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What Makes a Compact City? Differences Between Urban Research in the Global North and the Global South

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Abstract

Compact cities are promoted in policy as a response to current societal challenges, but it is unclear or ambiguous what qualities or benefits a compact city is supposed to deliver. The concept of the compact city is widely debated in the research literature, and there are numerous arguments both for and against compact cities. However, many studies or reviews tend to apply a delimited approach, discussing a confined number of qualities or basing the assessment on fairly narrow empirical material. Research is also carried out from within a number of separate disciplines or "discourses". This paper aims to provide a clearer and more consolidated understanding of the wide spectrum of qualities that make up the compact city in support of better planning, governance and management of cities in the Global South. The objective is to present a review of current articles discussing the compact city in order to capture similarities and differences in the academic discourse between Global North and Global South contexts, and to outline a comprehensive compact city taxonomy. This is achieved by answering three questions: (1) What types of urban qualities are discussed in scientific articles studying urban compactness? (2) (How) do articles focusing on Global North and Global South contexts differ when it comes to exploring compact city qualities? and (3) Do the findings indicate areas of research withing the broader scope of urban compactness where research should be initiated or strengthened? The analysis is based on literature searches in the Scopus database for 2012-2015 using the search term "compact city". A quantitative assessment was carried out, sifting out what terms are used to label purported (or debated) qualities of compact cities. Papers are sorted into different categories according to geoeconomic context (i.e. Global North, BRICS, Global South). The outcome is an extended taxonomy of compact city qualities, including twelve categories. Weaknesses in compact city research aimed at cities in the Global South were identified, linked in particular to nature, health, environmental issues, quality of life, sociocultural aspects, justice and economy, as well as a significant lack of compact city research linked to urban adaptability and resilience.

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Introduction

The global population is predicted to reach 9.7 billion by 2050, with 6.4 billion of us living in cities (UN DESA 2014; 2015). The bulk of this growth will take place in Sub-Saharan Africa and parts of Asia. The African population is estimated to double to 2.5 billion by 2050, rapidly urbanising into a situation where more that 50% of the population live in cities (UN DESA 2010; 2014). Thus far, urbanisation pressures in Sub-Saharan Africa have typically resulted in extensive and random growth of inequitable and low-density settlements (Arku 2009). Even so, ongoing urbanisation pressures can be used as leverage in response to serious social and environmental shortcomings, in order to make cities more resource efficient, liveable, lively and equitable (Hardoy et al. 2001; UN-Habitat 2012c).

Shaping more compact cities has been promoted widely and globally as a significant policy response to numerous societal challenges. The European Environment Agency argued in 2006 that "urban sprawl should rightly be regarded as one of the major common challenges facing urban Europe today" (EEA 2006, 5). The *Leipzig Charter on Sustainable European Cities* from 2007 sees cities as "centres of knowledge and sources of growth and innovation" (EU Ministers 2007, 1) and claims that compact settlement structures are "an important basis for efficient and sustainable use of resources" (EU Ministers 2007, 4). The same argument has been repeated more recently by the European Commission in *Cities of Tomorrow* (European Commission 2011) and in a more recent assessment of the Urban Agenda for the European Union promoting "liveable compact cities and the use of nature-based solutions" (Korthals Altes and Haffner 2019, 27).

The *World Development Report* from 2009 maintains that "density makes the difference" (World Bank 2009, 211), here focusing on economic concentration, i.e., "the richer, the denser" (World Bank 2009, 56). On a parallel note, the OECD sees the compact city as a key concept to meet so-called green growth objectives since "it can enhance both the environmental and the economic sustainability of cities" (2012, 19).

These numerous policy statements tend to rest on a Global North perspective of urban development, however, more internationally inclusive organisations, such as various UN agencies, are also passionate promoters of compact city policies. According to the UN-Habitat, "housing, employment, accessibility and safety (…) are strongly correlated to urban form" (2012c, 13), and they claim that effective policies on urban density will bring prosperity and social cohesion, and minimise adverse external impacts. In doing so, they will deliver "good quality of life at the right price" (2012c, 13). Moreover, it is argued that compact city policies "positively enhance the life of the city dweller and support related strategies aimed at promoting a green economy and sustainable urban settlements" (UN-Habitat 2012a, 81). The UNEP states that "compact, relatively densely populated cities, with mixed-use urban form, are the most resource-efficient settlement pattern" (UNEP 2013, 6). Similar policy arguments are also mirrored at national and local levels. In Sub-Saharan Africa, compact city policies are in place, not only in large cities, such as Cape Town (City of Cape Town 2012), but also in smaller regional centres, such as Kisumu in Kenya

(Nodalis Conseil 2013). Although some policy documents acknowledge that urban compactness "brings challenges as well as its opportunities" (UNEP 2013, 44) and that this is not a "magic bullet" (UN-Habitat 2012a, 1), such policies are largely seen as a universal approach to enhance urban performance and quality of life worldwide. Nonetheless, urban policies are often unclear with regard to what concrete qualities or benefits a compact city is actually supposed to deliver, and it can be argued that "the compact city model is necessary, but not sufficient for sustainable urban development" (Nabielek 2012, 3). In the New Urban Agenda drafted at Habitat III, it was agreed that urban development should pursue "appropriate compactness and density, polycentrism and mixed uses, through infill or planned urban extension strategies as applicable, to trigger economies of scale and agglomeration, strengthen food system planning, and enhance resource efficiency, urban resilience and environmental sustainability" (United Nations 2017, 9)

In contrast to the relative consensus in global policy, the extensive academic debate on compact cities is a multi-faceted mix of positive, negative and inconclusive accounts. This literature can be traced back to various origins and has emerged gradually over the years, fuelled by urban ecology theorists "such as Mumford, Wirth, Burgess and Jacobs" who "promote the compact city as the crucial site for urban life" (Ye 2006, 24), thus incorporating social perspectives within the concept. As early as in the 1960s, Jacobs argued that vibrant inner cities are "natural generators of diversity and prolific incubators of new enterprises and ideas of all kinds" (Jacobs 1965, 145). In the 1970s, the term compact city was used for the first time by Dantzig and Saaty (1973) whose ideal urban model was grounded in systems thinking and space—time efficiency. A few decades later, Newman and Kenworthy (1989) presented an influential study showing how energy use for passenger transport decreases in cities with higher densities. These arguments in combination – transport efficiency plus economic and sociocultural vibrancy – can be seen as the starting point of an increasingly extensive literature on partially overlapping concepts, such as compact cities (Jenks et al. 1996), sustainable cities (Haughton 1997), new urbanism (Calthorpe 1993), transit-oriented development (Boarnet and Crane 2001), smart growth (Burchell et al. 2000; Downs 2005), urban resilience (Ahern 2011) and others. Shared arguments are that proximity, diversity and scale promote resource efficiency and new technologies, save rural land, reduce consumption of fossil fuels, increase accessibility, bring down infrastructure costs, lead to better quality of life, result in innovation and economic development, and strengthen social cohesion (e.g. Jenks et al. 1996; Keiner et al. 2004; Satterthwaite 2010). In contrast, others claim that wider impacts on energy use, travel, resource depletion and land use are not proven (Echenique et al. 2012) and that inconsiderate implementation of more compact cities would infringe on individual choice of lifestyles and decrease urban liveability (Neuman 2005; Howley et al. 2009). In both Global North and Global South contexts, there is a high risk that compact cities lead to crowding, unaffordable housing, inequity, health problems, congestion, pollution, and loss of green space (Dave 2011; Echenique et al. 2012).

