

Chapter 4

Urban Resilience through Participatory Governance and Resident Satisfaction in Informal Housing, Batna, Algeria

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Introduction

The phenomenon of informal neighborhood in Algeria highlights profound structural shortcomings in urban governance. As Belguidoum and Mouaziz-Bouchentouf (2010) describe this situation as a paradox of urban policies, where the State fails to regulate urbanization, thereby allowing contested urban spaces to emerge. In most Algerian cities, this issue manifests clearly, as tensions surface between public policies and residents' practices. Residents construct outside legal frameworks and implement autonomous adaptation strategies in response to inadequate basic services, land insecurity, and environmental risks). Through their territorial rootedness, daily practices, and negotiation of space in urban peripheries, they actively display a form of bottom-up urban resilience.

Over the last few decades, the Algerian authorities have implemented two main approaches to solving the problem of informal housing: demolition and regularization. With law no. 08-15 of 2008 on urban planning and development (Ministry of Housing and Urban Development, 2008), the government established a legal framework for integrating these neighborhoods into the formal city. The authorities have made this integration conditional on physical improvements and demanded the active participation of residents.

These efforts can only be successful if residents are actively involved at every stage of the project. Participatory governance is based on the co-production of decisions between institutions and citizens, and is a key mechanism for transforming informal settlements. The habitats also take responsibility for working with local authorities to legalize their homes and gain public support for renovations (Zitoune, Zouaoui & Chabou, 2020). Through these actions, they help shape their future and play an active role in the transformation of their neighborhood.

In Batna, local authorities launched several urban improvement projects during the 2010-2014 five-year plan to improve the city's image and living conditions. One of the main projects was to develop the belt along the Oued Batna canal, which runs through the city center. However, economic and political crises delayed completion until 2019. In addition, residents resisted the demolitions, which disrupted the initial phases of the project. Although the authorities demolished some structures, they preserved most of the illegal buildings after consulting stakeholders. They imposed one condition: residents had to improve the facades of their houses after regularization (DPAT, 2019). All these forms of local adaptation demonstrate how residents gradually appropriate space and integrate it into the city's urban dynamics, revealing their urban resilience.

These developments raise a central question: How does participatory regularization influence residents' resilience strategies, the effectiveness of local governance and residential satisfaction in an informal settlement like Z'mala? The chapter addresses at how regularization policies can improve living conditions while respecting local social dynamics. The case of Z'mala allows us to observe how theoretical concepts - resilience, participatory governance and residential satisfaction - materialize in an ongoing negotiation between residents and authorities.

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Between 2019 and 2024, we conducted a retrospective study to assess how residents engaged with the transformation process and how they perceived urban change. The aim of this research was to identify concrete forms of participation by residents in the transformation of their neighborhood and to assess their post-intervention satisfaction with quality of life and the availability of services. This dual approach allows us to understand how participatory governance influences residents' behaviors and their perceptions of urban transformation, thereby reflecting local urban resilience.

This empirical chapter is divided into four sections. The first section establishes the theoretical framework, mobilizing the concepts of informal housing, urban resilience, participatory governance and residential satisfaction, while exploring their interconnections. Next, the second section presents the case of Z'mala informal neighborhood in Batna and explains the methodological choices. Then the third section presents the empirical results, analyzing patterns of participation, transformation processes and levels of resident satisfaction. Finally the section, devoted to discussion and conclusion, summarizes the main findings, calls for greater citizen involvement and highlights the need to improve quality of life through inclusive urban planning. It also examines the implications of the findings for urban policies, focusing on the conditions required to guarantee equitable and sustainable development. Before analyzing the fieldwork, it is essential to establish a well-structured theoretical framework. This framework articulates the notions of informal housing, urban resilience, participatory governance and residential satisfaction to better grasp the dynamics of transformation in the Z'mala district.

Urban resilience, participatory governance, and residential satisfaction in the context of informal housing in Algeria

In Algerian cities, urban development is marked by rapid, often chaotic dynamics, linked to growing demographic pressure and structural deficiencies in planning arrangements (Belguidoum, Cattedra & Iraki, 2015). In this context, urban vulnerabilities are multiplying, manifesting themselves in a lack of basic services, land insecurity, environmental risks (flooding, insalubrity) and socio-spatial marginalization, illustrating the processes of urban exclusion described by Castells (1977) and Davis (2006). These factors favor the emergence of informal settlements, produced by processes of self-building, land exclusion and the reproduction of social inequalities in space. Far from being simply marginal or illegal zones, these urban fabrics represent a pragmatic solution to the inequalities of access to urbanized land and the dysfunctions of public policy. They represent another form of urbanity based on solidarity, self-organization, gradual constructive progress and territorial resilience (Roy, 2005 ; Bayat, 2010). Aware of these stakes, and faced with the challenges posed by uncontrolled urbanization and the scale of informal housing, the Algerian authorities have launched a major urban restructuring program framed by Law no. 08-15 of July 20, 2008 relating to development and urban planning regulations (People's Democratic Republic of Algeria, 2008). This law aims to establish a legal framework for integrated urban planning, including the regularization of informal housing, the rehabilitation of precarious neighborhoods, and citizen participation in planning dynamics throughout the country.

This regulatory approach is part of a wider theoretical debate that fundamentally redefines the nature of informal housing. Contemporary research, notably the work of Dovey (2025), emphasizes that "informality constitutes an original form (ur-form) of urbanity", and should no longer be perceived as a simple deviance or anomaly of planning, but as a constitutive mode of urban production. These spaces should therefore be seen as territories of social innovation, where the boundaries between legality, institutional tolerance and self-organization are constantly being negotiated. From this point of view, informal housing is seen as a modality of bottom-up urbanization, revealing the adaptive and creative capacities of marginalized groups. As stated by Shrestha, Gurran and Maalsen (2021), these forms of housing, can reduced to precariousness, are often based on resilient practices of occupation and consolidation, combining "physical precariousness and social stability" within systems of self-organization that are both flexible and robust. All this process gives rise to hybrid arrangements between local populations and authorities, where negotiated forms of life are co-constructed, often outside formal normative frameworks.

