Defining best practices in Sustainable Urban Regeneration projects

Guilherme Castanheira
University of Minho, Laboratory of Building Physics and Construction Technology, Guimarães, Portugal
guilhermecastanheira@hotmail.com

Luís Bragança, Ricardo Mateus
University of Minho, School of Engineering, Department of Civil Engineering, Guimarães, Portugal
braganca@civil.uminho.pt, ricardomateus@civil.uminho.pt

ABSTRACT: This paper aims at analysing three international sustainable urban regeneration projects. The analysis is based in the application of ten urban sustainability indicators from two sustainability assessment tools (Sustainable Building Tool for Urban Planning in Portugal - SBTool^{PT}-UP and International Sustainable Building Tool for Urban Planning– SBTool Urban) that are being developed at national and international level, respectively. Through this analysis it is intend to define the best practices for sustainable urban design, which allows to define the benchmarks of both tools and to support designers in the processes of decision making which goal is to optimize the sustainability of new or regenerated urban areas.

1 INTRODUCTION

Urban regeneration is on the agenda of many municipalities and nowadays it is perceived that this issue has an increasingly importance. Aspects like e.g. optimizing citizens' satisfaction are now in the basis of many urban projects (new or regeneration). At the moment the aim is not only to preserve the cultural heritage but also to avoid uncontrolled urban sprawl, avoid excessive use of natural resources while improving the population quality of life. It is known that every year buildings together with others constructions consume 40% of the global natural resources (Roodman & Lenssen, 1995) and current trends predict that the number of urban inhabitants will keep rising, reaching almost 5 billion by 2030 out of a world total of 8.1 billion (UN-Habitat, 2007). These data summarize the global concerns, and leave evidence that urban regeneration is considered as one of the fundamental mechanisms for achieving sustainable urban development (Turcu, 2012). Souza & Awad (2012) argue that sustainable development concerns are at the present more urgently in cities with considerable problems, but in future all cities would have to be based in sustainable principles, since they are the largest resources consumers and the largest generators of waste of the planet.

Recently, some urban regeneration projects stand out for their greater concern with sustainability, as well as his legacy. According to Dale & Newman (2009), urban regeneration has been seen as a tool to create "incubation zones" for sustainable development, and its application has been expressed on projects with long-term thoughts, targeted to the benefit of the citizen and city, with direct influence mainly in the project area - i.e., the plot. These projects are supported by principles of sustainability, which are responsible for the design of strategies and urban policies for renovation/regeneration of the cities/neighbourhoods.

However, there has been little research regarding to the benchmarking (good sustainability and conventional practices) in urban regeneration, mainly due to the relative infancy of sustainable urban regeneration (Hemphill et al., 2004b). Even knowing that sustainable urban regeneration projects promotes sustainable public policies or even sustainable cities, it is important to define, beyond good intentions, what are the best sustainability practices and the best quantitative/qualitative benchmarks, supporting urban planners in improving the results of their projects.

There are already some forums for exchanging experiences among cities, but it is necessary to highlight that there are no unique solutions and therefore each site and project require specific measures related to their own characteristics (Miana, 2010).

Europe is the continent with the largest experience in urban regeneration, prominently the UK, Germany and France (Couch et al., 2011). In this study three projects were analyzed in order to assess the best practices: Nations Park, Lisbon (Portugal); La Confluence, Lyon (France); and Queen Elizabeth Olympic Park, London (England). The chosen case studies have common characteristics, are based in the rehabilitation of old industrial areas that were abandoned or degraded, and are considered by responsible authorities as sustainable projects. Urban regeneration projects are generally linked to vacant spaces and or brownfield sites - regarded as urban voids -, and its principles revolve around the attempt to solve urban problems through economic, social, environmental and physical improvements (Roberts & Sykes, 2000), as the reuse of unoccupied buildings, as well the improvement of infrastructures, facilities and urban services.

Among the analysis of three projects from different regions it is possible to verify how urban regeneration strategies are being applied by local authorities in the search for more sustainable cities and improved citizen's quality of life, respecting the environment and its natural resources.

