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## Conference Paper

# The 'Urbanforest' and 'Green space' Classification Model in the Spatial Arrangement of Registro-SP, Brazil

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# The 'Urbanforest' and 'Green space' Classification Model in the Spatial Arrangement of Registro-SP, Brazil.

45<sup>th</sup> Congress of the European Regional Science Association  
"Land Use and Water Management in a Sustainable Network Society"  
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## Abstract

In view of several environmental problems that have accumulated, the need for handling green areas relating to urban settings has become one of the vital system management challenges in the last few decades. In the United States and Canada, several investments are being made for new techniques and instruments towards adequate environmental planning, involving urban forest researches, both in the local and national scale. However, there are few reports on urban forest classification connecting spatial characteristics, urban model and expansion phenomenon. The main objective of research is to organize the hierarchy of urban functions together with green areas for integrated planning. By applying the Urban Forest Chat (UFC), *Urban forest* concept has a helpful understanding relating to other *urban green* features relating to *green infrastructure*, green areas, and spatial typologies of urban settings and structures. Analyses have contemplated the urban occupation and land use, structural categories of urban vegetation types of built environment of Registro-SP that was identified and classified. Result has outlined the territorial modeling of integrated patterns and structures for technical details. Model structures can be of vital environment reference in the any suitable GIS (Geographical Information System) physical and environmental report in urban and system management planning.

**Key-words:** urban forest; landscape planning; integrated system planning, natural resources and territorial modeling.

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## Introduction

In Brazil, the preservation of the urban green areas has strongly assisted natural resources achievement. In the case of water for catchments within urban areas, *urban vegetation*, commonly referred to as urban forests, has helped the growing population of some cities. Historic examples are: Tijuca forest (1861) in the city of Rio de Janeiro-RJ, Serra da Cantareira reforested in the end of Nineteenth Century, São Paulo-SP and Mata de Buraquinho forest (1899) located in the city of Joao Pessoa-PB.

Although mostly occupied by parks and preservation areas, since Sixteenth Century, the Atlantic forest region is facing continuous replacement and pressures of the built environments which are associated to many urban green spaces connecting several city centers. This is the case of the hydrographical region of Vale do Ribeira, where Registro municipal area is located. Moderately transformed, but still attached to the remaining exuberant native forest, discovered initially as a paradise.

Though, positive concept of territorial image as “collective resource” (Healey, 2003) may support the key understanding of different resources pertaining to urban and institutional forces, as cities have expanded into city regions *urban green space* concept is important on the particular challenge for sustainable measures in the actual decision process of public policies (Szulczewska et al., 2003). However, sound systemic concept has been introduced to the term “*urban forest*”, all inclusive in order to establish strategic planning for sustainable development.

Nevertheless terms like urban green, green space, urban spaces, urban areas, built environment, green environment, urban green space, are examples of different expressions which are related to a major term, referred to as urban forest. A number of key reports dealing with aspects of urban vegetation have emphasized the need for clear definition of such terms, which are loosely used (Swanwick et al. 2003).

In the definition of urban forest and qualified vegetation (Badiru, et al., 2005), perhaps, a vital strategic area under discussion in the direction to simplify a more “integrated” strategic and innovative approach (Swanwick et al., 2003; Tjallingii, 2003; Pauleit et al., 2003; Szulczewska et al., 2003) is the production of Urban Vegetation Audits, incorporating quantitative and qualitative information, formulation of vegetation categorization and holistic strategies (Swanwick et al., 2003).

In this case, city planning is driven to a larger network where population influence of an urban forest is interconnected to another. The urban forest classification represents a solid urban reference towards strategic policies and a more sustainable approach capable to melt the

difference between rural and urban categories, which are areas of dichotomies holding the real understanding of city concept pertaining to urban.

This paper is divided into two parts: a brief comment on the actual concept of *urban forest* and a technical approach, which applies the UFC -Urban Focus Chat (Badiru et al., 2001), in the case of Registro-SP, for its *urban vegetation types and green space network*.