Each one of these positions in relation to the compact city has its group of proponents and opponents (Churchman 1999). Holman et al. (2015) divide these

arguments and counter-arguments into three main discourses: the *discourse of conviction*, largely ignoring associated challenges and complexities; the *discourse of suspicion*, with a distrust of both state and market agendas; and the *discourse of pragmatism*, focusing on implementability and empirical evaluation of the compact city as a policy objective. Here, the pragmatists strive reach beyond the selectivity of the convinced and the scepticism of the suspicious in ambition to bridge an implementation gap ridden by ideology and trade-offs (Holman et al. 2015), but the politicised nature of the compact city debate (Dijkink and Knippenberg 2001) makes this endeavour very difficult. Nonetheless, there are efforts to avoid simplification and to tackle the full complexity of the compact city concept. Boyko and Cooper (2011) carried out an extensive review of 75 papers on urban density from 1976 to 2011 with a particular focus on synergies and trade-offs identified through empirical research. Based on this review they present a long list of advantages and disadvantages deriving from higher urban densities, and also discuss potential relationships between density and other variables, such as affordability, well-being, biodiversity, pollutants, energy use, economy and travel. Furthermore, the authors also grouped different urban density types into a density taxonomy covering five main themes:

- *Natural form (e.g., forests, lakes, flora, fauna)*
- *Built form (e.g., dwellings, non-dwellings, infrastructure, other structures)*
- *Mobile material form (e.g., vehicles, by foot)*
- *Static form (e.g., waste, advertising, transit stops)*
- *People: a) individual and social (e.g., demography, household)*
  b) organisational (e.g., economy)

Of these themes, "people" was present in roughly 46.5% of the studies and "built form" in 41%. The remaining three themes had attracted less attention: "natural form" 7%, "static form" 3.5% and "mobile material form" in just about 2%. By collecting opinions of different types of experts on urban issues, the authors also identified density types that were missing in the reviewed 75 papers, such as cropland (natural form); trains, airplanes, buses, bicycles (mobile material form); products, food, equipment, digital technology (static form); culture, lifestyle, health, spirituality (people – individual and social); governance, business, religion (people – organisational). Boyko and Cooper (2011) associate such imbalances and gaps with a significant need of future research, especially to understand relationships between density and other variables. This study by Boyko and Cooper is undoubtedly useful but does still not fully capture the richness of the debate on compact cities. For example, the proposed taxonomy of density does neither include diversity and complexity being intrinsic aspects of urban compactness (e.g. Dantzig & Saaty 1973; Rueda 2014) not urban form (e.g. Breheny 1996; Westerink et al. 2013). A more recent study by Ahlfeldt and Pietrostefani (2017) confirms a need to extend the list of the characteristics of compact city qualities beyond those identified by Boyko and Cooper.

The aforementioned reviews by Boyko/Cooper and Ahlfeldt/Pietrostefani are also clearly biased towards a Global North perspective, except from a few studies on China, India and Nigeria. Nevertheless, the compact city concept is starting to appear also in African urban studies (Arku 2009; Du Plessis and Boonzaaier 2015; Horn 2015), but since the compact city agenda has largely been focused on Global North perspectives (Robinson 2006; Myers 2011) its relevance for informal settlements of the Global South is still underexplored. It is questionable whether increased density is the best recipe in Global South cities that are already characterised by high densities (Kotharkar et al. 2014) since the result may well be an increase in health problems, pollution and low-quality living conditions (Dave 2011). Other aspects of urban compactness than just densifying the population are probably more relevant for Global South informal settlements, such as employment opportunities and the quality and affordability of housing and travel (Dewar 2000), noise pollution and conflicts between different uses (Kotharkar et al. 2014), or the social and institutional dimensions of urban densification (Parnell et al. 2009; Watson 2012). Furthermore, a primary objective for cities in developing countries is presumably to strengthen social and economic equity (Horn 2015) but there is a lack of knowledge regarding social impacts of compact city policies in developmental contexts (Dave 2011).

All in all, there is a strong case against just transplanting North urban growth policies, such as green belts, smart growth, polycentrism and smart cities (Prior and Raemaekers 2007; Watson 2009; 2015; Lwasa and Kinuthia-Njenga 2012; Horn 2015), especially since such policies often are implemented by donor agencies or bodies, such as UN-Habitat (Watson 2002; Parnell et al. 2009). Here, UN-Habitat maintains that “the promotion of the compact city as a sustainable urban form might be easier in the developing world because many cities are already quite dense” (UN-Habitat 2012a, 14) and that this spontaneously emerged density provides accessibility to job opportunities and improves the local economy. Nonetheless, compact city policies developed in the North can also be seen as a palette from which Global South cities can select appropriate policy measures (Jenks 2000a). Depending on how cities of the South suffer from rapid urbanisation processes, low incomes, colonial legacies and ineffective governance systems, prevalent “generic” notions of compact cities still need to be translated into locally relevant and applicable planning principles to ensure justice, social cohesion, service delivery, economic development and access to ecosystem services (Arku 2009; Horn 2015). Instead of applying Global North blueprints, compact city theories and policies need to be regionally and locally tailored to best respond to specific urban contexts and development needs, especially in relation to widespread informality (Jenks 2000a; Daneshpour and Shakibamanesh 2011; Horn 2015).

Taking all this into consideration, a relevant topic is whether the taxonomy presented by Boyko and Cooper (2011), with its emphasis on certain types of density, is equally relevant in Global South contexts. As can be learnt from their review, compact city studies tend to apply delimited approaches that discuss restricted sets of qualities, base the assessment on a limited empirical material, and carry out research from within single disciplines or discourses. The aim of this article is therefore to deliver a clearer and more consolidated understanding

of the wide spectrum of compact city qualities in support of better planning, governance and management of cities, and especially informal settlements, in the Global South. The objective is to present a review of a set of recent articles discussing the compact city to capture similarities and differences in the academic discourse between Global North and Global South contexts, and to outline an extended compact city taxonomy. This is achieved by answering three questions:

1. *What types of urban qualities are discussed in scientific articles studying urban compactness?*
2. *(How) do articles focusing on Global North and Global South contexts differ when it comes to exploring compact city qualities?*
3. *Do the findings indicate areas of research withing the broader scope of urban compactness where research should be initiated or strengthened?*

The following section describes the methods used to carry out the review, followed by an account of the results of this review. The results are then further analysed and discussed, and some conclusions are presented.

Method

This article reviews research articles distinguishing between studies focusing on Global North and Global South contexts. The review was the starting point for case-study based research in two parallel research projects: one on the compact city notion in a Global North perspective (with Barcelona, Gothenburg and Rotterdam as case cities) and one with a Global South perspective (with Buenos Aires, Cape Town, Havana and Kisumu as case cities). The article therefore presents review results from 2015 and does not claim to discuss later contributions in the literature.

A methodological hurdle is that the split of the world into the Global North and the Global South is not at all clear-cut and it has been argued that particular insights can be gained by seeing all cities as part of a cosmopolitan mix of ordinary cities (Robinson 2006). We appreciate that cities in the two contexts have both similarities and differences (Jenks 2000b). The same goes for cities located within the Global South, where, e.g., population density may imply very different impacts on quality of life depending on the conditions of housing and infrastructure, where one city can be considered efficient (e.g., Hong Kong) and the other overcrowded (e.g., South African townships) (Jenks 2000a). Recognising these caveats, it is still relevant to compare research by taking a North—South distinction into consideration as long as the results are discussed in relation to that particular limitation.

The *DAC List of ODA Recipients* (OECD 2014) is used to set a boundary around the group of Global South countries, where all countries on this list are seen as part of the Global South. However, those so-called BRICS countries that are listed as Upper Middle Income Countries and Territories (i.e., Brazil, China and South Africa) are singled out for sensitivity analysis, the argument being that such large economies possibly bring about urban development patterns and

interests that are more similar to those of the Global North. Since the BRICS country India is listed within the Lower Middle Income Countries and Territories category, it is seen as part of the general group of Global South countries.

The review identifies different types of qualities that compact city policies or compact city environments deliver – or are supposed to deliver. Such qualities are also inferred from the diverse challenges that such compact city policies or environments purportedly will address. The study hence focuses on the substance of planning (Faludi 1973) rather than the planning processes that intend to deliver such qualities.

The starting point for the analysis is a literature search in the Scopus database carried out in November 2015. The search term was "compact city" and the time period was set to 2014-2015, a time frame allowing us to study the contemporary debate on compact cities and to capture a sufficient number of articles. Texts discussing urban compactness using other terms, such as "dense city", "mixed-use city" or "smart growth" were therefore not captured. We acknowledge that both the choice of database and the choice of search term may exclude research that covers similar ground, but we see an extended review as a topic for future research that may corroborate or challenge the findings of this study. From this search, 85 articles were identified, which was seen as a sufficient but still workable number for getting a reliable result. A first scanning of their abstracts judged all 85 articles as relevant for the study (see Appendix). For six articles, only the abstract was analysed due to language problems, the full text being in Japanese or French. Four articles were unavailable for different reasons. The first scan also revealed that only very few articles actually studied the Global South as defined above. To provide a reasonable basis for analysis but still remain within contemporary texts, an additional search including articles from 2012-2013 using the same search term was carried out to identify further articles with an empirical focus on the Global South. This scan resulted in an additional three articles that were included into the study.

