



**AFRICAN FORUM**  
ON URBAN FORESTS

# 2nd African Forum On Urban Forests

*Green Horizons: Shaping the Future Resilience of African Cities through Urban Forests*

**18 March 2025 - 21 March 2025**



*in partnership with:*



Food and Agriculture  
Organization of the  
United Nations



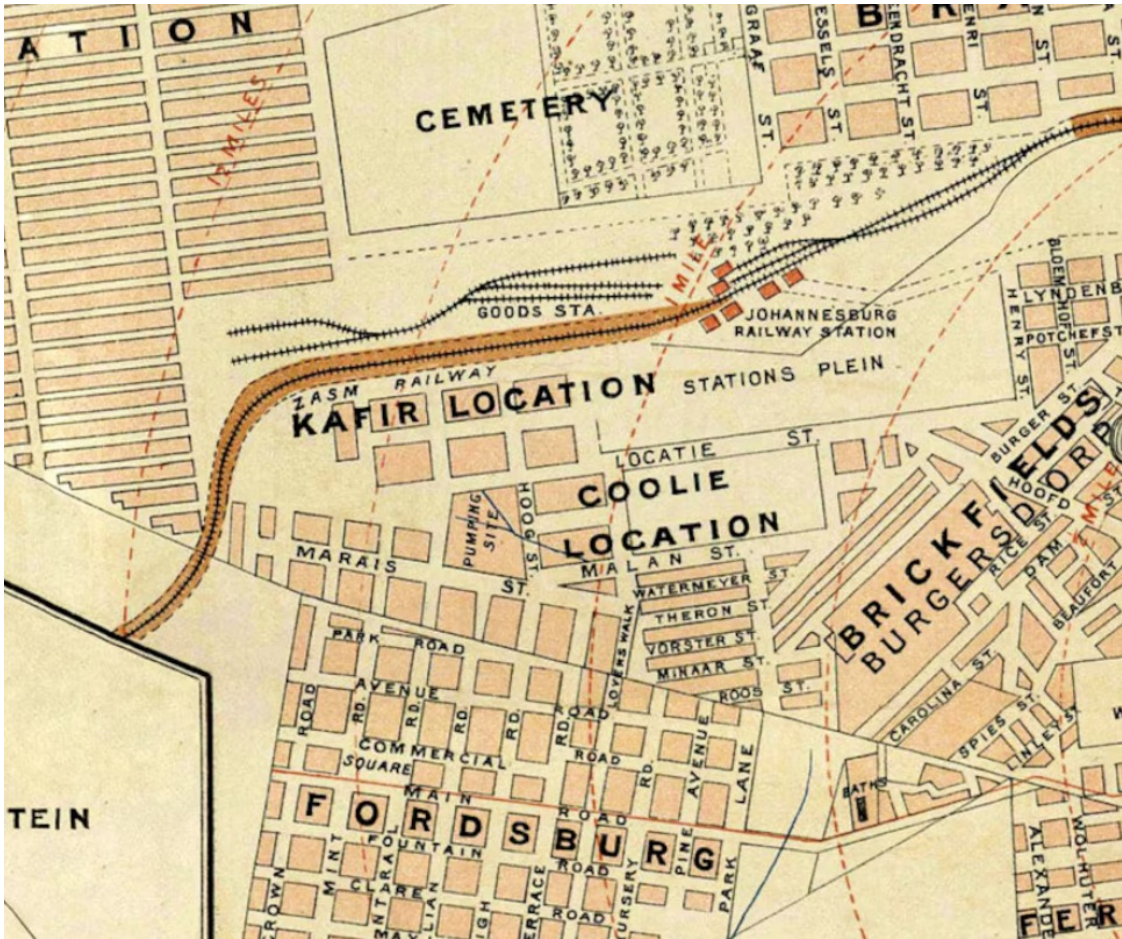
# Colonial ontologies and climate vulnerability: a planetary health perspective of Johannesburg, South Africa