### **The actual concept of urban forest**

Due to forest devastation, several studies have shown the link between water dynamics and the tropical rain forest with evidence to forests with climatic conditions, river flow and other erosive process, but recent conclusion has revealed that the forest is not just a consequence of the climate; to the contrary, the equilibrium climate depends on the vegetal cover. On one hand, the colonial devastation has intensively substituted the native forest with other types of covers (pasture, urban agriculture, annual agriculture and etc), which may be affecting the climate, hydrologic balance, native flora and fauna. On the other, the same process of devastation has established many town and villages that have transformed into urban areas, obviously producing the built environment, here, referred to as the “*urban forest*”, subject to be misunderstood with initial thought significance and which may be unquestionable.

Historically, in the mid-1960's, as a response to a more sophisticated management measure, the concept of *urban forest* became matured as for management practice, allied to the interest of environmental system management and necessary measures on environmental policies (Grey et al., 1978). Such complex concept of the urban forest is synthesized as the “*integrated whole*”, But the total area that is influenced by the urban population were not very clear with the panorama of different urban green. The natural and artificial arrangement that was raised for systemic concept have really considered the environment (surroundings) separating biological structures in the integral blend that were suggested to be jam-packed.

Up till now, the general idea of the above *urbanity* concept is limited to the tree-plant component, setting aside the urban meaning which is exactly where the natural constituent was derived from. In this manner, at first sight, it may be seen as controversial to admit the natural and artificial as the prone. The same process of culture is mutually and wholly involved in both construction of houses and its natural surrounding.

Human settlement may be considered as the *city* - social establishment physical development established can be defined as the *urban*. This basis focuses on more ecologic than economic in the real aspects. The urban forest earlier defined as the entire vegetative can

instead be admired as the “breakdown” or the “built-up” of both forest-urban with multi-attributes (ecologic and economic), not only in the environmental arena but in the entire site. Thus, Pauliet et al. (2003) draws attention to the multi-functional *green space* network to be used for another term. Though the idea is to serve the “integrated” concept pointed by Tjallingii (2003), considering combined forces on issues pertaining to recreation, natural conservation and management of water in the city.

The actual paper understands the term *urban forest*, not only as an integrated whole as Jorgensen had explained in his thesis reported by Grey et al. (1978), but simply as the entire human habitat necessary for systemic management. The importance of a clear basis for this concept may be the core to many solutions, specially, in environmental planning and eco-dynamic strategies with emphasis on plant ecology, relating to spatial realities where various urban habitats can be observed (Newman, 1982).

The nuts and bolts of any *urban forest* component are blended as image depiction composed of several objects. In this case, the ecological classification is a revision of the urban setting, with the aim of identifying and characterizing homogeneous unities qualified for sub-structural vegetation types that are inter-related to biotic and abiotic components (McHarg, 1972). Sustainable urban planning is required to systematize the types of vegetation in order to establish adequate management criteria where monitoring programs and decision making process are suitable by social participation. The urban forest chat as a technical instrument adopted for this study is adjustable to dissolve the dichotomy between the rural and urban categories of human settlement.

### **The anatomy of urban forest in the Municipal area of Registro (SP).**

Registro-SP, the capital city of the hydrographical basin of Vale do Ribeira is located in the heart of the main river valley, in the southeastern coastal region of the State of Sao Paulo. In this region, the municipal area is the most populated, having around 56,214 inhabitants in its territorial area of 716 square kilometers (Figure I). It is not the biggest but the highest with population density of about 78% per square kilometer (IBGE, 2005).

The main environmental element is Ribeira de Iguape River that divides the area into two. Within the lower region which includes several terraces, narrowed in the upper part of the territory and widened in the southern part. The main river corridor retains typical features of sand bars, floodplains with oxbow lakes and creeks accompanied by natural and cultivated land. In the land use structure, the urban is separated from the rural zones, while riparian area has been occupied and reduced to a fragile natural hydrologic system with little native plants.

