Maria Lucia Refinetti Martins
Paula Custódio de Oliveira

The urban environment as an issue

Abstract

In the broad framework of meanings and scope of the contemporary environmental issue, this article seeks to highlight particularities of its dimension in the scope of cities, observing the tension between urban settlement and the environment in its various dimensions. From the Metropolitan Region of São Paulo, the text draws on the results and conclusions of two recently concluded researches, one in the subject of environmental sanitation and housing, the other in the field of urban design and environmental comfort. In this context, it seeks to articulate the relationship between natural dynamics and processes with social dynamics and processes, structuring the formulation of socio-urban comfort.

Keywords

Urban environment. Inadequate settlements. Urban density increase. Environmental comfort.

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O MEIO AMBIENTE URBANO COMO QUESTÃO

Resumo

No amplo quadro de significados e abrangência da questão ambiental contemporânea, o presente artigo procura evidenciar particularidades de sua dimensão no âmbito das cidades, observando a tensão entre assentamento urbano e meio ambiente em suas diversas dimensões. A partir da Região Metropolitana de São Paulo, o texto recorre a resultados e conclusões de duas pesquisas recentemente concluídas, uma na área do saneamento ambiental e habitação, outra no campo do desenho urbano e conforto ambiental. Busca, nesse contexto, articular as relações entre dinâmicas e processos naturais com as dinâmicas e processos sociais, construindo a formulação de conforto sociourbano.

Palavras-chave

Meio ambiente urbano. Assentamentos precários. Adensamento. Conforto ambiental.

Introduction

Within the broad framework of meanings and scope of the contemporary environmental issue, this article seeks to highlight particularities of its dimension in the scope of cities. Hence the use of formulation as an Urban Environment, which has a specific interpretation and regulation, with its own particularities.

The persistent permanence and expansion of the irregularity of urban settlements, particularly in environmentally sensitive areas, leads to the identification that the urban environmental issue is intrinsically associated with the theme of housing, the lack of opportunities and alternatives.

Thinking about the environmental theme in large Brazilian cities implies discussing the issue of the model of development and urban development. It is essential to assume that, without strong investment and priority to social development, it will be impossible to achieve minimally reasonable environmental conditions, even if all industrial pollution is strictly controlled - which has been progressively occurring, mainly due to the demands of the international market regarding the certification of quality. In any case, the dimension of the problem requires that reflection on patterns, minimum levels, densification and intensification of land use or horizontal expansions, as well as on the distribution of the burden of the options adopted, be taken seriously.

Currently in Brazil, and especially in its metropolitan regions, the condition of environmental issues has been attributed to urban social problems, particularly precarious housing in risk areas, unhealthy conditions, floods and overflows.

This "feeling" could be interpreted as an expression of a tendency to mediate a radical preservationist vision and one that defends urbanization without restrictions. It could express the recognition of the existence of overlap between social, environmental and urban aspects and, consequently, of the need to adopt new policies, technologies and forms of production and space management that are different from current practices. However, the appearances stop there. If environmental disasters, on a local and global scale, are perceived as a consequence of an inadequate action in the treatment of nature, the relationship between this action with the production mode and the standards determined by the consumer society is not highlighted.

In any case, what is being observed is that, at the same time that climate change and major natural disasters have raised the sensitivity of society to environmental issues, and the dispute between the preservation of forests and the expansion of extensive agriculture and livestock is centralizing attention, the better understanding of the environmental issue in the urban environment ends up having a distorted and unspecified perception.

The city is not seen in its specificity. The environmental issue is much more focused on the macro, on the relationship between exploitation of the environment and industry, between preservation of forests and the expansion of extensive agriculture and livestock. Such perceptions are simply transposed to the city, with little or no sensitivity to its specificity.

It is in these terms that it is necessary to deepen the debate on the shape of the 21st century city, the density and environmental conditions of the settlement in large urban concentrations, to develop alternatives for urban settlement that contemplate environmental and social objectives.

New paradigms are needed to guide a practice aimed at reconciling the space intervention with environmental quality. This construction, in turn, must consider the specificities, contradictions and conflicts of the Brazilian social context.

What this article seeks is that, to address the urban environment, one must go beyond the environmental agenda to the local level, including specificities. There is something to think about when it is observed that in Brazil today, more than 80% of the population lives in cities, in a distribution in which around 50% of the population lives in approximately 1% of the territory[1] . Thus, what is now focused refers to this 1%, of very particular characteristics, in which general rules and principles cannot be simply replicated.

This means that the urban environment, as we know it today, includes the differential and intense presence of a specific species - humans, in an infinitely larger and aggregate proportion than in the whole of the territory. Thus, a particular vision fits, which includes needs, demands and conditions of survival of this species.