Jonathan Melamdowitz

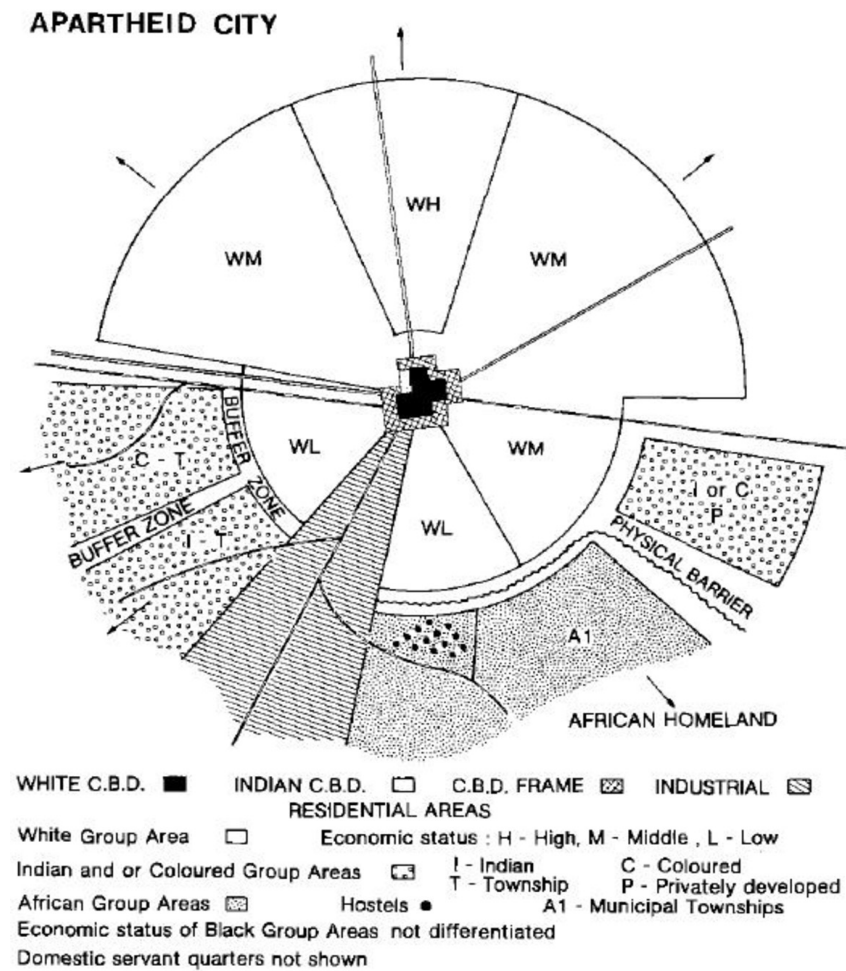




# Spatial Marginalisation



Detail of Plan of Johannesburg and Suburbs 1897



Davis, R.J. 1981. The model of the apartheid city according to Davies