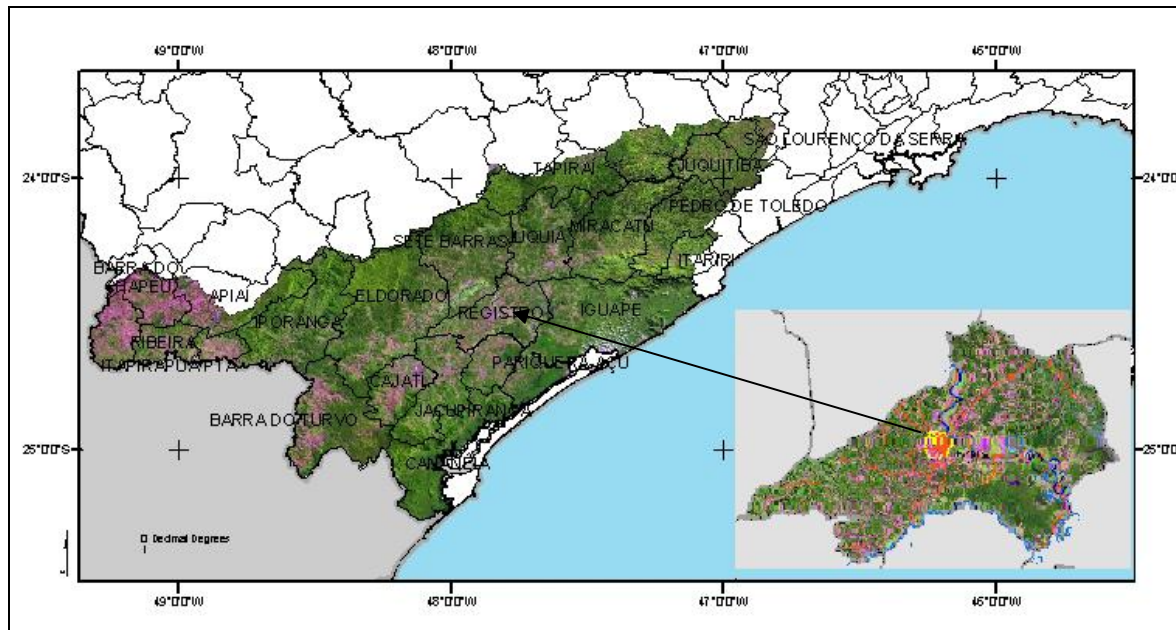


FIGURE 1 - Image-Map of the Hydrographic Region of Vale do Ribeira: location of Registro-SP

Like many municipal areas, the *urban forest* understanding comprises two property ownerships: the private or public entity. By adapting UFC (Figure 2), two spatial arrangements, namely the external and internal, have acknowledged the main *urban forest environments*. In this case, the former is determined as the area from the intermediary line outwards, while the later from the same line inwards, binding the central and intermediate zones together (figure 3).

The overlaying approach has considered three layers of spatial attributes: *urban forest zones*, *urban vegetations*, and *green areas*, utilizing UFC for the forest morphology and zone categories in the first and utilizing the legal Land-use and city occupation established in the Direct Plan of Registro (1992-1999), for the determination of *urban vegetation* and *green areas* maps for the remaining two, from which different patterns and structures were synthesized into two different layers. Such modeling have dissolved and reorganized the rural and the urban land-use, which has been identified and classified for integrated management concept (Tjallingii, 2003).

In this approach, three perspectives were integrated in *urban forest* pattern and process: *temporal*, *spatial* and qualitative investigations, treated respectively in three steps: 1) temporal analysis for the observation of the urban forest evolution, to verify the spatial dynamics and expansion, relating to urban extensions in different decades associated to geographic changes of the center point of the UFC. The second assessment has integrated the result of the first with the urban vegetation typology based on the legal zones of main areas

specified in the Direct Plan. However, the third has considered the green space typology suggested by Swanwick, et al. (2003), integrating sub-structures and elements identified in urban vegetation types for detail understanding.

