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KEY FEATURES FOR SUSTAINABLE DEVELOPMENT OF URBAN

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A central challenge in urban regeneration is designing sustainable programmes that genuinely improve housing quality and everyday living conditions. In the Netherlands, since the 1990s, the pursuit of durable, long-term solutions has become a core element of regeneration strategy, alongside an integrated approach that combines physical upgrades with environmental, social, and economic initiatives. Because neighborhoods continually evolve under shifting societal and economic pressures, renewal policies must remain adaptive and responsive to changing conditions. Drawing on research into Dutch regeneration programmes and informed by international debates, this paper proposes sustainability criteria for evaluating and guiding urban regeneration. The analysis focuses on urban design and planning, as well as social and economic structures. From a social perspective, key concerns include reducing inequality, preventing exclusion and displacement of vulnerable groups, and strengthening neighborhood safety. Economically, the paper considers how regeneration influences property values and local economic development. Overall, evaluations suggest that Dutch cities have improved, in part due to sustained physical and spatial interventions carried out through regeneration and renewal efforts.

Index Terms —

INTRODUCTION

Urban regeneration must adapt to shifting urban contexts, including new concentrations of economic activity and the emergence of new markets serving different population groups within existing city communities. As cities face changing social conditions, needs, and expectations, two priorities have become central to regeneration strategies: finding solutions that endure over time and applying an integrated approach that links physical, environmental, social, and economic programmes.

In the Netherlands, urban renewal became a major policy focus, and Rotterdam in particular was widely seen—both nationally and internationally—as a leading example during 1975–1993 [1]. Significant investments of financial resources and social capital modernised large sections of older neighbourhoods. Yet the key issue remains whether these changes truly produced long-term solutions. The fact that additional interventions and further funding continue to be required—even after years of large-scale government initiatives and billions spent on physical renewal followed by social and economic programmes—suggests that lasting outcomes have not been fully achieved.

This leads to the central question: which characteristics define sustainable development in the context of urban regeneration? This paper approaches sustainability by emphasizing the extension of the life of the urban fabric—buildings and neighbourhoods—through improved adaptability and flexibility. Social sustainability includes residents' satisfaction with living conditions, housing, and the local residential environment, as well as demographic composition, labour-market participation, and income distribution. It also involves strengthening the neighbourhood economy, reducing poverty, and ensuring that housing retains economic value and remains viable for continued use. These issues are illustrated through the development of two urban renewal areas in Rotterdam. In addition, sustainable urban design has been a key objective in certain projects, such as redevelopment on the former municipal waterworks site in Amsterdam.

SUSTAINABLE URBAN DEVELOPMENT

Economic expansion, the push for faster technological advancement, and the strong emphasis on increasing consumption have often caused the shaping of urban space to clash with natural systems and environmental limits. The Brundtland Committee's report (1987) brought the concept of sustainable development into global policy discussions. Later, the 2002 Earth Summit in Johannesburg highlighted three core dimensions of sustainability—social, ecological, and economic—frequently described as the "Triple P": People, Planet and Prosperity. Key issues identified included urban growth and environmental pressures, the need for partnerships and financing, and questions of social inclusion (and exclusion) as well as cohesion [2].

Debates on sustainability also open possibilities to redesign cities in ways that are fairer, especially for disadvantaged groups. From an economic perspective, sustainability relies on connectivity: participation in established networks, the capacity to build new links, and the presence of human resources able to generate added value. Social sustainability, meanwhile, includes several connected dimensions, such as fostering bridges across groups, recognizing multiple identities, and implementing active policies that prevent social exclusion. It relates to liveability, stability in residential life, safety, support for older people, and education. At the same time, "perceived liveability" reflects how individuals personally experience and judge their surroundings.

In recent years, urban regeneration has increasingly been framed through approaches such as England's "Sustainable Communities Plan" [3]. However, as the recent economic crisis in the Netherlands illustrates, putting sustainability into practice can be difficult when short-term, market-driven thinking dominates decision-making [4].

