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Smart Cities in Postwar Karabakh

Comparative Insights from the Balkans

Orkhan Nadirov, Vusal Mammadzayev, and Bruce Dehning

The development of a Smart City concept is essential for many devastated regions including Karabakh. While traditional methods typically address basic infrastructure repairs, implementing smart city solutions can promote long-term sustainability and enhance the well-being of individuals affected by war. The Smart City concept is viewed as a promising solution for challenges in postwar regions, and scholars argue that it effectively aids in developing post-conflict zones. This approach relies on the concept that it enhances emergency forecasting and planning, assesses disasters, and effectively manages

and shares geographic information. Failure to implement smart city initiatives in postwar zones could significantly delay recovery efforts and sustainable development, hinder economic growth, and diminish resilience against future disasters.

This paper examines the smart city concept as a vital strategy for the Karabakh region. It draws on lessons from the post-conflict Western Balkans, highlighting the key challenges these regions encountered in developing smart cities and, thus, aims to provide insights for the Azerbaijani government to learn from their experiences.

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The Azerbaijani Context

Azerbaijan has been dedicated to implementing the "smart city" concept since the "National Action Plan for the Promotion of Open Government for 2020-2022" was approved by President Ilham Aliyev on 27 February 2020 and, more specifically, his 19 April 2021 executive order to advance both "smart city" and "smart village" initiatives.

Consequently, a working group was formed to promote these concepts throughout Azerbaijan. Currently, the regions of Karabakh and Eastern Zangezur, recently liberated from nearly three decades of Armenian occupation, are being reconstructed using the principles of "green energy," "smart city," and "smart village."

The first village, Aghali, was established in the Zangilan district, and families already reside there. Plans are underway for a second village, Dovlatyarli, in the Fuzuli district, funded by the Azerbaijani government. A third initiative is also being developed

for the village of Bash Garvand in the Aghdam district.

However, significant challenges exist, notably the high initial costs associated with these projects, which include infrastructure development and the integration of advanced technologies. Infrastructure has to be built from scratch due to the devastation in the area, and as ADA University's Anar Valiyev has emphasized in various publications, the needs of the returning population (having again become the local population) must be prioritized.

Sustainable financing poses another concern, as these initiatives largely depend on government grants and international aid that may not be consistently reliable. The Azerbaijani government has committed substantial funds to the smart city and village projects, indicating strong initial investment.

However, there are worries about the future sustainability of this funding. These projects' economic viability hinges on attracting

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private investments and managing operating costs effectively. High infrastructure expenses and regulatory obstacles may deter private sector involvement, making it challenging to ensure the economic health of these projects if reliant solely on public funds.

Overall, the potential for smart cities and villages in Azerbaijan is promising. Its success will depend on addressing the financial challenges, infrastructure needs, and the involvement of both public and private sectors to create sustainable urban environments.

Managing Financial Difficulties

By 2030, approximately 150,000 new jobs are anticipated to be created in the Karabakh economic region, as stated by Emin Huseynov, Special Representative of the Azerbaijani President for parts of the liberated regions. The job creation projections include about 5,000 positions in the

Aghdam Industrial Park, 15,000 to 17,000 in agriculture, 1,500 to 2,000 in mining, 1,500 to 2,000 in tourism, and around 10,000 to 11,500 in small and medium-sized enterprises (SMEs).

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The first phase of the Great Return program aims to be completed by the end of 2026, facilitating the return of 34,500 families, approximately 140,000 individuals, to the liberated areas of Karabakh and East Zangazur, with plans for 34,500 new apartments and homes. This reflects the government's effort to balance job creation with the resettlement of people. However, a significant gap between job creation and resettlement figures could hinder the development of a smart city.

Achieving the target of 150,000 new jobs by 2030 while resettling 140,000 individuals by 2026 is critical. Addressing this four-year gap is essential for the initiative's success, ensuring that the number of new jobs aligns with resettlement efforts, thus contributing to the overall development of the Karabakh region.