This small portion of territory fundamentally occupied by human beings, the universe of their conditions of shelter and survival are a part of this ecosystem and must be treated and regulated such as this. In these terms, it is necessary to characterize and evaluate what these specificities mean from the environmental point of view and what they imply.

The different species have peculiar forms of group leadership and coexistence, but the relationship between humans is infinitely more complex. Rules are built and grounded in a much more sophisticated way than the mere food chain and alpha leadership. Social tensions exist in parallel and intertwined with environmental tensions. Seeking to better understand this intertwining of tensions, this text seeks to express investigations developed within the scope of LABHAB (acronym in Portuguese of Laboratory of Housing and Human Settlements, FAUUSP) that articulate two aspects of research on human settlements: the relationship with the natural environment and the relationship with the built environment.

The background reflection, the way of focusing on the urban environmental issue, is that the environment does not consist only of natural processes, but includes the relationships between these and social dynamics and processes. It

[1] Calculation of the authors from population and density data from IBGE, 2010 Census.

seeks an approximation of the field of social sciences with that of architecture and urbanism, seeking to face the challenge of articulating political ecology to the production of urban space to relate social practices to forms of appropriation and use of urban spaces and nature. From the perspective of understanding the production of the space engendered by the capitalist mode of production, the theoretical formulations on the relations between man and nature are observed, based on authors who associate social and environmental criticism, aiming at political ecology. From the empirical and methodological point of view, it results from applied research, extensions, which articulates research, reading and formulation of alternatives based on cases.

Unlike the broader environmental thinking, in which the economic issue related to the territory - agriculture, mining and energy option are the central tensions, in the urban environment social tensions are more relevant. It is from this perspective that the construction of an identity, a specificity for the urban environment with its own questions and forms of regulation, is proposed.

The urban environment, a space of predominance of the human species, makes it evident that social relations assume a privileged dimension and their tensions go far beyond frictions with the natural world. It is no wonder that Guha (2000, p.84) ponders:

> *"biologists have a direct interest in species other than humans, they are alert to the interests of bird, plant or animal life. This interest in other species, however, sometimes blinds them to the legitimate interests of the less fortunate members of their own."*

Based on the Metropolitan Region of São Paulo, the article will discuss, based on investigations and extension activities developed, the urban environmental issue, considering two extreme situations that express it: the inadequate settlements in the peripheral fringes next to the springs and in environmentally sensitive areas and central areas, consolidated, that lose population, but have the potential for urban density increase, at the same time that they need attention to avoid points of over-density and heat islands. These aspects were studied during the following research projects: Damage Repair and Adjustment of Conduct in Urban-Environmental Matters (FAPESP 2002-2006), Rainwater Management in Urban Environment (MCT/Finep/Cnpq/Transversal Action Environmental Sanitation and Housing - 2011-2016), Building and Urban Design with urban density increase and environmental quality: social housing in the recovery of degraded urban areas (CAPES 2010-2014).

They are applied research with the conception that experimentation and practice are part of the theoretical construction. The development of projects and their applicability are essential to this construction. They developed proposals for relief and environmental improvement, as pilot projects, involving research, teaching and extension. It is from these experiences that it became possible to specify levels of irregularity and possibilities, ways of intervention and overcoming and paths for qualification and regularization, also in the legal field.

Urban environment – foundation and literature review

The Environment is defined in the Basic Vocabulary of Natural Resources and the Environment of IBGE as "the set of physical, chemical, biological and social factors that may have a direct or even indirect effect, immediate or long-term, on all beings alive, including man" (IBGE, 2004, p.210).

Environment, as well as other concepts, is a social construction, constituting a wide territory to be delimited. Nature, as an environment, is another subject of the Social Contract (FUKS, 2001). The construction process of the Environment as a relevant issue, recognized and incorporated into the agenda of public concerns and political debates has stages, mechanisms and certain logics. The Environmental Issue is assumed and designated as such from the Stockholm Conference, of the UN, in 1972. The highlight of the city arises from international networks of municipalities, in the midst of Agenda 21, of 1992 and perspectives of its local implantation (ACSELRAD, 1999).

The environmental issue in Brazil was initially understood and formulated in a perspective of protecting ecosystems of aesthetic and cultural value, preserving "untouched portions of nature", which led to the formulation of the Forest Code, promulgated in 1934, under the management of Getúlio Vargas, as a Federal Decree. From the 1960s onwards, there was a change of emphasis in conceptualization, moving to the protection of threatened species and ecosystems. However, public policies started to be designated as environmental only in the 1970s, with the creation of the Special Secretariat for the Environment – SEMA (acronym for "Secretaria Especial de Meio Ambiente" in Portuguese), in 1973 (ANCONA, 2002).