The next step was to review all papers, sifting out terms or phrases used to describe purported (or debated) qualities of compact cities, or conversely the challenges compact cites are seen to address. A "quality" is hence seen to denote an aspect or condition that can be positive or negative. The number of "hits" for each term/phrase was registered and the terms/phrases were grouped into main categories to facilitate further analysis. This made possible a calculation of aggregated results for each such category with regard to number of "hits". However, it should be noted that since neither discourse analysis nor any extensive content analysis (apart from counting the "hits") was the purpose of this study, the count of one hit does not differ between a quality just mentioned in passing and a long and well-developed discussion around a certain quality.

The "hits" were subsequently sorted according to the geoeconomic context of the study (i.e., Global North, Global South, BRICS or generic), and were also coded regarding whether they derived from theoretical discussions (i.e., state of the art or reviews) or were based on findings from empirical studies. This facilitated an understanding of which compact city qualities were actually studied empirically (by pragmatists, as argued above by Holman et al. 2015), and how these empirical "hits" were distributed across different Global North and Global South contexts.

Results

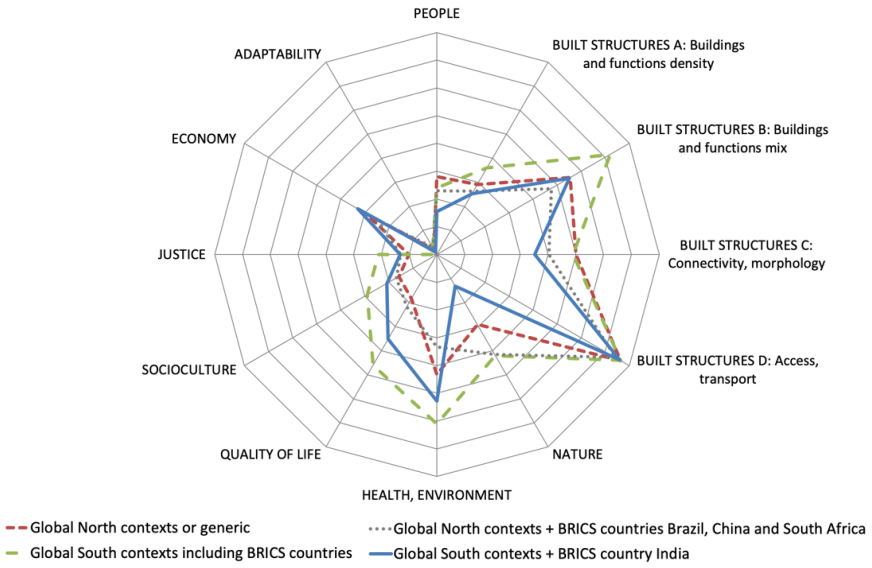
In total, 84 articles were reviewed: 81 from the period 2014-2015 and three additional Global South articles from the period 2012-2013. Of these 84 articles, twelve had an empirical focus on countries on the Global South as defined above: Ecuador (1), India (3), Jordan (1), Malaysia (3), the Middle East (1), Serbia (1), Thailand (1), and Vietnam (1). All but two of these countries (India and Vietnam) were found within the Upper Middle Income Countries and Territories category of the DAC list. The three Upper Middle Income BRICS countries were covered by 14 articles: Brazil (1), China/Hong Kong (11), and South Africa (2). It may also be noted that almost all studies on Global North and Brazil/China/South Africa contexts were carried out by researchers active at universities located in similar contexts. In contrast, for the Global South studies, four out of twelve studies were carried out by non-Global South researchers.

Twelve main categories of compact city qualities were identified based on a clustering of the different terms used in the reviewed articles (see Table 1). This also facilitated linking all the "hits" in the articles to these main categories to establish which categories were most prevalent in the articles and which categories were less present. Figure 1 shows the distribution of terms for compact city qualities across the twelve main categories. This analysis was based on a quantitative aggregation of the number of "hits" found in the reviewed articles. It also included a sensitivity analysis by shifting the BRICS countries Brazil, China and South Africa to the Global North context (continuous blue line) while the BRICS country India remains with Global South countries (dotted grey line).

Table 1. Clustering of urban qualities mentioned in the reviewed articles into twelve main categories.

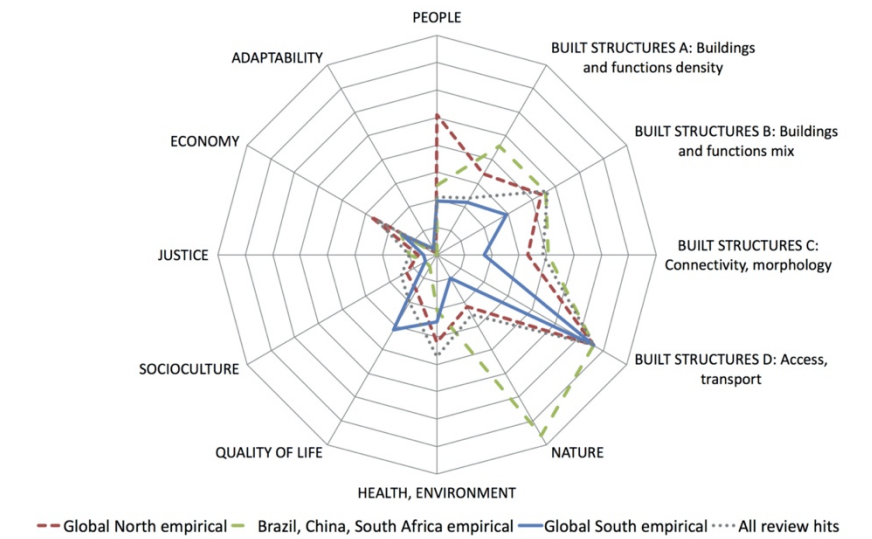
Categories of urban qualities	**Terms used in the articles to describe categories**	**Occurrence**
People	Population density, Population size, Population growth or decline, and Population mix	6.3%
Built Structures A: Buildings and Functions Density	Density in general, Building density (e.g. floor space index), Site coverage, Residential density, Residential floor area, Building heights, Number of public facilities, and Open land suitable for development	7.3%
Built Structures B: Buildings and Functions Mix	Land use in general, Mixed land use, Intensification of activities, Regeneration and/or reuse of brownfields, less Land consumption for urbanisation, and Efficient land use	14.0%
Built Structures C: Connectivity, Morphology	Urban form in general, Monocentric, polycentric or corridor development, Non-sprawl, and Network density	11.7%
Built Structures D: Access, Transport	Mobility and accessibility, less Congestion, Short distances (walkability, bikability), Access to green space, Less cars, and Efficient public transport	20.0%
Nature	Green/blue areas in general, smaller Ecological footprint, less Habitat fragmentation, more Green roofs/walls, and more Ecosystem services,	7.6%
Health, Environment	Health in general, Active commuting, less Traffic fatalities, Environment in general, Energy efficiency, lower Resource use, less Air and noise pollution, less Heat island effects, and mitigation of Climate change	11.2%
Quality of Life	Quality of Life in general, Pedestrian and attractive public spaces, Human-oriented street life, Look and feel of place, and Security,	6.0%
Socioculture	Social aspects in general, Social capital (interaction and community), Vibrant communities, Social control, Community integration and social cohesion, Social inclusion, and Social diversity	4.5%
Justice	Equality and equity, more Social or affordable housing, and Equal access to mobility (affordable public transport)	3.0%
Economy	Vibrancy (revitalise the local economy), higher Income levels, higher Employment and workplace density, Reduced expenditures on infrastructure and services, higher Land and property values (and rents),	7.6%
Adaptability	Resilience, Form as outcome of micro-behaviour, Salient features of informality and micro-behaviour, and Flexible use	0.6%

Figure 1. Radar chart showing the quantitative distribution of terms for compact city qualities mentioned in the reviewed articles across twelve main categories.



