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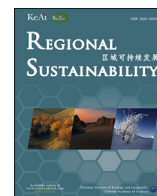
Towards a sustainable campus-city relationship: A systematic review of the literature

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ABSTRACT

The relationship between a university and its city is considered strategical to achieve university targeted ambitions and visions. The university-city relationship is also encouraged for the benefit of the city, as universities unleash their respective cities' potentials to act as driving forces not only for their local communities, but also for the whole nation. Therefore, maintaining a mutual relationship between the university and the city is considered essential to accomplish strategic goals for both. However, the nature of this relationship is quite complex, overlapped, interconnected, and diverse. Therefore, this paper conducted a systematic review of the literature on university-city and campus-city relationships to evaluate recent research trends to uncover the aspects that connect universities with their respective cities. The search included articles published in 4 different databases from January 1990 to January 2021. A total number of 50 articles were selected in this review. The findings uncovered different aspects that could help or hinder university-city relationship based on the physical and functional linkage between the campus and the city. Moreover, findings have shown that it is necessary to understand universities according to their contextual differences, as universities have shown different impacts on their respective cities in terms of their sizes and locations. Results have also shown that the impact of the physical connection between the university and the city goes far beyond campus's accessibility as it deeply affects students' social life as well. Therefore, decision makers, stakeholders, and university administrators need to co-design campus development process especially in the early stages to maximize the mutual benefits of campus-city relationship. The main conclusions of this paper address several perspectives and lessons for a more sustainable campus-city relationship.

1. Introduction

Partnership between universities and cities shapes the dynamics of the society and the economy by applying knowledge for the improvement of cities and regions. To stimulate this partnership between universities and cities, different forms of learning programs, academic activities, social initiatives, network platforms, and scientific projects have been created to address different economical and societal challenges (van den Berg et al., 2005; Den Heijer, 2011). Moreover, the needs of students and staffs open the door for creating an inspiring environment to offer a wide range of amenity, affordable housing, convenient transportation, and entertainment service (Drucker and Goldstein, 2007; Fernández-Maldonado and Romein, 2008). Additionally, the location of the university in its respective city affects the quality and type of available services. Therefore, cities need to offer suitable solutions for different campuses and

universities, which affect the image and the competitive profile of the city (Baltzopoulos and Broström, 2013). In this context, university-city relationship usually refers to any form of partnership, engagement, or connection that links the university with its city or vice versa. While, a campus-city relationship usually refers to the physical relationship between the campus as a built environment and the urban setting of the city. Research papers use both terms alternatively depending on the fact that university is a general term that includes its campus. Moreover, campus as a term refers to the physical identity of the university especially if the university has only one campus. Therefore, concisely, the campus-city relationship is the main part of the university-city relationship. In this paper, both terms will be used alternatively based on the context.

Many universities and institutions want to have a close physical and functional contact with the city because of the innovation and convenience that cities offer. Thus, to operationalize the relation between the university or campus and the city, it is necessary to define their characteristics and topologies. The definition of campus-city relationship is divided into two different types: physical relationship and functional relationship (Den Heijer and Curvelo Magdaniel et al., 2018). A campus-city physical relationship refers to the location of the campus in the city. This physical relationship could be defined on the basis of the borders of the city or the size of the campus. Some campuses could be considered as part of the city or as a city itself. Furthermore, there are three main spatial configurations of the physical relationship between the campus and the city: outside the city, gated within the city, and integrated with the city. Moreover, spatial configuration of the campus affects the topology of its respective city as the campus could equal, disjoint, touch, contain, or overlap the city (Curvelo Magdaniel et al., 2018). On the other hand, functional relationship between the campus and its city refers to the types of spaces and services available on-campus or off-campus that could serve both the campus and the city. Campus-city functional relationship varies among residential function, retail and leisure function, academic function, infrastructure, and related business. Therefore, these functions can also be used to describe how dependent a campus is. Both physical and functional relationships between the campus and the city exist concurrently overlapping with each other. Universities can benefit from available functions in the city depending on how far the campus is located from the city. Therefore, it is important to connect both the physical and functional dimensions when analyzing the campus-city relationship.