URBAN REGENERATION AND SUSTAINABILITY

Urban regeneration is now a well-established field in design, focused on delivering solutions that remain effective over time [1]. A central task is dealing with the functional ageing of buildings and sites—for example, converting office space into housing as user needs and expectations change. Roberts [5, 5:17] captures the core idea by describing urban regeneration as a comprehensive, integrated vision and set of actions that addresses urban problems and aims for lasting improvements in an area's economic, physical, social, and environmental conditions after change. In practice, this strategic activity typically includes economic renewal and financing, physical and environmental interventions, social and community concerns, employment and education (including training), and housing.

At the same time, design faces an ongoing tension: buildings are often created with a relatively fixed character, based on the standards of their time, while the people who use them have needs that shift and evolve. For this reason, adaptability and long-term viability strongly influence whether places can continue to be used successfully. A building's sustainability can be understood in terms of how long it can remain useful—whether occupied, rented, or otherwise utilized—a timeframe that may shrink due to both technical deterioration and changes in rules, expectations, and standards (normative ageing). Economic downturns can make this challenge more visible, for instance through high levels of office vacancy. In Dutch cities, the pressure to maintain and upgrade buildings is often driven more by normative ageing than by purely technical wear.

Within regeneration processes, improving the quality of housing or the residential environment can change how spaces are used, which then shapes social and economic sustainability outcomes. The chosen urban design approach is therefore closely tied to how much adjustment is needed (or has been needed) and to whether the adopted solutions are ultimately viewed as strengthening—or weakening—social and economic value.

SUSTAINABLE URBAN NEIGHBOURHOOD DEVELOPMENT: CASE STUDIES

This section presents the Dutch state of the art through three case studies. Two of these focus on broader socio-economic characteristics and were selected from earlier research [1, 6]. The neighbourhoods of Oude Noorden and Spangen illustrate the dominant approach to urban renewal in Rotterdam since the 1970s. Guided by the principle of "building for the neighbourhood," these areas experienced large-scale construction of new social housing and extensive modernization of the existing stock. Both neighbourhoods reflect wider demographic trends, including a declining number of families, a rise in single-person households and immigrant populations, and relatively high unemployment rates. Over the past decades, targeted programmes have been introduced to enhance social conditions, driven by local government ambitions to foster a socially cohesive city.

The third case examines the first Dutch sustainable urban development project in Amsterdam, situated within the existing urban fabric on a former industrial site. This initiative was selected as one of five key projects from a pool of 200 for evaluation [4]. The primary emphasis was on sustainable urban design, aiming to create a compact built environment while improving the conditions for healthy, safe, and high-quality residential living.

Oude Noorden

Between 1975 and 1993, the Oude Noorden underwent extensive urban renewal, largely focused on upgrading the housing stock and refurbishing inner courtyards through the removal of outdated commercial premises. A persistent challenge in this area has been the limited availability of public space, especially in neighbourhoods

with dense plot layouts. During this period, 28 percent of the housing stock consisted of newly constructed social housing, while 45 percent was modernized, also within the social sector. One unintended consequence of this strategy was a 27 percent decline in small businesses and local shops.

From the 1990s onward, public investments increasingly sought to integrate social, physical, and economic policies. These efforts targeted long-term unemployment reduction, improvements in public amenities—such as the development of enterprise zones functioning as creative "incubators"—and further upgrades to buildings and public spaces. Joint investments by housing associations, the municipality, cultural and creative entrepreneurs, and an art foundation were made in a local shopping district to stimulate small-scale employment. As a result, the proportion of owner-occupied housing rose from 9 percent in 1999 to 18 percent in 2009, partly due to new affordable owner-occupied homes replacing demolished social housing, making homeownership accessible to upwardly mobile residents.

Spangen

Spangen was developed between 1920 and 1940 as a unified urban ensemble, in contrast to the individually developed plots along main streets that characterized Oude Noorden a few decades earlier. Most dwellings in Spangen were originally constructed as social housing. Similar to Oude Noorden, the area suffered from a shortage of green public spaces. Substantial investments were therefore made to establish new public squares and redevelop the riverfront.

