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Monitoring real estate and urban changes in post-war Damascus using geospatial and economic tools

30 September 2025

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Introduction – Disasters and Real estate

Disaster: a serious **disruption** in the functioning of a **community** (UNDRR 2015), leading to dilapidated infrastructure, social disruption, and strains urban systems (Norris 2002)

- **Market disruptions** in affected and adjacent areas (Bond et al., 2023)
- **Declining property values** in impacted areas (Sheldon & Zhan, 2019)
- **Increased demand** for safer buildings, driving up their value (Morshedi & Kashani, 2020)
- **Loss of property rights** due to local conflicts over scarce real estate resources (Korf, 2005)
- **Corruption** as a driver of property rights conflicts (Cox, 1998)
- **Destruction of real estate registries** (Waters, 1999)

Wenchuan earthquake 2008
(UNDP China)

Hurricane Andrew 12 1992
Times (1992)

Russian-Ukrainian war Bakhmut 2022
(Photo/Roman Playshko, Shutterstock)

Syrian war Damascus 2018
(AMMAR SULEIMAN/AFP/AFP/Getty Images)

Introduction - Urban changes

The form of Urban changes:

- Urban-rural disputes (Wong 2005)
- Socio-economic and geographics disparities (Bolin 1986; Peacock et al. 2014)
- **Spatial differentiation** in neighboring areas (Peacock et al. 1997)

Key research question

Question

Monitoring

How can spatial differentiation of real estate be effectively monitored through economic and geospatial frameworks?

A robust framework for identifying spatial differentiation in real estate values within the Damascus metropolitan area

Supporting balanced post-recovery investment prospects

Promoting equitable and sustainable post-war development

Methodology - Economic and geo-spatial monitoring tools

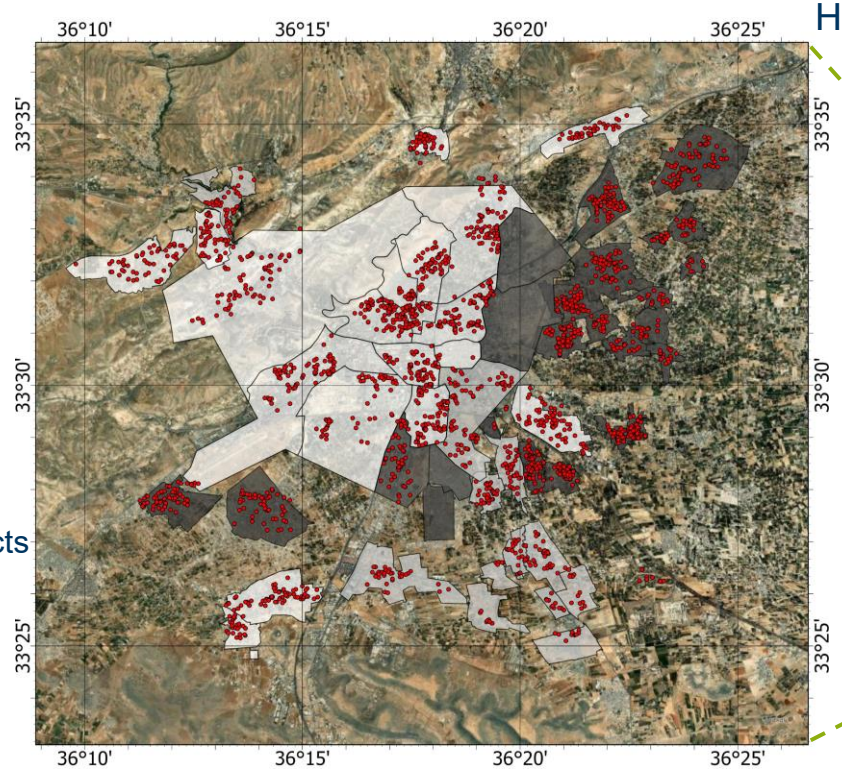
Hedonic Price Method
HPM

Gray-Level Co-occurrence Matrix
GLCM
Homogeneity - Correlation

Severely damaged district (SDD)