Nowadays, universities have more opportunities to serve their cities and become engaged in many different levels. These opportunities come from the changing role of higher education institutions that play a major role in harnessing knowledge and innovation in local communities. As a result, universities'values have changed from being "place-based institutions" to become "a driving force of knowledge" (Perry et al., 2009). Additionally, the scale of universities' facilities and functions has also changed the physical settlements and urban relations to the surrounding areas and neighbourhoods. This intrinsic relationship between the campus and the city has shown different aspects of cities, helping them to flourish in many ways. However, universities' existence in cities could be accompanied with some extra challenges that need to be handled in a sustainable way to get the most out of this mutual relationship between campuses and cities (Den Heijer and Curvelo Magdaniel, 2012). Most of these challenges are related to student population in the area and their needs for a wide range of services that could change the hue of the neighbourhood. All these opportunities and challenges in the campus-city relationship have brought the attention of many researchers over years of scientific research. However, there were some aspects of this relationship that have yet to be discovered. Therefore, the selected research articles were chosen to answer the following two research questions in this review:

(1) To what extent can the existence of a university benefit the sustainability of the city or vice versa?
(2) What are different topics related to university/campus-city relationship that have been discussed in previous research and what have been moderately examined?

The results from this paper will provide an overview of the latest research trends on the relationship between universities and cities to highlight research gaps and uncover the depth and complexity of the campus-city relationship.

Table 1
Number of research articles acquired from the SAGE Journals, Science Direct, Springer Link, or Taylor & Francis.

Database	Inclusion exclusion criteria	Keywords	
		Campus-city relationship	University-city relationship
SAGE Journals	Search results	141	1503
	Included based on title	5	7
	Included based on abstract	5	7
	Included based on full text	5	6
Science Direct	Search results	30	246
	Included based on title	9	8
	Included based on abstract	5	4
	Included based on full text	3	4
Springer Link	Search results	131	5
	Included based on title	15	4
	Included based on abstract	7	2
	Included based on full text	6	2
Taylor & Francis	Search results	363	669
	Included based on title	7	26
	Included based on abstract	3	17
	Included based on full text	2	14

2. Research method

A systematic literature review method was followed to acquire articles. Two keywords were used for searching articles: campus-city relationship and university-city relationship. Four different databases were selected to collect articles: the SAGE Journals, Science Direct, Springer Link, and Taylor & Francis. Journal articles, conference proceedings, book reviews, and reports were included in the search process. Advanced search process was utilized to refine the number of chosen articles. Specifically, from the SAGE Journals database, the search process focused on keywords from the abstract; from the Science Direct and the Taylor & Francis databases, the keywords in the title or the abstract were used; and from the Springer Link database, the exact phrase was employed. Moreover, to limit the number of search results, we filtered the search by subject area to include only articles related to the field of environmental and socio-economic studies. For the timeline, search criteria were for articles published from January 1990 to January 2021. Articles' inclusion and exclusion process was done through careful readings of the title, abstract, or full text. First, we filtered the acquired articles based on the title and its relevance to the research questions. Then, we further filtered the included articles based on the abstract. Lastly, we continued to filter articles based on full text readings and their relevance to the problems raised in research questions (Table 1).

3. Results and discussion

We collected 42 articles from the aforementioned 4 databases based on the inclusion and exclusion criteria, and added additional 8 other articles through manual searching using Google Scholar for their relevance to this topic (Fig. 1). We used CiteSpace software to analyze the datasets of articles' keywords downloaded from the Scopus database to visualize the content of acquired research articles in this study. Fig. 2 shows the frequency of keywords in the selected articles. From the keyword frequency analysis, topics related to the physical and functional relationships between the campus and the city have been the core focus of previous researches. However, it is important to highlight that we categorized the selected articles in this section basically according to their relevance to each other and their main findings, not according to their keyword frequency, as the keyword frequency does not necessarily reflect the main findings of the selected articles.