Between 1982 and 1993, approximately 22 percent of Spangen's housing stock was newly built, and 34 percent was modernized. In the early 1990s, residents faced serious declines in quality of life due to issues such as drug tourism and prostitution, particularly in the privately rented parts of the neighbourhood. In response, residents attempted to restrict vehicle access to discourage illicit activities. The area subsequently became part of targeted social and physical regeneration programmes, with local authorities taking action against exploitative landlords [6]. An innovative renewal strategy emerged, promoting self-built housing and co-housing with municipal support. These developments altered tenure patterns: owner-occupation increased from 5 percent in 1999 to 24 percent in 2009, while the share of social rental housing decreased from 77 percent to 64 percent.

GWL Area

On the former industrial site of the Municipal Waterworks, a new residential development was completed in 1998, primarily intended for residents from the Westerpark district. The 591 dwellings were designed for a socially diverse population, with a mix of low- and high-income households reflected in the housing distribution: 46% social rental and 54% owner-occupied units. The project also included accommodation for five communal living groups (including studio units) and six dwellings for people with disabilities [**?**]. Several units were designed to be multifunctional, allowing residents to integrate workspaces into their homes.

With a density of 100 dwellings per hectare, the project exemplifies principles of compact urban development. Additional sustainable design features included energy-efficient systems, separate rainwater drainage from the sewage network, rooftop vegetation, an extensive network of hedges, and car-free inner zones [5].

FEATURES FOR SUSTAINABLE URBAN NEIGHBOURHOOD DEVELOPMENT

Evaluation studies conducted in Rotterdam—particularly in the neighbourhoods of Oude Noorden [1, 6] and Spangen [6]—as well as in Amsterdam [4], supported by findings from other research on practical

applications and the implementation of sustainable urban renewal [3], and informed by relevant theoretical frameworks, have led to the identification of several key features for sustainable neighbourhood development. The policies examined primarily addressed challenges inherent in urban regeneration, with a focus on the needs of lower-income groups and the role of the Dutch welfare system, which has historically limited the formation of large, concentrated pockets of poverty. Nevertheless, due to broader shifts in the labour market and changes in the local economy, Rotterdam remains one of the Dutch cities with the highest number of areas experiencing deprivation and social exclusion. A central principle in Rotterdam's urban renewal strategy has been the prevention of displacement among low-income residents. While residential mobility in itself is not problematic, it becomes an issue when it reinforces or intensifies social inequalities.

Within this framework, the post-renewal urban fabric is assessed from a sustainable development perspective, incorporating environmentally conscious urban design principles. Housing and the built environment should be durable, easy to maintain, and capable of supporting multifunctional use, in line with international debates on the relationship between sustainability and compact city models. Key design considerations include accessible public spaces, a diverse range of local amenities, the adaptive reuse of office buildings for residential purposes, the reduction of transport needs, and spatial conditions that support high-quality public transport. Housing provision should be inclusive, ensuring accessibility, availability, and affordability for all social groups, while allowing sufficient flexibility to accommodate different lifestyles.

From an urban planning perspective, strategic planning is essential in connecting inward- and outward-looking approaches [7], particularly through strong integration with housing policies. Social dimensions should focus on preventing exclusion and displacement, reducing inequalities, respecting diverse identities, fostering social cohesion, and enhancing public safety. Economic considerations should highlight the importance of linking neighbourhoods to broader urban networks to generate added value. Physical improvements resulting from urban renewal must be analysed within a wider context, including their impact on social structures at multiple spatial scales. Governance has also played a crucial role, particularly through community engagement during renewal processes and shifts in housing provision and planning toward privatisation. Since the mid-1990s, the increasing reliance on market-driven regeneration approaches in the Netherlands has raised new governance challenges, including decentralisation, the formation of new partnerships involving housing associations, residents' organisations, local entrepreneurs, and schools, as well as more flexible planning procedures and new forms of participation enabled by digital platforms and social media.

Functional obsolescence in the urban fabric and housing stock can be evaluated in relation to evolving standards and norms. Contemporary sustainable urban design is heavily influenced by innovations in sewage systems, wastewater management, and water purification. Substantial progress can be achieved by addressing the entire infrastructure chain, particularly energy systems, in combination with compact urban development concepts [4]. In the GWL project, many such design strategies were implemented simultaneously. Resident involvement in planning and constructing sustainability measures proved vital for fostering shared responsibility and acceptance. However, the car-free design of the area also led to increased parking pressure in surrounding neighbourhoods.