2 HOW TO MEASURE BEST PRACTICES?

The goal of this paper is to set the current best practices, in relation to what is practiced both at national and in European urban regeneration projects. The process of establishing best practices will be based on the use of sustainability indicators, since they are fundamental instruments for urban analysis, for the design of policies, strategies, programs and actions for sustainable urban development (Rosales, 2011). The indicators are the basis to measure sustainability; however, one must be very careful in selecting the indicators to be used at each context because indicators to measure the sustainability of an urban area might not be useful for others.

2.1 *Sustainability indicators*

The indicators considered in this study are based in the work carried out in the development of the SBTool^{PT} methodology for Urban Planning (SBTool^{PT}-UP). This tool is still being developed and will follow the steps of the overall methodology, which considers a set of indicators related to different categories and evaluated by a set of parameters. These indicators along with their categories represent the three dimensions of sustainable development: environmental, social and economic. Scheduled for release in late 2013, this tool will allow assessing the sustainability of urban planning projects and urban regeneration, but also will serve as a guide for implementing best practices, supporting the development of more sustainable cities.

The structure of this methodology is being developed and adapted to the Portuguese context by the Laboratory of Building Physics and Construction Technology of University of Minho (LFTC-UM), based on the work of Serge Salat (Salat et al., 2011) and on the work of the iiSBE working group SBTool Urban (iiSBE, 2013), which is also in development. A cooperative effort is being made for the improvement of these methodologies taking into account the latest scientific developments in sustainability at the urban scale.

The process of developing indicators to the SBTool^{PT}-UP methodology was based the following goals: to create a list of indicators that is organized, transparent, objective and takes in consideration the most important aspects of sustainable development. This list was developed based upon the current state-of-the-art of existing methodologies to assess the sustainability of urban projects and urban communities and based upon the indicators of the building sustainability assessment tool SBTool^{PT}.

According to Bragança et al. (2013), the tool encompasses twelve categories under the scope of the main sustainability dimensions (environment, society and economic). Additionally, an extra category is considered covering the sustainability of buildings and information and communication technologies. The forty one indicators included in this tool, as well as the respective categories and dimensions, are presented in Table 1.

Table 1. List of categories and sustainability indicators of the SBTool^{PT}-UP methodology.

Dimension	Categories	ID	Sustainability indicators
Environment	C1. Urban Form	I1	Passive Solar Planning
		I2	Ventilation Potential
		I3	Urban Network
	C2. Land use and Infrastructure	I4	Natural Land Potentials
		I5	Density and Flexibility of Uses
		I6	Reuse of Urban Areas
		I7	Rehabilitation of the Built Environment
		I8	Technical Infrastructures Network
	C3. Ecology and Biodiversity	I9	Distribution of Green Spaces
		I10	Connectivity of Green Spaces
		I11	Indigenous Vegetation
		I12	Environmental Monitoring
	C4. Energy	I13	Energy Efficiency
		I14	Renewable Energy
		I15	Centralized Management of Energy
	C5. Water	I16	Consumption of Drinking Water
		I17	Centralize Management of Water
		I18	Management of Wastewater
	C6. Materials and Wastes	I19	Sustainable Materials
		I20	Construction and Demolition Waste
		I21	Management of Urban Solid Waste
Society	C7. Comfort of Outdoor Areas	I22	Air Quality
		I23	Outdoor Thermal Comfort
		I24	Acoustic Pollution
		I25	Light Pollution
	C8. Safety	I26	Safety in the Streets
		I27	Natural and Technological Risks
	C9. Amenities	I28	Proximity to Services
		I29	Entertainment Equipments
		I30	Local Production of Food
	C10. Mobility	I31	Public Transportation
		I32	Pedestrian Accessibility
		I33	Cycle Paths Network
	C11. Local and cultural identity	I34	Public Spaces
		I35	Heritage Valuation and Landscapes
		I36	Integration and Social Inclusion
Economic	C12. Employment Promotion and Investment	I37	Economic Viability
		I38	Local Economy
		I39	Employability
EXTRA		I40	Sustainable Buildings
		I41	Information and Communication Technologies

