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"SOLUTIONS ATLAS" FOR THE FERGANA AND MARGILAN AGGLOMERATION: TOWARDS SUSTAINABLE, SMART, AND CULTURALLY INTEGRATED URBAN DEVELOPMENT

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Abstract:
This paper explores the development and strategic importance of a proposed "Solutions Atlas" for the agglomeration of Fergana and Margilan—two historically and culturally significant cities in the Fergana Valley. In response to accelerating urban growth, infrastructure demands, and environmental challenges, the Atlas aims to serve as a comprehensive planning framework that integrates sustainable urban design, artificial intelligence (AI) tools for decision-making, ecological strategies, principles of urban acoustics, and housing renovation mechanisms. Emphasis is placed on preserving the region's architectural heritage while guiding a human-centered, future-oriented urban transformation.

Keywords: Fergana, Margilan, urban agglomeration, sustainable development, artificial intelligence, urban acoustics, air quality, public spaces, cultural identity, renovation, housing redevelopment.

Introduction

Fergana and Margilan, located in the heart of Uzbekistan's populous Fergana Valley, are undergoing increasing demographic pressure and spatial convergence.

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Traditionally distinct urban centers, they are now merging into a single urban corridor, necessitating a cohesive, innovative, and sustainable approach to regional planning. The proposed *Solutions Atlas* is envisioned as a strategic roadmap to ensure balanced development by addressing infrastructure, environmental quality, public space design, local identity preservation, and urban renewal through an interdisciplinary lens.

Core Objectives of the Solutions Atlas

The *Solutions Atlas* proposes a unified methodology across six thematic pillars:

1. Urban Infrastructure Design Powered by Artificial Intelligence (AI): Implementation of AI-based simulations to optimize traffic flow, predict population density, and manage public services in real time.
2. Environmental Protection and Air Quality Management: Introduction of green infrastructure, urban forestry, and passive ventilation to improve air quality and enhance urban climate resilience.
3. Architectural Harmonization: Guidelines to integrate modern design approaches with traditional aesthetics, drawing from Margilan's textile heritage and Fergana's modernist architectural legacy.
4. Urban Acoustics and Noise Mitigation: Strategic noise mapping, zoning, and the use of sound-absorbing materials to reduce transport and industrial noise, especially in residential and educational areas.
5. Inclusive and Livable Public Spaces: Development of accessible, multi-functional public spaces that encourage community interaction and promote psychological well-being.
6. Urban Renovation and Housing Redevelopment: A special focus is placed on the implementation of structured renovation (renovatsiya) strategies to modernize aging housing stock and optimize urban land use. Renovation programs are designed in several phases:

- Phase I: Identification of renovation-prone areas in Fergana and Margilan and development of corresponding architectural plans. Residents are offered either new housing units or financial compensation. All agreements are formalized individually and certified by notaries. District-level Renovation Funds are established to finance these projects.

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- Phase II: The renovation program is reviewed and approved by regional and national planning councils. Designated construction firms are selected via transparent procedures.
- Phase III: Construction of new residential buildings is completed, and residents are resettled accordingly. The newly built multi-storey structures often include commercial, service, and small-scale production facilities on their ground and first floors.

These steps are expected to significantly enhance the economic potential of renovated areas while ensuring that the process remains equitable and beneficial for current residents. It is estimated that the implementation of this system will help save approximately 20,000 hectares of land, with the first phase alone aiming to construct around 20,000 new housing units.

Methodological Approaches

At the heart of the Atlas is the creation of digital twins for both cities—interactive virtual models for simulation, forecasting, and spatial planning. AI algorithms enable real-time data analysis to anticipate the impact of planning decisions before they are executed.

For example, rush-hour congestion is modeled together with pedestrian safety, acoustic exposure, and pollution levels. This allows the redesign of urban road networks in ways that reduce stressors and improve livability.

Ecological and Acoustic Urban Design

Environmental sustainability is a foundational element of the Atlas. Measures include expanding vegetative corridors, promoting permeable urban surfaces, and developing green roofs and gardens. Air quality sensors at key intersections feed data into planning dashboards that inform real-time maintenance and interventions.

From the acoustic standpoint, quiet zones are planned in residential and educational areas, guided by sound-mapping technologies and reinforced by land use zoning and facade soundproofing. These policies align with Uzbekistan's national green policy under the "Yashil Makon" initiative (Presidential Decree No. PF–6319, 2021).

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Architecture and Cultural Identity

A major aim of the Atlas is to uphold and reinterpret the rich architectural identity of both cities. In Margilan, known for its silk weaving traditions, new public buildings may feature ikat-inspired designs and textures. In Fergana, newly planned districts aim to blend modernist layouts with regional ornamentation and sustainable materials, ensuring aesthetic continuity and cultural resonance.

Conclusion

The *Solutions Atlas* is not merely a set of urban planning instructions; it is a visionary instrument for resilient, inclusive, and culturally rich urban transformation. By integrating AI, ecological sensitivity, architectural renovation, acoustic planning, and heritage preservation, it becomes a dynamic framework capable of evolving with urban challenges.

Furthermore, the Atlas is fully aligned with the *New Uzbekistan Development Strategy for 2022–2026* (Presidential Decree PF–60, 2022), which prioritizes innovation-driven growth, smart urban infrastructure, and citizen-oriented development. Renovation strategies introduced within the Atlas will serve as key tools to ensure spatial efficiency, housing modernization, and improved quality of life for the urban population.

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