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High-rise buildings in the perception of the users of the urban space

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ABSTRACT

This study aims at identifying, through the perception of different groups of users of urban space, the height at which a building is considered high. It investigates the perception of urban space's users of the impacts produced by tall buildings in the city, trying to understand whether the changes caused by tall buildings in the urban landscape are considered positive or negative by the respondents, whether or not they are users of tall buildings. As part of the methodology, questionnaires were administered via internet to different groups of users of urban space, to a total of 148 respondents as follows: architects, non-architects college graduates and non college graduates. Among the main results found are: the minimum height of 10 floors can be established as an indicator of high-rise building; the main impacts generated by tall buildings were the change of the urban landscape, the overload in urban infrastructure, the increase of population and traffic density, the change of the local microclimate, and that most of the respondents consider that tall buildings negatively affect the city's landscape. Moreover, it was found that perceptions of change in the urban landscape are independent of the respondents' groups.

Keywords: Uprighting. Tall buildings. Impacts on urban space. Perception of users.

Introduction

The high-rise building arises as a result of the vertical integration process that seeks the vertical multiplication of the soil to enable its occupation by a greater number of people and activities (eg, SOMEKH, 1998; MACEDO, 1991). This vertical integration was made possible by advances in construction techniques such as metal structures and the use of the elevator in the second half of the nineteenth century in the United States, leading to a transformation in cities of various countries in the twentieth century (eg, SOMEKH, 1998 ; MACEDO, 1991). The high-rise building has had its image associated to economic power and technological development. For example, the image of the high-rise building in the post-war period was associated with American strength; and currently in Asia, where high-rise buildings proliferate, their image represents a status of power and supremacy. More than other parameters, economic interests explain the variation in heights and dimensions of these buildings in different cities around the world (GONÇALVES, 2010).

However, the definition of a high-rise building, or how many floors building must have in order to start being perceived and defined as high, is subject to variations. For some (eg, Gifford, 2007), a building above three floors tall can already be considered tall. Based on the human scale and the safety of the occupants of buildings as a limit of verticality, a building would be high if it were taller than five floors, as this is the maximum height allowed in many countries for vertical movement without the use of elevators (GONÇALVES, 2010). In a study for the city of San Francisco, Dornbusch and Gelb (1977), as parameters, consider residential buildings as tall when they are above 10 floors and commercial buildings above 15 floors.

For decades, the limit of 20 floors, due to the demand for a more sophisticated vertical circulation, was used as the definition of high-rise buildings in the United States and Europe, a limit also adopted by the Council of Tall Buildings and Urban Habitat (“Council on Tall Buildings and Urban Habitat”; CTBUH, 2011), an organization whose purpose is the dissemination of multidisciplinary information on tall buildings and sustainable urban environments. However, the CTBUH (2011) has no current definition for tall buildings strictly in terms of number of floors or height, and a building can be classified as such by presenting one or more characteristics in different categories. Thus, the height is relative to the context since the perceived height of a building depends on the height of buildings in a context and on the location of the observer (eg, KOSTOF, 1991; GONÇALVES, 2010; CTBUH, 2011). The perception of height also depends on the proportion of the building in relation to the context; buildings that do not have many floors but are narrow in width may seem like a tall building, especially when in an urban context of buildings that are not as tall (CTBUH, 2011). The use of specific building technologies, such as wind-resistant structures and technology for vertical transport can also help to define a building as

high (CTBUH, 2011). On the other hand, the global provider of information on tall buildings Emporis (EMPORIS, 2011) defines tall buildings (“high-rise buildings”) as those with a height between 35 (or 12 floors) and 100 meters (or 39 floors), and as skyscrapers, buildings with heights over 100 meters. And the parameter for defining the height from which a building can begin to be considered high, can only be considered in relation to the human scale proportion and of the heights permitted by the master plans of each city. Therefore, based on the presented material, an understanding of the definition of tall buildings through the perception of users of specific urban spaces seems to be relevant.

However, regardless of the lack of a precise and accepted definition as reference, buildings considered tall can have a substantial impact in the areas where they are built; impact with regards to: the economy (real estate appreciation or depreciation), infrastructure (increased population density, overloading networks, intensification of traffic), microclimate (shading, ventilation), urban landscape (alteration and adulteration of the local landscape), and the use of urban space. Although tall buildings have been the subject of several studies (eg., MARTIN; MARCH; ECHENIQUE, 1975; MACEDO, 1991; SOUZA, 1994; SOMEKH, 1998; GONÇALVES, 1999; HEATH; SMITH; LIM, 2000; GIFFORD, 2007; KUPCHIL, 2008; NUCCI, 2008; GONÇALVES, 2010; SCUSSEL; SATTTLER, 2010), these studies have not considered the perceptions of the users of the urban space regarding the impact produced by tall buildings in the city and in particular in the urban landscape.