3 CASE STUDIES

3.1 *Nations Park project*

Located in the eastern area of Lisbon, the Nations Park is an ambitious project that came up with the city's bid to organize the last World Exposition of the 20th century, the EXPO'98, with the purpose of regenerating a degraded industrial port area. The former industrial area, which had been abandoned, was totally obsolete, presenting soil contamination problems due to heavy metals and oil, but which held, however, great development potential due to its proximity to the Tagus River. The project consisted on urban and environmental regeneration of an area of 340ha which led to the modernization and internationalization of Lisbon, restructuring and re-

habilitation, as well as the implementation of new accesses, transport, facilities, services and infrastructure, by demonstrating great care with the urban fabric.

3.2 *La Confluence project*

La Confluence is a contemporary proposal, which respects the historical legacy of the region. Located at the south end of Lyon's central peninsula, at the confluence of the Rhône and Saône rivers, it is a project that aims the renovation of an area of 150ha characterized by the development of an industrial suburb. Among the design principles is the extension of the current centre of the city, with the creation of generous public spaces, making the place accessible to all citizens, ensuring the social mix and balance of functions (housing, offices, leisure, commerce), and the sustainability of the city.

3.3 *Queen Elizabeth Olympic Park project*

The Queen Elizabeth Olympic Park is a project that demonstrates the UK experience in urban regeneration. The park is located in East London, more precisely in a region known as Lower Lea Valley, characterized by retaining the poorest neighbourhoods of the city. It was considered an area with the highest UK rate of unemployment, with low access to open spaces, isolated by poor access, the river and derelict land - although not far from the centre of London. The project combines the rehabilitation and decontamination of an area of 226ha, providing a new public infrastructure that will provide long term benefits to the residents of the city, including employment, housing, educational and recreational opportunities, and the development of sport and assurance to come to host the most sustainable Olympic Games to date.

4 RESULTS AND ANALYSIS OF RESULTS

From the list of 41 indicators of the tool SBTool^{PT}-UP, only 10 indicators were analyzed: 4 from environmental dimension, 5 from social dimension and 1 from the economic dimension (Table 2). In addition to ensuring that the indicators belonged to the three dimensions of sustainable development, the authors also have had a strict care to ensure that the basic characteristics of the indicators should be present in each case study in order to provide conditions for a proper comparison between them. Likewise, only the parameters whose data project is consistent with the assessment methods proposed by the tool were considered. The list of evaluated indicators and parameters and their results are presented in Table 2. The scores will be presented in percentage for a better understanding. Then, in the next subsections further explanations about the used indicators and obtained results are presented.

Table 2. Projects analysis – Performance at the level of each sustainability indicator.

Sustainability indicators	Parameters	London	Lisbon	Lyon
Reuse of Urban Areas	Percentage of decontaminate soil area	100%	100%	61%
Built Environment Rehabilitation	Percentage of existing structures rehabilitated and reused	0%	10,15%	44%
Distribution of Green Spaces	Percentage of green spaces	19,91%	32,35%	20%
Management of Wastewater	Index of effluent management	57%	50%	57%
Safety in the Streets	Index of safety on the streets	94%	88%	82%
Public Transportation	Index of quality and frequency of public transport	77,33%	76%	82,67%
Cycle Paths Network	Index of cycle paths network quality	87,5%	75%	94%
Public Spaces	Percentage of urban public spaces	45%	57%	43%
Integration and Social Inclusion	Percentage of affordable housing	34%	0%	25%
	Index of population participation	75%	33%	92%
Employability	Index of employability	100%	83%	50%

4.1 *Reuse of Urban Areas*

This indicator promotes the restraint of urban sprawl through the reuse of previously built areas and adequate treatment of contaminated soils (if any). All studied projects feature the reuse and soil decontamination. However in Lyon the development is partly in an existing area of the city with dwellings fulfilling nearly half the total area of intervention and another parcel previously occupied by industrial activities. Thus, their percentage of soil decontamination is less than the other projects, 61% of decontaminated soil area compared to the 100% in London and Lisbon.