In the 1980s, the institutionalization process of the environmental issue and its translation into public policy dimensions were witnessed, with the creation of the National Environment System, at the federal level, focusing mainly on the protection of forests (FUKS, 2001).

On the other hand, the regulation and control of city planning has been attributed to municipalities since the colonial period. As provided by the country's Constitution, it is incumbent on the Municipalities "to promote, as appropriate, appropriate territorial ordering, through planning and control of the use, parceling and occupation of urban land" (Art. 30, item VIII).

The two systems intertwine in the city, which is certainly one of the most significant creations of civilization, at the same time that it represents one of the most impactful forms of appropriation and transformation of nature, being considered its complete antagonism. It is necessary to discuss the concept and specificity of the urban environment, observing the tension between urban settlement and the environment in all its dimensions (MARTINS, 2011; 2015). For this, it is necessary to incorporate reflections and methodologies of work in different areas, from those of an environmental nature, as well as those of landscape and water resources, soil protection, sanitation, ambience and

comfort, ventilation, district heating, according to Steinberg (2006), Pellegrino (2014), Costa (2015), Mello (2008), Miana (2010), and Duarte (2015).

The 2010 Census points to more than twenty million inhabitants in the metropolitan region, formed by São Paulo and 38 other municipalities. In 1940, the region that constituted this cluster registered just over one and a half million inhabitants. Once the difference is calculated, a new city is highlighted, with more than 18 million inhabitants, which was built in 70 years. The highest annual growth rate occurred in the 1950s. Since then, rates have been falling, but still, the 0.97% of the last decade represents more than 190 thousand new inhabitants per year.

This scenario, which is embodied in a largely precarious and informal settlement, has been increasing urban-environmental tensions in the region, as is the case in all large Brazilian cities. These are irregular subdivisions, informal occupations and slums, precisely in the most environmentally fragile places, "protected by law", therefore, disregarded by the formal real estate market.

This is a situation that has been investigated and highlighted since the last decades of the 20th century in works such as Socrates, Grostein and Tanaka (1985), Maricato (1996), ISA (1996-2010).

What is observed is an enormous liability that reproduces from precarious conditions, in which the tensions between urban expansion and environmental conditions are gradually amplified. The advance on nature for urban settlement as well as for economic development represents, since colonial times, a cushion between social tensions.

But the environmental issue in cities is also characterized by the constitution of heat islands, wind corridors and even floods and overflows (BAPTISTA; NASCIMENTO; BARRAUD, 2005), which occur in the built and consolidated areas.

Understanding the relationships among the society, as well as the relationship between city and nature, certainly involves articulating political ecology to the production of urban space to relate social practices to forms of appropriation and use of urban spaces and nature. This implies bringing the social sciences field closer to that of architecture and urbanism so that concrete situations in the urban space can both incorporate and contribute to the theoretical-practical formulations. (MARTINS; FERRARA, 2010)

It is on these bases that it is proposed to discuss the concept and specificity of the urban environment, and to deepen the understanding of the relationship between man (society) and nature, aiming to find in theory the foundations of the norms and public policies dichotomized between "natural" and "artificial", who came to understand human activities as necessarily destructive of nature. Within this analysis, it will be possible to explore the role that the "urban" has been playing in the relationship between man and nature.

Urban environment and the expansion of settlements

The enormous urban-environmental liability that characterizes urban peripheries in Brazil led to the revision of a paradigm of interdiction and exclusion to one of mitigation and harm reduction, as expressed in Section III of Law No. 11,977/2009 (My home, my life), replaced by Law No. 13,465/2017. In the same sense, State Law 9.866/1997 - "New Water Spring Policy" was previously configured. These legal mechanisms brought new perspectives, but also new challenges in facing the gap between the real city and the rules that regulate it.

In relation to settlements in environmentally sensitive areas, from the beginning of this century, paradigm changes began, which are expressed in the normative changes, in which the infrastructure changed from an element to be restricted to avoid stimulating occupations (according to the Law of protection of the Water Springs of the Metropolitan Region of São Paulo - RMSP, 1975), for the necessary condition of environmental recovery of precarious settlements and the environmental context itself. Recent interventions have been guided by the notion of environmental recovery associated with sanitation and urban, land and environmental regularization under the terms of the Specific Laws (in the case of the Billings and Guarapiranga watersheds) and, in general, under Section III of the law that creates the "My home, my life" Program, Law nº 11.977/2009 and subsequent Law nº 13.465/2017, as it applies to land tenure regularization of social interest.