The importance of considering the perceptions of various groups of users of the urban space is evidenced in several studies (eg., BROWN; GIFFORD, 2001; DEVLIN; NASAR, 1989; FAWCETT; ELLINGHAM; PLATT, 2008; GIFFORD et al. 2002; HERSHBERGER; CASS, 1992; PURCELL; NASAR, 1992; STAMPS, 1999). These studies show that the opinions of different groups vary according to specific aspects such as gender, age and culture. Many of them highlight that assessments involving urban space or buildings should be carried out not only by architects, but also by lay people, with or without a college education, or from other professional areas, so that they can verify the perceptions of the professionals who design the spaces as well as of the other users of the built environment. Also, according to Hershberger (1969 apud DEVLIN; NASAR, 1989) architects, may have a differentiated discernment regarding the built environment, due to their spending more time than most people studying physical environments. Additionally, Appleyard and Fishman (1977) emphasize the importance of determining the type of participant in the evaluation of the physical impact of tall buildings, since a particular impact can be perceived by one group and not another, such as the users, residents of the surrounding areas, and the general public. Each group of responders may use a different priority order when evaluating buildings, particularly high-rise buildings (SIMON, 1977). Consequently, there is a need to enhance the understanding of the perceptions of the different groups of users regarding the impact generated by tall buildings in a specific urban context.

Objectives

Therefore, the objectives of this study are: (i) to identify the urban space through the perception of different groups of users (including groups who live or work in high-rise buildings) from which height a building may be considered high enough for the scale of the city, (ii) investigate the perception of different groups of users of the urban space as to the impacts produced by tall buildings in the city, (iii) to understand whether the changes caused by tall buildings in the urban landscape are considered positive or negative for the different groups of respondents, regardless of whether they are users of tall buildings or not.

Methodology

As a methodological procedure to meet the proposed objectives, data was collected through questionnaires via the Internet. This instrument was adopted according to its potential for discovering regularities or differences between representative groups of respondents by comparing the responses to the same set of questions (REIS; LAY, 1995). Apart from the positive aspects highlighted by other studies (eg RECKZIEGEL, 2009; JOHN, 2012), the internet was used for the questionnaires due to: the possibility of obtaining a larger number of respondents in a given space time; its low cost; the elimination of the need of finding a respondent in order to distribute the questionnaire, as well as the time needed for such distribution; a significant reduction of time required for tallying data, and the elimination of the possibility of error in tabulation, since data is transferred directly to the worksheet of a statistical program such as SPSS / PC.

In order to meet the objectives of the investigation, the access link to the questionnaire was made available via email and published on social networks in order to meet the objectives of the investigation. A minimum number of 30 respondents in each group was defined so that reliable statistical tests could be carried out (REIS, 1992). The *online* questionnaires were available to respondents for a period of ten days. After this period and receiving 148 answers, the number of respondents was considered satisfactory.

The respondents were divided into three groups, according to their academic training: (i) architects, (ii) non-architects with a college degree, (iii) respondents without college degrees. For the analysis of the heights of the buildings respondents were divided into three other groups: (i) those who do not live / work in buildings, (ii) those who live or work in buildings up to 10 floors, (iii) those who live or work on buildings with more than 10 floors.

The sample consists of respondents living in the metropolitan area of Porto Alegre and in some cities in the interior of Rio Grande do Sul. Porto Alegre, after going through a period where the government (PORTO ALEGRE, 1979) restricted the heights of buildings and the so-called “high-rises”, relented to the pressure

and economic interests that eventually led to changes in the urban laws, which not only increased the height limits to 52 feet (or 18 floors), but also the rates of utilization (KIEFER, 1989, 2007). Since the approval of the Plano Diretor de Desenvolvimento Urbano Ambiental –PDDUA (Urban and Environmental Development Master Plan) in 1999 (PORTO ALEGRE, 2000) a process of vertical integration and consequently intense urban density has occurred, which in turn has created a conflict of interests in the different users of the city – the residents of the neighborhoods most impacted by the new buildings, the civil construction executives, the environmental movements, and the public administration managers (SUCUSSEL & SATTTLER, 2010). These conflicts led to a recent review in the PDDUA (PORTO ALEGRE, 2012), which resulted in reduction of the height parameters of buildings in 24 neighborhoods (Picture 01).

An amount of 148 respondents makes the total sample, with a division into three groups as follows: 29.7% (44 of 148) with a university degree in Architecture and Urbanism; 43.3% (64 of 148) with college degrees in diverse areas (non-architects with a college education) and 27% (40 of 148) those who did not have a degree nor were attending college (respondents without higher education; Table 01).