Since the results shown in Figure 1 were based on both literature reviews/state of the art and empirical studies, it was of interest to single out which compact city qualities were actually studied empirically in Global North and Global South contexts (see Figure 2).

Figure 2. Radar chart showing which compact city qualities were studied empirically, based on a quantitative analysis of number of "hits" in the reviewed articles.



The BRICS countries Brazil, China and South Africa are shown separately. The BRIC country India is included among the Global South countries. Numbers are converted into a uniform scale for comparison and are therefore not numerically comparable.

Analysis and Discussion

The articles reviewed above serve as a basis for addressing the three research questions guiding this study, and especially for a discussion around the concept of compact cities in urban planning for the Global South. The analysis and discussion will cover five topics: 1) the extent of compact city articles with a Global South focus; 2) the distribution of "hits" across different compact city qualities in these articles; 3) possible reasons for the abovementioned distribution in Global North and Global South articles; 4) variations in Global North and Global South articles regarding choice of empirical focus for research on compact city qualities; and 5) the apparent lack of research on critical resilience/adaptability qualities linked to compact cities.

A first observation is that only few articles discuss the compact city in Global South contexts. Although 26 out of 84 articles studied urban challenges in countries on the DAC list, only twelve of these articles can be referred to the Global South if we do not include the BRICS countries Brazil, China and South Africa into the Global South. It is even more notable that only four papers are from poorer countries on the DAC list (i.e., Lower Middle Income or below): One for Vietnam and three for India, although it can be questioned whether India should really be seen as poor country considering its large and emerging economy. Even when the review was extended to cover the years 2012-2015 and thus include 194 articles, no additional articles about poorer Global South contexts where found. This finding indicates a poor response to the calls for a new body of urban planning theory, independent from prevailing "North" theories (Watson 2002; 2009; Arku 2009; Parnell and Robinson 2013; Horn 2015).

Second, among the identified twelve main categories of urban qualities, there are some that clearly dominate the debate and studies (see Figure 1). Just over 50% of all counted qualities pertain to different dimensions of built structures, while less than 25% are related to other issues, such as health, liveability, social interaction and justice. Possibly, this is a consequence of the origins of the compact city notion in debates about transport efficiency (Newman and Kenworthy 1989) and containment of urban growth (Hall 1974). The very low interest in linking urban adaptability to urban compactness is surprising, since the diversity and complexity emphasised in many of the articles also are key aspects of the increased urban resilience (Ahern 2011; Marshall 2012) needed to respond to pressures from climate change, migration and natural hazards.

When compared with the previously mentioned review by Boyko and Cooper (2011), a rather slim interest in urban nature can be seen in both studies: 7% in the Boyko and Cooper study versus just under 8% in the present study (see Table 1). Other categories are more difficult to compare since they are not very compatible. Still, it can be noted that the 20% share of "Built Structures D: Access, Transport" in this study is not at all matched by the 1.75% share of "mobile material form" in Boyko and Cooper, while "Built Structures A, B and C" in the present study (all in all 33%) is somewhat close to the 41.22% "built form" of Boyko and Cooper, especially if some of the "Built Structures D" items possibly could be shifted to this category. Boyko and Cooper's "people"

category (46.49%) is difficult to compare with the findings of the present study, since it seems to cover a number of the categories defined here, such as "People", "Health, Environment", "Quality of Life", "Socioculture" and "Economy" (all in all 31%). Aspects linked to "Justice" and "Adaptability" is missing in the taxonomy proposed by Boyko and Cooper while the present study have not detected the governance issues mentioned by Boyko and Cooper. All in all, a main difference between the two reviews is the emphasis on social issues in Boyko and Cooper's review covering a time span from 1976 to 2011, while the more recent articles reviewed in the present study have a stronger focus on built structures.

Third, Figure 1 shows that all twelve categories are present in articles studying both Global North and Global South contexts. A possible interpretation is that terms used in articles linked to the Global North are equally relevant for Global South contexts and vice versa; that they to some extent are generic. Another explanation could be a remaining hegemony of Global North theories (Lwasa and Kinuthia-Njenga 2012), resulting in a dominance of inappropriate or even obsolete theories in urban debates of the Global South (Roy 2005; Robinson 2006). Either way, Figure 1 still indicates some differences between Global North and Global South contexts. In Chart B (Global South including Brazil, China and South Africa) the focus on built structures is slightly less accentuated compared to Chart A (Global North) in favour of quality-of-life, sociocultural issues and justice. When Brazil, China and South Africa is excluded from Global South contexts (Chart D) this emphasis becomes even more evident. This is consistent with research stressing the need for increased justice, social cohesion and service delivery in Global South cities (Arku 2009; Horn 2015).

Regarding quality of life in Global South cities (Chart D), highlighted issues include functional and attractive open space (Bardhan et al. 2015; Hermida et al. 2015) identity versus anonymity and isolation (Kotharkar et al. 2012), crowding (Kotharkar et al. 2012; Zhu 2012) and how the development of urban settlements correspond with the preferences of inhabitants (Shirazi and Falahat 2012). Among sociocultural qualities, social relations, social cohesion, diversity and vibrancy are extensively mentioned (Kotharkar et al. 2012; Zhu 2012; Kotharkar et al. 2014; Hermida et al. 2015) but these urban qualities seem equally relevant for Global North cities. In the area of urban justice, inequality in general, and unequal access to mobility and services more specifically, are highlighted (Kotharkar et al. 2012; Shirazi and Falahat 2012; Hermida et al. 2015) but not as expected in relation to the wider compact city literature (Murillo 2001; Arku 2009; Horn 2015). Still, it is noted that processes of gentrification (Wang 2014) can be especially fierce in low-income cities and, in times of increasing migration, social equity between current and new residents (Zhu 2012) become a critical concern in Global South cities.

In Chart D also health and environmental issues grow in significance as several of the reviewed articles focus on improved public health (Abdullahi et al. 2015b; Kotharkar et al. 2012), e.g. through less air and noise pollution and increased physical activity (Kotharkar et al. 2014; Hermida et al. 2015); less environmental degradation (Kotharkar et al. 2014; Wang 2014); and mitigation of climate change, e.g. through less use of fossil fuels, especially for transport

(Zhu 2012; Kotharkar et al. 2014; Wang 2014; Abdullahi et al. 2015b; Radulovic et al. 2015). Again, these arguments seem as relevant also for Global North or BRICS country contexts while issues, such as passive solar design (Kotharkar et al. 2012) and the need for direct sunlight as main source of light (Freewan et al. 2014) appear particularly relevant in Global South informal settlements. Also the availability of open space to alleviate effects of disasters (Zhu 2012) seems particularly important in informal neighbourhoods with high plot coverage ratios.

Surprisingly, the Global South articles do not explore the impact on urban economy despite the urgent need for economic development in Global South cities (Horn 2015). Research on Global North and Global South cities display similar levels of interest in economic aspects, e.g. regarding expenditures, vitalisation, workplace densities, property values and tenure costs. Nevertheless, some distinct Global South qualities are discussed, such as urban poverty and access to banking facilities (Bardhan et al. 2015). Moreover, interest in urban nature is alarmingly low in Chart D, implying poor impact of concepts, such as urban ecosystem services (TEEB 2011) on current urban research in the Global South. A closer look at the mentioned qualities also reveals that most of them are quite generic, such as proximity and access to urban green areas and green hinterlands (Kotharkar et al. 2012; Radulovic et al. 2015) and preservation of green space for supply of ecosystem services and support of biodiversity (Kotharkar et al. 2012; Hermida et al.,2015). Still, the promotion of urban nature as part of preserved open space to improve urban light conditions (Freewan et al. 2014) can be seen as more specific to dense informal settlements. Surprisingly, only one Global South article refers to urban agriculture (Kotharkar et al. 2012) commonly seen as vital for food security in the Global South (UN-Habitat 2012b).