The acquired articles discussed 8 different aspects of university-city relationship through their physical and functional relationships. Aspects related to safety and security, design and spatial configuration, transportation mode, smartness and greenness, residential pattern, stakeholders' partnership, and community engagement, as well as cityness and globalization were shown to be associated with the efficiency and capacity of university-city relationship. Moreover, the wordings used for these 8 aspects came from the shared definitions illustrated in the selected articles. Some research papers discussed how important and, in some cases, essential to sustain an active relationship between the city and its universities. On the other hand, other research articles highlighted the challenges that stand in the way of acquiring such a sustainable relationship between universities and their respective cities. This section discusses these 8 aspects of the university-city relationship supported with literatures from previous researches.
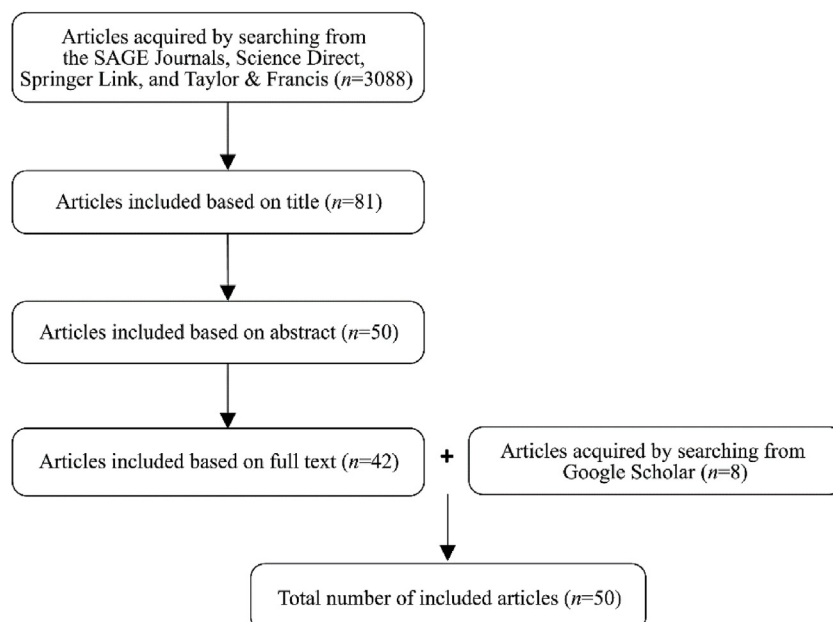