Educating the Community

The evolution and prosperity of a city are significantly influenced by its intellectual capacity, which serves as a key indicator of the knowledge and skills possessed by the local population. This intellectual capacity is essential for fostering economic growth and driving innovation. A primary means of enhancing intellectual capacity is through education. Consequently, a country must invest in educational institutions to ensure its population is adequately educated.

Furthermore, the predominant argument for fostering innovation in urban environments centers on the co-location of economic actors and educational institutions. This interaction among government, industry, and academia is conceptualized within the framework of the triple helix model. An examination of different case studies in the United States, Europe, and South America all point to the significant role of educational institutions in achieving a high level of innovation. Furthermore, extensive research indicates that educational institutions play an important role in entrepreneurial activities by providing essential skills and acting as knowledge intermediaries and gatekeepers.

Therefore, educational institutions are vital in creating knowledge-based urban economies or smart cities.

President Aliyev signed a decree establishing Karabakh University on 28 November 2023, seen as an important step by the government to increase the intellectual capital of the liberated areas. The main purpose behind the establishment of this university is to address the need for skilled professionals, armed with innovation skills, in the socio-economic life of Karabakh and serve as a symbol of reconstruction and revitalization efforts in the liberated areas.

The university offers a wide range of social sciences, humanities, and engineering programs to be a leading institution in the South Caucasus. Located in the city of Khankendi, the university plans to enroll 1,000 students during its initial phase. "Following our brilliant victory in the Patriotic War, schools built to the most modern standards are now in operation in the liberated territories. The future worthy citizens are studying in these schools. The newly established Karabakh University will undoubtedly rejuvenate the historical educational environment

in the region in the near future,” Aliyev said in his congratulatory letter to the participants of the 16th Congress of Azerbaijani Teachers. Consequently, establishing Karabakh University represents a strategic initiative to enhance the human resource potential in the liberated regions.

Nevertheless, this investment should be well-planned to avoid oversaturation of educational institutions. While establishing educational facilities is crucial, excess can result in inefficiencies and the misallocation of resources. Firstly, maintaining and staffing multiple educational institutions incurs significant public financial commitments, potentially leading to the suboptimal use of taxpayer funds. Secondly, the proliferation of schools may dilute educational quality, as resources could become insufficiently allocated among numerous institutions. Thirdly, certain schools may experience low enrollment rates, rendering them financially unviable. Therefore, policymakers and urban planners need to achieve a harmonious balance between the number of educational facilities and the population they serve.

Engaging Citizens

Creating smart cities in Karabakh necessitates the active involvement of citizens. Research indicates that a lack of citizen participation in developing smart cities can result in unsuccessful outcomes. Citizen participation brings numerous benefits. First, the firsthand experiences of citizens contribute to developing more effective plans, solutions, and services. Some citizens possess valuable skills and knowledge that may not be available to city authorities. Engaging these individuals early on can provide critical insights to tackle issues proactively and reduce the chances of failure.

Additionally, actively involving citizens can facilitate the collection of environmental and other data through smartphones and various other technologies. For instance, the UK “FixMyStreet.com” application allows citizens to report problems related to roads and infrastructure. Another noteworthy initiative is the “Green Watch” project, which provides smartwatches to citizens to measure ozone and noise levels in their daily lives in Paris. Such projects significantly lower costs while empowering citizens to take

an active role in environmental monitoring and regulation. Additionally, the involvement of citizens fosters democracy within local communities and is beneficial for developing sustainable local environments.

Currently, there is insufficient citizen participation in the development of smart projects in Azerbaijan, which could undermine their long-term effectiveness. Hence, to foster this active engagement, the government must implement various initiatives, including e-participation, open data access, interactive mapping, and proactive communication strategies, to build trust and encourage participation.

Technology now enables the concept of e-participation. These services can be initiated by the Azerbaijan government or by citizens themselves. A popular method for government-led participation is the participation platform. This platform allows citizens to submit their ideas, vote on their favorites, and engage with one another. Through this platform, as citizens contribute, the government can

gather valuable information to effectively design and enhance smart city projects.