In this framework, the concept of urban resilience has emerged as an essential analytical framework for understanding how the inhabitants of informal housing neighborhoods adapt, resist and transform in the face of multiple vulnerabilities, whether physical, social, institutional, economic or environmental. In Meerow et al (2016) point out, resilience is not limited to the ability to absorb shocks: it also implies the capacity to transform existing spatial and social structures in response to crises.

Over time, this approach has undergone several improvement by more recent work, which emphasizes the need to consider local dynamics of learning, community organization and adaptive governance (Khalfallah & Amrane, 2023; Leulmi, Lazri & Abdelkebir, 2023). In Algerian, this resilience urban is reflected in the persistence of social ties, the continuity of collective practices, and a strong attachment to places, despite the absence or inadequacy of

public facilities and services. Where state institutions are often perceived as distant or even failing, residents develop forms of self-organization and civic engagement that enable them not only to survive, but also to transform their living environment. The Active participation irregularization processes, co-design of rehabilitation projects and co-management of public spaces become tools of action through which communities strengthen their collective resilience (Satterthwaite et al., 2020).

Today, participatory governance and co-production in urban areas are key levers for the sustainable integration of informal housing. According to Fung (2006), participatory governance is based on the direct participation of citizens in determining public policies. In Algeria, this dynamic is reflected in institutionalized forms of involvement of residents in land organization, co-design of development projects and joint management of community facilities. These practices go beyond formal consultations to establish genuine co-decision mechanisms, where residents' voices are taken into account in the choices that shape their living environment (Saidani, Kalla & Bendib, 2023). Thus, public consultations prior to demolitions, negotiated agreements on façade improvements or even the partial legalization of housing illustrate a growing desire to recognize residents as co-actors in urban production (Lemkhalti & Khalfallah, 2022). The transition from top-down planning to a collaborative logic establishes co-production as a strategic tool for adapting, mediating and legitimizing urban transformations, particularly in contexts marked by informality and institutional fragmentation.

Residential satisfaction is an essential indicator for assessing the perceived quality of urban transformations, particularly in informal settlements. However, this notion remains fundamentally subjective and difficult to define in a universal way, as it depends so much on individual perceptions, which are themselves influenced by residential paths, socio-economic conditions and the specific expectations of residents. Indeed, it is not limited to material improvements such as roads, lighting or technical networks, but also encompasses fundamental immaterial dimensions: a feeling of recognition, regained dignity, residential security and social appreciation (Sirgy & Cornwell, 2002). All These elements contribute to a subjective sense of well-being that goes beyond mere compliance with urban norms. However, the results observed in several contexts remain ambivalent. Residents' overall satisfaction often remains limited, even after substantial interventions. The paradox of regularization, as formulated by Payne, Durand-Lasserve and Rakodi (2009), highlights a gap between legal recognition of housing and the actual feelings of residents. Obtaining a title deed, in the absence of improved local services, a quality visual environment or inclusive local governance, is not enough to guarantee residential well-being. This observation highlights the limits of a purely technical-administrative approach to urban integration. Too often perceived as a universal solution, land regularization can, on the contrary, reinforce certain inequalities if it is not accompanied by social and spatial rebalancing. In front of this big challenge, we need to adopt a more integrated vision, based on the equitable redistribution of urban resources, the continuous improvement of basic services, and the implementation of mechanisms for the active participation of residents. As Soja (2010) reminds us, fair spatial planning is an essential condition for ensuring inclusive and sustainable urbanity. In Algeria, this complexity is accentuated by the absence of systematic surveys of residential satisfaction in informal settlements, making empirical assessment difficult. This is due in particular to the multidimensional and contextual nature of the concept, in a country marked by a heavy colonial heritage, unfinished regularization policies and urban transformations often far removed from actual usage.

In short, the Algerian experience shows that informal housing is neither a residue nor a failure, but an urban system in its own right, conveying territorial intelligence. Successful regularization requires recognition of this resilience, as well as genuinely participative governance and sustained attention to resident satisfaction. The informal economy can thus become a lever for urban innovation, spatial justice and inclusive transformation, provided it is supported by a strong political will and appropriate institutional tools..

From Definition to Systemic Articulation: Towards an Integrated Model of Urban Transformation

From the conceptual foundations outlined above, it is now important to observe how these dimensions are materialized in residents' practices. In the face of these vulnerabilities, residents, as local actors, deploy urban resilience strategies through community-based adaptation, spontaneous investment and the ongoing pursuit of land security. These citizen initiatives reveal a form of territorial intelligence, which often precedes institutional intervention (Meerow et al., 2016). such as municipalities, and public policies based on Law 08-15, intervene in the logic of regulating or normalizing these spaces, often in a delayed or vertical manner. Only by integrating the principles of participatory governance can these policies respond appropriately to the real needs of local residents. The implementation of public consultations, negotiated regularizations and co-production processes enables a better articulation between institutional dynamics and local aspirations (Terdoo, 2024). When effectively implemented, this inclusive governance strengthens community resilience, legitimizes spontaneous investment and establishes a more stable framework for housing improvement. These cooperative dynamics lead to tangible

physical transformations in the urban fabric: renovations, targeted demolitions and the installation of new facilities reconfigure the inhabited space. These interventions, although initiated by public action, are all the more effective as they are part of a dialogue with resident practices. In return, they generate greater residential satisfaction, marked by improved infrastructure, a renewed sense of dignity, social recognition and, more broadly, a higher quality of life. (Figure 1)