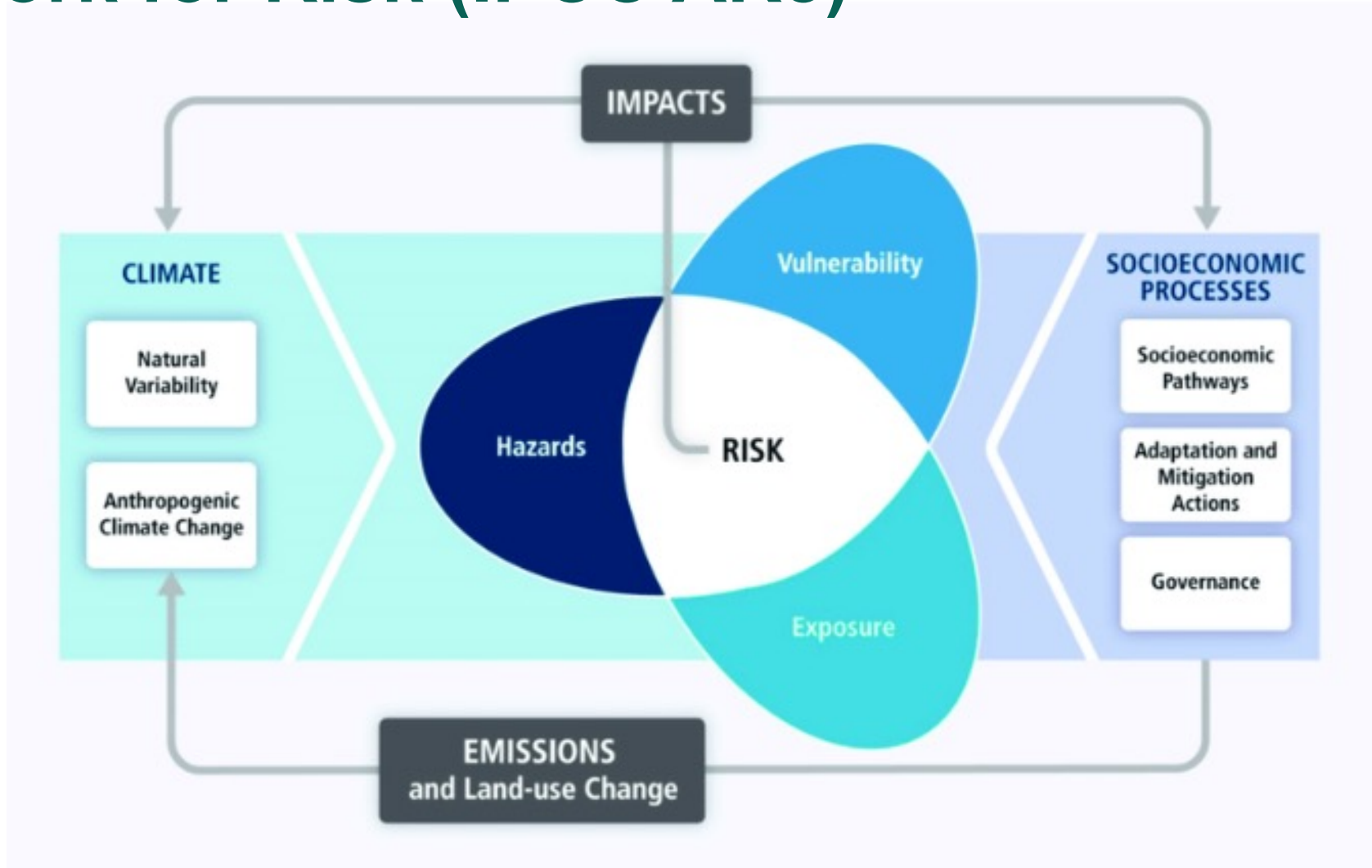


# Spatial Marginalisation



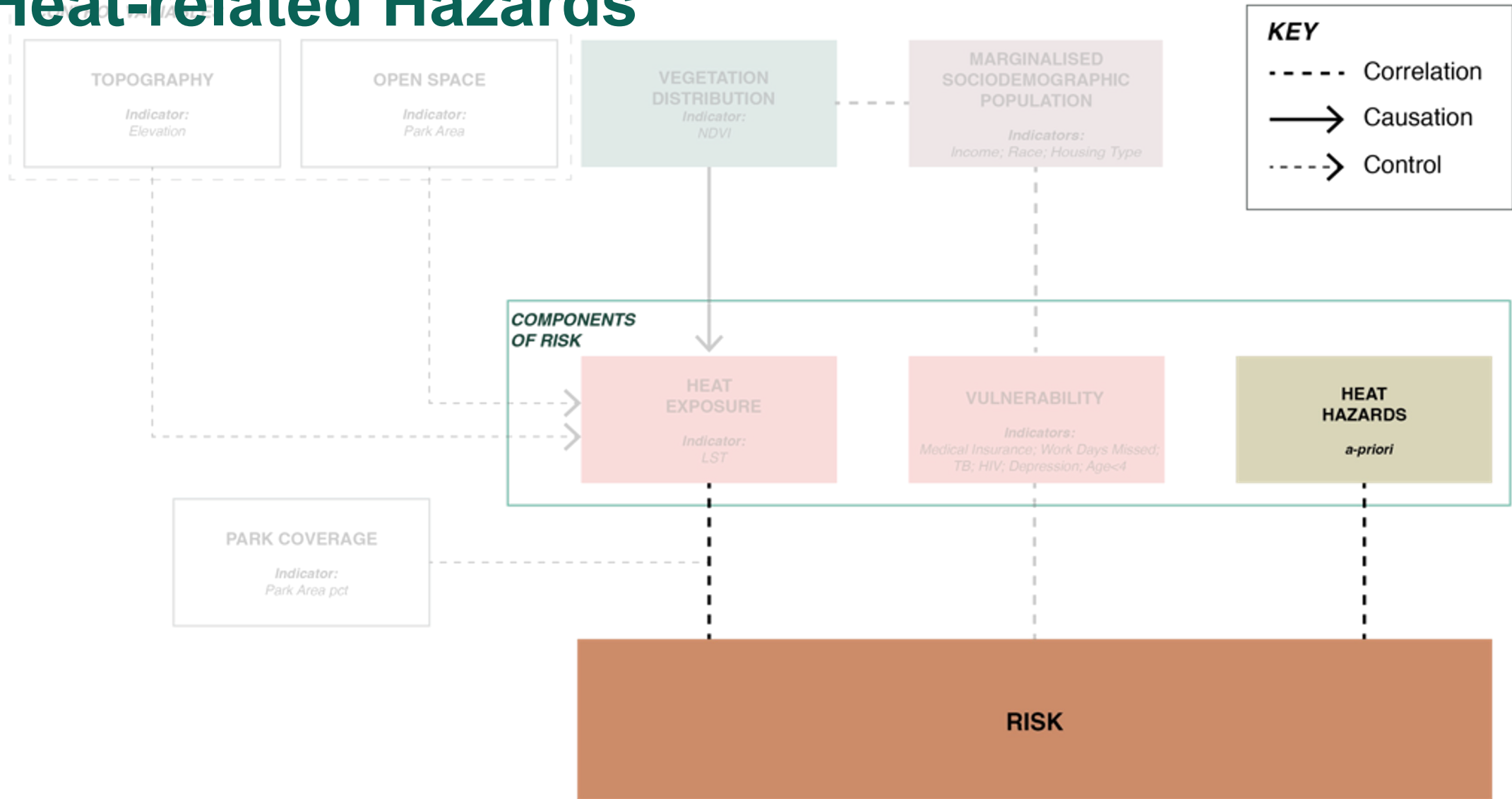


# Framework for Risk (IPCC AR5)



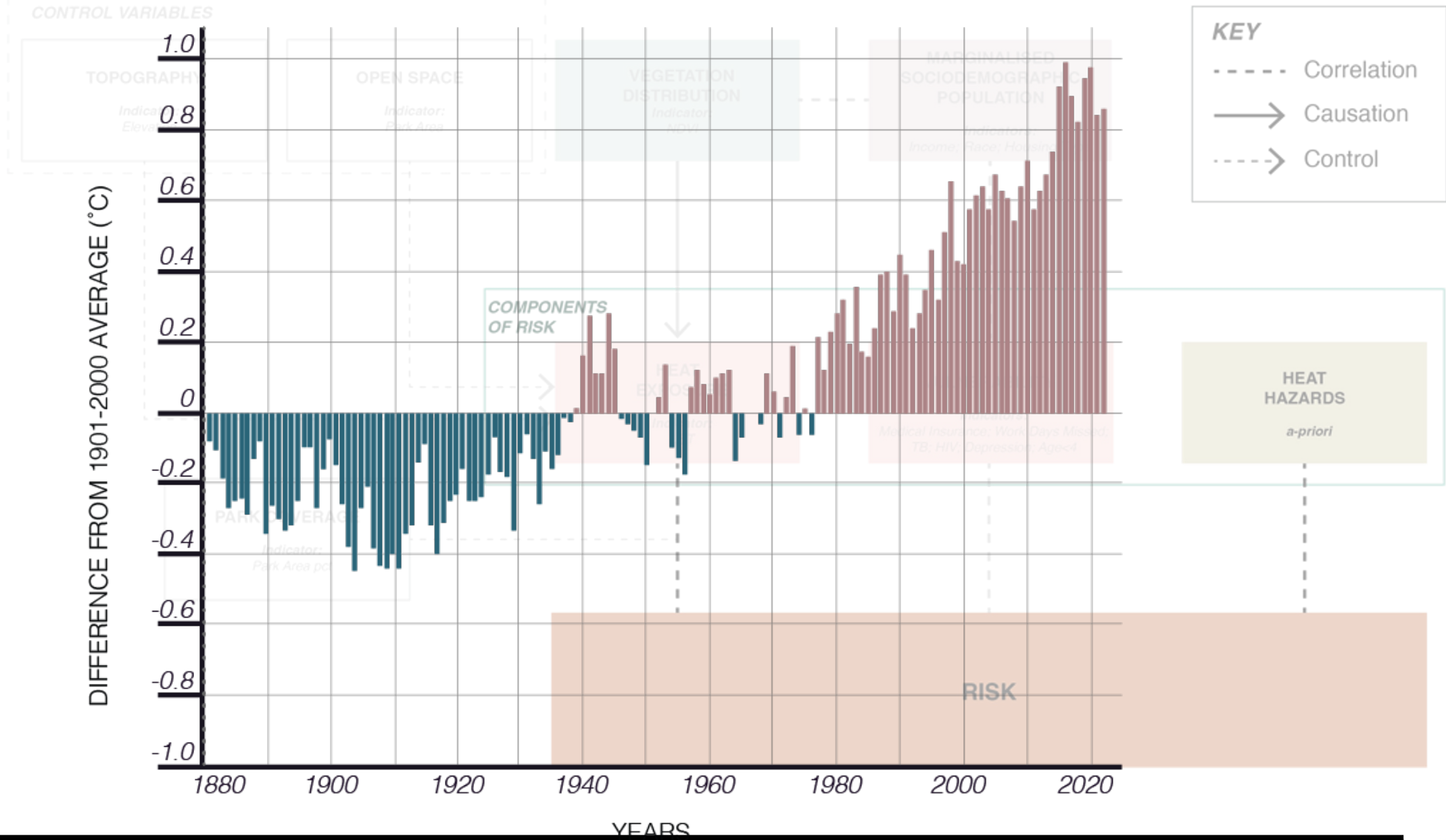
The IPCC AR5 conceptual framework with risk at the center