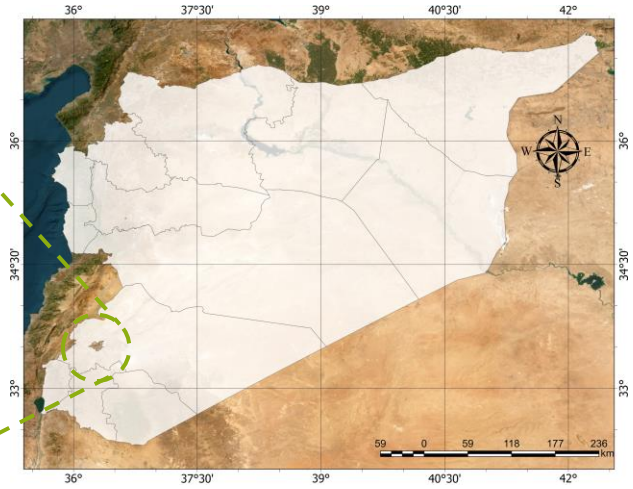
Moderately damaged district (MDD)

Unaffected district (UD)



12 districts DG

37 districts RDG



2,411 housing transactions over the period 2010-2022

Modified from the Syrian Cities Damage Atlas (REACH, UNOSAT, UNITAR 2019; Azzam et al. 2024)

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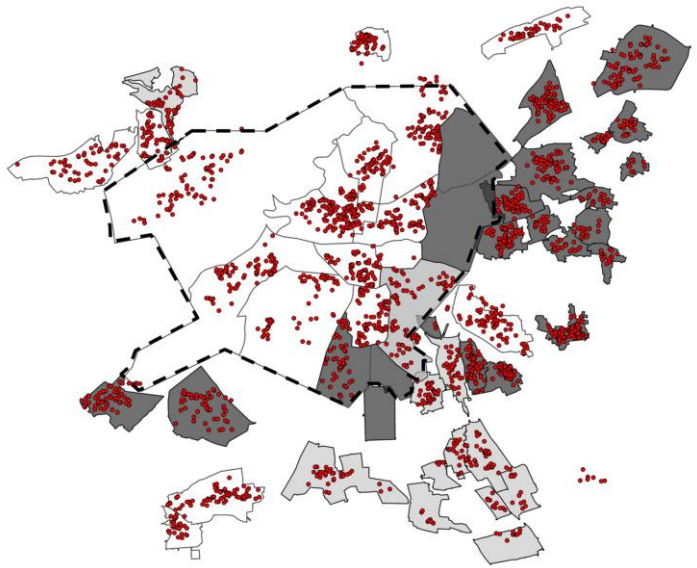
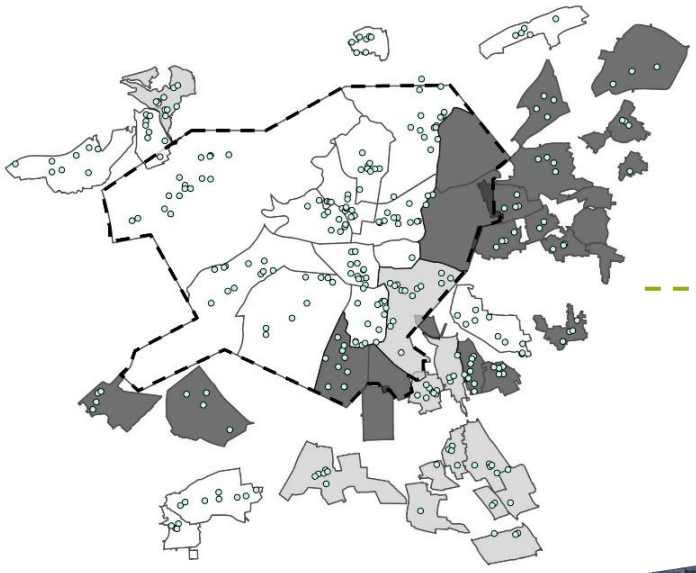
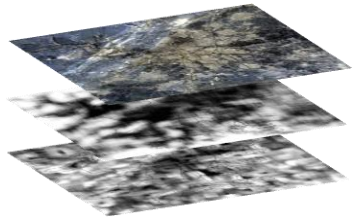