Fig. 1. Flowchart of the inclusion and exclusion criteria used in the article selection process. *n*, number of articles.
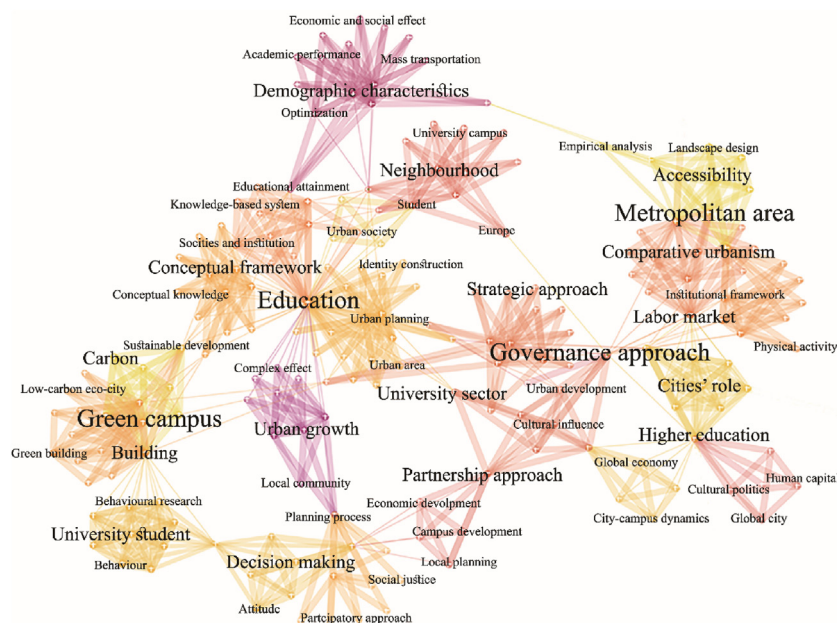
Fig. 2. Keyword frequency of the selected 50 articles. This figure shows the content of acquired articles published during January 1990–January 2021 to provide a quick overview of the most discussed topics in the university- or campus-city relationship. Each node represents a keyword; however, to simplify the figure, only the most frequent keywords were visualized and centred on their relative nodes. The bigger the font, the more frequent the keyword is. Keywords have also been categorized in different clusters with different colours in terms of their frequent use together in the same article. Some clusters shared the same keyword, which is represented by a line drawn from one cluster to another.

3.1. Safety and security

University and college campuses tend to provide many safety procedures to protect students from serious crime incidents, as students' safety is the core focus of campus administration. Moreover, due to the natural and mechanical surveillance measures taken by the university, there is a little room for crime opportunities to occur inside the campus (Cohen and Felson, 1979). Previous research has also shown that in cities with high crime rates, campuses are proven to be less vulnerable to crimes (Fox and Hellman, 1985). However, security procedures taken by the administration of a university do not usually go beyond campus borders. Therefore, campus-city security procedures need to be taken to assure the safety of student on-campus and off-campus.

On the campus-city level, previous research focused on analyzing the relationship between proximity to university campuses and crime rate. It was found that bordering areas to campuses have higher rates of burglary and robbery incidents compared to other areas within the same city (Cundiff, 2021). Offenders usually seek for victims in areas with high traffic, so they can target different individuals who carry valuable products. Furthermore, areas around campuses are known for the high presence of individuals due to students' foot traffic for shopping, restaurants, bars, or entertainment venues. Another research has also shown a strong relationship between the presence of businesses in the area and the high traffic of individuals, which in turn results in higher rates of crimes (Weisburd et al., 2012). Therefore, areas surrounding universities could be regarded as crime attractors and generators. As a result, safety and security in areas around campuses should be considered as important as inside campuses.

On the other hand, on the campus level, research focused on measuring the level of security and privacy in university campuses by space syntax methodology has shown that fenced areas of campuses achieve higher privacy (Aqli, 2019). However, roads and routes with higher privacy inside campuses become less supervised especially with lack of activity, which could result in greater opportunities for crime to occur (Aqli, 2019). Researches have also shown that students' participation with local citizens in the neighbourhoods around university campuses can deter different sorts of vandalism, creating a safer social environment (Mohammed, 2021; Mohammed and Hirai, 2021). Therefore, the campus-city relationship to security and privacy depends mainly on the physical connection of the street network between the campus and the city, as well as the social and functional activities provided by city around the campus.

3.2. Design and spatial configuration

The design and spatial configuration of the campus play a significant role in its relationship with the city. The spatial configuration of the campus in the city changes over time with newly built schools and buildings, which results in increasing the number of students and staffs that need more facilities and amenities to serve their daily needs. Therefore, universities are considered as extensive landholders in the urban morphology (Larkham, 2000). Campus's spatial configuration also affects its integration with the city. Some campuses are integrated with the city, which allows higher levels of interaction between the academic community and the public. This can be seen in

the USA campus models and many other historical European universities that have buildings scattered across city centres. Alternatively, there are other types of campuses that are considered as self-sufficient campuses located outside the city, such as university campuses in different parts of Asia (Mohammed and Ukai, 2021). These different models of campuses play a major role in the publicness of the university and in students' social life as well, as each model must generate its own social life either on its own or in relation to the city (Hebbert, 2018).