Fourth, the charts in Figure 1 indicate a 50-50 balance between qualities linked to Built Structures on the one hand and all other types of qualities on the other. A similar ratio can be seen when looking at the empirical focus of the reviewed articles (see Figure 2, comparing with the dotted line). Global North studies are particularly consistent with the pattern of all review “hits” which again confirms a remaining hegemony of Global North theories (Lwasa and Kinuthia-Njenga 2012). Still, all three groups of studies (Global North, Brazil/China/South Africa and Global South) display some variation when compared with all review “hits”: Global North studies have a stronger empirical focus on demography (People) and land use (Built Structures A); studies from Brazil/China/South Africa play up land use (Built Structures A) and, in particular, urban greenery (Nature); and Global South studies display a systemic low interest in most categories, apart from demography (People), mobility/accessibility (Built Structures D) and liveability (Quality of Life). For the last group of countries, it seems evident that many of the urban qualities that are brought up theoretically (e.g., in the state of the art) are not studied empirically to the same extent.

When scrutinising the empirical studies, particular differences between Global North, Brazil/China/South Africa and Global South contexts become evident (see Figure 2). Global North articles have a strong focus on demography (People), mixed use (Built Structures B) and mobility/accessibility (Built

Structures D), closely followed by land use (Built Structures A), morphology (Built Structures C), wellbeing (Health, Environment) and financial issues (Economy). The studies in Brazil, China and South Africa share a similar interest in the built environment (Built Structures) and especially mobility/accessibility (Built Structures D) but are less engaged in social issues (Health, Environment, Quality of Life, Socioculture and Justice). However, in contrast with the other two groups of countries, urban greenery (Nature) stands out as a key issue.

The empirical focus of the Global South articles is very strong on mobility/accessibility for the urban poor (Built Structures D) (see Figure 2), including proximity to various urban areas (residential, commercial, industrial) and functions (community and recreational facilities), and to roads, infrastructure and public transportation (Abdullahi and Pradhan 2015; Abdullahi et al. 2015a; 2015b; Kotharkar et al. 2012), potentially leading to improved access through walkability (Kotharkar et al. 2014). Other issues of particular Global South relevance include "congestion" (Kotharkar et al. 2014, 4253) and "public transport availability" (Bardhan et al. 2015, 60) or "accessibility" (Kotharkar et al. 2014, 4253). To a lesser extent, the Global South articles also study mixed use (Built Structures B), where some of the qualities seems fairly generic, such as "land use diversity" (Abdullahi and Pradhan 2015, 27), "mixed use land composition" (Kotharkar et al. 2014, 4253), containment of urban growth and share of open space (Hermida et al. 2015), and "availability of workplaces" and "availability of housing" (Bardhan et al. 2015, 60). Other qualities may have a more particular relevance for the Global South, e.g., how "individual households encroach upon the open space" (Zhu 2012, 82); the importance of "public attraction points (…) such as mega malls, markets, and places of worship" (Abdullahi et al. 2015b, 22), and "light penetration at street and ground level" (Freewan et al. 2014, 39).

Global South empirical studies are even more indifferent to urban green (Nature) than the Global North articles (see Figure 2), which is surprising in relation to critically important urban food security issues (UN-Habitat 2012b). Still, one article studies the distance to agricultural fields (Abdullahi and Pradhan 2015) and another underlines the importance of "how open and green spaces can be created to enhance biodiversity" (Zhu 2012, 78).

Wellbeing (Health, Environment) and liveability (Quality of Life) receive some attention in the Global South studies (see Figure 2) but a closer look reveals that two articles represent 80% of the health/environment "hits" and that one of the Indian articles stands for 75% of the quality-of-life "hits". This comparably low interest is, once again, unforeseen when taking into account, e.g., the prevalence of disease in low and middle income country cities (Rydin et al. 2012). The reviewed articles focus on how to deal with different types of pollution, such as how to improve air quality (Kotharkar et al. 2012; Bardhan et al. 2015), for example through improved air ventilation through dense informal neighbourhoods (Zhu 2012); bring down noise levels (Kotharkar et al. 2012); create less waste (Kotharkar et al. 2012); and reduce heat island effects (Radulovic et al. 2015). When it comes to quality of life, a number of issues with direct relevance for Global South contexts are listed, such as effects on the existence of slums, crowding, provision of drinking water and drainage, and

provision of healthcare and education (Kotharkar et al. 2012; Bardhan et al. 2015).

There are surprisingly few empirical studies of social issues (Socioculture) and urban equity (Justice) in Global South contexts (see Figure 2). Socioculture is studied in relation to "social interconnectivity" (Bardhan et al. 2015, 60) and "autonomous micro-communities" (Shirazi and Falahat 2012, 251), where the latter may be especially relevant for informal settlements. Regarding Justice, any comparison with existing disparities in Global South cities would deem the current extent of empirical studies as highly inadequate. Still, one article that examines this topic sees "social equity" (Zhu 2012, 86) as a key quality of compact cities, defined as an adequate supply of housing to boost affordability combined with well-defined land rights. A second article investigates urban justice in terms of "percentage of area of slums in a ward" (Bardhan et al. 2015, 60).

In all three research contexts there is a slight peak on urban economy, which is closely linked to urban justice. Even if market failures and unjust policies may shift economic benefits towards wealthier segments of the population, a general perception is that "more economic benefits than costs are present in high-density areas, especially in less developed countries" (UN-Habitat n.d., 3). Economic aspects are therefore a critical component of compact city qualities, but again, few of the empirical Global South studies deal with this important topic (see Figure 2). One article mentions the share of dwellings having electricity or upgrading to better cooking fuels as key issues in informal settlements (Bardhan et al. 2015). Another study highlights that "residential land parcels (…) equipped with infrastructure and facilities should be efficiently utilized to maximize the provision of housing" (Zhu 2012, 85).

Fifth, even though climate change, migration, economic crises and disasters are prominent on global policy agendas (UN-Habitat 2015; World Bank and GFDRR 2015) there is very little empirical interest in urban resilience (Adaptability) (Ahern 2011) in all three research contexts (see Figure 2). Only one of the Global South articles studies resilience at all, and then rather tangentially in the form of market and state failures (Zhu 2012).

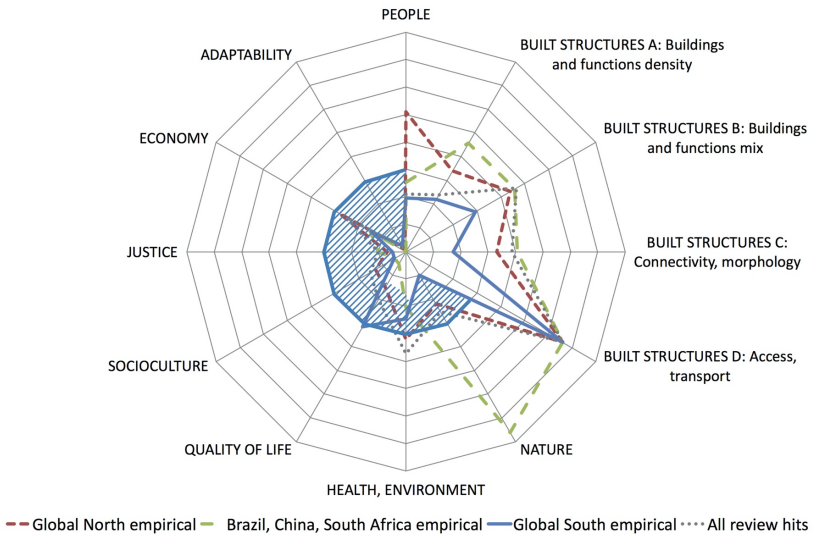
Conclusions

This paper presents an outline of an extended taxonomy of compact city qualities, including twelve categories: People; Built Structures A (Buildings and Functions Density); Built Structures B: (Buildings and Functions Mix); Built Structures C: (Connectivity, Morphology); Built Structures D: (Access, Transport); Nature; Health/Environment; Quality of Life; Socioculture; Justice; Economy; and Adaptability. By applying this taxonomy, we have revealed gaps and weaknesses in the current research agendas on compact cities, which is inappropriately overlooking Global South cities. By doing so, we have made a case that this new taxonomy provides a valuable addition to existing frameworks, applicable to both the Global South and the Global North

From a geographical perspective, the findings in this literature review demonstrate that compact city research should be reshaped in order to develop more relevant knowledge for cities in the Global South. With this purpose, more

attention must be given to compact city qualities linked to Nature, Health/Environment, Quality of Life, Socioculture, Justice and Economy (see Figure 3). There is a significant field in need of further empirical research to balance up the current North-oriented focus on research linked to built structures of different kinds. Of course, research on built structures also in Global South contexts needs to continue and expand. Along similar lines, Global North research should strengthen its endeavours in topics linked to Quality of Life, Socioculture and Justice. All in all, it is possible to argue that there is a need to shift focus from generic compact city qualities to specific issues that are directly relevant for compact cities in the Global South. In a longer time perspective, this would serve to address the current imbalance in compact city studies between the Global North and the Global South when it comes to deciding which urban qualities are the most relevant and decisive, and would impact on the subsequent formulation of new theory.

