Structuring a new paradigm: form Mixed Use Developments to Integrated Urban Ecosystems

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Abstract. Cities are key to achieve sustainability, concentrating more than the half of the world population, in what seems today an uncontrolled, irreversible and challenging urban expansion. Whether we choose a non-planning perspective or a structured one, sustainable urban design becomes a must for human environment. Mixed-Use Developments (MUD) raised decades ago as a supposed spark that could enlighten the design of our settlements, initially focused on density and walkability to address energy, liveability, health or safety challenges. Analysing literature on MUD methodologies and results, it seems clear that an excessive focus on design has reduced its potential to achieve sustainability. The concept must be widened: a) from land use to human being experience, integrating the different stakeholders in the process b) from stratified 2D land uses to flexible 3D activities guided by real time data in 24/7 updated urban regulations c) from urban morphology to a transversal vision that combines disciplines initially considered far away from design d) from compliance with energy standards, to a complex approach focused on achieving the SDGs, e) from isolated self-profitable market operations to enlarged understandings of sustainable socioeconomic balances based on circular economy principles and e) from energy certificates to urban systems integrated in their socio-cultural, environmental and economic framework. This huge shift on the scope commits the MUDs to give way to the Integrated Urban Ecosystems (IUE), synthetizing this new approach in a conceptual model. The model becomes a tool to support reflection, design and communication with stakeholders. Taking it as a basis, a set of urban design principles are structured in a Sustainable Design Matrix combining sustainability (through the SDGs) with disruptive transdisciplinary approaches. Finally, the global to local transference overlaps the cultural and societal layers to produce affordable and scalable solutions. IUEs potential to leapfrog to more sustainable and resilient human settlements is discussed and conclusions extracted.

1. Introduction
Cities are key to achieve sustainability, concentrating more than the half of the world population, in what seems today an uncontrolled, irreversible and challenging urban expansion. Whether we chose a non-planning perspective or a structured one, for both, sustainable urban design becomes a must for human environment. Since the 60’s, defending the positive impact of mixed use became common for both community activist and progressive planners like Jacobs [1] or Lynch. Sustainability, New urbanism or Smart Growth guidelines embraced this principle as key for urban development. It became an important element to national organizations like APA and international like UN or EU, or the New Charter of Athens [2] and was the core of a new concept: Mixed Use Developments (MUD). The need of mixing uses is a key element of current approaches to sustainability. Therefore a revision of the conceptualization of mixed use from different perspectives led to the development of a new concept: Integrated Urban Ecosystems.
2. State of the Art

Urban conceptual models are a useful tool for understanding the city with analysis, evaluation, implementation or foresight purposes. The conceptualization of the city as a system comes from the end of the sixties [3] but it has been used for the reinterpretation of current urban trends. Fernández-Güell et al [4] organized an urban model for Smart cities into layers in a demand-supply scheme where demand is placed at the core and different subsystems are placed around, surrounded by external change trends. Other approaches to urban systems in a demand-supply logic are present in the proposal of Pollalis [5] of an infrastructure-based approach, identifying Landscape, Transportation, Water, Energy, Solid Waste, Information and food infrastructures. Regarding Mixed use, one of the most important conceptualizations is the proposal of Rowley [6] that connects urban form characteristics (urban texture and settings) to different locations in the city and influential forces (Public Policy and regulations, Property Markets and Cultural ideas and Values). Taking as a departure point these different models, the conceptualization of the Integrated Urban infrastructure proposes the articulation in 5 different layers, as we will see in section 4.

3. Research methodology

The methodology for this research was structured in 5 steps:

1. Literature review and analysis of both papers published in scientific journals and public entities handbooks and guidelines. SWOT analysis for the identification of existing gaps in the development of MUDs.
2. Conceptualization of Integrated Urban Ecosystems (IUEs) aiming to close the identified gaps transforming the concept in a tool to reach the SDGs in an integrated and holistic way.
3. Development of the IUE methodology to approach the concept through strategic design.
4. First approach through existing case studies
5. Conclusions of the process and identification of strengths, flaws and future research paths.

The main result is a methodology for the development of IUEs integrating the SDGs as a key element.