Some regions do not include specific legislation on rehabilitation of contaminated soils, as is the case of Portugal (APA, 2013). Thus, based on the urban regeneration projects the best practice will be fixed an index of 100% of reuse of pre-built or contaminated areas.

4.2 *Rehabilitation of the Built Environment*

This indicator aims at promoting the refurbishment and reconstruction instead of new construction, maintaining the legacy and the built heritage of each site through sustainable practices rehabilitation. Thereby it promotes the efficiency of material resources, energy and water. In the London project there were no actions to preserve and rehabilitate existing buildings, since there were no buildings with architectural value on site. In Lisbon the situations is practically the same, since only one old oil refinery tower was reused. Nevertheless the project involved the reconstruction of two important pre-existent infrastructures: Doca dos Olivais (old dock) and Aterro Sanitário de Beirolas (sanitary landfill) - two important infrastructures for the area. Lyon stands out for the large number of buildings with historical and architectural value, and by the promotion of sustainable rehabilitation practices, providing different uses through the adaptation of buildings to current needs.

Based on studies conducted by Hemphill et al. (2004a) and the state of the art of the methodologies for sustainability assessment for urban planning, the best practice will be the index equal to or higher than 40% of the total built up area which has been reused and rehabilitated.

4.3 *Distribution of Green Spaces*

The primary objective of this indicator is to promote the protection and enhancement of local biodiversity. Nevertheless it also promotes other benefits resulting from the use of urban green spaces, which include: better physical and psychological health of the inhabitants; social cohesion; climate change mitigation; pollution reduction; biodiversity conservation; improvement of urban microclimate and air quality; increase of permeable areas of the city; and aesthetic benefits. Although the Lisbon project has the highest percentage of green spaces, these spaces are less uniformly distributed than in the Olympic Park and La Confluence projects.

According to Singh et al. (2010) there are some emerging trends from cities that promote the implementation of urban green spaces in 20-30% of the total area of the urban development/regeneration projects. A comprehensive study in 386 European cities (Gaston & Fuller, 2009) suggests that the coverage of green spaces vary significantly, with an average of 18.6%. Thus, based on these arguments and on data of case studies, the best practice corresponds to an urban regeneration project that presents the index equal to or higher than 25% of the total project area for green spaces.

4.4 *Management of Wastewater*

The purpose is to reduce the implementation of sewage systems and main drains by introducing in situ systems to treat waste and rainwater, allowing its reuse e.g. for irrigation and helping to reduce the occurrence of floods. This indicator is evaluated through the index of effluent management, through a qualitative process (checklist). In general, the analyzed urban regeneration projects feature concerns about effluent management. In all case studies the wastewater and storm water are treated on-site or nearby and reused for irrigation of urban green spaces.

Therefore best practice corresponds to projects that have a management plan for surface water that considers the principles and techniques of infiltration and percolation (for control of soil erosion), evapotranspiration (deployment and protection of green areas, green corridors), and

include in situ treatment systems and reuse of water. According to the developed checklist and scores this means that the best practice corresponds to values equal to or higher than 55%.

4.5 *Safety in the Streets*

This indicator aims at promoting the safety of users of the urban area and crime prevention through urban design. The concern with pedestrian's safety is present in all projects, especially the Olympic Park which use the Secured by Design Principles as the basis of project. This indicator is measured by the index of safety on the streets, which is assessed through a checklist.

The best practice will be the project that presents the index of safety on the streets with values equal to or higher than 80%. The good performance of urban regeneration projects are based on the implementation of measures related to some key strategies: territoriality (orientation and dimensions of the plots, streets, and houses to encourage interaction between neighbours; accentuate entrances with different paving material, changes in street elevation and landscape design), natural surveillance (avoiding landscaping that might create blind spots or hiding places; distribution of mixed uses) and access control (designing streets to discourage cut-through or high-speed traffic; designing sidewalks in safe places for pedestrians, and use them to set limits). Another crucial dimension concerns the continuous and effective maintenance and management of urban space (maintaining common areas, lighting equipment and parking areas; keeping walks clean and repaired, lines of sight open, plantings and grounds in good condition), discouraging unused space (e.g. abandonment).