Table 01

Sample of
respondentsNotes: a.n. =
absolute number

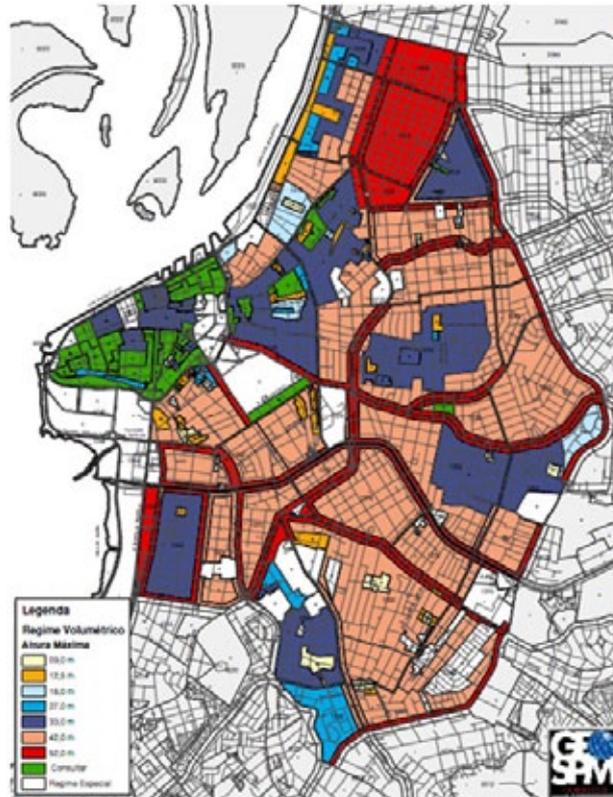
The questionnaires consisted of simple closed questions on the status of the respondent and on the heights of the buildings, and multiple-choice questions on the impact produced by tall buildings in the city. The survey respondents

Group of respondents	a.n.	%
Architects	44	29,7 %
Non-architects with a college degree	64	43,3 %
Respondents without a college degree	40	27,0 %
Total of respondents	148	100 %

Picture 01

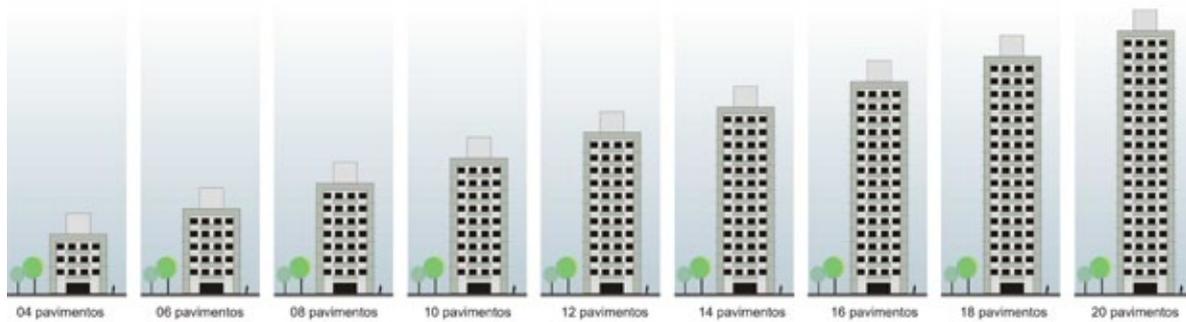
Map of maximum heights
allowed in the city of Porto
Alegre – Macro-area 01

Source: Porto Alegre -
PDDUA (2012)



were shown pictures of nine buildings (Picture 02) with an even number of floors, starting with a building with four floors and finishing with a building with 20 floors, in order to identify from what height a building is considered high according to their perception. Open questions were also part of the questionnaire, with the objective of knowing the explanations the respondents would give for their choices. Before being implemented, the questionnaire was tested through a pilot study to check the comprehension of the questions.

The quantitative data obtained from the questionnaires were tallied and analyzed using the SPSS / PC (“Statistical Package for Social Sciences”), through non-parametric statistical tests of frequency - which shows the distribution of the data with respect to the categories considered - and cross tabulation (Phi coefficient) - which indicates how the data distribution is related to some variable, i.e. it indicates the strength of the relationship between two nominal variables. The tests that indicate the existence of a relationship between variables are considered statistically significant when the value of the significance (Sig) is less than or equal to 0.05 (REIS, 1992).



Picture 02

Illustration used in the questionnaire

Source: Image from the authors

(Translator's note: pavimento = floor)

Results

As the goals of the research are presented, the results will follow below:

Identification through the perception of different groups of users of the urban space regarding the height a building must have in order to be considered high.

First, the places of residence and work of the respondents were identified. As to the place of residence, 61.5% (91 of 148) of the respondents live in apartment buildings. Regarding the academic level of the respondents, residents in apartment building were predominant among the respondents from both groups with a university education (architects - 77.3% - 34 of 44; non-architects - 65.6% - 42 of 64) as opposed to the group without a university degree where most of the respondents (62.5% - 25 of 40) do not live in buildings (Table 02). This relationship between the levels and types of academic respondents and their places of residence, is statistically significant ($\Phi = 0.300$; $\text{Sig.} = 0.001$), suggesting that the academic education of individuals tends to affect the choice for their place of residence.

Table 02

Place of residence

Notes: a.n. = absolute number

	Architects	Non-architects with a college degree	Respondents without a college degree	Total
	a.n. (%)	a.n. (%)	a.n. (%)	a.n. (%)
Doesn't live in a building	10 (22,7%)	22 (34,4%)	25 (62,5%)	57 (38,5%)
Lives in a building	34 (77,3%)	42 (65,6%)	15 (37,5%)	91 (61,5%)
Total of the sample	44 (100%)	64 (100%)	40 (100%)	148 (100,0%)

Table 03

Work place

Notes: a.n. =
absolute number

As for the workplace, only 30.4% (44 of 148) of the respondents work in buildings (Table 03). However, this relationship between levels and types of academic respondents and their workplaces, is statistically significant ($\Phi = 0.265$, $\text{Sig.} = 0.006$), suggesting that the academic training of individuals tends to be related to their working in buildings.