Figure 3. Radar chart showing the need for a broadening of empirical Global South research into a number of compact city qualities: Nature, Health/Environment, Quality of Life, Socioculture, Justice and Economy.



Alarmingly, compact city qualities linked to urban Adaptability appear to have been even more neglected in recent compact city research for both the Global North and the Global South. This is worrying since increased urban resilience is key to preparing cities for imminent and growing challenges linked to adaptation to climate change, natural disasters, economic crises, as well as to mounting migration due to conflicts, climate change, natural catastrophes and poverty. Again, a particular Global South focus would be pertinent since Global South cities tend to be the most vulnerable to different types of crises, and with limited resources for effective adaptation and mitigation.

A weakness of the present study is the rather few articles with a clear Global South focus identified through the review. Still, there may be reason to take the

findings of this review as a motive for revisiting Holman et al. (2015) and their division of compact city discourses into those of conviction, suspicion and pragmatism. Dominant discourses of conviction and suspicion from the Global North have influenced compact city research agendas globally to inflict the imbalances observed in the review presented above. Also, this study is influenced by the Global North perspective we have criticised. As the results are informed by the Scopus database, it is feasible that literature generated and published in other regions of the world and written in other languages, such as in Latin America, has been excluded from the study. Future research on compact city qualities and debates should not only challenge and/or bridge North and South divides, but also explore beyond conventional literature, research data and research contexts to make it possible to reshape how we problematise and discuss issues, such as compact city qualities in urban studies. A more empirically-based, pragmatic and inductive approach to the definition of research tasks would potentially orientate Global South urban research towards a better response to critical and endemic socioeconomic and equity challenges.

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Appendix

Legend:	White = Global North
	Green = Global South + BRICS India
	Yellow = BRICS countries Brazil, China and South Africa
	Red = Unavailable

No	Authors	Year	Title	Journal	Type of paper	Focus	Research context	Disciplines of authors	Countries of authors
A1	Bardhan et al.	2015	Does compact urban forms relate to good quality of life in high density cities of India? Case of Kolkata	Cities	Empirical, SoA	Density vs Urban quality of life	BRICS, India	Urban Engineering; Advanced Science and Technology	Japan
A2	Caruso et al.	2015	Greener and larger neighbourhoods make cities more sustainable! A 2D urban economics perspective	Computers, Environment and Urban Systems	Conceptual, modelling	Microeconomic modelling	Generic	Geography and Spatial Planning; Agronomy; Operations Research & Econometrics	France, Belgium, Luxembourg
A3	Jun et al.	2015	Land use characteristics of subway catchment areas and their influence on subway ridership in Seoul	Journal of Transport Geography	Review, Modelling	Transit	Global North, Korea	Urban Planning and Real Estate; Transportation Systems Engineering	Korea
A4	Holman et al.	2015	Coordinating density; working through conviction, suspicion and pragmatism	Progress in Planning	Empirical, SoA	Planning	Global North, UK	Geography and Environment	UK
A5	Morinaka et al.	2015	Variation of ear temperature when walking outside in summer	Urban Climate	Empirical	Ear temperature	Global North, Japan	Toyohashi University of Technology; Shibaura Institute of Technology	Japan
A6	Wolsink	2015	Environmental education excursions and proximity to urban green space – densification in a 'compact city'	Environmental Education Research	Empirical	Distance from schools to greenery	Global North, The Netherlands	Geography, Planning and International Development Studies	The Netherlands
A7	Biasi et al.	2015	In-between sprawl and fires: long-term forest expansion and settlement dynamics at the wildland–urban interface in Rome, Italy	International Journal of Sustainable Development & World Ecology	Empirical, GIS	Habitat fragmentation	Global North, Italy	Agricultural sciences	Italy
A8	Wojan & Hamrick	2015	Can Walking or Biking to Work Really Make a Difference? Compact Development, Observed Commuter Choice and Body Mass Index	PLOS ONE	Empirical, statistics	Health	Global North, US	Agriculture Economic	US
A9	Buccolieri et al.	2015	The breathability of compact cities	Urban Climate	Modelling	Air quality	Global North, Italy, France	Scienze e Tecnologie Biologiche ed Ambientali; and more	Italy, France
A10	Salvati et al.	2015	Lost in translation, found in entropy: An exploratory data analysis of latent growth factors in a Mediterranean city (1960-2010)	Applied Geography	Statistical analysis, GIS	Urban growth	Global North, Greece	Agriculture; Economic and Regional Development; Geography; Social & Economic Sciences	Italy, Greece, Spain
A11	Tan & Ismail	2015	The effects of urban forms on photosynthetically active radiation and urban greenery in a compact city	Urban Ecosystems	Empirical	Effect of shade on photosynthesis	Global North, Singapore	Architecture	Singapore
A12	Du et al.	2015	A dual effect of urban expansion on flood risk in the Pearl River Delta (China) revealed by land-use scenarios and direct runoff simulation	Natural Hazards	Simulation model	Flooding	BRICS, China	Earth Surface Processes & Resources Ecology; Geography; Earth & Environmental Sciences	China, Belgium
A13	Jim & Zhang	2015	Urbanization effects on spatial-temporal differentiation of tree communities in high-density residential areas	Urban Ecosystems	Empirical	Trees	BRICS, Hong Kong	Geography	China
A14	Abdullahi & Pradhan	2015	Sustainable Brownfields Land Use Change Modeling Using GIS-based Weights-of-Evidence Approach	Appl. Spatial Analysis	Modeling	Brownfields	Global South, Malaysia	Geospatial Information Science	Malaysia
A15	Lo & Jim	2015	Community attachment and resident attitude toward old masonry walls and associated trees in urban Hong Kong	Cities	Empirical	Mature trees	BRICS, Hong Kong	Urban Research; Geography	Australia, China
A16	Tang & Ho	2015	Land-use planning and market adjustment under de-industrialization: Restructuring of industrial space in Hong Kong	Land Use Policy	Empirical	Regeneration of industial properties	BRICS, Hong Kong	Urban Planning and Design	China
A17	Lee et al.	2015	Development of the compact city index and its application to Japanese cities	Urban Studies	Empirical	Compact city index	Global North, Japan	?	Korea, Japan, Hong Kong
A18	Rogatka et al.	2015	A compact city and its social perception: A case study	Urbani izziv	Empirical	Social perception of a compact city	Global North, Poland	Regional Development; Environment Studies	Poland, Spain
A19	Abdullahi et al.	2015	GIS-based modeling for the spatial measurement and evaluation of mixed land use development for a compact city	GIScience & Remote Sensing	Modelling	Mixed land use	Global South, Malaysia	Geospatial Information Science; Engineering; Biological and Agricultural Engineering	Malaysia
A20	Muranaka et al.	2015	Evaluation of political cost and effect on surrounding areas of a compact city policy (in Japanese, only abstract in English)	Studies in Regional Science	Modelling	Impact on surrounding suburban land	Global North, Japan	Science and Technology	Japan
A21	Min et al.	2015	Calculation and analysis of urban compactness using an 21 integrated ARCGIS tool	Lecture Notes in Electrical Engineering	Modelling, simulation	Measuring compactness	BRICS, China	Computer science and technology	China
A22	Sager	2015	Ideological traces in plans for compact cities: Is neo-liberalism hegemonic?	Planning Theory	Empirical	Neo-liberalism vs Participatory democracy vs Environmentalism	Global North, Norway	Civil and Transport Engineering	Norway
A23	Wood	2015	The look and feel of a place: Character, community, and the compact city	Journal of Architectural and Planning Research	Empirical	Resident attitudes	Global North, Australia	Geography and Planning	Australia
A24	Stathakis & Tsilimigkas	2015	Measuring the compactness of European medium-sized cities by spatial metrics based on fused data sets	International Journal of Image and Data Fusion	Empirical, SoA	Land use, sprawl	Global North, European	Urban and Regional Planning Engineers; Geography	Greece
A25	Abdullahi et al.	2015	GIS-based sustainable city compactness assessment using integration of MCDM, Bayes theorem and RADAR technology	Geocarto International	Empirical	Evaluation of compactness through remote sensing	Global South, Malaysia	Engineering,; Geospatial Information Science	Malaysia
A26	Radulovic et al.	2015	Growing cities in Serbia in the light of projected global warming: The situation in urban morphological zones	Urban Forestry & Urban Greening	Modelling	Sealing and temperature	Global South, Serbia	Faculty of Forestry	Serbia
A27	Lee et al.	2015	Impact of Individual and Urban Traits and Urban Form on Vehicle Hours Traveled	Journal of Asian Architecture and Building Engineering	Empirical, modelling	Vehicle Hours Traveled	Global North, Korea	Architecture	Korea
A28	Gonçalves et al.	2015	Mudanças no consumo de energia e intensidade energética: um estudo do setor de transportes brasileiro	Revista ESPACIOS	Empirical, statistics	Fuel for transport	BRICS, Brazil	Engineering	Brazil
A29	Lewis	2015	Moral Intuitions and Smart Growth: Why Do Liberals and Conservatives View Compact Development So Differently?	Journal of Urban Affairs	Empirical	Moral worldviews and attitudes	Global North, US	Politics and Global Studies	US
A30	Sjöman et al.	2015	Herbaceous Plants for Climate Adaptation and Intensely Developed Urban Sites in Northern Europe: A Case Study From the Eastern Romanian Steppe	Ekológia (Bratislava)	Empirical	Analysis of species useful for urban areas	Global North, Romania	Landscape Management, Design and Construction;	Sweden, UK, Romania
A31	Ranalli & Salvati	2015	Complex Patterns, Unpredictable Consequences: The Distribution of Sealed Land along the Urban-rural Gradient in Barcelona Province	Documents d'Anàlisi Geogràfica	Empirical, statistics, GIS	Analysis of urbanization-driven soil sealing	Global North, Spain	?	