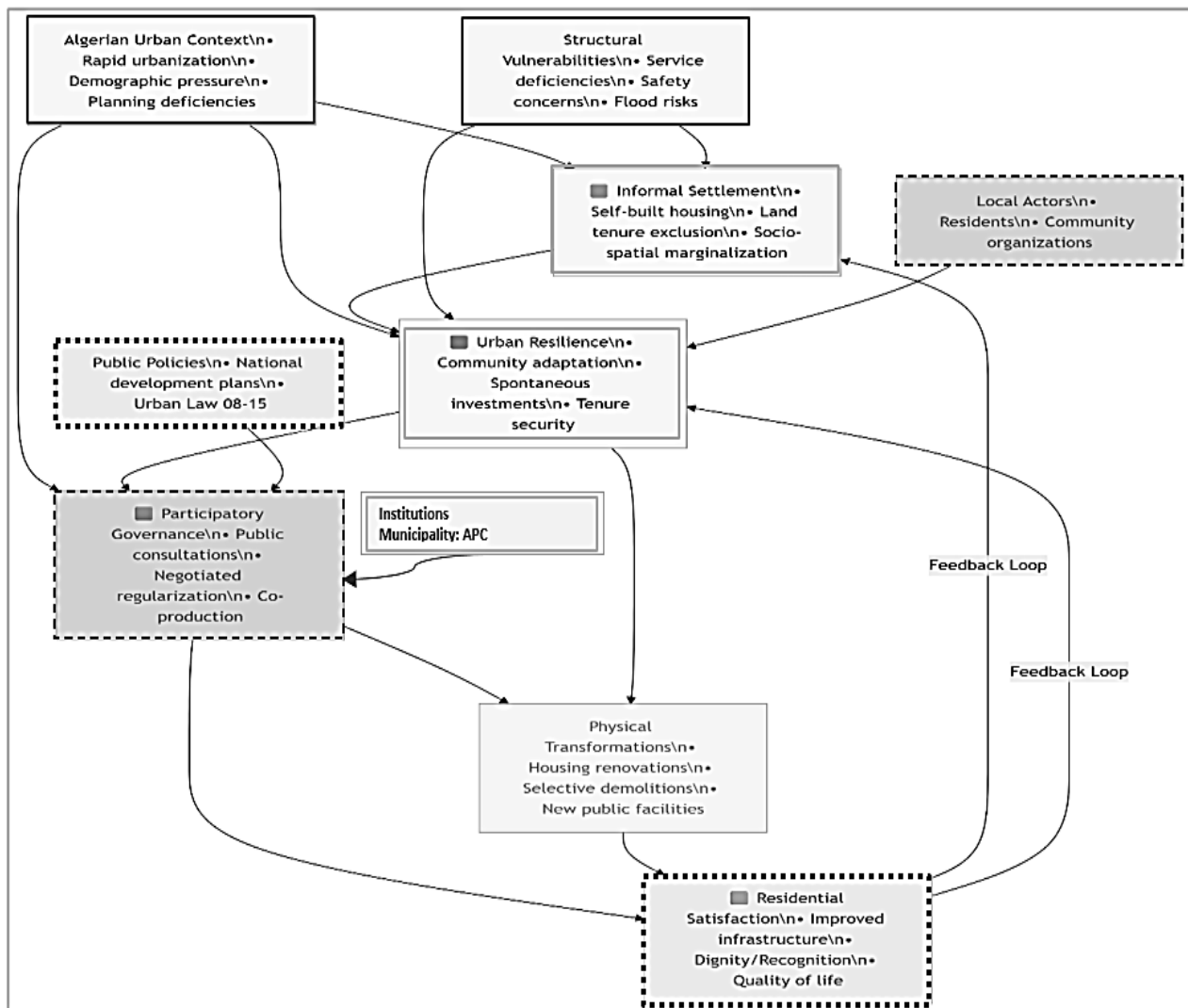


Figure 1. Diagram Feedback loops between the four pillars of inclusive urban transformation.

All the process is not linear, but operates according to a feedback logic: residents' satisfaction fuels their civic commitment, reinforces their participation in decision-making processes, and fosters sustainable urban resilience. The latter, in turn, stabilizes the urban framework and contributes to more firmly rooted and legitimate governance. In this way, a virtuous loop is created, where bottom-up and top-down dynamics work together to co-construct a fairer, more inclusive and more resilient. The four theoretical pillars mobilized in this chapter - informal housing, urban resilience, participatory governance and residential satisfaction - interact according to a systemic logic. By linking them together, we can interpret the requalification of the Z'mala as a bottom-up, co-constructed urban process rooted in residents' practices. Although it was developed outside the legal framework, Z'mala has gradually asserted itself as a territorial player in its own right, actively participating in the dynamics of urban transformation that are shaping the city of Batna. On the basis of this integrated theoretical framework, we present in the following section the methodological approach adopted to empirically analyze the requalification dynamics at work in this neighborhood.

Materials and Methods

Case study

This chapter presents the case of the informal neighborhood Z'mala case located in Batna, a major city in the High Plateaus region, southeast of Algiers, and the capital of the province bearing the same name. As a major urban center in the Aurès region, is facing challenges associated with accelerated urbanization, socioeconomic inequalities, and the rise of unregulated housing. These are the factors that make Batna an appropriate setting for considering participatory regularization (DPAT, 2022). The choice of Z'mala is founded on several considerations. This case clearly illustrates the urban tensions caused by the proliferation of unregulated housing. Located in the immediate vicinity of the city center, Z'mala consists of a cluster of informal dwellings spread along both sides of the El Oued canal, forming a dense and poorly structured urban fabric. Its strategic position along this canal, which runs through the city, makes it a central focus for requalification initiatives aimed at reconciling infrastructure development with residents' expectations.

In this context, the regularization of Z'mala raises major issues of urban resilience, understood as the capacity of a territory to anticipate, withstand, and adapt to social, economic, and environmental disruptions. The participatory approach adopted here serves as a lever to strengthen this resilience by mobilizing local resources, valuing user knowledge, and promoting social inclusion in urban transformation processes.

The Urban Metamorphosis of El Oued Batna: From Informal housing to a New Urban Identity

The urban evolution of the El Oued Batna belt between 2010 and 2019 illustrates a dramatic transformation, marked by the shift from uncontrolled urbanization to a structured and modernized space. The analysis of photographs taken before the development project reveals profound changes in both the landscape and residents' quality of life. In 2010, the urban belt of El Oued Batna exhibited a landscape shaped by spontaneous and unregulated growth. Photographs from that time show dense, disorderly occupation along the canal banks, where precarious housing had proliferated without adherence to urban planning or safety standards (PDAU, 2009). The informal neighborhood, built with various materials, created a labyrinthine urban fabric with narrow alleyways and hard-to-access areas. Additionally, the lack of proper infrastructure worsened living conditions. Sewage systems virtually nonexistent, were leading to stagnant water and unsanitary conditions. Roads, where present, were in poor condition, making transportation difficult especially during rainy seasons. There were no properly designed public spaces, depriving residents of areas for socializing, relaxation, or recreation. The area was perceived as an urban "no man's land," requiring deep intervention to integrate it into the rest of the city. (Figure 2)