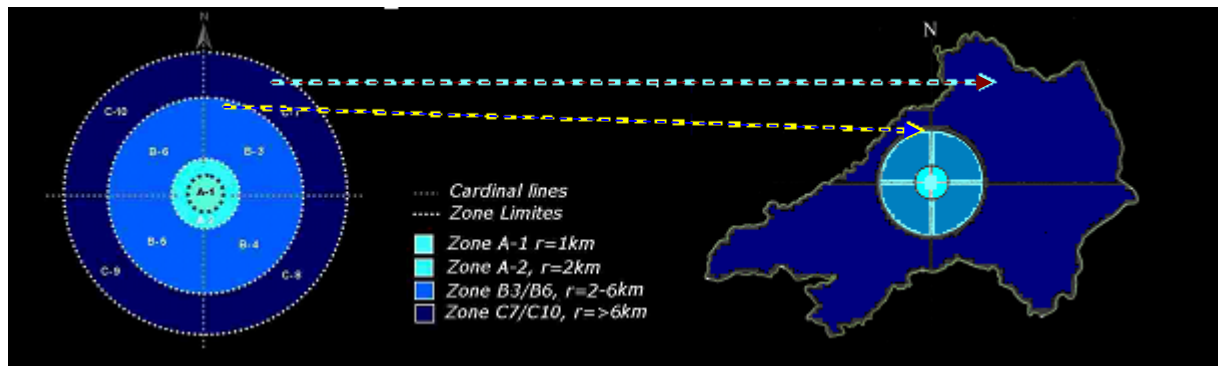


FIGURE 2 -UFC-Urban Forest Chat (Badiru et al., 2001); FIGURE 3 – Registro-SP .Int. and ext. environments.

**Temporal perspective:** by applying UFC to various historical maps, the temporal analysis has observed spatial dynamics relating to historical facts and changes of urban dimension associated to different geographic center in which the urban forest area is invested. The urban area of Registro-SP has emerged initially through the emancipation of two little districts of the former territory of Iguape, which were earlier agricultural lands. Since 1908, owing to social political and economic interest, the fertile lowlands are engaged in the cultivation of rice and tea, the Japanese colonies created has reorganized the previous linear settlement along Ribeira River.

The Port of Registro together with the waterways and eco-geographic conditions were found responsible for the environmental transformation of the rural Japanese colony that was gradually converted into urban setting. Since 1945, the rural area has witnessed a rapid urban process in which several administrative authorities were involved in the establishment of transportation infrastructures. Though, historically dependent on the costal Port of Iguape (SP), a city by the delta of Ribeira de Iguape River, nevertheless, environmental location has favored political interest of the State Government to embark on a development that has consolidated the municipality as the regional capital.

About one kilometer away from the original position, the ultimate observation of the actual geographic urban centre has noted changes to the actual administrative centre, a point closer to the Mall than to the old historic centre linked to the Port. Such changes have corresponded to the expansion process, which has concentrated more activities of the inhabitants and consolidated the urban structures at the right part of Ribera de Iguape River than at the left side.

**Spatial Perspective:** assessment has contemplated adequate classification of ecologic function based on the physiographic features (hydrology, vegetation, geology topography morphologic) and, principally, the territorial divisions in integral areas and zones specified in the Direct Plans of the Registro (1972; 1992-1999). Ten *urban vegetation* typologies are classified and were integrated in environment arrangement by overlaying the UFC result from the previous step (See pattern of *urban vegetation* environment and typology in figure 4).

Our evaluation has recognized the internal central zone (UFC core), holding particularities to subject importance, in this case, as the prime *urban vegetation* type. Such distinct special areas are vital for technical reference, since the dynamic aspect of urban vegetation class is connected to the use of technical instrument (UFC) that can easy correlate different observation to *nodal* areas such as satellite community vegetation types that are environmentally linked to the social and physical components.

In this case, the central community vegetation that is considered as the prime vegetation may be holding a unique environmental and social property, relating of the main city image interconnected with other vegetation types. However, the internal *central zone* has been considered on its own, as a separate and integral *urban vegetation* quite different from the rest of the entire territory, where nine other types are arranged in hierarchical order.