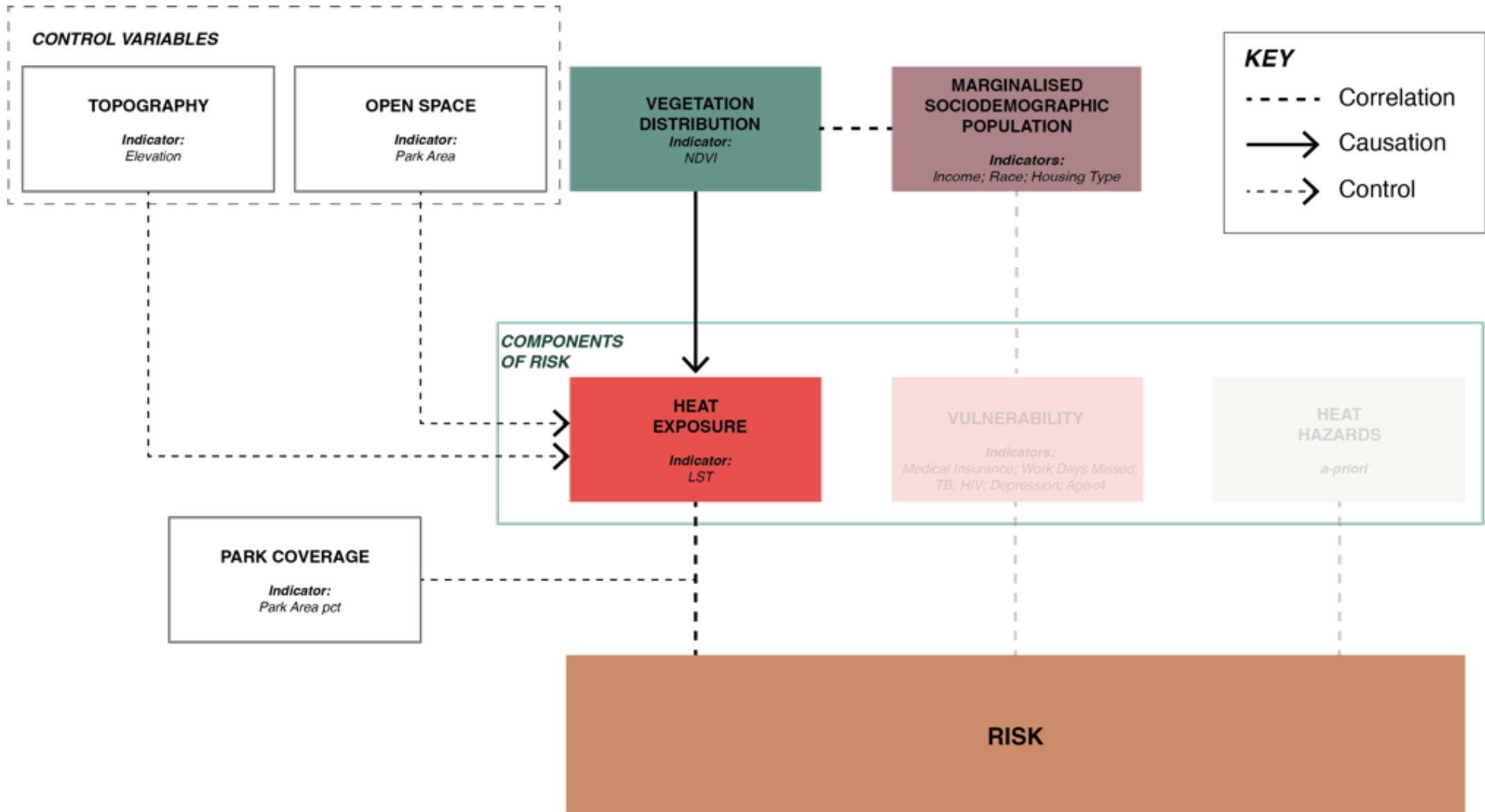
# Heat-related Hazards





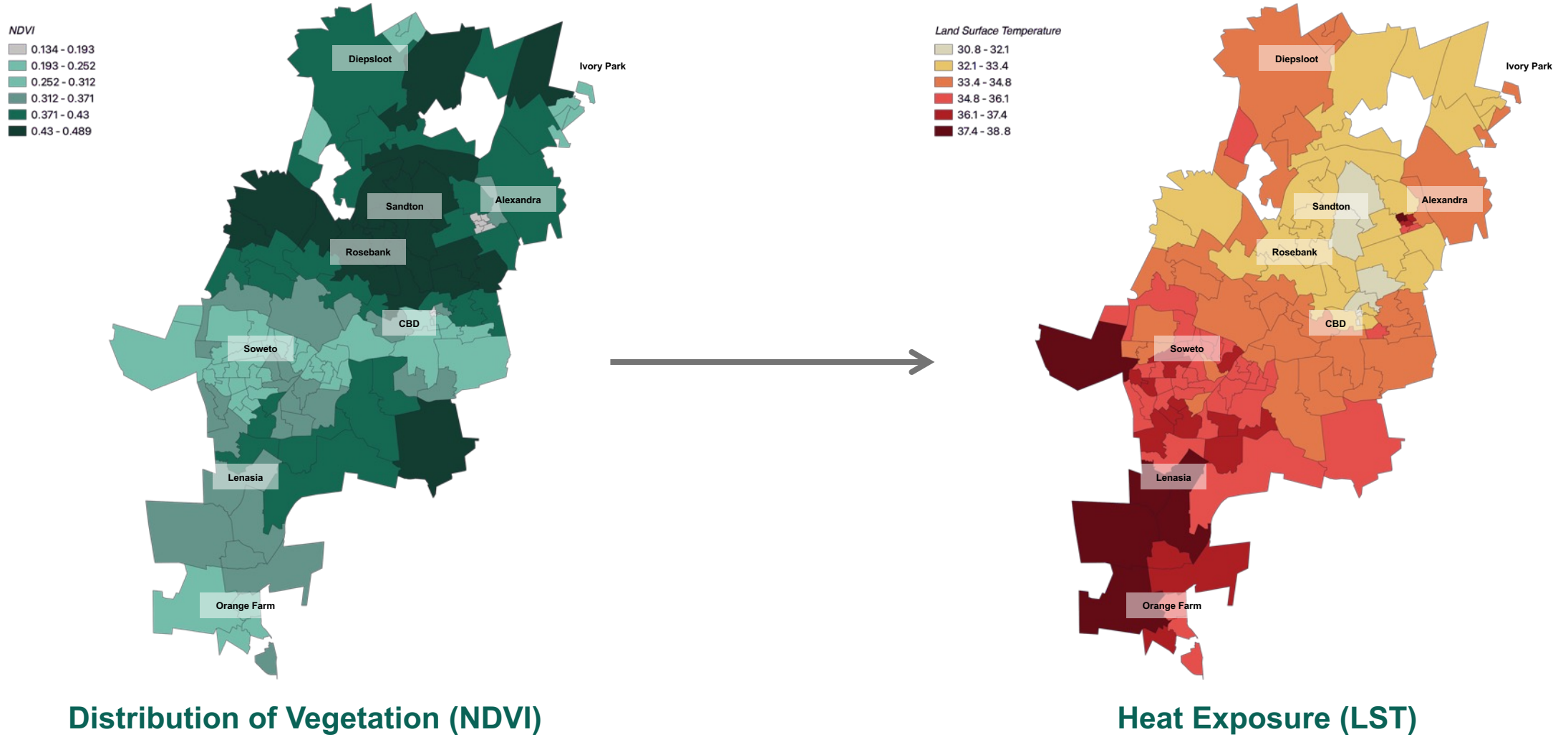
# GLOBAL AVERAGE SURFACE TEMPERATURE



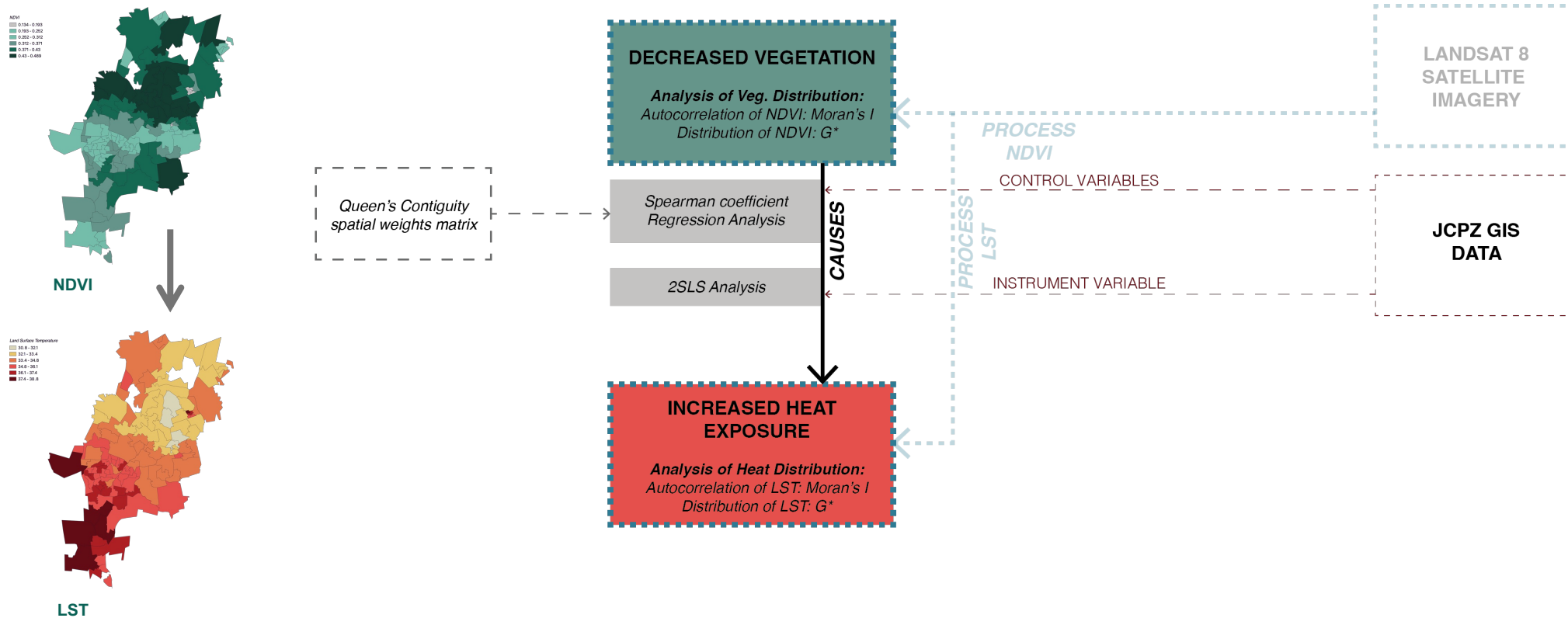




# Does the spatial distribution of vegetation affect heat exposure?



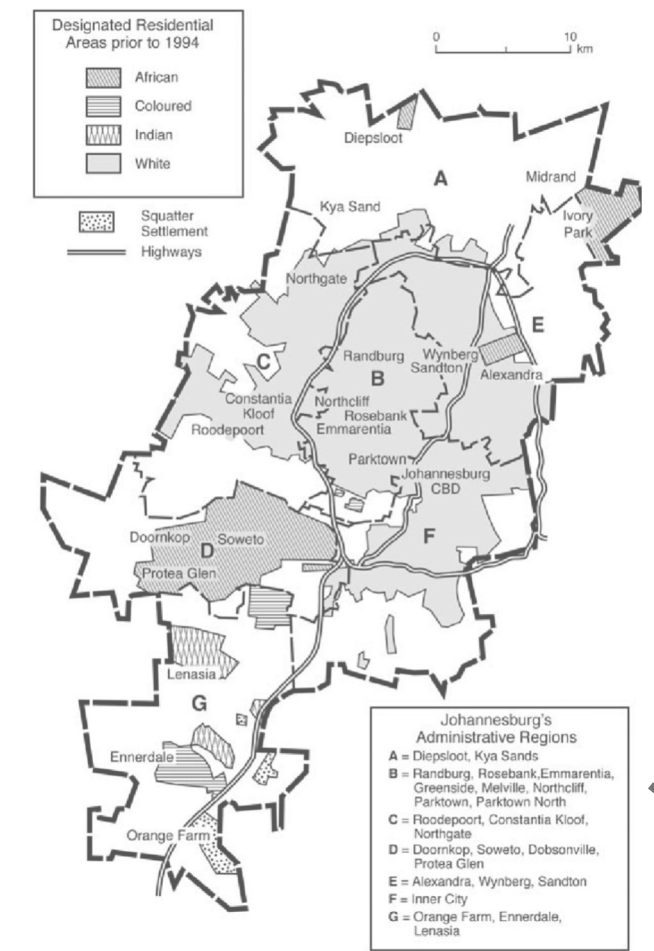
# Does the spatial distribution of vegetation affect heat exposure?