In response to the challenges of uncontrolled urbanization and informal housing, Algerian authorities launched a major urban restructuring project under Law No. 08-15 of July 20, 2008, concerning city planning guidelines, as shown in recent studies (Ministry of Housing and Urban Planning, 2008). In Batna, significant urban improvement projects were initiated as part of the 2010–2014 five-year plan, aiming to enhance the city's image and residents' living conditions. Among these projects was the development of the Oued Batna Canal belt, which runs through the city center. However, due to persistent economic and political crises, the project was only completed in 2019. The law sought to rationalize urbanization, eliminate illegal constructions, and promote balanced socio-spatial integration. The project combines several strategic interventions, such as the demolition of informal housing areas, the modernization of infrastructure, and the revitalization of urban areas, to improve the social inclusion of the impacted communities. This comprehensive approach aimed to ensure sustainable and harmonious urban development in addition to improving living conditions, thereby ensuring sustainable and harmonious urban development, as evidenced by this case.

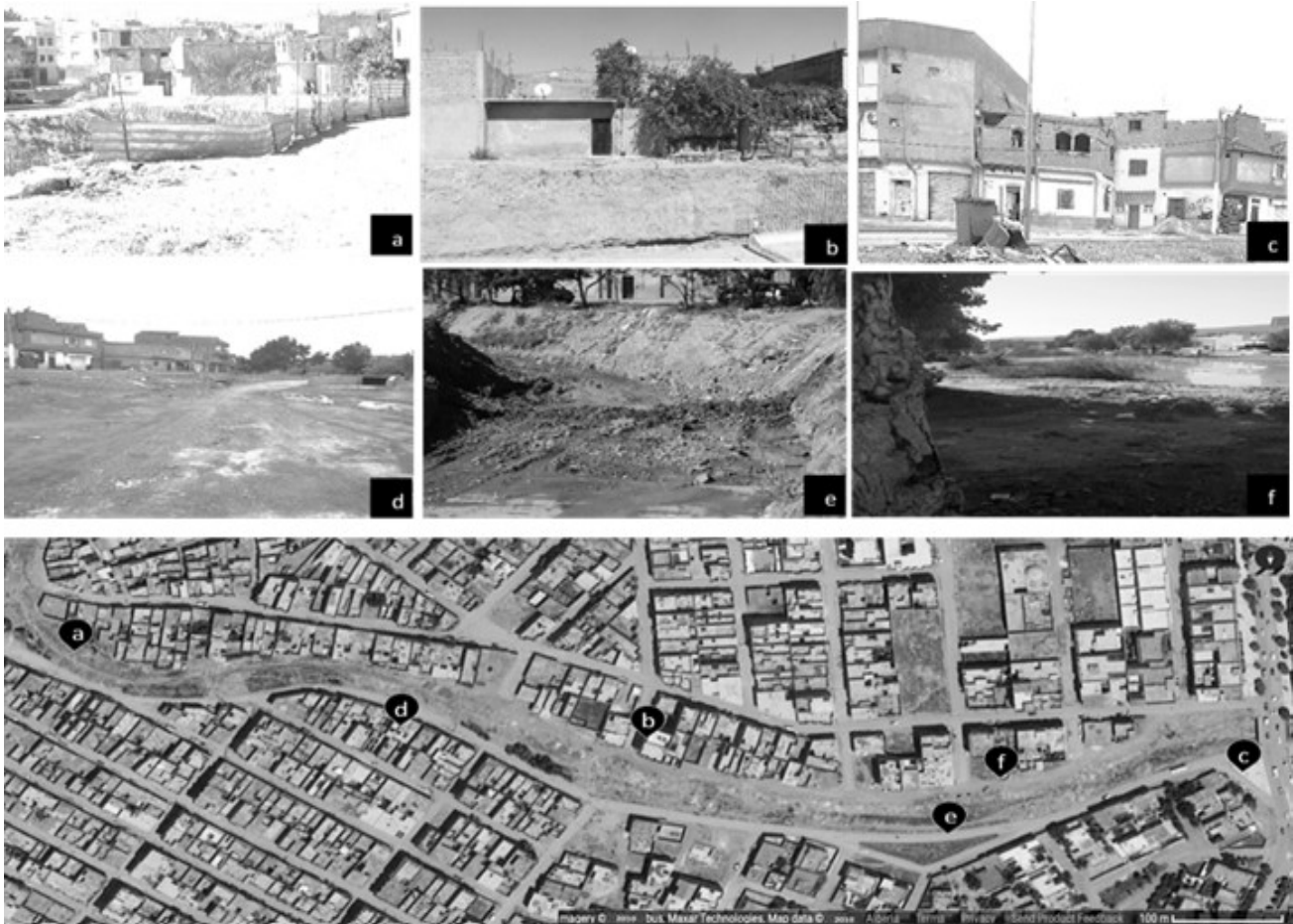


Figure 2. Photos and satellite Map taken Prior to urban transformations. The right bank : **(a)** Primary view showing: Foreground: El Oued Batna canal with inadequate physical barriers and Background: Dense cluster of informal settlements. **(b)** Property for sale along canal bank. **(f)** Recurrent flooding during rainy seasons. The left bank : **(c)** Grouping of informal dwellings. **(d)** Complete lack of formal road infrastructure. **(e)** Natural State Canal View. (Source: Author)

In just fifteen years, El Oued Batna's belt canal area has undergone a theatrical, evolving from a marginalized peripheral zone into a modern neighborhood fully integrated into the city's urban fabric. This urban renewal project has not only revitalized the physical urban space but also significantly improved residents' quality of life, minimized environmental risks, and strengthened connectivity with the rest of the city. The starting point of this transformation was the elimination of informal housing that once defined the area. The old precarious structures, often built without adherence to safety or urban planning standards, were systematically replaced with standardized housing that meets residents' needs. This process was carried out in two main ways: selling existing homes to new owners for reconstruction after demolishing informal structures, or transforming existing homes by adding multiple floors. A key element of this restructuring was securing the canal running through the neighborhood. Previously, this infrastructure was a constant source of unsanitary conditions and a major flood risk during the rainy season. Covering and piping the canal eliminated these hazards while freeing up valuable space, which was then used to expand the road network. This technical intervention simultaneously resolved health and mobility issues. The second phase of the project focused on creating public spaces and upgrading transportation infrastructure. The neighborhood, which once suffered from a severe lack of public amenities, was equipped with landscaped squares, organized parking areas, gardens, and children's playgrounds.