Thus, it is necessary to discuss the role of urban infrastructure as an element of environmental recovery, being a fundamental element in the regularization processes. The necessary reflection contemplates, on the one hand, problematizing the homogenization of solutions in view of the diversity of situations of precarious settlements consolidations, as well as explaining the importance of maintaining environmental characteristics, particularly in the case of supply watersheds. In addition, on the other hand, it should support the debate on how to guide intervention projects in precarious settlements that, as objects that can be regulated in the social interest, have as a premise the flexibility of urban and environmental parameters (FERRARA, 2013).

This flexibility is a recognition that the parameters of the formal city do not apply in the context of precarious settlements, which are built outside the law. However, the purpose of regularization is to qualify them. Thus, minimum references should be sought to ensure qualities that are not spelled out in law, so that urbanization does not serve to consolidate precariousness and reproduce socio-environmental inequality, but seeks to increase the urban and environmental quality of the areas subject to intervention.

Urban and environmental improvement is possible as long as it seeks to guarantee some principles that are generalizable for any project, but assume greater importance when it comes to an environmentally protected area.

In the debate on regularization, it is clear that the search for a possible urban and environmental standard, which is not the standard established by law for the "formal" city, calls into question the application of environmental legislation without distinguishing the specificity of each occupation to regularize. This is a paradox because, on the one hand, the complete relaxation of environmental

requirements can compromise the improvement of the environmental quality of the intervention; on the other hand, its application without flexibilization or adaptation to the existing occupation can make regularization unfeasible or promote large removals of houses, reproducing the pattern of socio-territorial exclusion (RAMALHO, 2013).

These impasses are frequently present in urbanization projects in precarious settlements, when seeking to guarantee social rights. Moreover, their solution depends largely on the design solutions, as well as the possible forms of environmental compensation. They also depend on the population's adherence to the proposals so that they can be maintained over time, that is, they are not strictly resolved from a technical point of view. For this reason, technical studies and appropriate methodologies for the recognition of degrees of risk and degrees of precarious housing with the indication of the applicable solutions (from a social, technical, environmental, financial and institutional point of view) are very relevant.

However, to overcome these impasses, it is necessary to create ways to recognize, first, the social gains followed by environmental improvements of these interventions and its aggregation.

Currently, the regularization of social interest presents new possibilities from the legal point of view, both at the federal level and at the state and municipal levels. In the areas of watershed protection, the specific laws of the Guarapiranga and Billings watersheds opened up possibilities for regularization that did not exist before, in the sense of democratizing access to the city. However, the challenge of urbanizing and implementing infrastructures in these areas is not only to requalify the locations that are objects of intervention, guaranteeing the right to housing, but to do so in the context of planning aimed at the recovery and protection of a strategic territory for water supply in part of the metropolis of São Paulo (FERRARA, 2013).

On the one hand, the homogeneous application of urban and environmental parameters of the formal city generates conflicts and obstacles in the regularization process; on the other hand, the flexibility of these parameters cannot be integral, because what is sought is not the consolidation of precariousness, but the so-called full regularization, that is, the promotion of social, urban and environmental improvements in settlements that, historically, have been outside the rights of the city. The elaboration of intervention principles and some type of parameters is a challenge that presents itself to an interdisciplinary field of urban studies and environmental sciences.

In this sense, it must also be considered that since the approval of Law nº 6.766/1979, which prevents the promotion and sale of precarious and low-cost settlements, and the subsequent greater control over settlements in environmentally fragile and protected by law areas, density in slums has increased significantly in large urban centers such as São Paulo and Rio de Janeiro. The informal verticalization without technical conditions and the increase in the number of residents per household is the reality that today welcomes the demand for settlement of the population increase. Where and how to accommodate this growth is the great social and environmental challenge, while entire neighborhoods gradually lose their population and perform properties that have been degraded by lack of maintenance and abandoned.

Urban environment and the management of densities

In the city of São Paulo, the various plans and proposals for qualification in its central area have been very limited, if not disastrous. The market is always looking for areas of expansion and innovation, traditional areas are being abandoned by more dynamic economic activities as well as by middle or upper income housing. The built park, without maintenance, goes into physical decay, with part of the buildings unoccupied and even abandoned. They are areas with broad locational quality, in which those who would be able to occupy it do not show interest and those who would like to occupy it have no access for economic reasons and lack of adequate offers (EMURB, 2004; KARA JOSÉ, 2010).