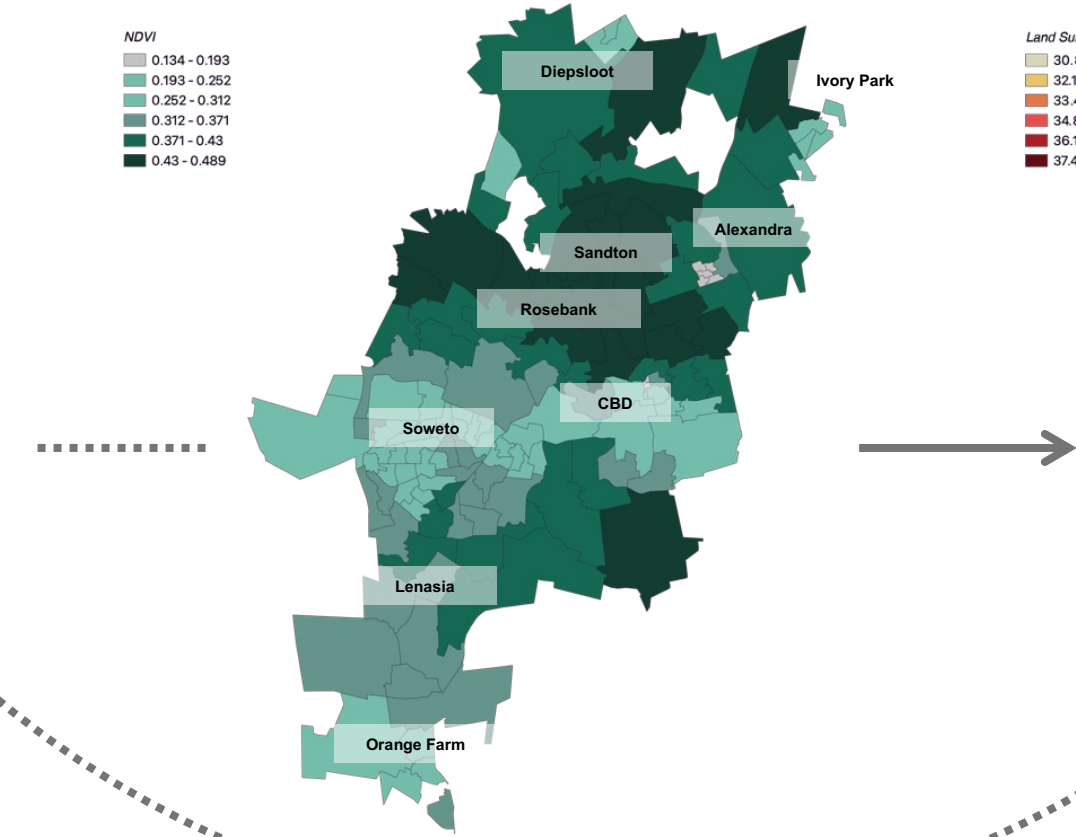


# Does the unequal distribution of vegetation increase heat exposure for marginalised sociodemographic populations?

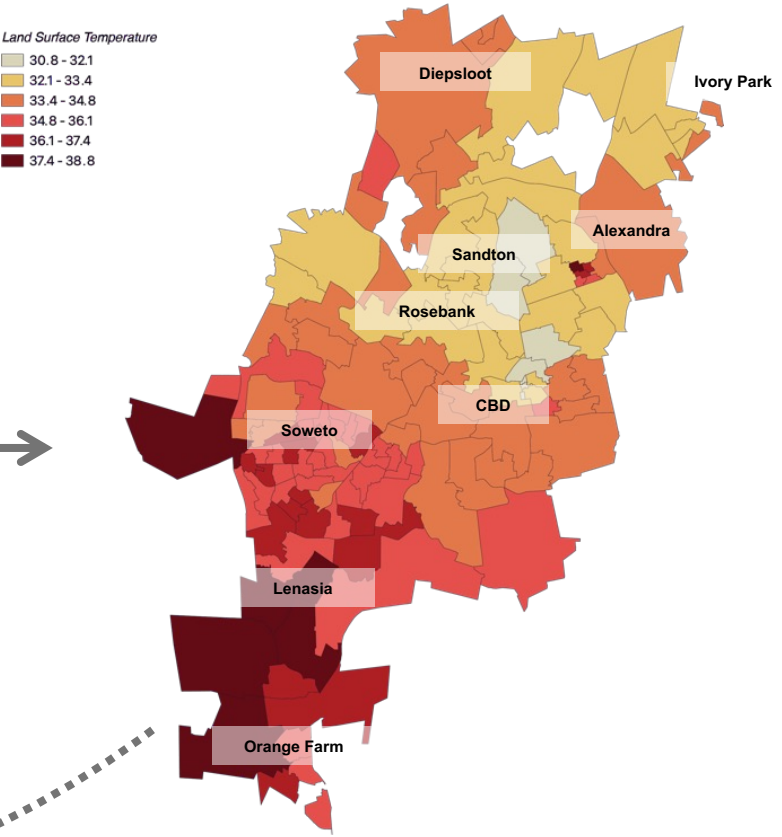
Segregated Residential Areas prior to 1994



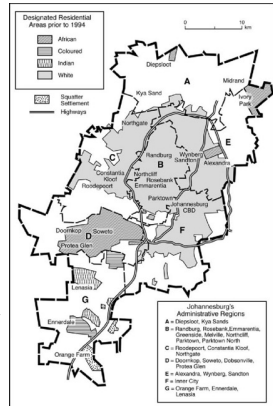
Distribution of Vegetation (NDVI)



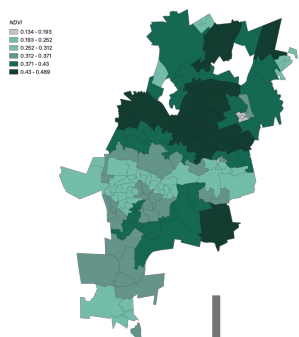
Heat Exposure (LST)



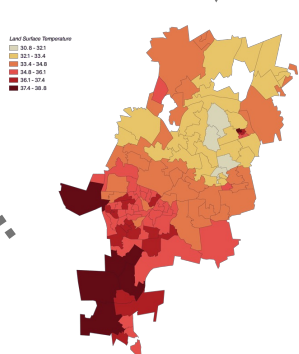
McKay, Tracey & Bell, Jarred. (2011). The Rise of 'Class Apartheid' in Accessing Secondary Schools in Sandton, Gauteng. *Journal of Southern African Studies*. 17. 27-48.



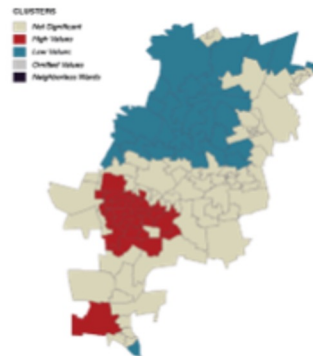
**Racial Segregation**



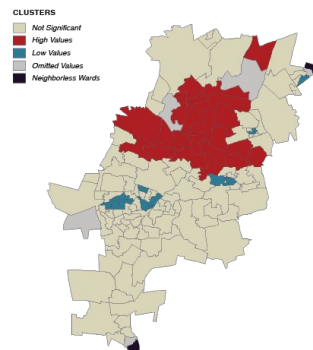
**NDVI**



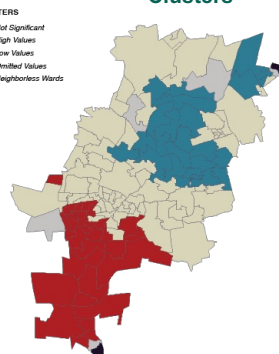
**LST**



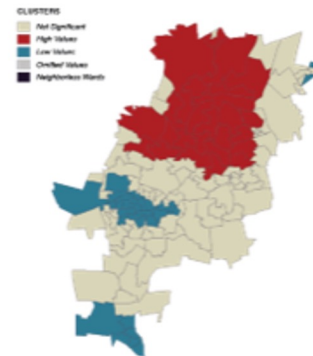
**Race Distribution Clusters**



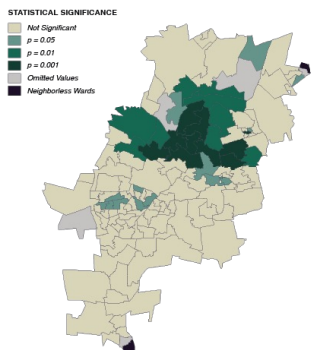
**Vegetation Distribution (NDVI) Clusters**



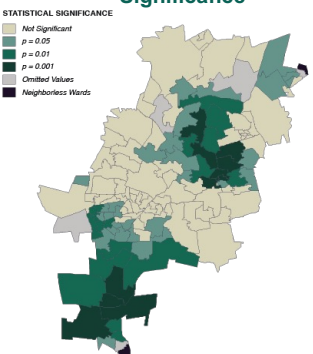
**Heat Exposure (LST) Clusters**



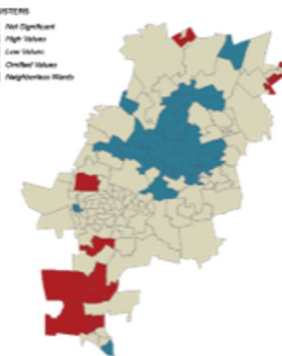
**Average Income Clusters**



**Vegetation Distribution (NDVI) Cluster Significance**



**Heat Exposure (LST) Cluster Significance**

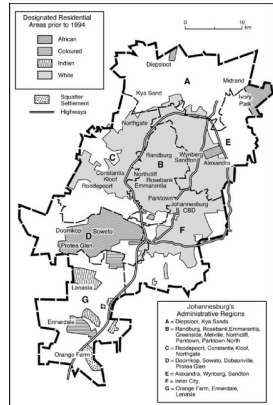


**Housing Type Clusters**

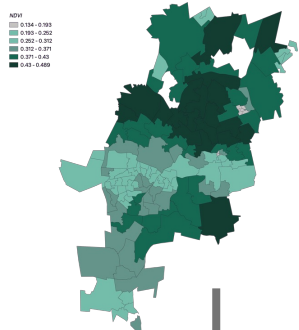
Figure 14: Clusters and clusters of high and low mean LST values per ward



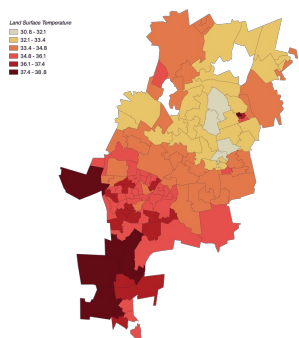
# Does the unequal distribution of vegetation increase heat exposure for marginalised sociodemographic populations?



**Racial Segregation**



**NDVI**



**LST**

## MARGINALISED SOCIODEMOGRAPHIC POPULATIONS

**Analysis of Marginalisation. Distribution:**  
Autocorrelation of Marginalisation Variables: Moran's I  
Distribution of Marginalisation Variables: G\*