The emergence of new urban spaces completely transformed residents' living environment, providing areas for social interaction and relaxation that foster community cohesion. At the same time, the road network underwent a complete modernization. The formerly narrow and deteriorated streets were explained and redesigned to align with modern urban standards. The addition of roundabouts and optimized traffic flow helped integrate the neighborhood into the city, significantly reducing travel times to downtown and other districts. these

transformation have significantly increased the neighborhoods residential and economic potential. Actually image contrasts sharply with its recent past, unveiling a transformed urban landscape where orderly tree-lined streets, renovated buildings, and well-maintained green spaces harmoniously coexist. Revel's new modern multi-story residential buildings now stand alongside tastefully restored traditional homes, some of which have been expanded with seamlessly integrated additional floors. This well-balanced architectural mix creates a cohesive urban fabric where old and new blend elegantly. The growth of a dynamic commercial and professional sector further enhances this revitalization. These Modern infrastructure— from LED lighting to waste collection systems, fast lanes, and safer intersections completes this new identity, offering residents a functional and pleasant living environment. This urban transformation, both architectural and social, has allowed the neighborhood to forge a unique identity a skillful balance between urban modernity and the preservation of its original character. Today, the site stands as a strong model of successful urban renewal, where every intervention has helped rebuild social bonds while enhancing quality of life. This event powerfully demonstrates how a holistic approach can breathe new life into a community while preserving its soul. (Figure 3)



Figure 3. A Satellite mapping and redevelopment plan for informal settlements along the rehabilitated canal.

A photo taken of part of the neighborhood showing: **(a)** Construction of new multi-storey houses after demolition of old ones. **(b)** Rental for residence, professional and commercial activity. **(c)** A renovated house on the right and construction of another floor for the house on the left. **(d)** **(e)** A street lighting, easements for household waste and a highway. **(f)** A public garden **(g)** A panoramic view of the entrance to the informal settlement after the completion of the development works. **(h)** A Parking area. **(i)** The neighborhood is growing upward with new construction. (Source: Author)

Method

This chapter adopts a qualitative and empirical approach to analyze the extent to which participatory regularization influences urban resilience, governance efficiency, and residential satisfaction in the informal neighborhood of Z'mala in Batna. The study is framed within a "Knowledge, Attitudes, and Practices" (KAP) approach, based on the typology proposed by Launiala (2009), which is recognized for its relevance in analyzing complex social behaviors. It also draws on the methodological guidelines formulated by UN-Habitat (2023) regarding the inclusive transformation of informal housing.

To grasp the diversity of dynamics at play in this informal neighborhood, a mixed-method approach combining quantitative and qualitative data was adopted. The fieldwork was conducted over two years (2022–2024), as part of a retrospective study on the effects of the regularization policies implemented since 2019. Two data collection tools were used: a survey questionnaire administered to a representative random sample of residents, and semi-structured interviews conducted with about half of the households living along the informal housing strip bordering the redeveloped, El Oued Batna's belt canal.

To elaborate the satisfaction questionnaire, we chose for closed-ended questions using a five-point Likert scale, where a score of one reflects a very low level of satisfaction and a score of five reflects a high level of satisfaction.

To assess residential satisfaction, five key quality-of-life indicators were chosen based on (Chen, Luh, Hu, & Shan, 2023): safety, visual atmosphere, local commerce, basic infrastructure, and public spaces. The safety indicator refers to the perception of security in our neighborhood, comprising the presence of police patrols and adequate street lighting. The visual atmosphere takes into account the general appearance of the neighborhood, such as street cleanliness and the aesthetics of buildings. Local commerce is assessed based on accessibility and the quality of essential services. Thus, based infrastructure includes potable water networks, public lighting, roadways, and sanitation systems. Lastly, public spaces refer to the quality and accessibility of recreational and leisure areas such as parks, playgrounds, or public squares.

Semi-structured interviews were conducted with nearly half of the neighborhood's households, using an interview guide structured around the main urban reforms. These reforms include land regularization, which covers the process of legalizing informal constructions, as well as administrative procedures and associated costs; the topic of sale, which explores residents' intentions to sell their property, their motivations, and encountered obstacles; renovation, which focuses on home improvement works (costs, materials, effects on quality of life); the construction of new floors, analyzed through residents' motivations and the impact on neighborhood density; demolition-reconstruction, involving the replacement of precarious housing with new buildings, with special attention paid to financial implications and effects on the social fabric; change of use, meaning the transformation of housing into commercial or professional spaces, their motivations, and their effects on the local economy; finally, rental, studied through the residential, commercial, or professional uses of housing, the income generated, and its impact on the community.

The collected data were processed using a rigorous methodology with the SPSS software. The analysis began with a descriptive statistical study aimed at characterizing the sociodemographic profiles of participants (age, gender) and evaluating general trends in satisfaction, thus providing a clear synthesis of the results. The study then focused on correlation analyses to examine the relationships between different variables, notably the effect of housing regularization on residents' satisfaction. This approach helped highlight determining factors such as the quality of infrastructure and access to basic services. In parallel, thematic analysis of the qualitative interview data brought out residents' main concerns and subjective perceptions while shedding light on the tangible impacts of redevelopment projects on their daily lives.

Results

Results of household interviews

The results of this study highlight the profound transformations that have taken place in the Z'mala district as a result of the urban redevelopment initiative. A significant proportion of informal housing has been regularized - almost two out of every three dwellings - representing a significant step forward in their integration into the formal urban fabric. This situation clearly illustrates how informal housing, initially conceived as a pragmatic response to the shortcomings of urban planning, can gradually be integrated into the logic of the formal city through regularization policies.

Despite this progress, just under a third of dwellings have undergone substantial physical transformation, including renovation, demolition or change of use. This contrast highlights the complex interplay between regulatory arrangements and the ability of residents to undertake major improvements to their property, focusing on the multiple challenges associated with urban upgrading projects. It also shows that regularization, while indispensable, is not a sufficient lever in itself: its effectiveness remains strongly conditioned by households' resources and capacity for action.