The real estate sector shows interest only in processes of total reconfiguration; "scorched earth" actions, in which all the built heritage and real estate are replaced. The recurrent proposals with very low response for downtown São Paulo and particularly the "Nova Luz" project are paradigmatic examples of this condition. Many public resources are invested and the area does not become attractive to the market. Everything shows that the qualification of these areas is only possible with the intensive action of the public power. It is what would be configured as Public Investment Planning, as characterized by Brindley, Rydin and Stoker (1987), as the only way to qualify depressed areas, with no interest to the market. But in this case, if there is room for public investment, it would be fair to promote public policy of social interest - as is the case with housing.

Despite being notable for its mass of tall buildings, the city of São Paulo presents overall and especially in certain neighborhoods of its expanded center, average densities that are not very significant.

The Zoning Law (1972) and its particular incentive device for the production of isolated tall buildings in the center of the lot, known as "Adiron Formula"[2], created an impoverished space. This pattern, associated with images produced by real estate marketing and the escalation of urban violence, built a pattern of housing that denies public space, urbanity and the diversity of urban centers.

The ideological transfer of these "values" to all social classes, associated with urban and building legislation that reinforces this typology, generates the abandonment of formal alternatives that could enable better urban and environmental quality. On the other hand, the prospect of translating concepts, hypotheses and underlying principles into drawings, in urban form, so that materialized and visible make it easier to assess the impact and the formal and environmental meaning of the choices of principles, concepts and urban indexes is an unavoidable contribution .

The zone typology called ZEIS 3 (Portuguese acronym for Special Social Interest Zone, corresponds to perimeter boundaries within the consolidated urban network, empty or underutilized, intended for the promotion of Social Interest Housing) was created in the 2002 São Paulo Master Plan with the objective to provide areas within the urban fabric for HIS (Brazilian acronym for Social Interest Housing) and encourage its promotion through free granting of construction potential up to 4 times the area of the lot, thus reducing the land

[2] The provision determined that buildings that reduced the occupancy rate (OR) would benefit from a higher utilization rate (UR), free of charge to the developer, without a counterpart of collective interest. The reduction in OR did not represent a technical option, with environmental implications, because the garages could occupy the basement, waterproofing the lot area; the result was just an urban pattern.

cost for the implementation of HIS. This incentive was reiterated in the 2014 Master Plan, in effect.

However, what is observed is that the urban regulations operate with urban parameters that are not linked to parameters of form and design, whether in terms of the mass plan, the simple template, or the conditions of the housing units. The application of such parameters, considering the use of the maximum allowed coefficient of utilization (CU) for the zone (four), can lead to a net density of 2,500 to 3,000 hab/ha, very high if applied in a continuous and extensive area. This shows limitations of the regulations that become visible when the parameters are translated in the form of a drawing. Thus, the potential economic viability translates into urban and environmental unfeasibility (MARTINS; RODRIGUES, 2010)

To promote the urban and environmental qualification of these regions with Social Interest Housing, it is essential to articulate criteria of architectural design, form of settlement and technology, and better knowledge of the functioning of financing mechanisms and real estate production and the logic of the design resulting from the economic calculation. The City Statute proposes instruments to promote the social function of the city and property. The Master Plans and, among them, the São Paulo Strategic Master Plan, seek to apply them, establishing foundations and regulations that, if on the one hand operate concepts and principles, on the other hand, cannot, due to their merely normative nature, materialize them in terms of urban space.

Finally, it is concluded by reiterating that the urban and environmental qualification of precarious São Paulo central areas is only possible with the promotion, conducted by the state, in these areas of Economic Housing. On the other hand, this dwelling should have a high density for better use of the good location and an urban design that provides a stimulating and diversified environment, with typologies that take advantage of the condition of centrality. Would it be possible to establish parameters for this?

Methodology

The purpose of investigating the complexity of the city - environment relationship, around a concept of urban environment, as exposed in the present work, as it progressed, from an initial work (started in 2002) focused on the settlements in water springs and borders of streams, led to two aspects of research focus regarding urban settlement and the environment:

In distant **peripheral fringes**, precarious and undervalued in the real estate market, conflicts are manifested between environmental preservation and the demand for urban settlement of the poor population, without access to housing alternatives offered by the market or by the state, settling in a precarious, irregular way, next to the water springs and protected areas, in conditions of risk to the residents and environmental damage.