	Architects	Non-architects with a college degree	Respondents without a college degree	Total
	a.n. (%)	a.n. (%)	a.n. (%)	a.n. (%)
Does not work in a building	27 (61,4%)	41 (64,1%)	36 (90,0%)	104 (70,3%)
Works in a building	17 (38,6%)	23 (35,9%)	5 (12,5%)	44 (30,4%)
Total of the Sample	44 (100%)	64 (100%)	40 (100%)	148 (100,0%)

Table 04Height of the place
of residenceNotes: a.n. =
absolute number

Of the people who lived in buildings, the majority (80.2% - 73 of 91) live in buildings up to 10 floors and only 19.8% (18 of 91) live in buildings with over 10 floors (Table 04), which tends to repeat itself for each of the three groups. This result is supported by the lack of a statistically significant relationship between the three groups and the fact of living in buildings with heights up to 10 floors or higher.

	Architects	Non-architects with a college degree	Respondents without a college degree	Total
	a.n (%)	a.n (%)	a.n (%)	a.n (%)
Lives in a residential building with up to 10 floors	27 (79,4%)	34 (81,0%)	12 (80,0%)	73 (80,2%)
Lives in a residential building with more than 10 floors	7 (20,6%)	8 (19,0%)	3 (20,0%)	18 (19,8%)
Total of people who live in buildings	34 (100%)	42 (100%)	15 (100%)	91 (100,0%)

Table 05Height of the work
placeNotes: a.n. =
absolute number

As for respondents who work in buildings, the majority, 84.1% (37 of 44) works in buildings up to 10 floors and only 15.9% (7 of 44) work in buildings with heights above 10 floors (Table 05), which also tends to repeat itself for each of the three groups. This result is supported by the lack of a statistically significant relationship between the three groups and the fact of working in buildings with heights up to 10 floors or higher.

	Architects	Non-architects with a college degree	Respondents without a college degree	Total
	a.n. (%)	a.n. (%)	a.n. (%)	n.a. (%)
Works in a commercial building up to 10 floors	13 (76,5%)	21 (91,3%)	3 (75,0%)	37 (84,1%)
Works in a commercial building with more than 10 floors	4 (23,5%)	2 (8,7%)	1 (25,0%)	7 (15,9%)
Total of people who work in buildings	17 (100%)	23 (100%)	4 (100%)	44 (100,0%)

Table 05

Height of the work place

Notes: a.n. = absolute
number

In the identification of the height from which a building is considered high, it is observed that while only 12.9% of the total sample consider a six-floor building as tall (some starting at four floors), 35, 9% of total respondents perceive an eight-floor building as tall (some starting at four to six floors), and 66.3% perceive buildings as tall when their heights are greater than or equal to 10 floors (some starting from four, six or eight floors) (Table 06). Thus, it can be assumed that to most respondents a building is considered to be high starting at 10 floors.

In your opinion, how many floors must a building have in order to be considered tall?	Architects	Non-architects with a college degree	Respondents without a college degree	Total
	a.n. (%)	a.n. (%)	a.n. (%)	a.n. (%)
4 floors	1 (2,3%)	1 (1,6%)	4 (10,0%)	6 (4,1%)
6 floors	4 (9,1%)	5 (7,8%)	4 (10,0%)	13 (8,8%)
8 floors	11 (25,0%)	12 (18,8%)	11 (27,5%)	34 (23,0%)
10 floors	14 (31,8%)	20 (31,3%)	11 (27,5%)	45 (30,4%)
12 floors	7 (15,9%)	10 (15,6%)	6 (15,0%)	23 (15,5%)
14 floors	2 (4,5%)	5 (7,8%)	2 (5,0%)	9 (6,1%)
16 floors	2 (4,5%)	6 (9,4%)	1 (2,5%)	9 (6,1%)
18 floors	0 (0,0%)	3 (4,7%)	0 (0,0%)	3 (2,0%)
20 floors	3 (6,8%)	2 (3,1%)	1 (2,5%)	6 (4,1%)
Total of the sample	44 (100%)	64 (100%)	40 (100%)	148 (100%)

Table 06Number of floors a building
must have in order to be
considered tall according to
education levelsNotes: a.n.= absolute
number

This trend was repeated in the analyzes of the responses of the groups with different levels and types of academic education, where most architects (68.2%), non-architects with a university education (59.5%), and respondents with no college education (75.0%) perceive as tall buildings with heights greater than or equal to 10 floors (some starting at four, six or eight floors) (Table 06). This

result is supported by the lack of a statistically significant relationship between the three groups and the number of floors a building must have in order to be considered high.