Landsat 8



2,411 housing transactions

250 focused samples

Google Earth Engine

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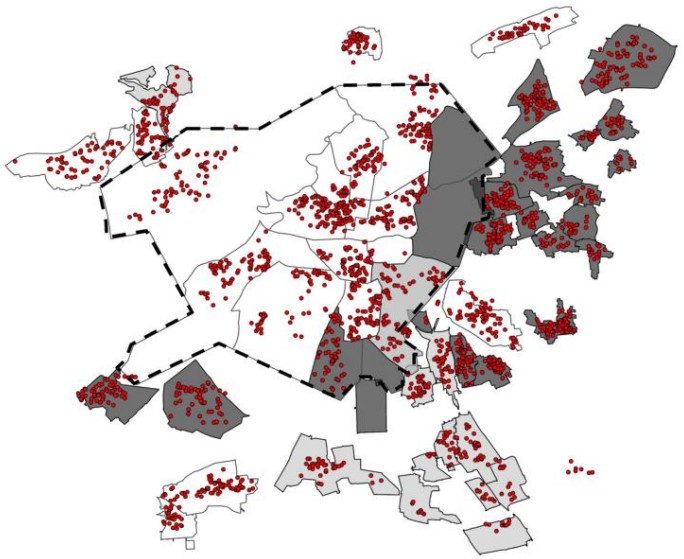
Results - Hedonic price method

Dependent variable

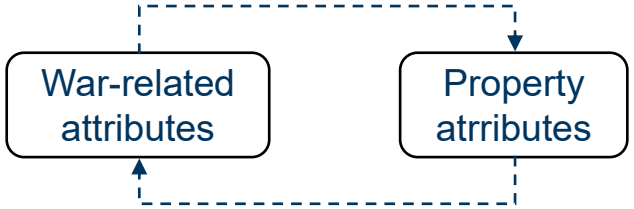
Independent variables

$$LnHP_{iy} = \alpha + P'_{iy}\beta_{i1} + D'_{iy}\beta_{i2} + W'_{iy}\beta_{i3}$$

- **Property attributes:** Size, age, view, Full/partial right ownership, and number of rooms
- **District attributes:** Housing density, quality of infrastructure, proximity to the city center
- **War-related attributes:**
  - Severely damaged district SDD
  - Moderately damaged district MDD
  - Unaffected district UD
  - Severely damaged building SDB
  - Moderately damaged building MDB
  - Lightly damaged building LDB
  - Unaffected building UB
  - Proximity to the nearest conflict point

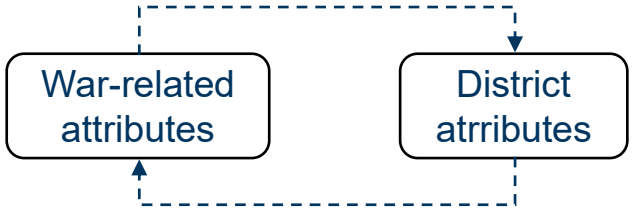


Results - Hedonic price method



Variable	Model 1 Damascus districts	Model 2 Rural Damascus districts
One-unit increase in area (m2)	+0.3%	+1%
One-year increase in age	-0.18%	-0.4%
Severely damaged buildings SDB	-89%	-50%
Moderately damaged buildings MDB	-74%	-47%
Lightly damaged buildings LDB	-74%	-42%
Unaffected buildings UB	-70%	-37%

