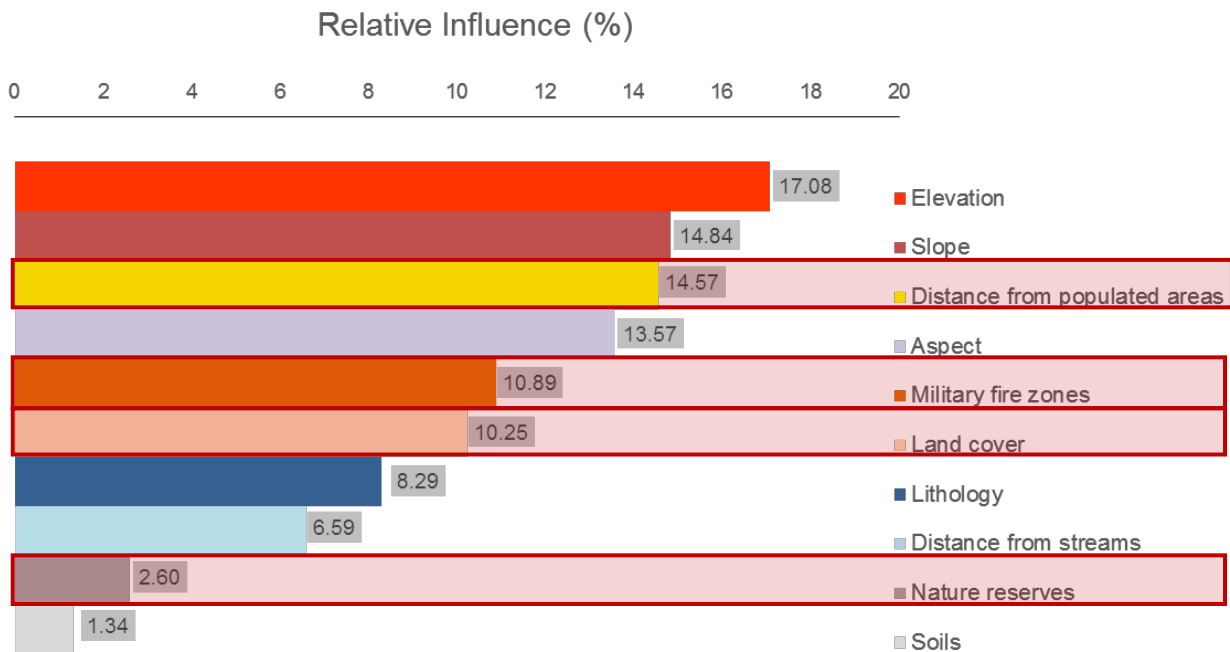
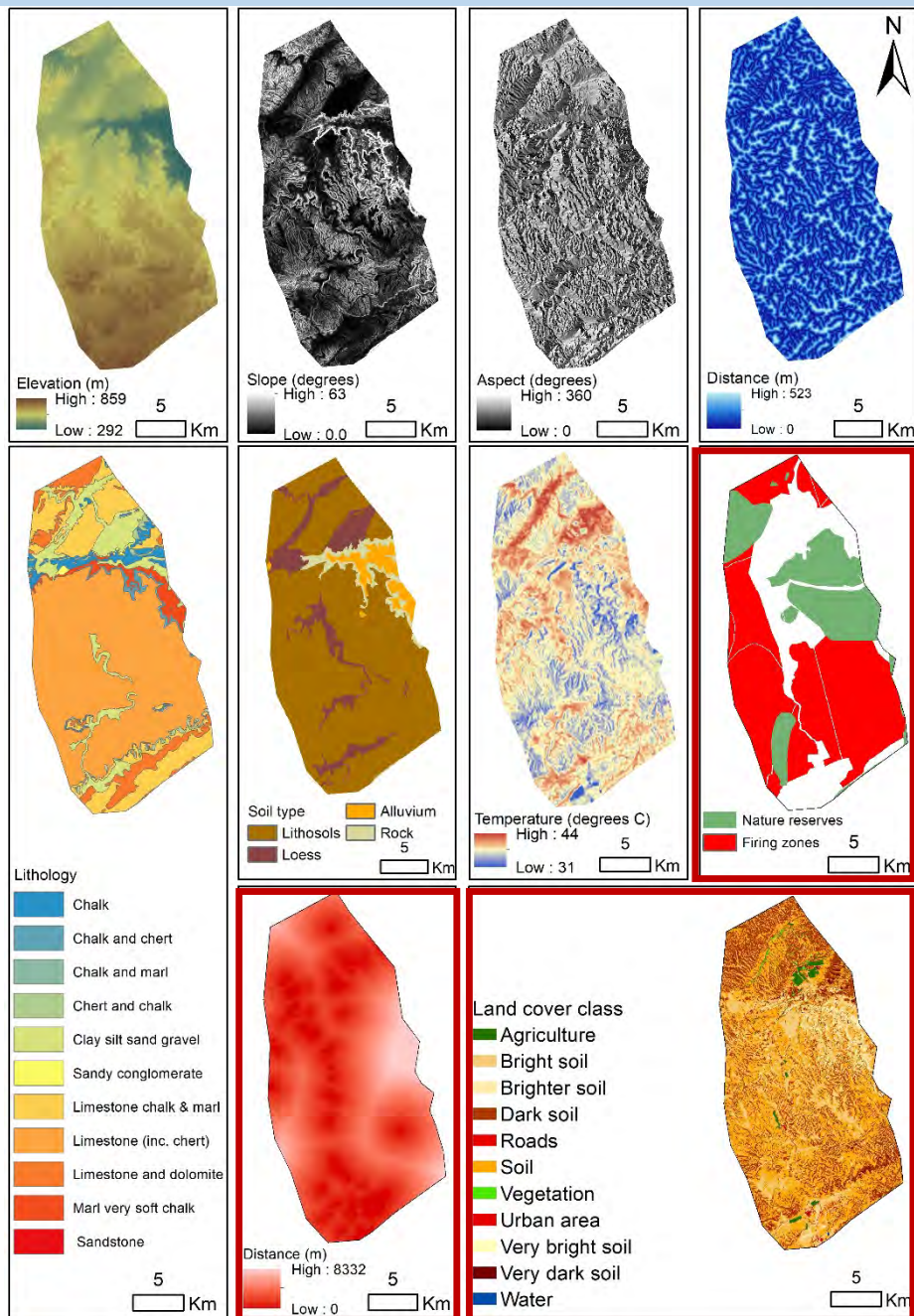


Differences between settlement types for each distance

Distance from centroid (m)	Agricultural settlements	Livestock settlements	Government facilities
100	a	a	b
200	a	a	b
500	a	b	c
1000	a	b	c
1500	a	b	c
3000	a	b	a
4500	a	b	a

Differences between distances for each settlement type

Settlement type	100 m	200 m	500 m	1000 m	1500 m	3000 m	4500 m
Agricultural settlements	a	a	b	bc	d	d	d
Livestock settlements	a	a	b	cd	d	d	c
Government facilities	a	a	a	a	a	a	a



Sum of relative influence of predictors that may change due to future development - **38.31%**

Conclusions

- The settlement type affects patterns of VCC.
- Environmental covariates with strongest effect - elevation and slope.
- Vegetation cover is most sensitive along streams.
- Protected areas have a great potential in preserving and increasing vegetation cover.
- Management strategies should be implemented to initiate further conservation and restoration processes.
- **Governmental and municipal regulations are required before population increases and degradation processes expand further.**
- Negative VCC in drylands have irreversible effects influencing the vegetation pattern and organization in space, altering the ecosystem structure and function.



Thank you for
your attention