4.6 *Public Transportation*

The aim of this indicator is to promote best practice in mobility, enhancing the quality of public transports and local connections that they establish. The main target is to reduce the use of the private vehicles. Public transportation was highly valued in the studied urban regeneration projects. A wide range of transport modes are found, as well as great investment in infrastructure to improve quality or to create new means of transport, routes and accesses.

The performance of an urban regeneration project in terms of this parameter is evaluated by the index of the quality and frequency of public transport that comes from summing up the credits achieved in a checklist that covers topics such as: transport conservation status; existing options of transportation; existing infrastructure; average frequency of transport; proximity to stops, and quality of stops. The best practice will be the urban regeneration project that scores an index equal to or greater than 75%.

4.7 *Cycle Paths Network*

The objective of this indicator is to promote the use of bicycles as a viable option of transport (safe and quality) for movements between residential, educational, commercial and industrial areas. Thus it is promoted the use of no-pollutant means of transportation, serving as an alternative to the use of polluting transport. This indicator was evaluated through the index of cycle paths network quality, consisting of a checklist with variable factors. The three projects provide bicycle paths to its residents and visitors. Lyon Confluence, however, stands out by the quality of the implemented cycle paths which allow an index of 94%.

In order to obtain a good performance in this indicator, the urban regeneration project should first check and assess the suitability of the land to be frequented by cyclists. Once the area of intervention is able to implement cycle path, the project must contain an urban plan offering conditions for a healthier mobility by promoting the development of a quality cycle path network that is both embracing and secure for users. This network should be preferably combined with the different means of transport, be provided with facilities to support cyclists and to be attractive. The best practice will be the urban regeneration project that provides the index equal to or greater than 85%.

4.8 *Public Spaces*

The aim of this indicator is to promote the identity of local community through the implementation of quality public urban spaces. Analysing the projects, it is verified that a large percentage of the areas were destined to urban public spaces, with an average over 43%. This indicator allows assessing the percentage of quality urban public spaces within the urban regeneration project that are accessible to the population.

The best practice is a project which has an area of quality urban public spaces equal to or greater than 40% of the total area of the project. The quality and diversity of the public spaces along with the existence of a network of paths that connect public spaces are aspects that are assessed through a checklist.

4.9 *Integration and Social Inclusion*

The main goal of this indicator is to promote affordable housing to a broad spectrum of people (age, social class, religion, ethnicity, etc.), along with promoting the participation of the population since the preliminary design phases. This indicator is measured by two parameters, one quantitative and the other qualitative. Both the Olympic Park as La Confluence had great concern to promote social housing, allocating much of the new construction to this typology. The design of the Nations Park did not allocate a percentage of dwellings for social housing and the public participation in the project was little.

The best practice for the percentage of affordable housing is equivalent to values equal to or higher than 20% of the total housing areas. The best practice for the index of population participation, assessed by a checklist, is equal to or higher than 75% which corresponds to a project that: promotes the population's participation through meetings, workshops, volunteering (ONGs); provides support for local business and enterprises; provides a strategic plan that includes a study showing the necessary number of social housing; provides different typologies of affordable houses (low-income families, students, young couples and disabled people), with different sizes and that are not apparently different from the others residences.

4.10 *Employability*

The aim of this indicator is to promote, through the urban regeneration design, the growth of local employment and professional training of residents. It is intended that the project set the basis to create strategies to promote local employment (temporary and permanent), during the construction and operation phases. This indicator is evaluated through the index of employability, consisting in a checklist with variable factors. London project showed best results, since one of the main aims was to solve a major problem that was identified in the Lower Lea Valley region: the high rate of unemployment. The London Employment Skills and Action Plan for 2012 promoted training courses and provided a National Skills Academy for Construction at the Olympic Park site which helped the Londoners to get employment with local contractors.

The best practice is an urban regeneration project that presents the index of employability equal to or greater than 75%. In order to obtain a good performance in this indicator, the urban regeneration project should perform an economic study covering aspects such as: business in existing area, unemployment rates, provision of facilities and location of business types. The project should also promote employability through the use of local workers, provision of training courses and promoting the increasing number of jobs and the local economy.