Furthermore, access to open data is an important factor in achieving higher citizen engagement in smart projects. The availability of data about environmental conditions, energy consumption, and public services helps citizens better understand the operations of smart cities. Therefore, successfully implementing data governance policies and collaborating with tech companies and academic institutions would allow the Azerbaijan government to develop user-friendly data platforms.

According to several studies, another effective tool to achieve citizen engagement is the creation of interactive maps with information about infrastructure projects, park locations, available Wi-Fi hotspots, and other community resources. Such resources would be very helpful in helping citizens recognize and appreciate the benefits of smart initiatives. Moreover, an interactive mapping platform would be even more effective in enhancing citizens’ involvement if feedback and

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suggestions features were enabled through it. Lastly, proactive communication from local authorities in Karabakh, such as frequent updates on social media, community or town hall meetings, online surveys, newsletters, and suggestion boxes, would ensure citizens' consistent and inclusive involvement in planning and implementing smart initiatives in the liberated areas.

Balkan Insights

Examining smart city initiatives and learning challenges in parts of post-conflict Western Balkans can offer valuable insights into the reconstruction of Karabakh. Here, we will look at three examples, starting with one from the capital of Bosnia and Herzegovina, Sarajevo.

Smart cities utilize insights from communities and businesses to develop technology-driven solutions that improve quality of life. The Smart Sarajevo Initiative, which began in December 2018, is one of the pioneering smart city projects in Bosnia and Herzegovina, which is led by UNDP in partnership with local governmental bodies.

This 15-month program aimed to involve the community, encourage cooperation among various

stakeholders, and tap into local expertise to create innovative concepts for a more livable urban environment. It focused on employing technology and digitalization to enhance public services and support a smart urban economy, prioritizing residents' health, and quality of life. A specific pilot area of 2 km² in the central Sarajevo municipality of Stari Grad acted as a testing site for multiple initiatives.

Concurrently, what was called City Mind Lab was established, which consisted of over 120 volunteers to assist in the initiative's development. In 2019, nearly 1,300 individuals participated in shaping a distinct urban vision for the municipal future of Sarajevo, highlighting key priorities and issues that they believed required attention. A survey conducted in March 2019 indicated that residents identified air pollution, inadequate public transportation, and corruption as significant issues.

Our second example focuses on Serbia, where various small-scale smart city projects and technological advancements are emerging nationwide. Though they face numerous challenges, leading cities like Belgrade, Novi Sad, Kragujevac, and Niš are at the forefront. The Serbian government has prioritized digital transformation,

recognizing the importance of smart cities for future governance. Initiatives focus on smart mobility, digitizing public services, and implementing smart energy solutions like public lighting and electric vehicle charging stations. Communication improvements, including city cloud data centers and public wifi servers, are also underway.

Standardized data collection and service delivery methods are essential for maximizing the benefits of smart technologies. The Parking Maniac app exemplifies this, helping users locate available parking spots via mobile networks and GPS.

Publicly accessible, machine-readable data will allow private companies and citizens to analyze information and create new applications. Engaging citizens in decisionmaking is crucial for developing smart communities. Serbia's open data initiatives, like the Open Data Hub launched in December 2021, aim to connect stakeholders to enhance public services.

Additionally, the Strategy for the Development of Artificial Intelligence (2020-2025) seeks to leverage AI for economic growth, especially in agriculture and industry, showcasing Serbia's commitment to

smart city transformation. A publication titled "Smart Cities of Serbia" Innovation and Resilience of Local Communities in Serbia" (2021) examines the concept of Smart Cities, highlighting its significance beyond just technological advancements in tackling urban issues and fostering sustainable development. It describes smart cities as collaborative environments where various stakeholders work together to achieve economic, social, and environmental sustainability.

The COVID-19 pandemic underscored the vulnerabilities faced by cities, illustrating how health threats intensified pre-existing territorial and social disparities. Despite this, the crisis accelerated the integration of digital technologies into urban living. Emerging challenges led to improvements in digital infrastructure, incorporating measures such as social distancing into the Smart City model. Engaging citizens is vital for creating smart communities, which requires initiatives like open data access, interactive mapping, and proactive communication from local authorities to build trust and participation.