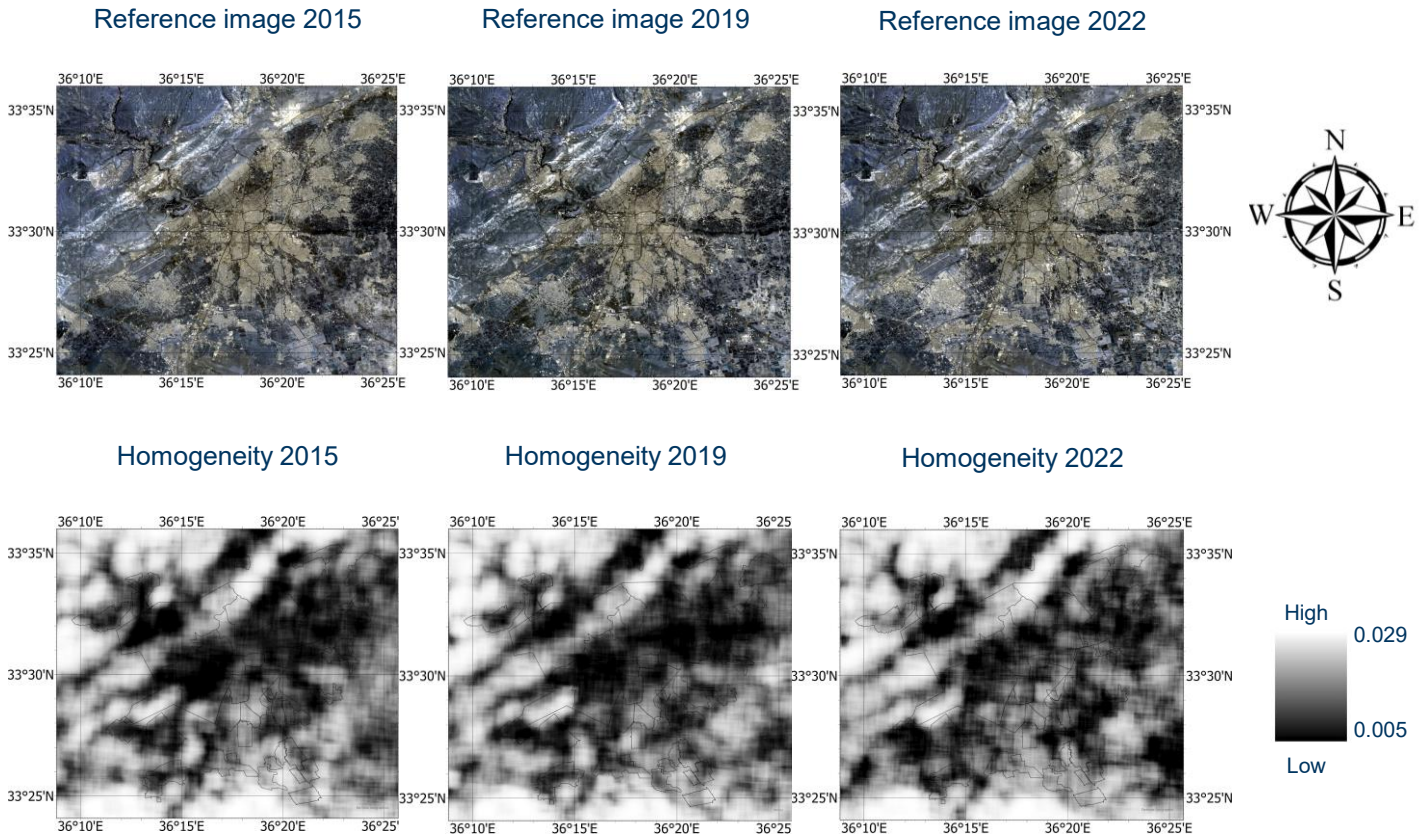
Results - Hedonic price method



Variable	Model 3 Damascus districts	Model 4 Rural Damascus districts
State of neighborhood State_n	+17.5%	+48.7%
Housing density HD	-1.8%	+11%
Quality of infrastructure QI	+47.3%	+15%
Severely damaged districts SDD	-36%	-48%
Moderately damaged districts MDD	-70%	-34%
Unaffected districts UD	-54.7%	-42%
Proximity to the nearest conflict point	-5%	-0.2%

Results - Gray-Level Co-occurrence Matrix

	Rural Damascus districts	Damascus districts
Pre-war period	63% of values exhibited low homogeneity	75% of values exhibited low homogeneity
Wartime period	100% decline in homogeneity	100% decline in homogeneity
Post-war period	The decline rate was 82.1%	The decline rate was 86.4%



Reference image and homogeneity (Azzam et al. 2024)