In the **equipped center**, valued and with many job offers, what takes place is the territorial disputes related to a built environment that become obsolete for some types of uses, being subject to precariousness by aging without

maintenance and abandonment. This space, which contains numerous closed and unused or underutilized properties, represents an opportunity to promote low-cost housing by intensifying land use. The promotion of the repopulation of central areas, which already have privileged conditions of infrastructure and location and which have undergone a process of population loss, has been repeatedly discussed as an important alternative to peripheral expansion. However, it is certainly not so simple. It is in this context that another scenario of settlement/environment tensions occurs. It is expressed in the debate between the increase of density to reduce costs and expand supply, and the environmental and social limits of this increase.

It is in this pairing of questions, also built in another Latin American context, by Schelotto (2008) that applied research was developed, aiming at reading and forms of intervention. The methodological path is precisely the advance on these two fronts, with specific research, each with its own methodology. Consubstantiates in researches developed in the Laboratory of Housing and Human Settlements – LABHAB (acronym in Portuguese), of FAUUSP, with different partners. In terms of precarious settlements in peripheral spaces, research and extension have been added since 2002, when the research on Damage Repair and Adjustment of Conduct in urban-environmental matters was started, in partnership with the Public Ministry, under the Public Policy Research Program of FAPESP. As of 2011, applied research began on Storm Water Management in Urban Areas, in partnership with the hydraulic engineering area (sanitation and drainage) [3].

The adopted methodology consisted, first, in the survey and characterization of the different approaches on urban drainage with regard to the technical aspects (projects and conventional and unconventional solutions), of production (execution in the urbanization worksites, relationship between public power and construction companies, the relationship of these agents with the local population) and planning (macro and micro drainage plans and relevant legislation). This survey was both bibliographic and practical experiences, through executed or in progress projects in the cases studied.

Within the scope of this research, the specific contribution of LABHAB, in collaboration with the FAUUSP Construction Practices Laboratory (LCC - acronym in Portuguese), aimed to develop urban alternatives that would incorporate compensatory rainwater management techniques into the urban design (aimed at its absorption and not accelerating flow), particularly in cases of regularization of precarious settlements, seeking environmental recovery and improvement of public spaces. The main justification of the project refers to the need to develop alternatives for urban and environmental recovery and to minimize the impact of urban occupation done informally, by self-construction, without infrastructure, under physical risk, in areas that are formally protected by law. Its purpose was to face one of the characteristics of the urban expansion process of the São Paulo metropolis, which is the fact that the speed of reproduction of the built spaces occurred informally and was not accompanied by the simultaneous construction of infrastructure networks.

[3] Network research of 14 university teams from different states in the country. General Coordination of the Network: Nilo O. Nascimento - UFMG. Coordination of the FAUUSP project: Maria Lucia Refinetti Martins. Public call 07-2009 MCT/Finep/Cnpq/ Transversal Action Environmental Sanitation and Housing - 2011-2016.

The density aspect in central spaces started with the dialogue between the Laboratory of Environmental Comfort and Energy Efficiency (LABAUT) and LABHAB, aiming to develop and give visibility to alternatives for the promotion of economical housing with greater density and environmental quality, seeking the best use of the good location and available infrastructure, in areas of consolidated urban fabric with underused building framework, of very low density or obsolete for its original use, precarious by aging without maintenance and even abandoned. The purpose was to associate the advance of knowledge in the fields of urban planning and built environment technology. It guided the purpose of integrating procedures for applying technology, building design, urban design and management, proposing to offer subsidies to public debate, the formulation of urban policies and to contribute to meeting housing needs on a larger scale. It was configured in the research: "Building and Urban Design with densification and environmental quality: social housing in the recovery of degraded urban areas"[4].

The methodology of this research involved working with two case studies that made it possible to test different densities through different intervention modalities: existing buildings/retrofit and new buildings; consolidated and new urban layout. Thus, it was defined to research two areas with the following characteristics: Area 1: Area of the Nova Luz project, because it is a densely built area and a perimeter for which surveys and simulations have already been carried out, however, the research will focus on the existing ZEIS 3 within the perimeter. Area 2: Area chosen due to the survey carried out at the ZEIS 3 with relevant existence of urban voids and underutilized lots.

For these analyses, some variables were considered for the evaluation of urban models: population density, energy, water, access to the sun and availability of natural light, air quality, urban and building accessibility/mobility and transport. Parameters such as built density, open public spaces, green areas (percentage and distribution of permeable surfaces and trees) and infrastructure for drainage strategies were observed for the preparation of mass plans for the areas under study. The socioeconomic information base provided by the IBGE Population Census for different years was used, as well as the information generated by the 2010 Census.