Facade renovations were carried out in around one in five dwellings, reflecting a form of bottom-up urban resilience, where the initiative comes not from the institution but from the residents themselves in the form of self-organization, mobilizing their networks, know-how and attachment to place to improve the aesthetic and functional appearance of their property after regularization. A minority of owners representing less than one in ten dwellings, chose to demolish their existing structure to build a new multi-storey building, indicating a broader trend towards spontaneous densification and modernization of the built fabric.

Significantly, more than a quarter of dwellings have been converted for commercial use, while only a tiny fraction have been allocated for professional use, revealing a shift towards local economic activities. These reforms also reflect a form of resident participation in the urban project, negotiated and contextualized on the basis of the diversity of strategies implemented by residents to adapt and take advantage of the opportunities imposed by the local APC authorities and created by the redevelopment project (Figure 4).

These results highlight the concrete impact of the redevelopment project on the physical and socio-economic dynamics of the neighborhood. The important role of land regularization as a catalyst for real estate investment underscores its importance in fostering resident involvement and encouraging improvements to the built environment. However, regularization alone does not guarantee transformation, and the relatively low rates of renovation and demolition suggest the need for support schemes. may be necessary to enable a greater number of households to engage in high-impact transformation projects. All by emphasizing the interplay between regulatory frameworks and the local resilience of residents, this study sheds valuable light on the complexities of urban requalification in informal settlements, while offering a nuanced reading of trajectories towards sustainable urban development.

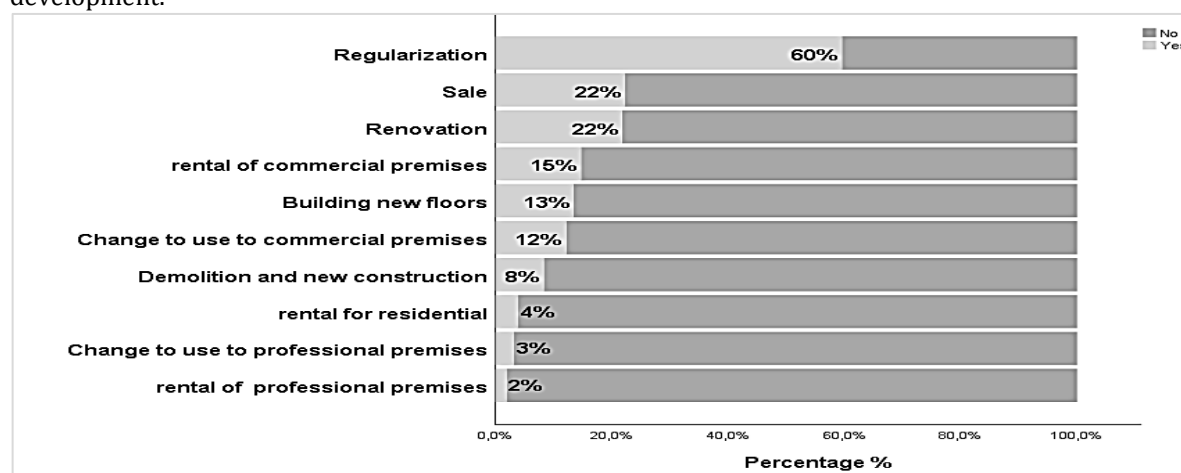


Figure 4. The distribution of informal housing according to the reforms made by their owner and percentage of informal housing reformed (Source: Author)

The four main urban transformations - namely renovations, property transactions, vertical extensions (adding floors) and demolition-reconstruction projects - proved significantly more frequent in dwellings benefiting from formal land regularization, as illustrated in Figure 5. This finding confirms that bottom-up transformation dynamics are activated when the legal conditions for securing them are met.

The analysis reveals significant differences between regularized and non-regularized properties. Dwellings with legal status are demolished and rebuilt much more frequently, vertical extensions are much more widespread, property transactions are more sustained, and renovations are more numerous. These considerable differences empirically validate the idea that legal security stimulates residential investment logics and transforms housing, once perceived as a mere means of subsistence, into a valuable asset on the real estate market. These results confirm the observations of Frediani, Cociña and Roche (2023), according to whom the regularization and securitization of land in informal settlements encourages residents to invest in their housing and helps transform it into a valued market asset, while improving living conditions and human development.

The data show that only residences with full regularization status (also known as “Yes/Yes”) seem to be able to benefit from this transformative dynamic. Conversely, partial regularization status (either “Yes/No” or “No/Yes”) shows very limited effects, as evidenced by the scarcity of cases of vertical extension observed in these circumstances, indicating an even more timid appropriation of the opportunities offered by regularization.

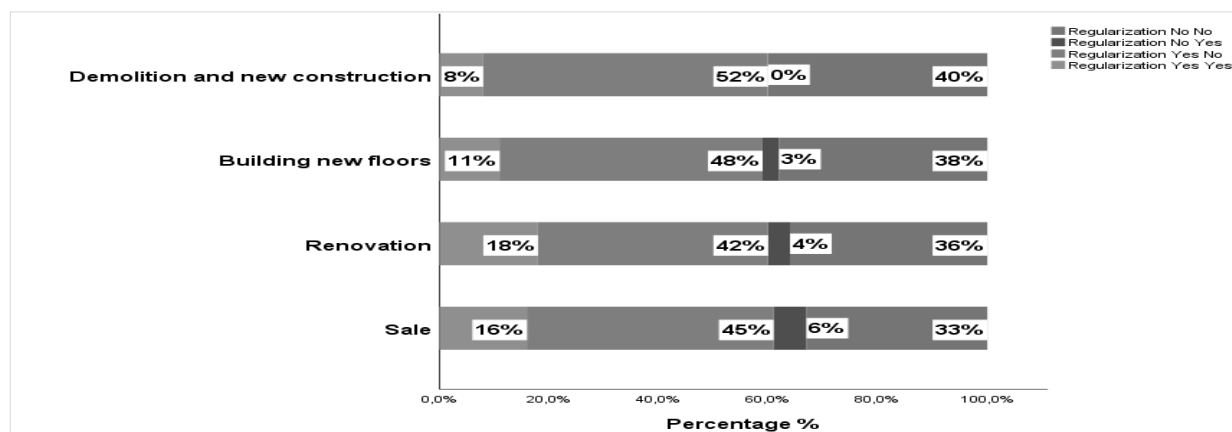


Figure 5. Urban Transformation Rates by Land Regularization Status. (Source: Author)

Finally, figure 6 presents the correlation analysis presented in the graphical correlation matrix between the five main urban transformation indicators (Table.1), highlighting several significant trends. Title regularization shows a positive impact on residential investment, with moderate but significant correlations between regularization and renovation, storey addition and demolition-reconstruction. These findings suggest that legal certainty encourages homeowners to improve the exterior appearance of their homes.