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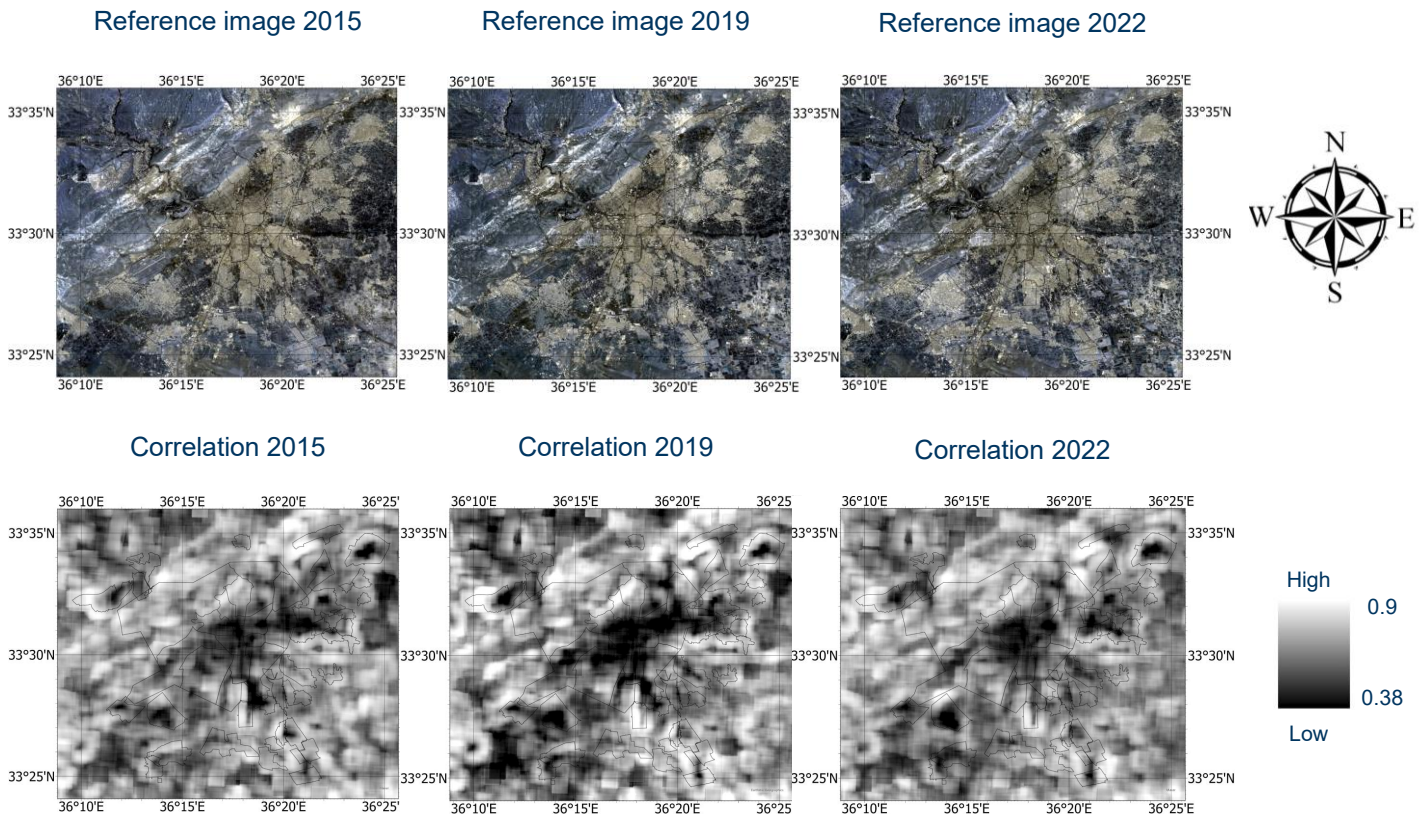
Results - Gray-Level Co-occurrence Matrix



Reference image and correlation (Azzam et al. 2024)