Each of the projects, as well as the set of theses and dissertations related to them, developed its own specific methodology, within the general framework of applied research, in which experimentation and practice are part of the theoretical construction. The development of projects and their applicability are essential to this construction. There are several proposals for environmental relief and improvement developed as pilot projects within the scope of this set, which involves research and extension. It is from these diverse experiences that it became possible to identify, from the norm point of view, its little effectiveness and, on the technical side, the immense distance between theory and the concrete needs of society. They are ways to specify levels of irregularity, to identify ways of intervention and overcoming, and ways to regularize and evaluate.

[4] Research that brought together experiences from the Technology Laboratories - LABAUT and from Housing and Human Settlements - LABHAB. Coordination: Marcia Peinado Alucci; Adjunct Coordination: Maria Lucia Refinetti Martins (2009-2014).

Results and discussions

The researches that support this article were developed jointly between the area of Urban Studies - Housing and Human Settlement addressed by LABHAB since its creation, more than 20 years ago, and the specific areas of the technology of the built environment: Hydraulic Engineering teams, linked to the study of compensatory drainage techniques and respective calculation methods, for the peripheral informal settlements, and the Comfort area, for the study on densification in central areas.

These are cases of interdisciplinary work, at the interface of environmental and socio-urban issues, in which the specific rigor of each area has to dialogue with the numerous restrictions of dealing with a real city and its users and their different cultural references.

In the case of peripheral settlements to be regularized and urbanized, initial studies sought to identify the possibilities for implementing non-conventional drainage systems, considering the difficulties of the physical condition in which the settlements were built, as well as the shape resulting from consolidated occupations. The rugged topography, the inadequate implantation of roads, the layout of the lots and the type of soil are elements that hinder the implantation of some of these systems. On the other hand, there are remaining areas, such as the existence of unoccupied lots, wetlands and areas with preserved vegetation, which can be the subject of specific projects.

At the same time, in the study area of the research on Rainwater Management in Urban Environment, on the edge of the Billings dam, paving, containment and drainage staircases were carried out by the Government, without articulating an urban design for the whole.

Under these conditions, the initial hypotheses of compensatory techniques to be implemented had to be reviewed from the technical point of view and their articulation with traditional techniques. The approach adopted for the problem, involving intense dialogue with residents, identifying problems from the lived experience and presenting technical alternatives in informal language and with practical associations with day-to-day knowledge, led the research team to a learning and vision that points to a pilot experience in São Bernardo do Campo (LABHAB, 2018, v. II).

In the case of the ZEIS, in which it was sought to identify elements of environmental quality within the scope of Comfort, it was necessary, from the beginning, to develop a glossary to guide the dialogue on common bases between the two areas of knowledge involved.

While the strand of urban knowledge aimed at developing denser urban design standards, but with guarantee of environmental quality (in the broadest sense), the challenge for the Comfort area was to develop environmental comfort studies on an urban scale, extrapolating the practice and technique used in building comfort studies.

If, on the one hand, the expectation was to receive objective inputs for urban design, on the other, the Comfort area made it clear that it has the appropriate methodology and instruments for assessing the environmental performance of

situations already implemented, with instruments and methodology to verify in existing cases the quality standard and, from there, infer alternatives.

Having made the "decompensations", it was possible to develop a comprehensive analysis, with a greater understanding of the dynamics of the urban space, considering the issue of settlement and infrastructure in the periphery and urban density increase in the consolidated and central areas, particularly in the ZEIS 3 in the central area of São Paulo, and identify some basic principles that projects for better use of central urban spaces should consider.

If, on the one hand, investigations and work related to peripheral areas have led to the need for new concepts of articulation between infrastructure and public spaces alongside community ownership and involvement, the perspective for consolidated, central areas also involves technical aspects, of urban design and social articulation.

Using the set of assessments and learning provided by the two strands of research developed - in relation to the natural environment and in relation to the built environment, to support projects that promote urban and environmental qualification, the notion of socio-environmental quality was developed.

We sought to transpose the concept of Human Requirements from technical standards for housing buildings (International Standard ISO 6241 – Performance Standards in Building, 1984, and in Brazilian NBR 15.575 – Performance of Residential Buildings up to 5 floors, 2008]) for an expanded notion of quality of life in the city, involving environmental and socio-urban conditions, bearing in mind that both physical qualities linked to environmental comfort and sociourban qualities linked to social comfort must be met. From this perspective, the meaning of the concept of each term classified as Human Requirements unfolds and expands. Here, the terms social comfort and environmental comfort dialogue as they propose the overcoming of social issues imposed by the occupation of the territory over the years and the overcoming of physical issues of the environment. Both seek to qualify the city space for the good enjoyment of its population.