It is also noted that most of the respondents, who do not live in buildings (64.9% = 7.0% + 12.3% + 17.5% + 28.1%), who live in buildings up to 10 floors (68.5% = 0.0% + 5.5% + 27.4% + 35.6%) and who live in buildings with over 10 floors (61.1% + 11.1% = 11.1% + 22.2% + 16.7%), perceive as tall buildings with heights greater than or equal to 10 floors (in addition to those who already perceive as tall buildings with four, six or eight floors; Table 07). Thus, although there has been found statistically significant relationships between living or not in a building and number of floors from which a building begins to be considered high ($\Phi = 0.336$, Sig. = 0.034), and between living in a building with up to 10 or more than 10 floors and the number of floors from which a building begins to be considered high ($\Phi = 1.361$; Sig. = 0.030), these significant relationships relate to the distribution of the responses from each group regarding the number of floors from which a building is considered high and not the assemblage of responses from those who understand that a building with 10 floors is a tall building, as the percentages presented above.

Table 07

Perception of a tall building
and the type of building one
lives in

Notes: a.n.= absolute number

In your opinion, how many floors must a building have in order to be considered tall?	Does not live in a residential building	Lives in a residential building with up to 10 floors	Lives in a residential building with more than 10 floors	Total
	a.n.(%)	a.n.(%)	a.n.(%)	a.n.(%)
4 pavimentos	4 (7,0%)	0 (0,0%)	2 (11,1%)	6 (4,1%)
6 pavimentos	7 (12,3%)	4 (5,5%)	2 (11,1%)	13 (8,8%)
8 pavimentos	10 (17,5%)	20 (27,4%)	4 (22,2%)	34 (23,0%)
10 pavimentos	16 (28,1%)	26 (35,6%)	3 (16,7%)	45 (30,4%)
12 pavimentos	15 (26,3%)	8 (11,0%)	0 (0,0%)	23 (15,5%)
14 pavimentos	2 (3,5%)	4 (5,5%)	3 (16,7%)	9 (6,1%)
16 pavimentos	2 (3,5%)	5 (6,8%)	2 (11,1%)	9 (6,1%)
18 pavimentos	0 (0,0%)	3 (4,1%)	0 (0,0%)	3 (2,0%)
20 pavimentos	1 (1,8%)	3 (4,1%)	2 (11,1%)	6 (4,1%)
Total of the sample	57 (100%)	73 (100%)	18 (100%)	148 (100%)

Regarding the type of building the respondent works in, it appears that the majority of respondents who do not work in buildings (69.2% = 4.8% + 9.6% + 26.0% + 28.8%) and those who work in buildings with up to 10 floors (62.1% = 0.0% + 8.1% + 13.5% + 40.5%) perceive as high buildings with heights greater than or equal to 10 floors (added to these those who perceive as tall buildings from four, six or eight floors; Table 08). Since the majority of the respondents who work in buildings over 10 floors (71.5% = 14.3% + 0.0% + 28.6% + 0.0% + 28.6%) perceive as high buildings with heights greater than or equal to 12-floor (some starting at four, six, eight or ten floors) (Table 08). However, this difference is not statistically significant.

In your opinion, how many floors must a building have in order to be considered tall?	Does not work in a commercial building	Works in a commercial building with up to 10 floors	Works in a commercial building with more than 10 floors	Total
	n.a. (%)	n.a. (%)	n.a. (%)	n.a. (%)
4 floors	5 (4,8%)	0 (0,0%)	1 (14,3%)	6 (4,1%)
6 floors	10 (9,6%)	3 (8,1%)	0 (0,0%)	13 (8,8%)
8 floors	27 (26,0%)	5 (13,5%)	2 (28,6%)	34 (23,0%)
10 floors	30 (28,8%)	15 (40,5%)	0 (0,0%)	45 (30,4%)
12 floors	13 (12,5%)	8 (21,6%)	2 (28,6%)	23 (15,5%)
14 floors	6 (5,8%)	2 (5,4%)	1 (14,3%)	9 (6,1%)
16 floors	8 (7,7%)	1 (2,7%)	0 (0,0%)	9 (6,1%)
18 floors	2 (1,9%)	1 (2,7%)	0 (0,0%)	3 (2,0%)
20 floors	3 (2,9%)	2 (5,4%)	1 (14,3%)	6 (4,1%)
Total of the sample	104 (100%)	37(100%)	7 (100%)	148 (100%)

Table 08

Perception of a tall building and the type of building one works in

Notes: a.n.= absolute number

Investigation of the perception of different groups of users of the urban space as to the impact produced by tall buildings in the city

In the perception of the survey respondents, the most significant impacts caused by tall buildings in the city were the alteration of the urban landscape (77.0%), overload in urban infrastructure (60.8%), increased population density (55.4%), traffic density (52.7%) and alteration of the local microclimate (45.9%) (Table 09). In the individual analysis of each group (Table 09), the architects identified impacts similar to the group in general: alteration in the urban landscape (24.3%), increased population density (22.3%), traffic density (20.9%) and

overload in urban infrastructure (20.3%). For non-architects with a university degree the most significant are: overload in urban infrastructure (28.4%), increased population density (24.3%) and traffic density (24.3%). The group without college degrees identifies mainly: alteration in the urban landscape (20.9%), altered local microclimate (12.8%) overload in urban infrastructure (12.2%, Table 09). Statistically significant relationships were found between the three groups formed by respondents with different types and levels of academic education and: increased population density ($\Phi = 0.312$, $\text{Sig.} = 0.001$); overload on urban infrastructure ($\Phi = 0.256$, $\text{Sig.} = 0.008$) and traffic density ($\Phi = 0.318$, $\text{Sig.} = 0.001$). These three types of impacts caused by tall buildings in the city were most mentioned by non-architects with a university degree and less cited by respondents with no college education (Table 09).