Spearman coefficient  
Regression Analysis

Spearman coefficient  
Regression Analysis

## DECREASED VEGETATION

**Analysis of Veg. Distribution:**  
Autocorrelation of NDVI: Moran's I  
Distribution of NDVI: G\*

Queen's Contiguity  
spatial weights matrix

Spearman coefficient  
Regression Analysis

2SLS Analysis

## INCREASED HEAT EXPOSURE

**Analysis of Heat Distribution:**  
Autocorrelation of LST: Moran's I  
Distribution of LST: G\*

CORRELATED WITH

CAUSES

TRIANGULATION

PROCESS  
NDVI

CONTROL VARIABLES

PROCESS  
LST

INSTRUMENT VARIABLE

SOUTH AFRICAN  
NATIONAL  
CENSUS

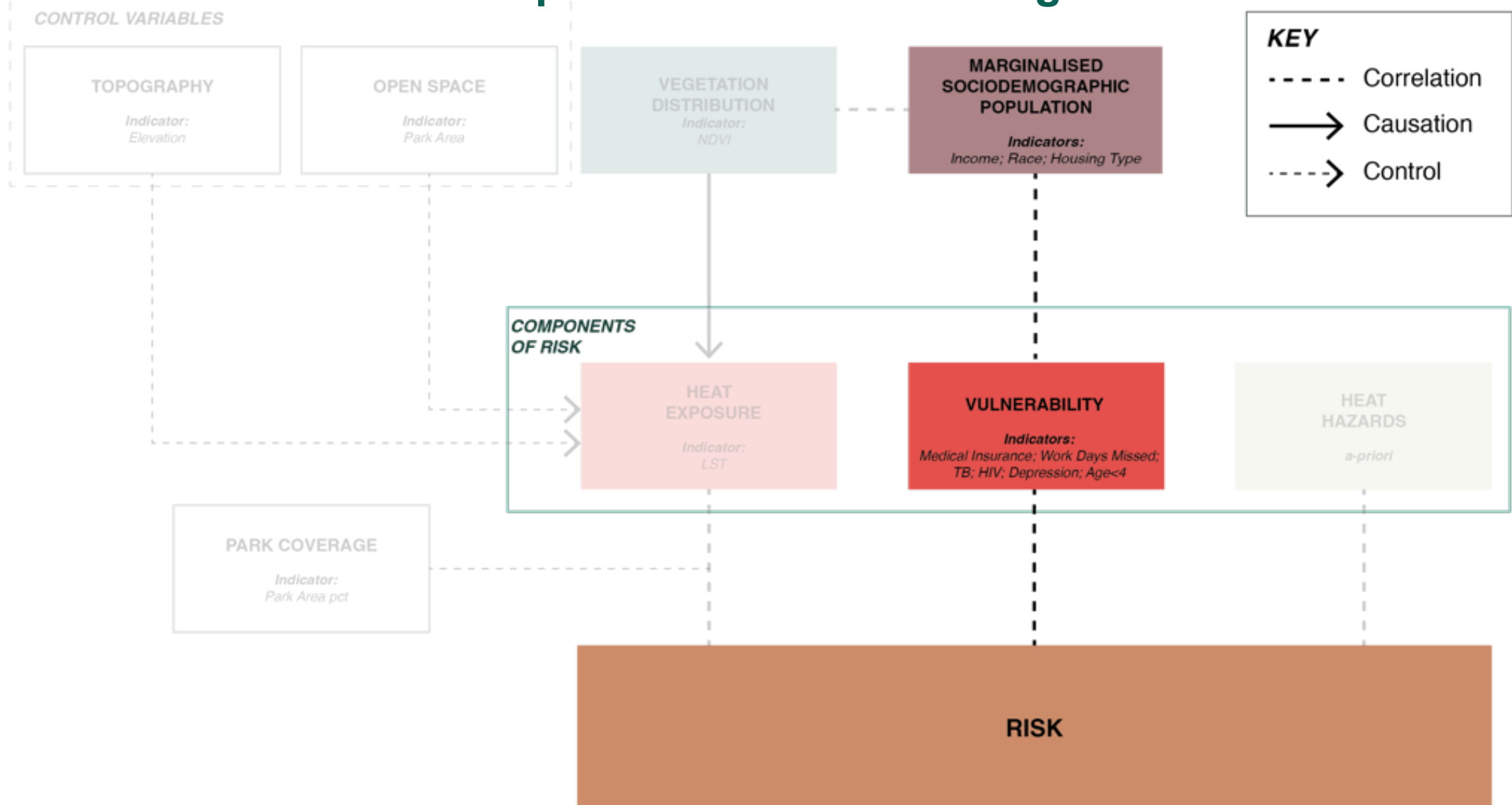
GCRO QOLS

LANDSAT 8  
SATELLITE  
IMAGERY

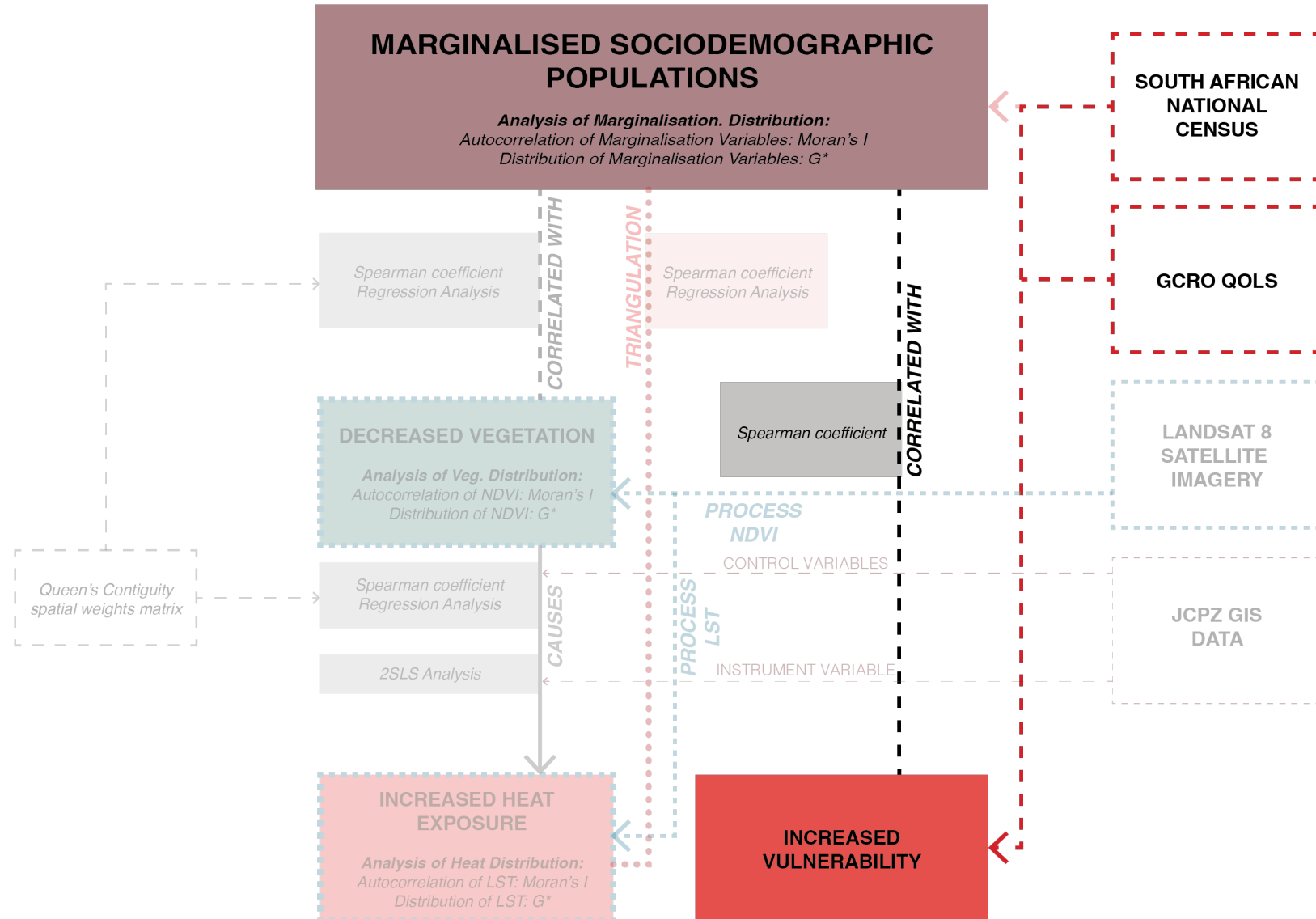
JCPZ GIS  
DATA



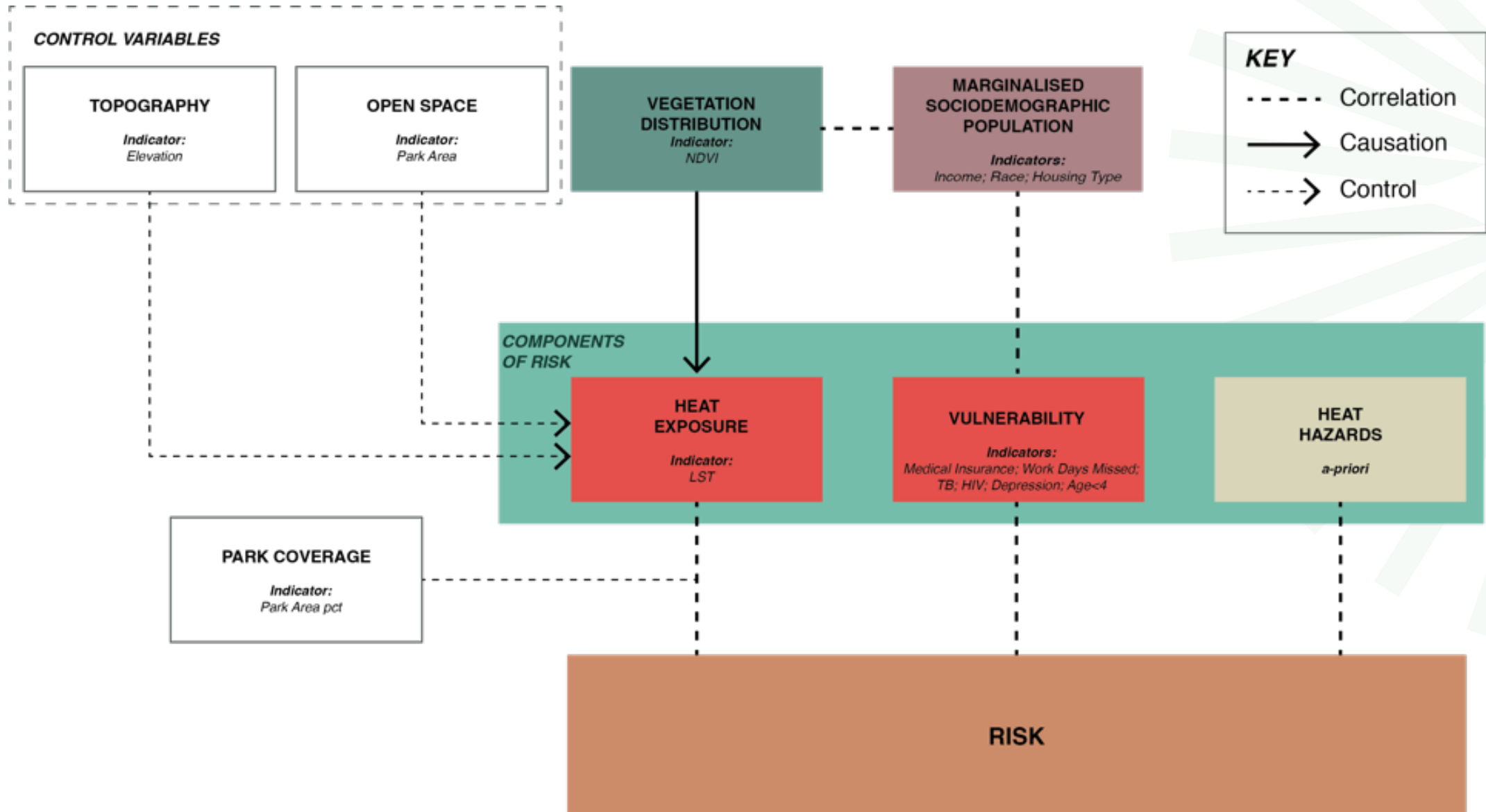
# Are marginalised sociodemographic populations more vulnerable to the adverse effects of heat exposure in Johannesburg?



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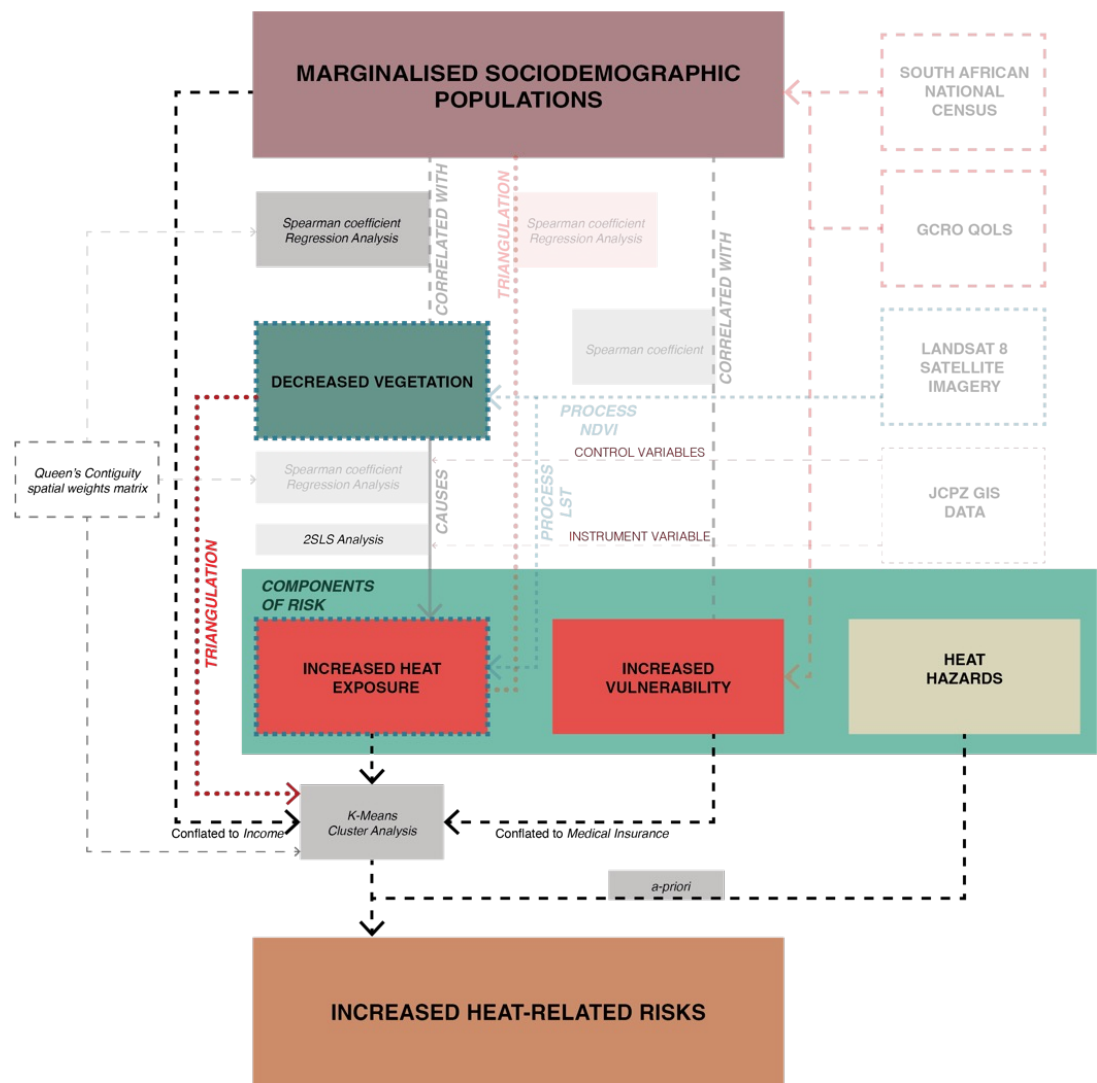


## Do increased heat-exposure and vulnerability intersect to produce outsized heat-related risk among socio-spatially marginalised populations within Johannesburg?