It is then proposed, experimentally, the adoption, as Human Requirements, of the following aspects: Healthiness; External and Internal Thermal Comfort; Acoustic Comfort; Air quality; Urban Security; Urban mobility; Urban Ergonomics; Accessibility and Reduction of Environmental Impact. Seeking to unfold and expand the meaning of each Human Requirement, they are associated with environmental and socio-urban variables. From this, each requirement associated with a variable result in intervention requirements and criteria, referring to social and environmental comfort, responsible for the direct dialogue with urban action. (OLIVEIRA, 2012; LABAUT / LABHAB, 2015).

The variables, requirements and socioeconomic criteria are based on references from the critical reading of Jane Jacobs (2014), from the LEED Development Neighborhood certificate (2009), added to the knowledge accumulated over the disciplines of urban planning and environmental comfort of undergraduate and graduate programs.

Urban healthiness is directly associated with both infrastructure issues and aspects of environmental comfort in the housing building, such as adequate sunshine and lighting and cross ventilation in the building. At the same time, the discussion about population density is associated with healthiness as density increases excessively.

It is worth mentioning here the understanding of density, in addition to that presented in UN documents as a positive aspect for environmental sustainability. This refers to the concept of built density, which can be regulated by urban regulations (utilization coefficients and occupancy rates). Another is population density (inhabitants per hectare), which does not correspond directly to the built density, as it depends on the size of the residential units and the "average household". Another is what the "Spanish speakers" call hacinamiento (which has no English counterpart), and expresses the excessive number of residents per room (more than three people).

The following figure illustrates, in relation to healthiness, the correlation between environmental comfort and socio-urban comfort. The same type of articulation can be made between the various other points of Human Requirements, as previously mentioned.

In summary, the urban environmental theme is essentially interdisciplinary and, like all issues that require this approach, it demands certain conditions. It is essential to prevent interdisciplinarity from becoming superficiality in the whole. To build it, it is necessary that each one dominates his field of knowledge in depth, very clearly about options and paradigms assumed and defended, but adopts a posture of generosity to listen to the other and seek to understand to dialogue with rationality or with the reasons for each area of

Figure 1. Table of environmental and socio-urban convergences.

Criteria	**Requirements**	Socio-urban variable	Human Requirements	Environmental variable	Requirements	Criteria
Maximum adequate population density, defined from health and cultural references.	Standard suitable for residents and free spaces Maximum walking distances to transport services and equipment for local use	Population density increase	**HEALTHINESS** (ISO 6241 – item 11 Hygiene requirements; NBR 15.575 – item Habitability	Access to the sun Availability of natural lighting	Minimum hours of sunlight on the façade Shading effect in summer Open spaces under sun exposure in winter	2 hours of sunshine on the winter solstice (Miana, 2010)
				Wind availability	Minimum ventilation rate (hygienic ventilation)	Simulation method with CFD / CF application Verified permeability (LABAUT)

knowledge. Perhaps the concept of mitigation is decisive for this construction. Mitigation between ideal and reality, between normative and passive, between areas of knowledge.

Inserting the environmental issue in the urban sphere implies assuming that it is intrinsically associated with the housing issue - lack of opportunities and alternatives, in ensuring for everyone an adequate settlement condition. It implies in evidencing that the inadequate way of treating nature is part of the relationship of these conditions with the mode of production and with the pattern guided by the consumer society.

The socio-environmental tensions that are expressed in the urban form and in its conflicts, do not stick only to principles of an environmental nature and are shown as part of the eternal social conflict regarding the division of labor and the distribution of goods.

It should also be noted that part of the basic ideas of this article were already outlined, although without much clarity, in a presentation made in 2015 at the 20th Brazilian Congress on Environmental Law, promoted by the institute "O Direito por um Planta Verde" (freely translated as The Right to a Green Plant), under the title Urban Environment - an interdisciplinary construction. The opportunity to expand the debate brought about by the January 2020 call for the thematic dossier: "Environment and built space: ideas, techniques and processes" motivated its resumption and complementation. The issues of the call ended up becoming even more pertinent in view of the health situation of the ensuing Covid 19 pandemic. Coincidences? Certainly not. The path of science has a course and a sensitivity that are not random.

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Maria Lucia Refinetti Martins
Universidade de São Paulo, Faculdade de Arquitetura e Urbanismo / LabHab
Rua do Lago, 876 – Butantã - 05508-080
Orcid: https://orcid.org/0000-0003-0670-7835
malurm@usp.br

Paula Custódio de Oliveira
Universidade de São Paulo, Faculdade de Arquitetura e Urbanismo / LabHab
Rua do Lago, 876 - Butantã - 05508-080
Orcid: https://orcid.org/0000-0002-2644-6030
pcoliveira.9@gmail.com