Table 09

Perception of the impact
caused by tall buildings
according to the academic
level

Notes: a.n. = absolute number

In your perception what are the impacts caused by tall buildings in the city?	Architects	Respondents without a college degree	Respondents without a college degree	Total
	a.n. (%)	a.n. (%)	a.n. (%)	a.n. (%)
Alteration in the urban landscape	36 (24,3%)	47 (31,8%)	31 (20,9%)	114 (77,0%)
Increased population density	33 (22,3%)	36 (24,3%)	13 (8,8%)	82 (55,4%)
Overload in the urban infrastructure	30 (20,3%)	42 (28,4%)	18 (12,2%)	90 (60,8%)
Traffic density	31 (20,9%)	36 (24,3%)	11 (7,4%)	78 (52,7%)
Alteration in the local microclimate	25 (16,9%)	24 (16,2%)	19 (12,8%)	68 (45,9%)
High energy consumption	12 (8,1%)	18 (12,2%)	14 (9,5%)	44 (29,7%)
Real Estate speculation	21 (14,2%)	19 (12,8%)	11 (7,4%)	51 (34,5%)
Appreciation of the real estate in the area	13 (8,8%)	10 (6,8%)	10 (6,8%)	33 (22,3%)
Devaluation of the real estate in the area	4 (2,7%)	4 (2,7%)	7 (4,7%)	15 (10,1%)
Other				8 (5,4%)

When the total number of respondents was asked about the main impact produced by tall buildings in the city, alteration in the urban landscape was the most cited (33.8% - 50 of 148), followed by overload on urban infrastructure (18.2% - 27, 148), alteration in the local microclimate (12.8% - 19 of 148), traffic density (12.2% - 18 of 148) and increased population density (10.8% - 16 of 148; Table 10). The change in the urban landscape was also the most cited impact (36.4% - 16 of 44) by architects, followed by the increase in population density (18.2% - 8 of 44) and overload on urban infrastructure (13.6% - 6 of 44). Respondents who were non-architects with a college education also consider alteration in the urban landscape (26.6% - 17 of 64) as the main impact caused by tall buildings, followed by overload on urban infrastructure (21.9% - 14 of 148) and traffic density (17.2% - 11 of 64). The group of respondents without higher

education further reinforces the alteration in the urban landscape (42.5% - 17 of 40) followed by overload on urban infrastructure (17.5% - 7 of 40) and alteration in the local microclimate (15.0% - 6 of 40; Table 10). Other impacts were mentioned by the respondents, such as reduction of green areas in the cities, lack of sunlight problems, and wind tunnels caused by tall buildings when located on both sides of the road.

Table 10

Perception of the main impacts caused by tall buildings in the city, according to the academic level

Notes: a.n.= absolute number

The relationship between the academic level of the respondents and the perception of the main impacts caused by tall buildings is not statistically significant, indicating that the academic training of individuals does not usually influence the perceptions of the respondents regarding the impact that tall buildings can cause in the city.

Among the impacts mentioned in the previous question, which is the most important?	Architects	Non-architects with a college degree	Respondents without a college degree	Total
	a.n. (%)	a.n. (%)	a.n. (%)	a.n. (%)
Alteration in the urban landscape	16 (36,4%)	17 (26,6%)	17 (42,5%)	50 (33,8%)
Increased population density	8 (18,2%)	5 (7,8%)	3 (7,5%)	16 (10,8%)
Overload in the urban infrastructure	6 (13,6%)	14 (21,9%)	7 (17,5%)	27 (18,2%)
Traffic density	5 (11,4%)	11 (17,2%)	2 (5,0%)	18 (12,2%)
Alteration in the local microclimate	4 (9,1%)	9 (14,1%)	6 (15,0%)	19 (12,8%)
High energy consumption	0 (0,0%)	3 (4,7%)	2 (5,0%)	5 (3,4%)
Real Estate speculation	2 (4,5%)	4 (6,3%)	0 (0,0%)	6 (4,1%)
Appreciation of the real estate in the area	1 (2,3%)	1 (1,6%)	2 (5,0%)	4 (2,7%)
Devaluation of the real estate in the area	0 (0,0%)	0 (0,0%)	0 (0,0%)	0 (0,0%)
Other	2 (4,5%)	0 (0,0%)	1 (2,5%)	3 (2,0%)
Total of the sample	44 (100%)	64 (100%)	40 (100%)	148 (100%)

Understanding the changes caused by tall buildings in urban landscape, according to different groups of respondents

When asked about their perception regarding alteration in the urban landscape due to the presence of tall buildings, the majority (59.5% - 88 of 148) of the respondents say that tall buildings adversely affect the landscape of the city, while 25.0% (37 of 148) were indifferent to the presence of tall buildings and only 15.5% (23 of 148) of the respondents think that tall buildings positively affect the urban landscape (Table 11).