Research focused on exploring forms and degrees of university campus's publicness in relation to its spatial configuration has revealed that functional facility, physical design, and social composition explain why some spaces in campuses have higher potential of publicness than others (Yaylali-Yildiz et al., 2022). Using space syntax methodology, a study conducted by Adhya (2009) has examined the relationship between the campus and city's downtown, as well as the effect of this relationship on university's publicness. Results of this study have revealed that residents' perception of campus publicness is strongly connected to campus-downtown relationship, as campus-downtown relationship generates spatial patterns that could create certain ecology based on actions, emotions, and forms of publicness (Adhya, 2009). Furthermore, campuses' integration with the city plays a major role in fulfilling students' needs as well. The physical design of campuses and available functional facilities affect students' space choice, rejection, and satisfaction. Therefore, students tend to find other spaces around campuses to cover their space needs. This has been discussed in an empirical study conducted to analyze the relationship between space-choice-rejection patterns and rational space utilizations (Kim et al., 2018). The results of this study uncovered that only 56% spaces for students' activities are chosen by students themselves. Furthermore, the results showed that students struggled to find appropriate spaces for their group activities. This lack of space requirement is usually due to rational space utilization policies to achieve higher levels of sustainability goals. However, this could be substituted by a city's available functional facilities. Therefore, the more integrated the campus with the city is, the easier to satisfy students' space needs.

Additionally, location of campuses affects students' academic performance in direct and indirect ways. Researches done on the relationship between green public spaces and students' performances have shown a positive and significant relation between tree cover and reading performance (Hajrasouliha, 2017; Hodson and Sander, 2017). These researches suggested that increasing tree cover inside and around campuses could boost academic performance for students, and concluded that campuses and their surrounding environment play a major role in students' social and academic life that in turn reflects on the achievements of the university. Another study on the relationship between school climate and student attendance has indicated that there are small associations between the school climate and attendance records (Hamlin, 2021). However, previous studies on the link between the school climate and the behavioural and academic outcomes proved that the location of the campus is deeply connected to students' performance and ability to achieve higher targets (Hopson and Lee, 2011; Thapa et al., 2013; Berkowitz et al., 2017).

Additionally, a recent study conducted in Beijing, China has shown that there is a relation between the distance of a college or a university from cities and the amount of granted research funds, i.e., a decrease in the number of National Social Science Fund projects by 0.24–0.50 per each kilometre away from the city of Beijing (Li and Wang, 2020). Moreover, the distance from the city could also affect students' socio-spatial experience, according to a study on education-migration nexus and its effect on students' protest activities (Robertson, 2013). This study reported that migrant students travelled to different urban spaces in Melbourne, Australia to protest unfair assessment and policies related to labour and rights for praying on-campus. This shows that these kinds of activities transform urban spaces in the city and produce a complex network of associations across different communities in a campus, a city, and a country (Robertson, 2013).

Additionally, the location and positioning of campuses in cities may create opportunities for future transformation of the city. According to a study on the attempts of University of Lincoln and University of Worcester to transform their respective cities, universities have the potential to transform their socio-economic and spatial environments in their cities based on the integration with surrounding areas (Namvar et al., 2019). This study has shown that University of Lincoln has more potential than University of Worcester to connect with surrounding areas due to the high correlation of integration with the city between local and global street networks (Namvar et al., 2019). Similarly, another study on the differences between urban and suburban campuses in Fukuoka, Japan, has shown that the location of the campus impacts campus's accessibility in a way that affects the social and economic environment around campuses (Mohammed and Ukai, 2021). As less accessible campuses have the potentiality to increase the number of students in the surrounding neighbourhoods, consequently, students can save on commuting cost (Mohammed and Ukai, 2021). Furthermore, less accessible campuses may also lack required facilities and amenities needed for students due to their location away from the city, which in turn affects the socio-economic environment around the campus (Mohammed and Ukai, 2021).