5 CONCLUSION

The analyzed urban regeneration projects proved to be good examples of sustainable projects, facilitating the definition of the best practices for the ten sustainability indicators of the tool SBTool^{PT}-UP. The levels of best practices were set by analysing three European representative projects, as well as considering other best strategies implemented at European level. The tool under development (SBTool^{PT}-UP) is also aimed to support designers in the development of more sustainable urban projects since the best practices are goals to be achieved, serving as an

incentive for sustainable design as well for evaluations and comparisons between different projects or project scenarios. According to the national and international context on the sustainability of urban development operations the study presents itself as an important tool to promote sustainability for both Portuguese and around the world cities, since the best practices can be used to support the development of more sustainable urban areas or the regeneration of cities by setting tangible goals to be used by designers, architects, planners and governmental entities in the process of developing a more sustainable built environment.

REFERENCES

APA, 2013. Agência Portuguesa do Ambiente [Online]. Available: http://www.apambiente.pt/index.php?ref=16&subref=84&sub2ref=222. Accessed August 2013.

Boyko, C.T. [et al.], 2012. Benchmarking sustainability in cities: The role of indicators and future scenarios, *Global Environmental Change*, 22(1): 245-254.

Bragança, L., Araújo, C., Castanheira, G., Barbosa, J.A. & Oliveira, P., 2013. *Approaching sustainability in built environment.* International Conference on Sustainable Building Asia. SB13 SEOUL. Seoul, Korea.

Couch, C., Sykes, O. & Börstinghaus, W., 2011. Thirty years of urban regeneration in Britain, Germany and France: The importance of context and path dependency, *Progress in Planning*, 75(1): 1-52.

Dale, A., & Newman, L., 2009. Sustainable development for some: green urban development and affordability, *Local Environment*, 14(7): 669–681.

Fuller, R.A. & Gaston, K. J., 2009. The scaling of green space coverage in European cities. *Biology Letters*, 5(3): 352-355.

Hemphill, L., Berry, J. & McGreal, S., 2004a. An indicator-based approach to measuring sustainable urban regeneration performance: part 1, conceptual foundations and methodological framework, *Urban Studies*, 41 (4): 725–755.

Hemphill, L., Berry, J. & McGreal, S., 2004b. An indicator-based approach to measuring sustainable urban regeneration performance: part 2, empirical evaluation and case-study analysis, *Urban Studies,* 41(4): 757–772.

iiSBE, 2013. International Initiative for a Sustainable Built Environment: Working Groups [Online]. iiSBE. Available: http://www.iisbe.org/r-n-d. Accessed August 2013.

Miana, A.C., 2010. *Adensamento e forma urbana: inserção de parâmetros ambientais no processo de projeto*. Doutorado em Arquitetura e Urbanismo, Tecnologia da Arquitetura, Faculdade de Arquitetura e Urbanismo da Universidade de São Paulo, São Paulo.

Roberts, P. & Sykes, H., 2000. *Urban Regeneration: A Handbook*. Sage, London.

Roodman, D.M., & Lenssen, N., 1995. A building revolution: How ecology and health concerns are transforming construction. *Worldwatch Paper*, *124*, 5.

Rosales, N., 2011. Towards the modeling of sustainability into urban planning: Using indicators to build sustainable cities. *Procedia Engineering*, 21: 641-647.

Salat, S., Labbé, F. & Nowacki, C., 2011. *Cities and forms - On sustainable urbanism*. Hermann, Paris.

Singh, V.S., Pandey, D.N. & Chaudhry, P., 2010. *Urban Forests and Open Green Spaces: lessons for Jaipur, Rajasthan, India*. Rajasthan State Pollution Control Board, Índia.

Souza, C.L. & Awad, J.M., 2012. *Cidades Sustentáveis, Cidades Inteligentes*, Bookman, São Paulo.

Turcu, C., 2012. Local experiences of urban sustainability: Researching Housing Market Renewal interventions in three English neighbourhoods, *Progress in Planning*, 78(3): 101-150.

UN-Habitat, 2006. *State of the world's cities 2006/7*. Earthscan, London.