As various reports indicate, several measures must be undertaken to help Serbia's smart city initiatives thrive. A key step

involves enhancing smart management practices and expanding initiatives in this area. Both at the national and local level, governments will need to foster a stronger relationship with the public and actively involve them in implementing significant projects.

Educating the community about the significance of smart cities also remains an unfulfilled task, as there is still a lack of enthusiasm towards these concepts among the populace.

Our third example is Kosovo, whose attempted secession from Serbia is unrecognized by Azerbaijan, together with around half of other UN member states (including, obviously, Serbia itself). Still, its local authorities, have sought to take a few strides in the direction of establishing the basis for incorporating the smart city concept in their urban planning endeavors.

Launched in September 2020 and overseen by the University for Business and Technology (UBT), a project that aims to prepare a Kosovo-wide strategy for “smart and sustainable urban development” as well as prepare smart city strategies for seven cities scattered across the territory was launched. It consists of a mapping study that provides an inventory of smart city

innovations and tools currently implemented, initiated, or planned by local self-government units in Kosovo. It also examines how the COVID-19 pandemic has influenced the attention and development of these smart city solutions. Problems that were uncovered by those survey during the project include budget constraints (27.1 percent), a lack of technical expertise (12.5 percent), the necessity for a long-term plan (12.5 percent), inadequate supporting infrastructure (10.4 percent), and insufficient internal capacities (6.3 percent).

However, besides investing in technological infrastructure and funding, there should be a focus on enhancing workforce skills. It is important to train officials in the relevant procedures and policies associated with new initiatives to ensure they have the skills to manage these systems effectively. Another significant drawback is the lack of cooperation among municipalities, which is essential for sharing experiences and lessons learned in smart city initiatives.

Lessons and Challenges

A primary challenge identified from the Western Balkan examples is the financial constraints they encountered, a

factor that Azerbaijan must also consider in its future planning. Financial resources can be generated without solely relying on the government budget—i.e., they can be supplemented through international donors, including through the engagement of multilateral organizations like the World Bank and UNDP. Also, fostering public-private partnerships is essential to attract international and local investors to the Karabakh region. Diverse funding strategies are critical for revitalizing and modernizing urban and rural areas in post-conflict zones, ensuring a sustainable and effective reconstruction process in Karabakh.

Data reliability is essential for effectively planning and implementing smart city initiatives in various regions. Upcoming research should concentrate on collecting high-quality data that reflects the unique context of Karabakh, including socio-economic metrics, the region’s geographic features, and ongoing reconstruction and community enhancement projects tailored to these conditions.

Such comprehensive information will enable more precise assessments and facilitate better decision-making, ultimately streamlining the implementation process.

Transforming a city into a smarter one starts with recognizing the needs and aspirations of its residents, as well as discovering creative solutions and concepts that can help meet those needs. Therefore, engaging local communities in both the planning and execution stages is vital for the success of smart city initiatives.

Since 2013, the Friedrich Naumann Foundation for Freedom has focused on promoting the smart city concept in the Western Balkans, especially at the local government level. Their mapping studies have been crucial in sharing experiences across the region, which emphasizes practical communication, discussion, and implementation of empirical data through initiatives that include educational programs, cross-border/boundary networking, and dialogue.

Data reliability is essential for effectively planning and implementing smart city initiatives in various regions.

Parts of this model could apply to Karabakh: focusing on the local level and strengthening connections to educational institutions, for instance. Also, local population involvement in developing the “smart city” concept, which can foster a sense of ownership and collaboration while enhancing their understanding of technology-related issues.

This approach boosts the relevance and effectiveness of smart city projects and their sustainability. By examining regional successes and conducting further research to address data gaps and specific needs, Karabakh can tackle these challenges and pioneer smart city development in the diverse landscape of this postwar region. **BD**

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