A32	Suzuki-Parker et al.	2015	Assessment of the Impact of Metropolitan-Scale Urban Planning Scenarios on the Moist Thermal Environment under Global Warming: A Study of the Tokyo Metropolitan Area Using Regional Climate Modeling	Advances in Meteorology	Modelling	Impact of urbanization on urban thermal environment	Global North, Japan	Life & Environmental Sciences; Computational Sciences; Environmental Studies	Japan
A33	Loo & Lam	2015	Does neighbourhood count in affecting children's journeys to schools?	Children's Geographies	Empirical, modelling	Children's school journeys	BRICS, China	Geography	China
A34	Artmann & Breuste	2015	Cities Built for and by Residents: Soil Sealing Management in the Eyes of Urban Dwellers in Germany	Journal of Urban Planning and Development	Empirical, survey	Residents and soil sealing	Global North, Germany	Geography and Geology	Austria
A35	Tønnesen	2015	Urban entrepreneurialism and car-use reduction	Planning Theory & Practice	Empirical, case study	policies for car-use reduction	Global North, Norway	Transport Economics	Norway
A36	Chobokoane & Horn	2015	Urban Compaction and Densification in Bloemfontein, South Africa: Measuring the Current Urban Form Against Mangaung Metropolitan Municipality's Spatial Planning Proposals for Compaction	Urban Forum	Empirical, statistics	Level of compactness and densification	BRICS, South Africa	Urban and Regional Innovation and Statistical Exploration	South Africa
A37	González-Vallejo et al.	2015	The ecological footprint of dwelling construction in Spain	Ecological Indicators	Empirical, method development, statistics	Ecological footprints of buildings	Global North, Spain	Building Construction	Spain
A38	Rousseau	2015	'Many Rivers to Cross': Suburban Densification and the Social Status Quo in Greater Lyon	International Journal of Urban and Regional Research	Empirical	Social mix	Global North, France	La recherche agronomique pour le développement	France
A39	Hermida et al.	2015	La densidad urbana como variable de análisis de la ciudad. El caso de Cuenca, Ecuador	EURE (Santiago)	Empirical	Population density, policies	Global South, Equador	?	Equador
A40	Peng & Jim	2015	Economic evaluation of green-roof environmental benefits in the context of climate change: The case of Hong Kong	Urban Forestry & Urban Greening	Modelling	Benefits of green roofs	BRICS, China	Urban and Rural Planning; Geography	China
A41	Bunker	2015	Can We Plan Too Much? – The Case of the 2010 Metropolitan Strategy for Adelaide	Australian Journal of Public Administration	Empirical	Efficiency of policy	Global North, Australia	?	Australia
A42	Anas & Timilsina	2015	Offsetting the CO2 locked-in by roads: Suburban transit and core densification as antidotes	Economics of Transportation	Modelling	Public transit offset emissions caused by new roads?	BRICS, China	Economics; Environmental & Energy	US
A43	Kim et al.	2015	Balancing mobility and CO2 reduction by a mode share scheme: a comparison of Los Angeles and Seoul metropolitan areas	International Journal of Urban Sciences	Modelling	Public transit mode share and CO2 emissions	Global North, US, Korea	Urban and Regional Planning	US, Korea
A44	Ewing & Hamidi	2015	Compactness versus Sprawl: A Review of Recent Evidence from the United States	Journal of Planning Literature	Review	SoA	Global North, US	Architecture and Planning; Architecture, Planning and Public Affairs	US
A45	Hassan & Lee	2014	The paradox of the sustainable city: definitions and examples	Environment, Development and Sustainability	Review	Urban sustainability	Global North, generic	Architecture; Engineering	Korea, Egypt
A46	Zhao et al.	2014	Effects of spatial form on urban commute for major cities in China	International Journal of Sustainable Development & World Ecology	Empirical	Morphological compactness; remote-sensing; survey CT	BRICS, China	Urban Environment & Health; Remote Sensing & Earth Sciences; Forestry & Natural Resources	China, US
A47	Boydell & Searle	2014	Understanding Property Rights in the Contemporary Urban Commons	Urban Policy and Research	Empirical	Contested public space	Global North, Australia	Property Rights; Planning and Environmental Management	Australia
A48	Schindler & Caruso	2014	Urban compactness and the trade-off between air pollution emission and exposure: Lessons from a spatially explicit theoretical model	Computers, Environment and Urban Systems	Modelling	How urban structure impacts traffic-induced pollutant emissions	Global North	Geography and Spatial Planning	Luxembourg
A49	No author name available]	2014	2013 International Conference on Future Energy, Environment, and Materials, FEEM 2013	WIT Transactions on Engineering Sciences					
A50	Wang	2014	Low-carbon development of compact city	WIT Transactions on Engineering Sciences	Conceptual	Low carbon development	Global South, Thailand; Global North, US, Sweden	Economics	China
A51	Tian et al.	2014	Assessing the landscape and ecological quality of urban green spaces in a compact city	Landscape and Urban Planning	Empirical, GIS	Landscape-ecological quality in different land uses	BRICS, China	Earth Surface Processes and Resource Ecology; Geography	China
A52	Akimoto	2014	Implications of a cluster-type compact city design for accessibility in the suburbs of Toyama City: Simulations in the Fuchu area	Geographical Review of Japan	Empirical	Accessibility through road network analysis	Global North, Japan	?	Japan
A53	Bunker	2014	How Is the Compact City Faring in Australia?	Planning Practice & Research	Empirical, statistics	Progress towards compactness	Global North, Australia	Built Environment	Australia
A54	Košar	2014	Koncept trajnostno kompaktnega mesta (summary in English)	RAZPRAVE	Review, a bit empirical	Compactness performance	Global North, Slovenia	Geography	Slovenia
A55	Ruegg et al.	2014	L'émiettement urbain? Ville compacte et ville diffuse sont dans le même bateau [Urban sprawl? The compact city and suburbia are two facets of the same reality] [in French, only abstract in English]	Cahiers de Geographie du Quebec	Empirical	Compact city and suburbia	Global North, Switzerland	Geography	Switzerland
A56	Kotharkar et al.	2014	Measuring Compact Urban Form: A Case of Nagpur City, India	Sustainability	Empirical	Measuring compactness in developing countries	BRICS, India	Architecture and planning	India
A57	Takeda et al.	2014	Methodology of city analysis for evaluating compactness using GIS	Proceedings of the 19th International Conference on Computer-Aided Architectural Design Research in Asia					
A58	Koike	2014	Mobility perspective for a local city in Japan	IATSS Research	Reflections	LRT & biking	Global North, Japan	City Life Studies	Japan
A59	Freewan et al.	2014	Improving daylight performance of light wells in residential buildings: Nourishing compact sustainable urban form	Sustainable Cities and Society	Empirical, simulation	Light into buildings	Global South, Jordan	?	Jordan
A60	Seya et al.	2014	Creation of future compact urban form scenarios of Tokyo in combination with adaptation policies	Energy Procedia 61	Empirical, modelling	Climate change	Global North, Japan	Environmental Studies	Japan
A61	Tanaka et al.	2014	A study on the preferable urban structure of provincial small town in the depopulation tendency [in Japanese, only abstract in English]	Journal of Environmental Engineering (Japan)	Survey	Shrinking population	Global North, Japan	Engineering	Japan
A62	Soga et al.	2014	Land sharing vs. land sparing: does the compact city reconcile urban development and biodiversity conservation?	Journal of Applied Ecology	Empirical	Effects on biodiversity; land-sharing and land-sparing developments	Global North, Japan	Environmental Resources; Environment & Sustainability; Environment Conservation	Japan, UK
A63	Morelli et al.	2014	Between suburbanisation and re-urbanisation: revisiting the urban life cycle in a Mediterranean compact city	Urban Research & Practice	Empirical, GIS	Historical population redistribution	Global North, Greece	Technology; sociology; agriculture	The Netherlands, Greece; Italy
A64	Salvati & Sabbi	2014	Identifying urban diffusion in compact cities through a comparative multivariate procedure	Annals of Regional Science	Empirical, statistics, GIS	Urban expansion in compact cities	Global North, Portugal, Italy, Greece	Plant–Soil Interactions; Statistical Institute	Italy
A65	Lukhele	2014	Mixed-Income Housing, Urban Transformation and Social Cohesion in Post-apartheid South Africa	Mediterranean Journal of Social Sciences	Review, discussion	Social cohesion through mixed-income housing	BRICS, South Africa	Planning and Management	South Africa
A66	Lee et al.	2014	Impact of ubiquitous computing technologies on changing travel and land use patterns	International Journal of Environmental Science and Technology	Empirical, modelling	Changes in urban form and travel patterns due to ICT	Global North, Korea	Urban Engineering; Planning and Urban Development	Korea, Australia