3.3. Transportation mode

Transportation is one of the main activities in students' daily life, so the physical relationship between campus and the city plays a significant role in the type and mode of transportation used not only by students, but also by faculty and staff members. Usually, campuses are surrounded by densely populated residential areas combined with other commercial and entertainment services that benefit the students who live nearby. This results in a burden on the transportation system, which can be seen in the high demand for parking, traffic congestion, and accidents. All this forms a sort of pressure on universities and transportation planning bureaus to develop transportation-related programs, practices, and policies to address these problems. A survey was conducted by 48 universities and transit agencies in the USA to examine factors that affect transit services and how they could be efficient to university populations (Daggett and Gutkowski, 2003). The results of this survey showed that there is a noticeable enhancement in the transit performance seen in various university communities by following certain fare policies suitable for students. This shows that public transit would be more promising for universities to depend on compared to using automobiles on campus, which waste resources that could instead be invested for other academic purposes.

Conversely, a recent research paper that investigated travel behaviour among Iranian students has shown that public transit is the most common mode of transportation (Etminani-Ghasrodashti et al., 2018). However, students reported their preference for private cars, which is related to different lifestyle factors reported by this research (Etminani-Ghasrodashti et al., 2018). Factors related to students' perception of public transit, economic factors, and lifestyles affect students' travel behaviour, which in turn influences energy consumption in the city in a direct way (Blumenberg et al., 2012; Klein and Smart, 2017). Therefore, campus-city transportation modes could shape a significant part of the sustainability of cities. Furthermore, a study on deserted schools has shown that travel distances could create access barriers to schools that are not only as a place to learn, but also as a community hub where students can meet with their friends and socialize (Alexander and Massaro, 2020).

Moreover, in a study on student's perception of campus and the city, it has been illustrated that walking and biking help students to engage more deeply with the space around campus, which helps them develop a deeper relationship with community off-campus (Yu et al., 2018). This study also concludes that not only the campus should be in the city, but also the city should eliminate gates as much as possible to avoid spatial segregation, which affects students' travel behaviour significantly. Gated campuses have been known for suffering from spatial segregation compared to open ones. In a study about public transport services to Wuhan University (China) and its impact on spatial inequalities, results supported that there are spatial and social inequalities resulting from the closure of the gated campus (Sun et al., 2018). Therefore, campus planning should take into consideration the provision of public transport services to avoid such inequalities.

3.4. Smartness and greenness

Sustainability, green buildings, low-carbon city, and energy consumption are the main topics that have been closely examined in previous researches. To achieve a sustainable relationship between the campus and the city, it is essential to incorporate environment-friendly, resource-saving, and green campus practices in research, training, and teaching activities. The study of Yang (2015) summarized the development process of green campus practices in China and concluded that from a building perspective, demonstration of energy technology should be popularized and strengthened. From a campus standpoint, regulatory agencies should take the responsibility of planning and monitoring the overall campus for more efficient low-carbon practices; and on a city level, low-carbon transformation movement should be promoted citywide (Yang, 2015). Therefore, sustainable development needs to be managed at all levels, which may be challenging to be achieved in the short term (Yu, 2014; Bayulken and Huisingh, 2015; Darko et al., 2017).

Another research paper conducted a review of sustainable development on three levels: buildings, communities or campuses, and cities to explore which is the best in terms of sustainability monitoring and assessment (He et al., 2020). Results of this research indicated that green buildings could be considered as the best practice among the three levels as they could be considered as micro-drivers to promote a low-carbon city. On the other hand, a low-carbon city and green campus practices are still restricted and require further definitions and localizations to be feasible enough to achieve concrete results (He et al., 2020). Therefore, the existence of campuses in cities provides more potentials for achieving low-carbon eco-city solutions, as energy-saving sustainable practices proved to be more effective if applied on a micro level starting from one building to another on a community or campus level then taking place on a citywide level.