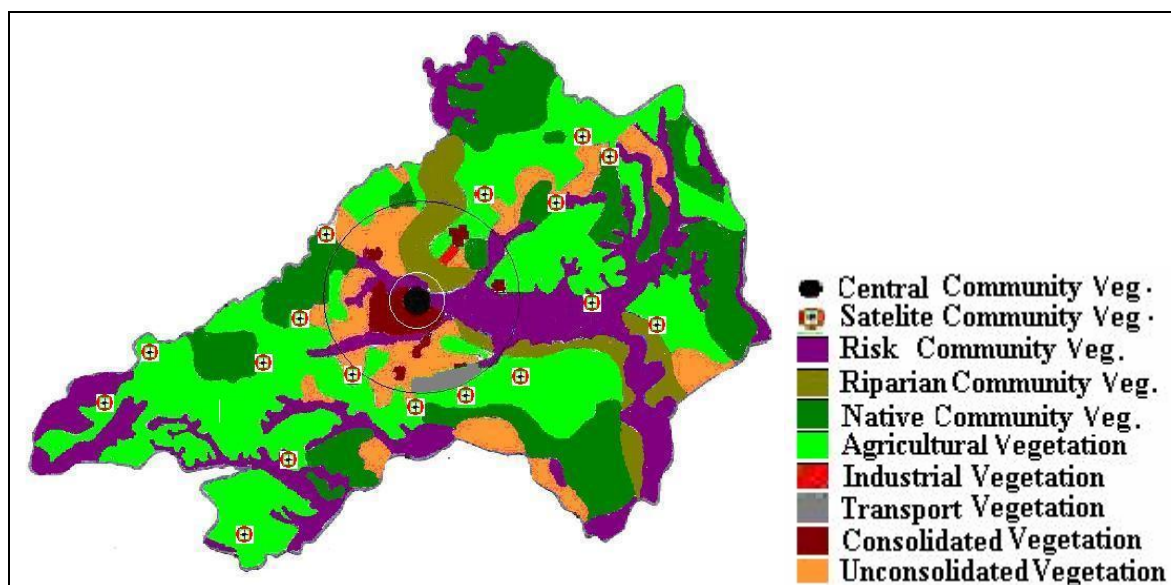


FIGURE 4 - Map of Registro-SP: the pattern of the urban vegetation types by UFC (Urban Focus Chat).

The first five of *urban vegetation* group link the ecologic community areas with the population condition: Central community vegetation, Satellite community vegetation, Risk



community vegetation, Riparian and native community vegetations. The minimum area is subject to discussion under public policy, though we propose a fixed radius of 500m for the Satellite vegetation types that are identified by the Direct Plan. On the same issue, other patterns of this type of vegetation may aid in the environmental perception linked to the sub-system and ecologic schemes. Consolidated vegetation type represents the habitation urban areas, while the “unconsolidated” urban vegetation is considered open land of unspecified urban use.

**Qualitative perspective:** the subdivision of urban vegetation is the green space category. Detailed evaluation has sub classified legal attributes as plots and areas. In their hierarchical order, the areas are higher than the plots. The organic pattern of urban vegetation can be easily perceived by areas while the plots arrangements can be seen as the “intra-structural” Thus, see figure 5, for detail example of the *green space (areas and plots)* in the Central community vegetation from where others are set in UFC.

The construction of Br-116 (Brazilian road) crossing the waterway has highly disciplined the urban-commercial use, associated to a mixed use of commercial and residential areas. In this zone, the attractive open space has been reduced considerably by residential buildings of different types, sharing unique social and structural similarities.

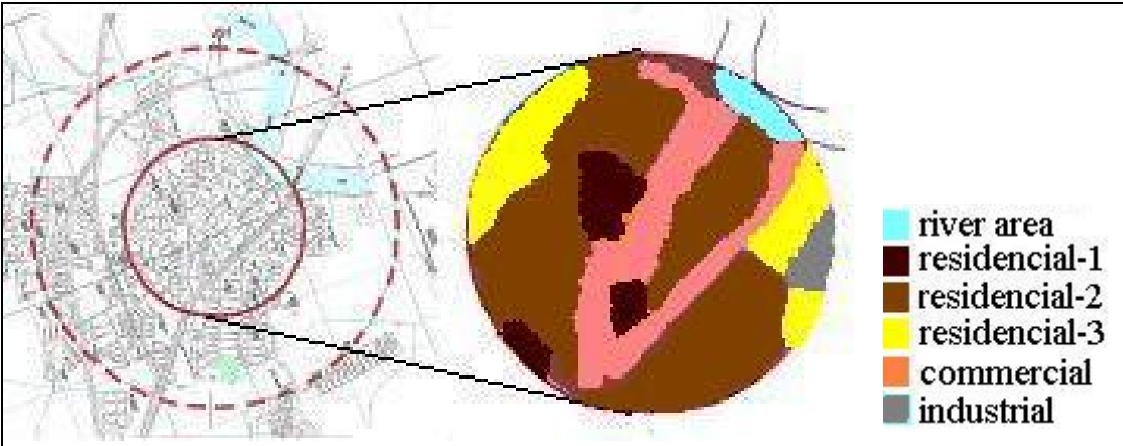


FIGURE 5 - Registro-SP: Detail of the *Central community vegetation* showing *greenspace* arrangement.