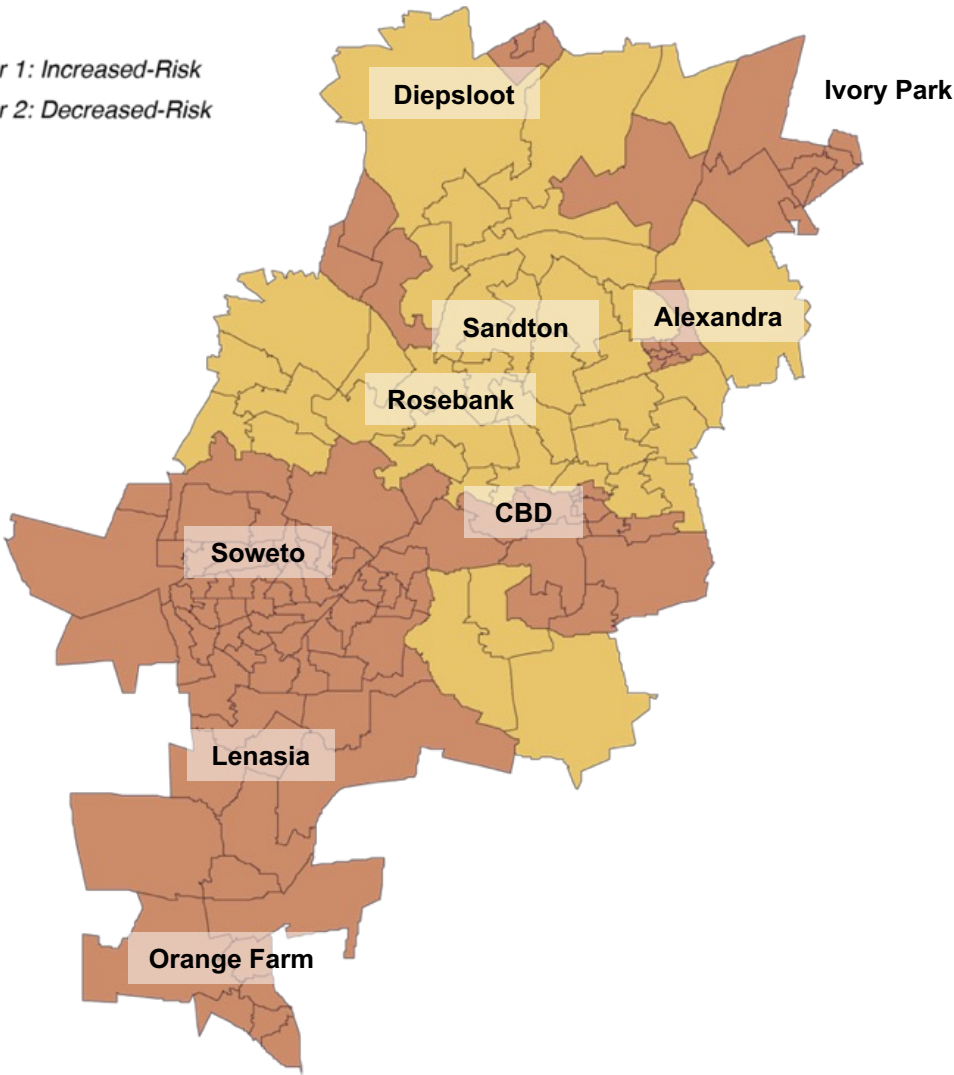


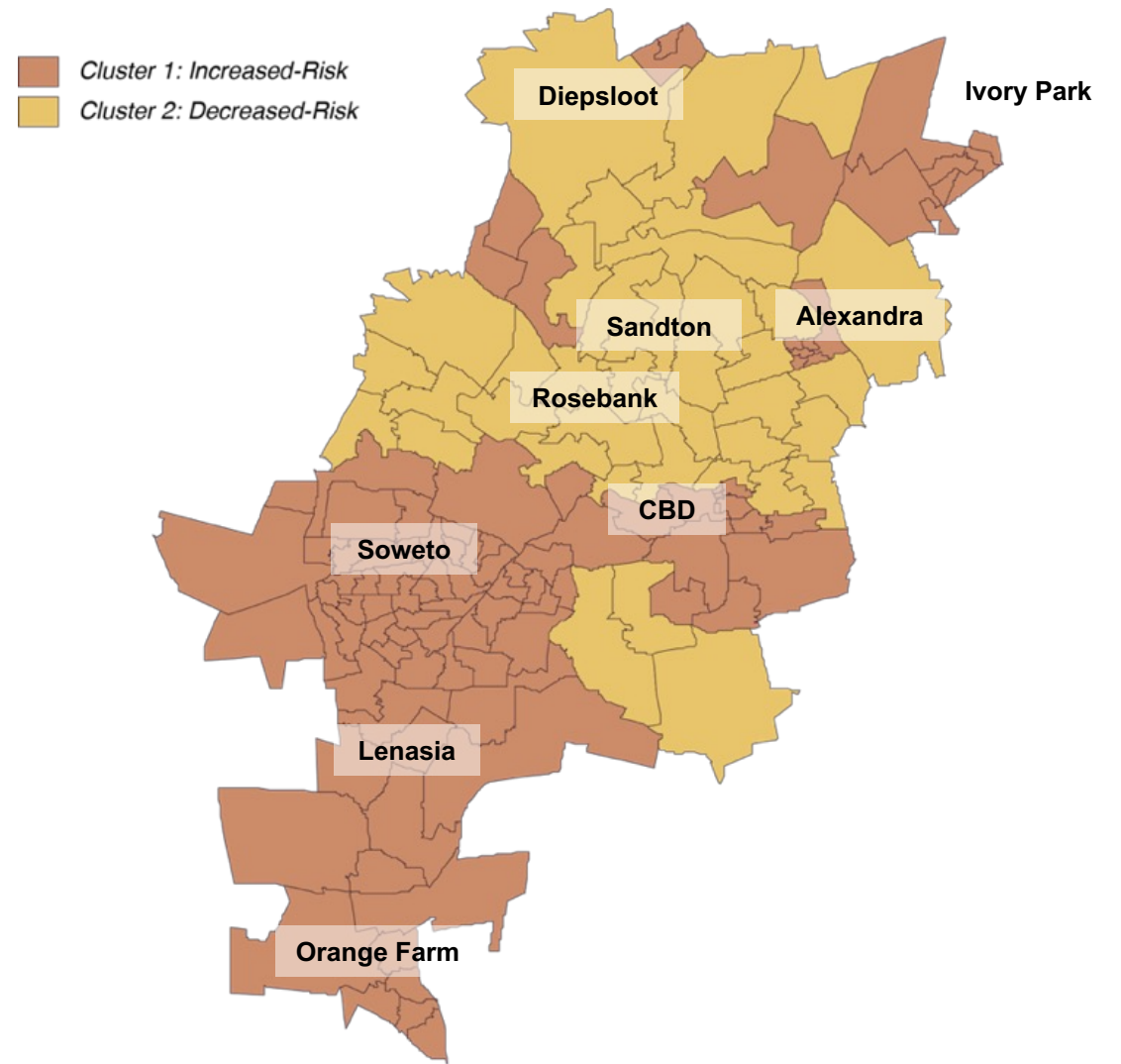
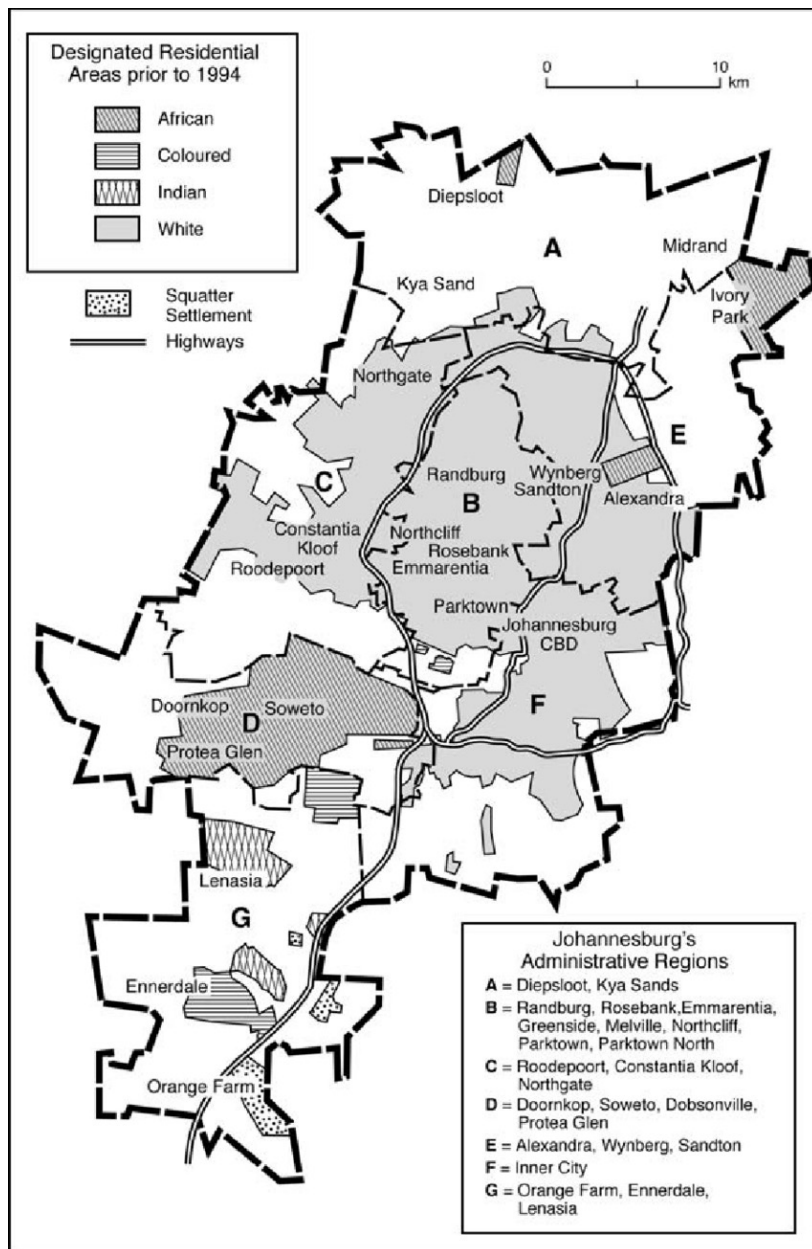


# Do increased heat-exposure and vulnerability intersect to produce outsized heat-related risk among socio-spatially marginalised populations within Johannesburg?



Cluster 1: Increased-Risk  
Cluster 2: Decreased-Risk





# Thank You.