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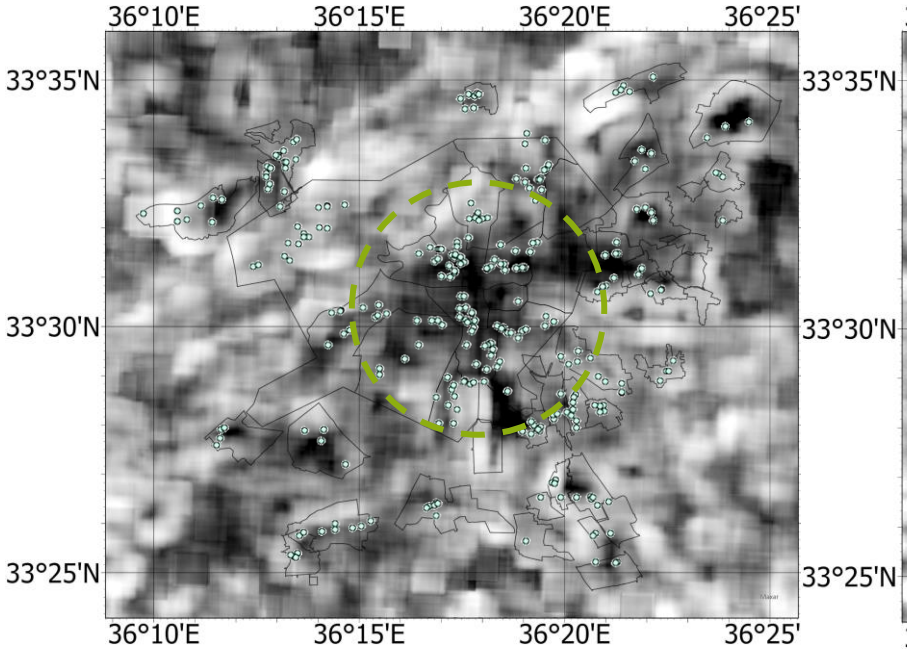
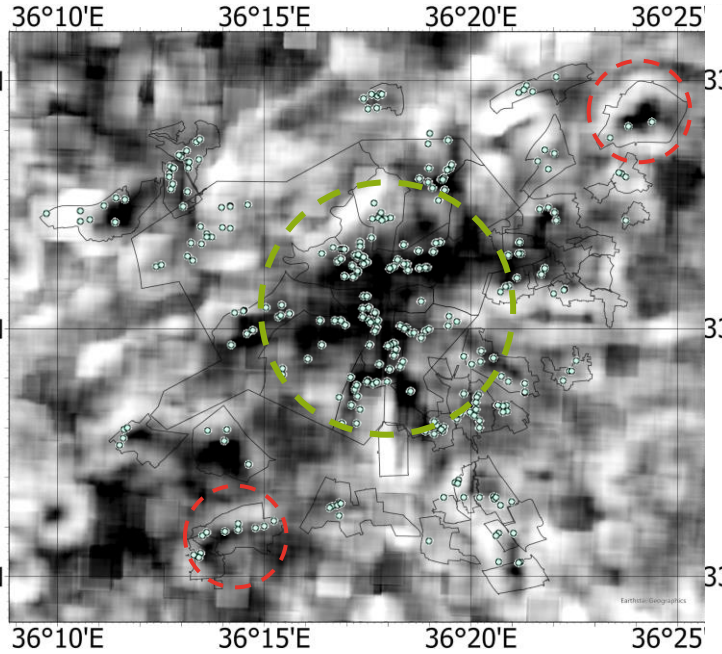
Results - Gray-Level Co-occurrence Matrix

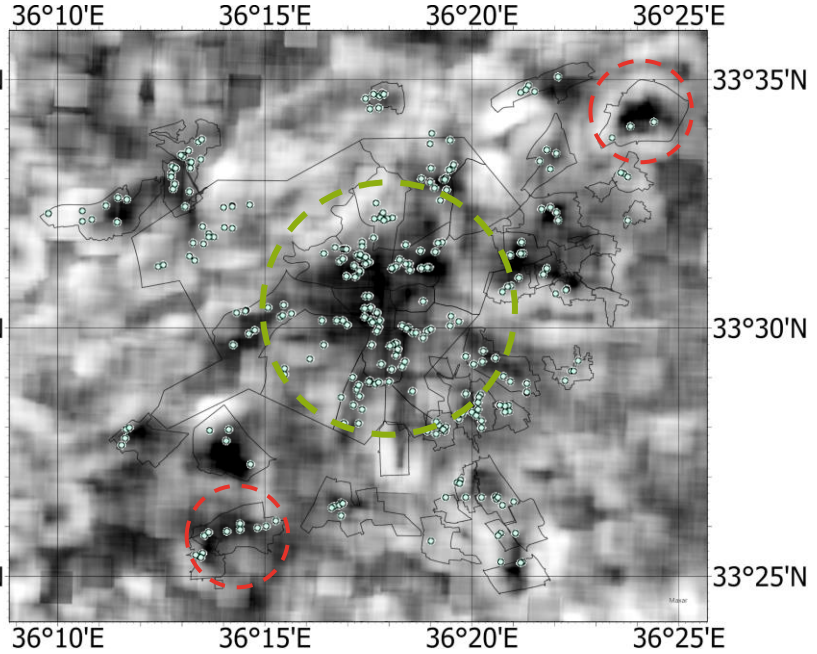
Correlation 2015



Correlation 2019



Correlation 2022



Reference image and correlation (Azzam et al. 2024)