These results repeat themselves when analyzing the three groups with different types and levels of academic training separately (Table 11), which showed that re-

Table 11

Perception of the alteration in the urban landscape, according to the academic level

Notes: a.n.= absolute number

regardless of one's academic education, tall buildings are perceived as negative to the urban landscape. These results are supported by the lack of a statistically significant relationship between the three groups and the perception of the alterations caused by tall buildings to the urban landscape. However, the group of architects showed a slightly higher percentage of acceptance of tall buildings (20.5%) compared to the respondents without a college education (15.0%) and to the non-architects with a college degree (12.5 %).

What is your perception regarding the alterations caused by the tall buildings to the landscape of the city?	Architects	Non-architects with a college degree	Respondents without a college degree	Total
	a.n. (%)	a.n. (%)	a.n. (%)	a.n. (%)
Affect positively	9 (20,5%)	8 (12,5%)	6 (15,0%)	23 (15,5%)
Affect negatively	26 (59,1%)	37 (57,8%)	25 (62,5%)	88 (59,5%)
Indifferent	9 (20,5%)	19 (29,7%)	9 (22,5%)	37 (25,0%)
Total of the sample	44 (100%)	64 (100%)	40 (100%)	148 (100%)

Considering the three groups (those who do not live in residential buildings; those who live in residential buildings with a height of up to 10 floors; those who live in residential buildings with more than 10 floors), all groups have the perception that the city's landscape is negatively affected by tall buildings (table 12). However, the lack of a statistically significant relationship between these three groups and the perception of change in the urban landscape indicates the fact that whether a person does live in a tall building with up to 10 floors or higher or not does not influence their perception regarding the impact generated by tall buildings. However, the residents of buildings with more than 10 floors are the ones that express this perception the most (66.7%). The group of respondents who do not live in buildings is, curiously, the one that believes the most (19.3%) that tall buildings positively affect the urban landscape, against 13.7% and 11.1%, of respondents living in buildings up to 10 floors in height and those who live in buildings with more than 10 floors, respectively.

Table 12

Perception of the alteration in the urban landscape, according to the type of building one lives in

Notes: a.n.= absolute number

What is your perception regarding the alteration caused by tall buildings to the landscape of the city?	Does not live in a residential building	Lives in a residential building with up to 10 floors	Lives in a residential building with more than 10 floors	Total
	n.a. (%)	n.a. (%)	n.a. (%)	n.a. (%)
Affect positively	11 (19,3%)	10 (13,7%)	2 (11,1%)	23 (15,5%)
Affect negatively	35 (61,4%)	41 (56,2%)	12 (66,7%)	88 (59,5%)
Indifferent	11 (19,3%)	22 (30,1%)	4 (22,2%)	37 (25,0%)
Total of the sample	57,0 (100%)	73 (100%)	18 (100%)	148 (100%)

Table 13

Perception of the alteration
to the urban landscape,
according to the type of
building one works in

Notes: a.n. = absolute
number

Analyzing the three other groups (those who do not work in commercial buildings; those who work in buildings with up to 10 floors; those who work in buildings with more than 10 floors), those who do not work in buildings (63.5%) and those who work in buildings with heights up to 10 floors (51.4%) consider that the urban landscape is adversely affected by the presence of tall buildings. On the other hand, the majority of respondents who work in buildings with more than 10 floors (57.1%) have the perception that the city's landscape is positively affected by tall buildings (Table 13). However, there were no statistically significant relationships between the three groups and the perception of change in the urban landscape due to the presence of tall buildings.

What is your perception regarding the alteration caused by tall buildings to the landscape of the city?	Does not work in a commercial building	Works in a commercial building with up to 10 floors	Works in a commercial building with more than 10 floors	Total
	a.n. (%)	a.n. (%)	a.n. (%)	a.n. (%)
Afetam positivamente	12 (11,5%)	7 (18,9%)	4 (57,1%)	23 (15,5%)
Affect negatively	66 (63,5%)	19 (51,4%)	3 (42,9%)	88 (59,5%)
Indifferent	26 (25,0%)	11 (29,7%)	0 (0,0%)	37 (25,0%)
Total of the sample	104 (100%)	37(100%)	7 (100%)	148 (100%)

Highlighted are some of the reasons respondents gave in order to justify their perception that tall buildings positively affect the urban landscape: the association with the idea of progress, modernity, development and power; a positive aesthetic impact on the landscape; the role of the tall building as a reference point, both as location reference point as well as a symbol or icon of a city. On the other hand, the reasons that respondents gave for considering that tall buildings adversely affect the landscape of the city are many: environmental issues, lighting, shading and ventilation were quoted repeatedly; alteration in the aesthetics of the city, with the visual barriers that are formed by tall buildings affecting the visual permeability and hiding the natural landscape of the cities were also pointed out. The lack of planning, which results in urban sprawl and the modification of the visual image of the neighborhoods, is also listed as a negative result of the alteration to the urban landscape. Many of the respondents who were indifferent to the fact that tall buildings affect the landscape of the city claimed that the positive or negative impacts depend on the location - city or city region - where the buildings are located. It was also noted that the problem was not the height of the buildings themselves, but the spaces or distance between them.