4. Results

The review of the literature on the concept of mixed use developments and its evolution throughout the twentieth century led to expanding the approach defining different layers for a new concept.

a) PERSON AND STAKEHOLDERS. Human centered approaches are being taken in many of the different disciplines combined or tightly related to the proposed IUE integrated vision: mobility, energy, accessibility to opportunities, climate change, nature based solutions, or technology; in the case of technology it is also an enabler though the analysis of geo-referenced data. Urban governance, understood as the confluence of different stakeholder [1] is being placed gradually at the core. The stakeholders related to the forces identified by Rowley are political, economic and social stakeholders.

b) ACTIVITIES. Changing the focus to the person instead of to land uses implies a switch from uses to human activities, as originally in the Charter of Athens. IUEs are based on 24/7 changing activities developed in the city without limiting the buildings and land uses to a 2D single function, guaranteeing access to adequate spaces for living, working, recreation (to which we propose the addition of “care”) and circulation. [5]

c) URBAN SYSTEMS. Although urban design is key to the success of mixed-use developments, IUEs also take into account the systemic vision of the city that integrates urban design with the city's infrastructure, also meeting functional criteria and overcoming urban morphology guidelines. Through the initial identification of disciplines involved in the selected case studies, we have added to the 7 identified infrastructure systems, 5 elements identified as key to achieve sustainability from the IUE perspective: Planning, Built, Art and culture, acoustic infrastructure and parametrization.

d) SUSTAINABLE DEVELOPMENT GOALS. The multidisciplinary approach allows addressing the complexity of the SDGs in an effective way.
c) FRAMEWORK INTEGRATION. From the bases of sustainable development comes the need of analysis of the environmental, economic and sociocultural framework in order to reach sustainability. This allows the extraction of conclusions of its potential to leapfrog to more sustainable human settlements including related concepts and guidelines like circular economy, smartness or the HIII NUA.

This huge shift on the scope commits the MUDs to give way to the Integrated Urban Ecosystems (IUE), which can be defined as: “An urban system that enables the person to develop their activities of daily living integrated in a rich, diverse and unique environment and contributing to achieve sustainability through a multi-disciplinary approach”.

A Strategic Design methodology for IUEs development is proposed, combining a Conceptual Model and a Design Matrix.

Figure 1: IUE premises, conceptual model and further development

The proposed elements are combined and a Conceptual Model (Figure 1) with all layers and elements interrelated among them and with its environment in a systemic vision. The model becomes a tool to support reflection, design and communication with stakeholders in consultation and participatory processes. Taking it as a basis, a set of urban design principles are structured in a Sustainable Design Matrix (Figure 2) combining the proposed transdisciplinary approach with sustainability, showing its higher potential to achieve the SDGs compared to other sustainability approaches: Nature Based Solutions, Circular Economy, Smart Cities, TODs, (as defined by UE institutions) and MUD [6]. The matrix allows further development of specific design criteria in each of the crosses to ensure the contribution of IUEs to the SDGs. I. e. intersecting Mobility and SDG3: situation of Public transport access at walking distance from any point of the development (400 m) or the accessibility to soft modes.

Figure 2: Integrated Urban Ecosystem Matrix, facing MUD and IUE approach to SDGs.
4.1. Implementation of Integrated Urban Ecosystems

The Integrated Urban Ecosystems model entails a combination of typologies to allow the realization of daily life activities at a walkable distance. Within the possibilities, a use is sometimes prioritized over the others, giving multiple possibilities (figure 3). The research preselected 12 examples to extract different typologies to be analyzed in the next steps of the research.

![Figure 3: IUEs typologies and case study pre-selection.](image)

5. Conclusions

IUEs become, through a multidisciplinary approach, an effective tool to overcome the limits of MUEs focusing on addressing the SDGs. They offer an integrated approach to the Urban System that allows understanding its complexity to provide sustainable answers. The research proposes a systematic methodology for analysis and development of urban areas based on the IUEs characteristics and focused on reaching the SDGs. The selection of different case studies shows the way the concept can be applied to projects with different characteristics and in different areas of the world. Future research will explore in detail the application of the proposed concept and methodology to one or more the selected case studies, allowing comparison and extraction of new conclusions.

References

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