A67	Balaban et al.	2014	Understanding the links between urban regeneration and climate-friendly urban development: lessons from two case studies in Japan	Local Environment	Empirical, case study	Spatial policy responses to mitigate/adapt to climate change	Global North, Japan	City and Regional Planning,	Turkey, Japan
A68	Newton & Glackin	2014	Understanding Infill: Towards New Policy and Practice for Urban Regeneration in the Established Suburbs of Australia's Cities	Urban Policy and Research	Empirical, GIS	Infill housing development	Global North, Australia	Social Research	Australia
A69	Iwamoto et al.	2014	Evaluating future scenarios from the viewpoint of CO2 emission in provincial small town: Designing and evaluating scenarios in Fuchu city, Hiroshima (in Japanese, only abstractin English)	Journal of Environmental Engineering (Japan)	Modeling	Energy consumption and urban structure	Global North, Japan	Engineering	Japan
A70	Adachi et al.	2014	Moderation of Summertime Heat Island Phenomena via Modification of the Urban Form in the Tokyo Metropolitan Area	Journal of Applied Meteorology and Climatology	Modeling	Moderation of the urban heat island	Global North, Japan	?	Japan
A71	Wheatley	2014	Residential acoustic amenity in 'vibrant' mixed use areas	43rd International Congress on Noise Control Engineering	Empirical, survey	Noise impacts between commercial and residential uses	Global North, Australia	?	Australia
A72	Molina	2014	Areas of urban expansion in Tovar, Mérida state-Venezuela	Revista geográfica venezolana					
A73	Hong et al.	2014	How do built-environment factors affect travel behavior? A spatial analysis at different geographic scales	Transportation	Empirical, statistics, GIS	Effects of built-environment factors on transportation	Global North, US	Urban Design and Planning; Civil and Environmental Engineering	US
A74	Salvati & Carlucci	2014	Distance matters: Land consumption and the mono-centric model in two southern European cities	Landscape and Urban Planning	Empirical, statistics, GIS	Compares population dynamics and land-use changes	Global North, Italy, Greece	Plant-Soil Interactions; Social and Economic Sciences	Italy
A75	Seya et al.	2014	Spatially Explicit Land use and Energy Scenario of Tokyo using Household Level Microdata	Proceedings of the 2014 0 International Conference and Utility Exhibition on Green Energy for Sustainable Development, ICUE 2014	Modeling	Climate change	Global North, Japan	Environmental Studies	Japan
A76	Martilli	2014	An idealized study of city structure, urban climate, energy consumption, and air quality	Urban Climate	Modeling	Thermal comfort, air quality and energy consumption	Global North	Atmospheric Pollution	Spain
A77	Charmes & Rosseau	2014	The suburban house and the apartment block: A geopolitics of urban consolidation in the city-region of Lyon (in French, only abstract in English)	Geographie Economie Societe	Empirical, case study	Political and social stakes of compact city policies	Global North, France	?	France
A78	Dujardin et al.	2014	Spatial planning as a driver of change in mobility and residential energy consumption	Energy and Buildings	Empirical, GIS	Influence of spatial planning decisions on energy consumption	Global North, Belgium	?	Belgium
A79	Park et al.	2014	Method for Analysis of Economic Reconstruction Planning for Disaster-affected Areas Based on Past Earthquake and Tsunami Experiences	Studies in regional science					
A80	Štefančić et al.	2014	Correlation between land use and urban public transport: Case study of Zagreb	Promet – Traffic&Transportation	Empirical, case study	Transit	Global North, Croatia	?	Croatia
A81	Takeuchi	2014	The ideal form of transdisciplinary research as seen from the perspective of sustainability science, considering the future development of IATSS	IATSS Research	Reflections	Population decline and aging	Global North, Japan	Sustainability Science	Japan
A82	Huang et al.	2014	Compact development of space-limited city: A case study of xiamen island	Sheng tai xue bao			BRICS, China		China
A83	Parady et al.	2014	Connection between built environment and travel behavior: Propensity score approach under a continuous treatment regime	Transportation Research Record	Modeling	Automobile dependency modelling	Global North, Japan	Urban Engineering	Japan
A84	Katoshevski-Cavari et al.	2014	A multi-agent planning support system for assessing the role of transportation and environmental objectives in urban planning	Journal of Transport and Land Use	Modeling	Multi-agent model of activity-travel patterns	Global North	?	Netherlands, Israel
A85	Simard	2014	Urban sprawl, ecological footprint and the sustainable city. Is there an alternative to densification? (in French, only abstract in English)	Cahiers de Geographie du Quebec	Review, discussion	Alternatives to densification? Reconsider sprawl. Ecological footprint	Global North	Scienes humaines	Canada

A133	Kotharkar et al.	2012	Compact City Concept: It's Relevance and Applicability for Planning of Indian Cities	PLEA2012 - 28th Conference	Empirical	Agglomerated environmental performance (AEP)	BRICS, India	Architecture and Urban Planning	India
A146	Shirazi & Falahat	2012	Compact urban form, question or solution? Examining the compact city in the Middle Eastern context: challenges and opportunities	International Journal of Urban Sustainable Development	Empirical on a meta level	Middle Eastern compactness	Global South, Middle Eastern cities: Egypt, Tunisia, Iran	Urban and Regional Planning; Architecture	Germany
A176	Zhu	2012	Development of sustainable urban forms for high-density low-income Asian countries: The case of Vietnam. The institutional hindrance of the commons and anticommons	Cities	Empirical	Commons and anticommons	Global South, Vietnam	Real Estate	Singapore