Regarding housing, the most influential factors include total floor area and the size of individual rooms. For long-term sustainability, it is crucial that buildings can be adapted for different uses without requiring major structural alterations. Consequently, housing typologies should be examined in terms of internal flexibility and the potential for home-based work. Changes in household types and the growing diversity of these categories significantly affect how housing quality and residential environments are assessed. While some of these changes result directly from urban renewal programmes, others reflect broader social transformations. In Oude Noorden and Spangen, approximately half of the population belonged to one or more vulnerable groups, including the unemployed, single-parent families, low-income elderly residents, and ethnic minorities. New household forms, particularly single-person households, have replaced families as the dominant group [1].

Social obsolescence, driven by shifting housing needs and expectations, has increased the emphasis on usability and residents' subjective evaluations of their living environments. Social sustainability should therefore be examined through indicators such as housing satisfaction, use value, and perceived urban quality. Issues of social exclusion, polarisation, and neighbourhood trust can be analysed using variables such as length of residence and reasons for relocation. Other relevant factors include population composition, neighbourhood stability versus mobility, and housing market dynamics. Residents' assessments of social dimensions—such as quality of life and public safety—should also be incorporated.

To evaluate the socio-economic prospects of sustainable communities, both general indicators, such as liveability and safety indices, and more specific measures—such as dependence on rent subsidies, social benefits, and rent arrears—are required. The Social Index of Rotterdam shows that both case study areas remain socio-economically vulnerable, with insufficient income identified as the primary challenge: approximately two-thirds of residents earn low incomes. However, between 2000 and 2010, unemployment and reliance on social welfare declined. The form of gentrification observed in recent years did not result in the complete displacement of former residents, as a significant proportion remained in their neighbourhoods.

Scores on the Liveability Monitor (Leefbaarometer) and the Safety Index (Veiligheidsindex) improved from negative to moderate. Neighbourhoods with dense plot configurations continue to lag behind due to the high demand placed on limited public space. Nonetheless, conditions have improved over the past decade, likely as a result of targeted investments. In Spangen, although economic growth has been modest, liveability and safety have improved significantly. While still fragile, conditions are far better than in the 1980s and 1990s. This progress is also reflected in residents' satisfaction: in both areas, roughly two-thirds of inhabitants now express satisfaction with their living environment. In Spangen, this represents a doubling since 2002.

Two forward-looking financial indicators include assessments based on the "value as a going concern," which considers projected income and expenditures of housing associations, and local property tax valuations [1]. For example, property values in Oude Noorden rose sharply between 2000 and 2008. The average price per square metre increased by 136 percent, compared to a citywide average of 97 percent. This growth can be attributed to the area's proximity to the city centre, its concentration of amenities, and the strong presence of the creative sector. In addition to these intrinsic advantages, large-scale investments—such as the redevelopment of public squares—played a crucial role. The historical character of the buildings and their central location further contributed to this rise in value [6].

CONCLUSION

Since the 1990s, linking sustainable development with urban regeneration has become increasingly complex. Doing so requires attention to urban design and planning, the social fabric, the economic structure, and systems of governance. In this sense, sustainable urban regeneration should be understood as a strategic process with goals that go beyond addressing physical decline. It must also develop plans that enable the urban fabric and building stock to adapt to shifting conditions, emerging demands, and new requirements. Experiences from Dutch neighbourhood renewal indicate that major investments in spatial quality have substantially extended the usable life of both buildings and urban form, although some contexts still required additional interventions. Efforts to improve liveability in deprived areas are frequently discussed in relation to gentrification, particularly as a spatial form of socio-economic upgrading. The case studies show rising economic value and measurable improvements in liveability and safety. While these neighbourhoods remain fragile, their conditions are far better than in the 1980s and 1990s, and this progress is also reflected in residents' greater satisfaction with their living environments.

At the same time, research and practice still need deeper integration of planning concerns, human-environment

relations, and environmental processes with social and economic considerations, particularly when identifying appropriate urban forms and housing typologies. This longer-term, integrated approach can conflict with short-term market-driven policies. New models of sustainable regeneration are therefore needed, especially in light of reduced public investment and shrinking subsidy support, to respond effectively to present challenges and future pressures.

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