Other types of urban vegetation in the UFC structures consist of different examples of green areas like: Protection areas, Park areas, Railway areas, Waterworks, river areas, Dump, Rural plantation, Cemeteries, Beach, Square and Garden. For such areas, some examples of plots may be classified as: luxury residential plots, regular residential plots, low standard

residential plots, mixed commercial plots, commercial plots, institutional plots, industrial plots, especial plots, rural site plots e etc.

In synthesis, the green areas can be classified under three integrated platforms: the Black, Grey and the Green (Figure 6). However, urban forest system management suggests the economic and environmental balance of green platforms spatial characteristic in human ecosystem.

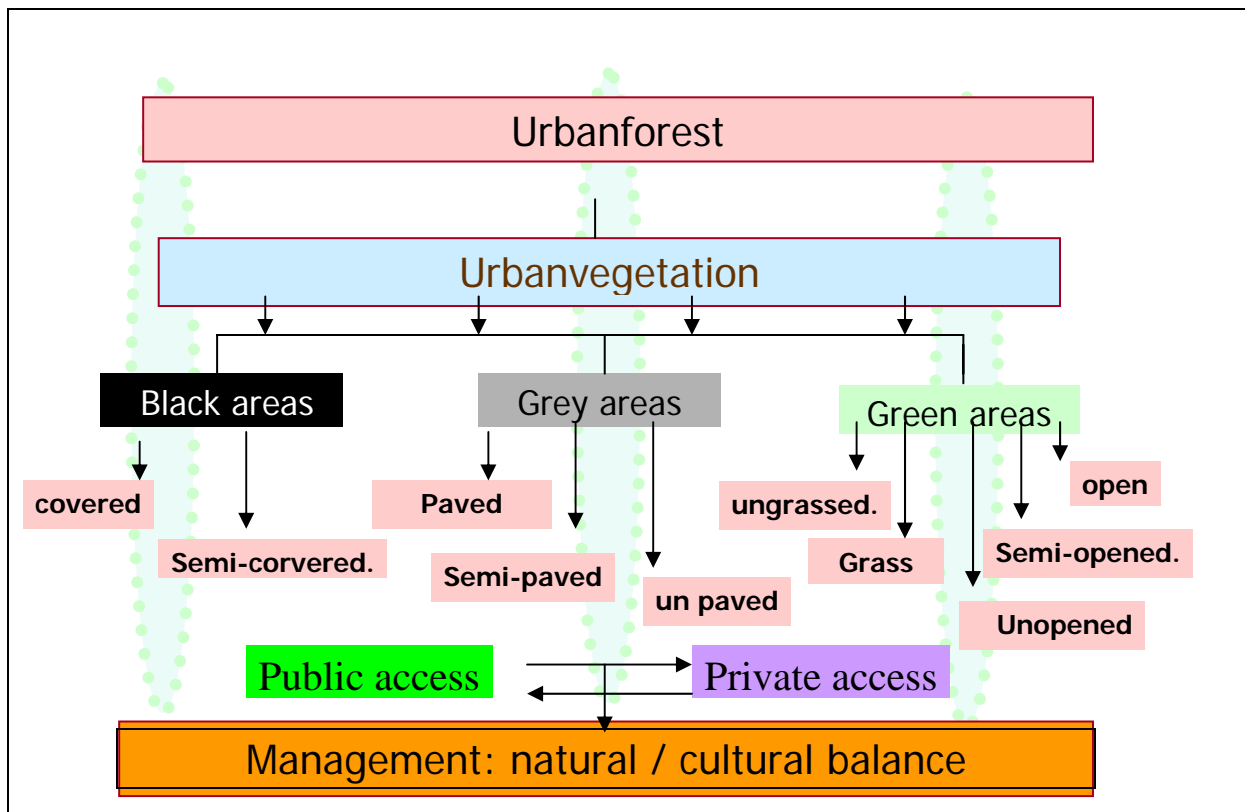


FIGURE 6 - Registro-SP: Syntheses of urban forest / vegetation / greens pace arrangement (adapted from Swanwick et al., 2003).

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