Moreover, there is a strong correlation between sales and demolitions and remodeling, suggesting that new buyers often prefer ambitious remodeling projects over straightforward renovations. There is a strong correlation between vertical expansion and renovation, suggesting an integrated modernization strategy.

However, no significant correlation was found between regularization and sale, nor between sale and renovation, confirming that regularization does not necessarily lead to a transactional dynamic, and that new owners may be less inclined to undertake work. After all, vertical extension and demolition-reconstruction seem to constitute two distinct dynamics.

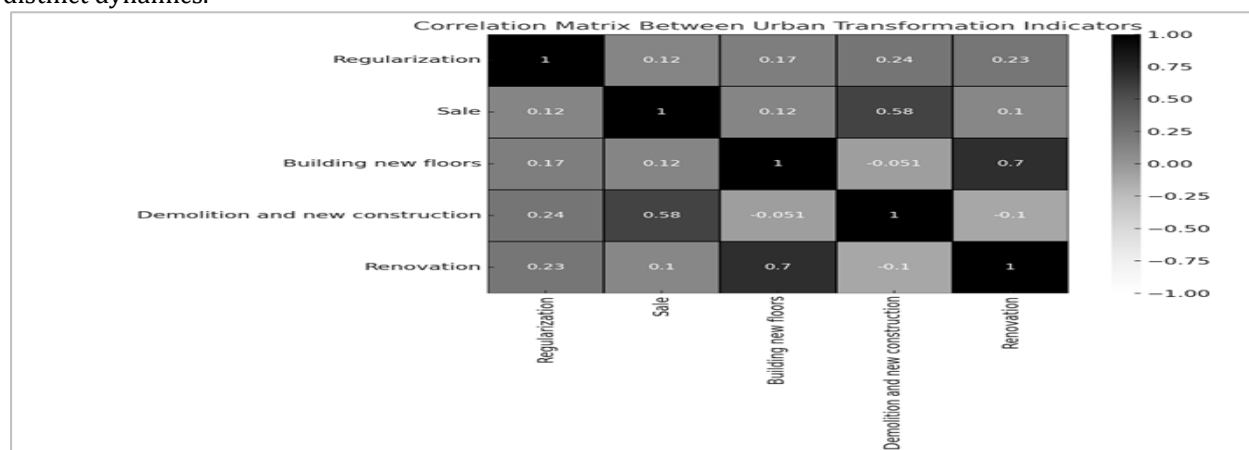


Figure 6. The graphical correlation matrix between the five main indicators of urban transformation.

Table1: Correlations between indicators

Variable		Regularization	Sale	Building new floors	Demolition and new construction	Renovation
Regularization	Pearson correlation	1	.120	.169*	.240	.228
	Sig. (bilatérale)		.201	.045	.004	0.007
Sale	Pearson correlation	.120	1	.124	.579	.105
	Sig. (bilatérale)	.201		.166	.000	.243
Renovation	Pearson correlation	.228	.105	.702	-.103	1
	Sig. (bilatérale)	0.007	.243	.000	.201	
Building new floors	Pearson correlation	.169*	.124	1	-.051	.702
	Sig. (bilatérale)	.045	.166		.527	.000
Demolition and new construction	Pearson correlation	.240	.579	-.051	1	-.103
	Sig. (bilatérale)	.004	.000	.527		.201

* The correlation is significant at the 0.05 level. (Source: Author).

Results of the Satisfaction Survey

The representative sample of participants was randomly selected for the survey in order to determine the socio-demographic characteristics of the neighborhood. a strong representation of young adults and relative gender parity. This demographic structure suggests that a population is actively involved in the dynamics of appropriating space, and residential projection is what drives the perception of urban transformation. The equal distribution of men and women makes it possible to analyze living practices that often differ according to gender, particularly in terms of perceived safety, management of public space and accessibility of services. To better understand the ways in which residents express their resilience, commitment and satisfaction, these framing elements provide an interpretative basis.

The assessment of residential satisfaction is based on five essential dimensions of perceived quality of life: safety, visual ambience of the neighborhood, accessibility to shops, quality of basic infrastructure and presence of public spaces. These indicators provide a qualitative reading of urban impact, based not on technical standards, but on the feelings and perceptions of residents. In order to interpret these assessments, three evaluation thresholds have been defined: a satisfactory level, a perfectible level, and a level deemed intolerable. This approach places residents' lived experience at the heart of the analysis, viewing satisfaction as an indicator of the social effects of urban transformation.

The results, based on the diagram (Figure 7) and the summary table2 , reveal an overall low level of satisfaction. Indicators relating to safety and accessibility to shops reach a level deemed perfectible, while the other dimensions of quality of life show results below the minimum acceptable threshold. Fewer than half of residents expressed an overall sense of satisfaction, and only a minority of residents declared themselves satisfied with all five dimensions simultaneously. This finding highlights a significant gap between the regularization efforts made in the neighborhood and the benefits actually perceived by residents. These data illustrate what the literature refers to as the "regularization paradox" (Payne, Durand-Lasserve & Rakodi, 2009): legal security of housing is not in itself sufficient to produce a better quality of life. Residential satisfaction does not depend solely on the possession of a title, but on a coherent, functional and dignified urban environment. It is therefore a strategic qualitative indicator, enabling us to assess the social relevance of urban policies beyond their regulatory scope.

Table 2. Table of frequencies and satisfaction and dissatisfaction rates for the five indicators studied.