Final Considerations

The buildings are perceived as tall by most of the users of the urban spaces in the metropolitan region of Porto Alegre and in some cities in the interior of Rio Grande do Sul, when they have 10 or more floors. The current urban legislation in the capital (PORTO ALEGRE, 2012) restricts to 42 meters (or 14 floors) the heights of buildings in most of the city and still allows buildings up to 52 meters (or 18 floors) in certain regions. When we compare these data with results that indicate that buildings with more than 10 floors are considered high, we may infer that the application of the local legislation may, over time, result in an urban space perceived as vertical by its users.

The level and type of educational background of the respondents did not seem to be determinant when it came to their perception of the heights of the buildings. The academic background of individuals tends to be related to the type of housing they choose to live in, with the great majority of architects and non-architects with college degrees living in buildings and the great majority of respondents without college degrees living in another type of building. Although the percentage of architects who live in buildings with more than 10 floors is larger than the other two groups, there is no relationship between the level and type of academic background and the choice to live in buildings with more or less than 10 floors, with only a minority in each group living in buildings with more than 10 floors. However, the fact that one does not live in a building, lives in buildings with up to 10 floors, or lives in buildings with more than 10 floors did not alter the perception that a building tends to be seen as high starting at 10 floors.

Although the academic background of individuals tends to be related to whether or not they work in buildings (with a higher percentage of those with college degrees working in buildings than those without college degrees), most in the three groups did not work in buildings. Thus, considering the type of building where the respondent works, apparently the majority of the respondents who do not work in buildings and those who work in buildings with up to 10 floors perceive as high buildings with heights greater than or equal to 10 floors, while most respondents who work in buildings with more than 10 floors considered as high buildings with heights greater than or equal to 12 floors. However, among the minority of respondents who work in buildings, only a small portion works in buildings with more than 10 floors in any of the three groups.

In general, the main impacts generated by high buildings in urban areas are alteration in the urban landscape, overload in the urban infrastructure, increased population density, traffic density and alteration of the local microclimate, which shows that the impacts perceived by users of the urban areas tend to coincide with those mentioned in other studies (eg. GONÇALVES, 2010; SCUSSEL; SATTLER, 2010). The perception of these impacts do not appear to be signifi-

cantly affected by the type and level of academic background since the results tend to repeat themselves in each group, with the architects and those without college degrees also highlighting the impact generated in the urban landscape and the non-architects with a college education highlighting the burden on the urban infrastructure. However, non-architects with a college education tend to reinforce the impacts caused by tall buildings in the city, such as increased population density overload in urban infrastructure and traffic density, while respondents without college degrees mention these aspects the least. Among the negative effects caused by high buildings, there are also the reduction of the green areas of the cities, reduction of the sunny areas, and wind tunnels caused by tall buildings when situated on both sides of the street.

Specifically, the majority of respondents believe that tall buildings negatively affect the urban landscape while only a minority perceives a positive impact in the urban landscape. Although the architects present a slightly smaller rejection to tall buildings than the other two groups of respondents, regardless of the type and level of academic background, tall buildings, in general, tend to be perceived as negative to the urban landscape. This perception was not altered by the fact of whether or not a respondent lived in a building with less than 10 floors, in a building with up to 10 floors, or in a building with more than 10 floors, although the ones who lived in the latter expressed this perception more strongly. Although the type of building where the respondent works also did not have a significant bearing on the perception of the kind of impact generated by high-rise buildings, while most of those who do not work in a building and those who work in buildings with up to 10 floors in height also consider that the urban landscape is adversely affected by the presence of tall buildings, the majority of respondents who work in buildings with over 10 floors have the perception that the city's landscape is positively affected by tall buildings. Among the main explanations for the negative impacts generated by tall buildings in the urban landscape are the environmental aspects, such as lighting, shading and ventilation, and aesthetic aspects, such as visual barriers formed by tall buildings and consequent blocking of views and natural landscapes of the cities. The location of the tall building, including its relationship to other buildings, was mentioned as a condition to be able to assess their impact as positive or negative by a majority of the respondents who were indifferent to the impact generated by the high-rise buildings to the urban landscape. Moreover, the explanations for the positive impacts of tall buildings in the urban landscape tend to be associated with the idea of progress, modernity, development and power, the positive aesthetic impact on the landscape and the function of the tall building as a reference point, both for location and as a symbol or icon of a city.

In conclusion, the results provided a better understanding of what may be perceived as a high-rise building in certain urban contexts, and can contribute to a better understanding of the impacts generated by high buildings in urban areas, as well as contribute to the creation of new investigations on the perceptions of the users of the different urban spaces regarding the presence of tall buildings.

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