Write a narrative store about urbanization, rapid growth of population and development of the Republic of Uzbekistan.

Write about developing economy and its balance with environment in Uzbekistan.

Write about vulnerability to a climate change and about its impact.

Write about actions Uzbekistan taking to tackle climate change issues.

Write about objective of research – understand the implication of a rapid urbanization that is happening in Uzbekistan since 2016.

Show already performed research and ongoing projects for Uzbekistan related to urban development.

Explain methodology of study – available satellite images and performed analysis.

**Core Analysis Areas:**

**Built-up Area Expansion**

1. Tracks urban sprawl and development patterns
2. Measures built-up probability changes over time
3. Calculates expansion rates per year
4. Land Cover Changes
5. Green space distribution and loss
6. Water body changes and availability
7. Impervious surface expansion
8. Vegetation Health Monitoring
9. NDVI (vegetation health) trends
10. Green space connectivity and fragmentation
11. Ecological impact assessment
12. Urban Development Indicators
13. NDBI (urban development intensity)
14. Enhanced Urban Index (EUI)
15. Nighttime lights (urban activity patterns)

Geographic Scope:

14 major Uzbekistan cities including:

Capital: Tashkent

Regional capitals: Samarkand, Bukhara, Fergana, Namangan, etc.

Urban core analysis with 4-15km buffer zones

Temporal Analysis:

10-year comprehensive study (2016-2025)

Annual time series analysis

Year-to-year change tracking

Long-term trend identification

**Key Research Questions Answered:**

* How has urban expansion altered land cover patterns?
* What are the impacts on green space availability?
* How has built-up area distribution changed?
* What are the implications for biodiversity and urban sustainability?

**SUHI analysis**

**Urban Heat Island Analysis and Temperature Patterns**

**Core Analysis Areas:**

**Surface Urban Heat Island (SUHI) Assessment**

* Quantifies temperature differences between urban cores and rural surroundings
* Calculates SUHI intensity using LST\_urban - LST\_rural formula
* Analyzes both day and night SUHI patterns
* Tracks SUHI changes over 8-year period (2016-2024)

**Multi-Source Thermal Data Integration**

* **MODIS LST**: Primary thermal data at 1km resolution
* **Landsat 8/9 Thermal**: Enhanced resolution thermal data (~100m)
* **ASTER LST**: Additional thermal source (~90m resolution)
* **Composite Thermal Products**: Combined thermal sources for improved accuracy

**Advanced Urban-Rural Classification**

* **Dynamic World V1**: 10m land cover probabilities
* **GHSL (Global Human Settlement Layer)**: Built-up surface data
* **ESA WorldCover**: High-resolution land cover classification
* **MODIS Land Cover**: Consistent temporal coverage
* **GLAD Global Land Cover**: Additional urban validation

**Vegetation and Environmental Monitoring**

* **NDVI Analysis**: Urban vs rural vegetation health
* **NDBI Calculation**: Urban development intensity tracking
* **NDWI Assessment**: Water body and moisture patterns
* **Multi-spectral indices**: Comprehensive environmental indicators

**🏙️ Geographic Scope:**

**14 major Uzbekistan cities including:**

* **National Capital**: Tashkent (15km buffer)
* **Regional Capitals**: Samarkand, Bukhara, Fergana, Namangan, Andijan
* **Administrative Centers**: Nukus, Jizzakh, Qarshi, Navoiy, Termez, Gulistan
* **Urban Cores**: Variable buffer zones (8-15km) based on city size
* **Rural Reference Areas**: 25km ring zones for comparative analysis

**📅 Temporal Analysis:**

* **9-year comprehensive study** (2016-2024)
* **Warm season focus** (June-July-August) for maximum SUHI effect
* **Annual time series analysis** with year-to-year change tracking
* **Long-term trend identification** and statistical analysis

**🔬 Key Research Questions Answered:**

1. **How has urban heat island intensity changed over time?**
2. **What are the temperature differences between urban and rural areas?**
3. **How do day vs night SUHI patterns vary across cities?**
4. **What are the correlations between urban development and heat patterns?**
5. **Which cities show the most significant warming trends?**

An interactive city fact sheet