$B_i$--$F_i$ (either via $H_i$ or S).

In Figure 1(c), a simple differentiation of landuse suggests no particular pattern of relations between the (lighter) residential and (darker) non-residential land uses; but the relations between buildings (B) and the street (S) are the same as in the earlier cases, i.e. on each side of the street, $B_i|B_{i+1}$ and $B_i \neg| B_{i+1}$ (for $i$=1 to $n$–1); $S|\Sigma B$; hence $B_i$–$B_j$ (for all $i$, $j$) via S.

Finally, in Figure 1(d), we see some small sections of regularity within a wider pattern of irregularity. Here, in general, $S|X_i$ and $X_i \neg| X_{i\pm1}$ are inferred (where $X_i$ is any area of any type), except in one case where a plot ($O_1$) appears to be 'boxed in' (i.e. $S \neg| O_1$). There are some consecutive series of buildings of the same type, namely a series of multi-storey flats [$F_2$, $F_3$, $F_4$]; two series of shophouses [$H_1$, $H_2$, …, $H_5$] and [$H_6$, …, $H_9$]; and three series of *zhutongwu* [$Z_1$, …, $Z_4$], [$Z_5$, …. $Z_9$] and [$Z_{10}$, …, $Z_{15}$].

Hence this kind of area structure analysis can be used to highlight regularities of structure, to compare structures, and deduce any common 'urban syntax' between cases (Marshall, 2009, p. 68). The symbolic treatment allows systematic articulation of structure in a way that is simple and intuitive – though abstract, it can be transparently related to the mapped morphology. It can transcend differences in language and nomenclature between different morphological traditions, and may also (like computer pseudocode) serve as a stepping stone between human-oriented expression and a more formal mathematical treatment amenable to computation.

The approach invites fuller formal definitions, further formal development (e.g. axioms of area structure) and applications to other contexts, whether building floor plans or any other morphologies expressed as area structures.

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# The metropolitan skyline: researching the vertical dimension in urban morphology

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In response to the debate in this journal on the definition of urban morphology (Conzen, 2013) and the importance of strengthening the interconnection of research and practice (Whitehand, 2013), we wish to outline the case for research on the metropolitan skyline. In particular, we summarize a major new project on this topic.

The urban skyline may be broadly defined as the

silhouette of the built environment seen against the sky. But there is more to it than the physical dimension (Attoe, 1981; Kostof, 1991). Skylines are socially selected combinations of viewpoints and of views framing urban panoramas from afar, or from high vantage points, that allow broad views of the city.

Why study skylines? There are a number of reasons, of which two are especially important. First, conflicts are emerging, often in the name of sustainability, about the vertical development and 'privatization' of the skyline following recent approvals of tall buildings by local authorities in major European cities (Appert, 2011). Secondly, the fact that tall buildings 'rescale' the urban landscape has meant that they have taken on especial significance, for example in relation to 'heritage' sites in the vicinity. Inevitably divergent points of view have emerged on the desired contours of the urban silhouette. It is therefore important to understand the key drivers of the changing skyline: not only the hard economics of real estate, but also images, representations, and identity claims (Appert, 2008, 2011; Charney, 2007; Dixon, 2010; Kaika, 2010; McNeill, 2002, 2005). By articulating local and global contexts (Swyngedouw and Kaika, 2005), skylines are acting as a kind of landscape 'grammar' (Debarbieux, 2007), common to transnational real estate actors (Sklair, 2005), but not always to planners and the wider public.

The SKYLINE research project, funded for the period 2013-2016 by the French research agency Agence Nationale de la Recherche, aims to respond to the lack of investigation of the skyline as a contested dimension of the urban landscape at a time when skyscrapers are rapidly diffusing throughout the world. SKYLINE is being conducted in a multi-disciplinary way, interconnecting researchers and practitioners. The Environnement Ville et Société Research Laboratory (UMR5600) is leading the project, together with Ecole des Ingénieurs de la Ville de Paris. The Laboratoire d'Informatique en Image et Systèmes d'Information (Lyon 1 and Lyon 2 Universities) and Agence d'Urbanisme de Lyon are team partners. Paris and Lyon in France, and London, UK, have been designated as case studies because they all face 'verticalization' pressures and because they are developing specific regulatory frameworks (Appert, 2008; Dixon, 2010; Short, 2004). Collaborators include the Greater London Authority, Westminster Borough Council, the Design Council Commission for Architecture and the Built Environment, locally organized groups, and CBRE, the world's largest commercial real estate services firm.

A website (http://recherche.univ-lyon2.fr/skyline/wordpress/?page_id=452) is designed to disseminate to a wider audience the team documents, presentations and videos from workshops. The gains of collaboration between practitioners and researchers are numerous: for example, researchers will improve their understanding of the way practitioners cope with the implementation of often inherited regulations, increase their appreciation of practitioners' 'cultures', and gain access to real estate actors. Practitioners will, in turn, improve their understanding of fundamental research by participating in workshops.

The 3 years work on the project will involve five missions, involving both researchers and practitioners. The first mission concerns quantitative and qualitative assessments of pressures for high-rise development in European cities. These will be made by improving existing databases on high-rise development and by detailed analysis of the spatial and temporal dynamics of skyscrapers in cities. The second mission is to assess the principles and tools of skyline regulations in Europe, taking into consideration the long American history of skyscrapers. The third mission will help to assess the perceptions and representations of the skyline by architects, landscape architects, planners, developers and the general public, using photo-polls and eye-tracking devices (Le Lay *et al*., 2008; Zacharias, 1999). Geometrical measures of skyline structures will also be taken in order to objectivate mental representations of skylines and identify specific features linked to perceptions (Stamps *et al*., 2005).

The fourth mission is to understand skyline conflicts. Economic and architectural constraints and regulatory environments for the design of the skyline will therefore be studied, and design iterations and perceptions of regulations will be assessed. The final mission consists of assessing viewpoints in relation to location, visibility measures, facilities and access. A typology based on the characteristics and conditions of access to views will help identify strategic places to regulate and identify new criteria for assessing applications for tall buildings, with the ethos of the city in mind (Ayoub, 2009; Lefebvre, 1968).

Although it is clearly impossible to cover the entire relevant field of study, both diachronic and synchronic analyses will be undertaken. The historical approach will enable us to compare skylines on the basis of their founding principles and the acculturation of practitioners. Certain questions need to be treated in a synchronic way beyond

America and Europe, to put the project into a broad contemporary perspective. Several other regions have been identified, in Japan, China and Brazil, taking advantage of existing collaborations with local researchers.

The project and discussions emanating from it among researchers and practitioners will provide the basis for both enriching and shaping the public debate on the impact of towers and tall buildings on the urban landscape.

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# Manuals for urban morphological education

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The debate on urban morphological education is regaining interest. Within ISUF this has been evident in a recent viewpoint in this journal (Oliveira, 2012), a number of papers presented at the conference in Delft (Larkham, 2012; Marat-Mendes *et al.*, 2012; Slater, 2012) and the report of the Task Force on the relation between urban morphological research and planning practice (Samuels, 2012). In addition, the organizing committee of ISUF 2014 has already announced