Evaluation criteria	Satisfied	Dissatisfied	Neither satisfied nor dissatisfied
	Number (%)	Number (%)	Number (%)
Safety	224 (64.0%)	26 (7.4%)	100 (28.6%)
Basic infrastructures	167 (47.7%)	64 (18.3%)	119 (34.0%)
Public spaces	79 (22.6%)	49 (14.0%)	222 (63.4%)
Visual ambience	164 (46.9%)	97 (27.7%)	89 (25.4%)
Convenience stores	179 (51.1%)	70 (20.0%)	101 (28.9%)

(Source: Author)

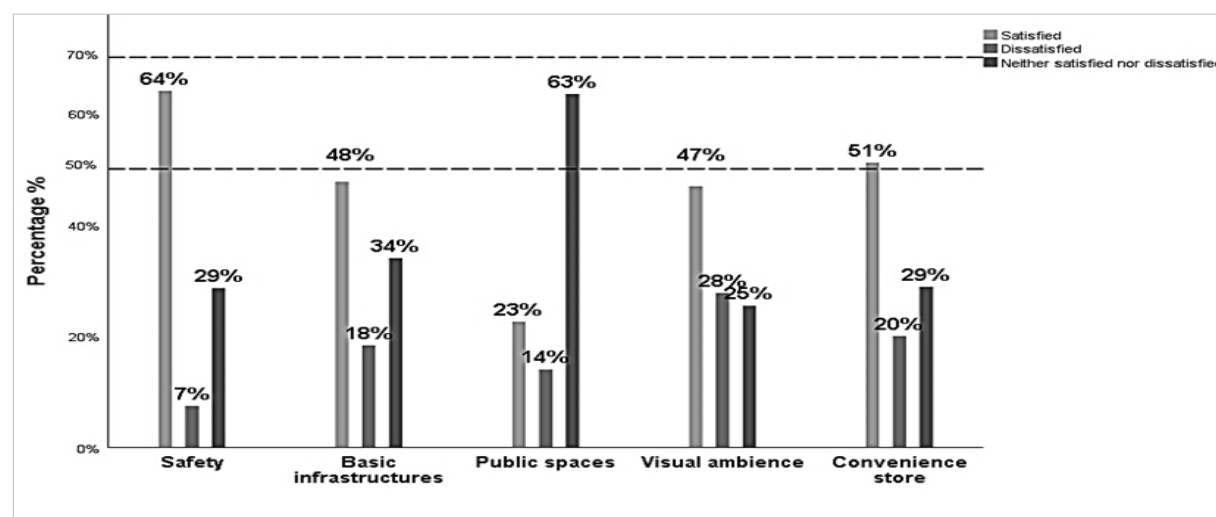


Figure 7. Diagram of satisfaction rates for the five indicators compared to satisfaction rate thresholds.
(Source: Author)

Discussion and Conclusion

The informal housing in Algeria illustrates the trade-offs between forced evictions and participatory regularization, while the Batna canal project demonstrates how securing land tenure fostered the rise of urban resilience based on encouraging residents to improve their housing themselves. Their management is difficult due to the poverty of the residents and the absence of basic infrastructure (DPAT, 2022): landfills, water access networks, roads, etc. The lack of roads makes them inaccessible to the local population. The lack of roads makes them inaccessible to household waste collection vehicles. Added to this is the insecurity caused by the presence of organized gangs. The best solution, albeit the most costly, remains demolition and relocation of the inhabitants to social housing on the outskirts.

In the case of Z'mala, the informal housing is located close to the town center, making it impossible to persuade residents to move to the outskirts. A development project, the regularization of more than half of the dwellings, combined with the effective participation of the residents through the renovation of their homes or the construction of new ones, were the two best solutions for integrating this informal settlement and transforming it into a dynamic hub of commercial and professional activity. What's more, it has become a major landmark in the city of Batna. More than a fifth of residents have been able to sell their homes at exorbitant prices, whereas previously they had no value at all. Regularization has had a significant impact on demolition by encouraging sales. The informal housing is gradually beginning to disappear, making way for beautiful new constructions.

Despite these changes and improvements, the average overall satisfaction rate remains intolerable. As Chiodelli & Gentili (2021) demonstrate through comparative cases, regularization alone is often not enough to solve deeper quality-of-life issues, in the absence of parallel investments in social services and infrastructure. This paradox of regularization helps explain why even successful land programs, such as the one in Batna, can result in limited gains in terms of satisfaction. The majority of complaints concern the quality of public spaces and the visual atmosphere. Indeed, this district, now a magnet for commercial and professional activities, is very busy, which calls for an improvement in its image.

The development of the El Oued canal in Batna has demonstrated that a participatory approach can transform an urban development project into an opportunity for socio-economic growth. The satisfaction of homeowners, whose informal dwellings were spared demolition, highlights the importance of balancing urbanization and social justice. Thanks to collaborative governance, the project - despite being more than fifteen years behind schedule - was completed, while rising land values encouraged stakeholders to become actively involved in maximizing the project's benefits.

This case study reveals several key lessons for the management of informal settlements. Firstly, involving residents in the process of regularization and urban integration is essential to ensure sustainable and widely accepted solutions. Secondly, the legalization of informal structures is not limited to administrative recognition - it paves the way for more far-reaching transformations, including the gradual disappearance of substandard housing in favor of more dignified, permanent dwellings. As shown by the Egyptian case analyzed by Bremer and Bhuiyan (2014), where community participation and investment in local infrastructure have led to significant improvements in informal areas.

To consolidate these gains, public authorities need to support this dynamic by strengthening basic infrastructure and services (health centers, schools, public spaces, etc.). In addition, financial incentives, such as subsidies for facade renovation or access to low-interest loans, could encourage homeowners to improve their living conditions. Finally, demolition and reconstruction initiated by the residents themselves, with the support of the State, represents a win-win solution: it promotes local employment, enhances the urban heritage, and gradually eliminates informal settlements, offering a more dignified alternative to the often stigmatized social housing. As demonstrated in the African (Huchzermeyer, 2009) and South Asian (Patel, Baptist & D'Cruz, 2012) contexts, this model - while imperfect - offers transferable lessons to cities facing informal sprawl through participatory regularization. It proves that a balanced urban policy - combining regularization, citizen participation and public investment - is the key to inclusive and sustainable urbanization.

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Conflict of Interests

The author declares no conflict of interest.

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