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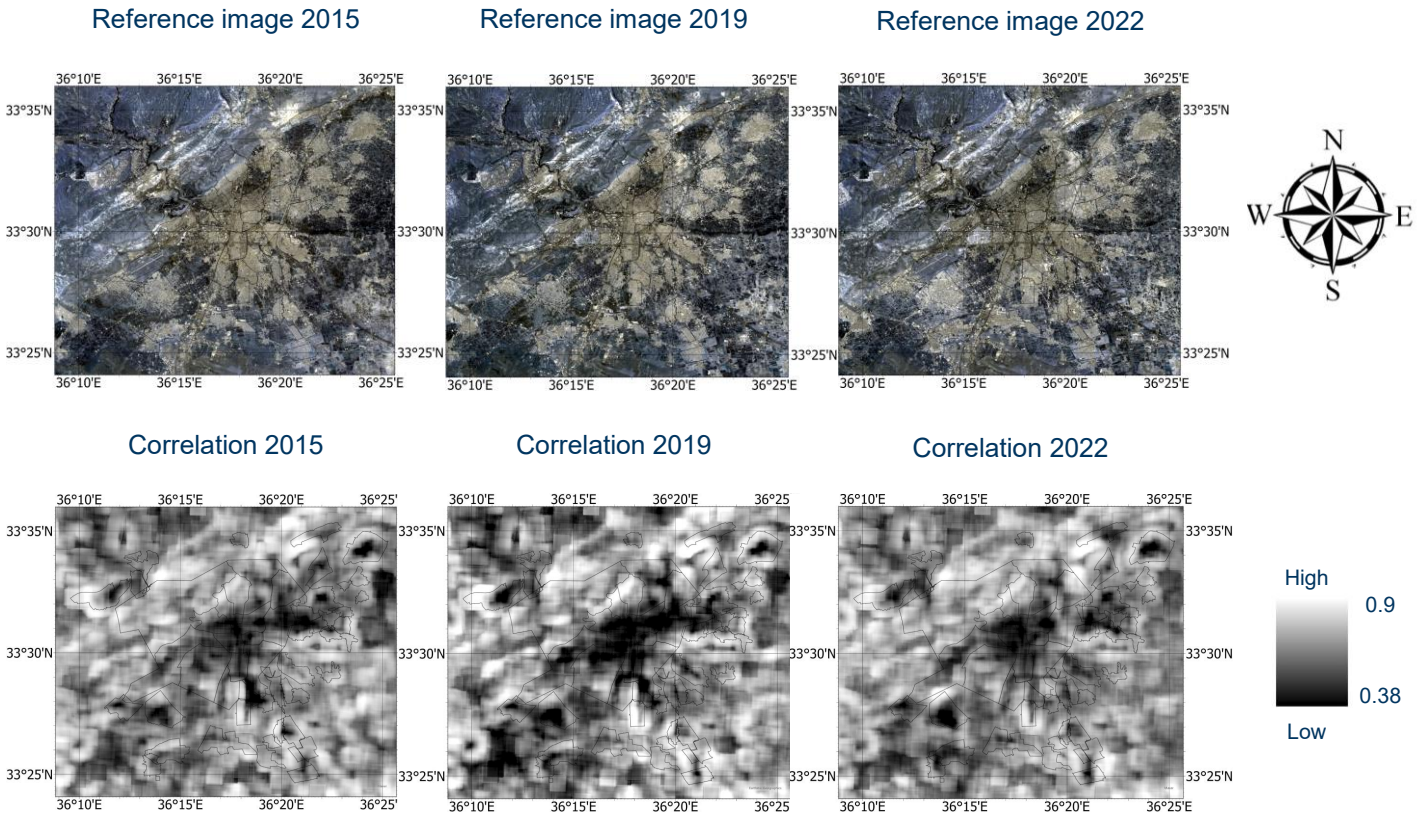
Results - Gray-Level Co-occurrence Matrix

	Rural Damascus districts	Damascus districts
Pre-war period	15% of values exhibited low correlation	41% of values exhibited low correlation
Wartime period	59.3% decline in correlation 47% in UD, 29% in MDD	84.5% decline in correlation
Post-war period	The decline rate was 87.2%	The decline rate was 61.8%



Reference image and correlation (Azzam et al. 2024)

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Key findings

During war

- The war can directly impact the urban texture, causing **both homogeneity and correlation** values to fall below their average levels.
- **Spatial differentiation** in values depreciation linked to **centrality.**

Post war

- **Homogeneity** improved slightly in the post-war period (from 12% to 14%).
- **Correlation** showed an **increasing shift** between Damascus (from -84.5% to -61.8%) and its surroundings (from -59.3% to -87.2%).
- **Center** responded more **positively** to recovery than **surrounding areas**.

Thank you for your attention!

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