The smart city concept has recently been widely researched not only for its ability to reduce maintenance cost to cities, but also because it is a revolution for cities to improve the relation among itself, the environment, and its citizens (Ahvenniemi et al., 2017). The smart city concept is always mentioned in tandem with sustainability to achieve the balance between smartness of the city and its resources and available services (Rösch et al., 2017). A study on the connection between smart campuses and smart cities has shown the complexity of achieving such a concept due to information technology (IT) challenges that require interdisciplinary work between the campus and its city (Verstaevel et al., 2017). However, smart campus could be considered as the seed of cities' smartness due to the similarities between campuses and cities in their spatial and social structure.

3.5. Residential pattern

Students occupy a major part of the relationship between a campus and its surrounding environment. They can bring positive or negative impacts to the neighbourhood, especially if they exist in high concentrations. Such concentrations arguably accelerate the change occurring in the area that is identified as studentification (Moos et al., 2019). Expansion of student results in a high demand for accommodation that cannot, in most cases, be covered by the institution alone. Therefore, the private sector plays a major role in covering that need (Rugg et al., 2000). Students usually find "student areas" attractive because available facilities are focused on their needs. Moreover, "studentified areas" or "student areas" can urbanize the area around the campus in a positive way by bringing different mixes of land uses to the area (Macintyre, 2003). However, high concentrated student areas can also bring negative consequences to the neighbourhood, as conflicts might appear with different lifestyles between students and other residents of the area (Allinson, 2006), in addition to minor crimes that might occur due to some students being drunk, causing noise, or vandalizing properties (Selwyn, 2008).

In the UK, a review was conducted on the impact of student areas growth on spatial residential patterns (Munro et al., 2009). Findings of this review show that highly residentially concentrated areas of students have a noticeable degree of segregation from other residents who are non-students. This impact has shown to be one of the main causes of disruption in cities (Munro et al., 2009). Furthermore, a survey, which was conducted to clarify factors that affect the overall satisfaction among students who live off-campus, has shown that the satisfaction degree of students and residents defers significantly depending on levels of residential environment (house level, neighbourhood level, or city level) (Muslim et al., 2013). Unlike residents, satisfactions with the house and the neighbourhood were the two important factors for students (Muslim et al., 2013). This shows where the segregation in the locality between

students and residents originates from. Another research focused on the segregation of foreign students, discovered that educational segregation and residential segregation are two connected phenomena (Bonal et al., 2019). This presents how educational segregation of foreign students could be a factor of neighbourhood disruption as well. Therefore, students' residential patterns have an impact on the social and cultural atmosphere in the area, which cannot be neglected to ensure a sustainable relationship between original residents and students without any form of segregation or disruption.

3.6. Stakeholders' partnership

Universities can be considered as driving forces for urban development in cities. However, the pace and efficiency of this potential depend on the exchange between universities and various stakeholders, including higher educational institutions, entrepreneurs, academic communities, students, local communities, and municipalities (Hoyt, 2010). Maintaining a link between all these partners and stakeholders can achieve higher urban development goals. To address this possibility, Russo et al. (2007) examined 9 case studies of European cities to propose a sustainable university-city relationship. Findings of these case studies have indicated that a student-friendly city approach should be adopted to come up with an effective urban strategy for the city. This approach should be focused mainly on students as the core facilitators by encouraging local communities to market the city to attract students, or by increasing contact opportunities between students and other local stakeholders (Russo et al., 2007). Initiating this approach would make a sustainable university-city model more possible to achieve. Another similar study on building friendly cities has proposed a university-city complex that stimulates sustainable development by community engagement, spatial planning, and education programs services (Ngo and Trinh, 2016).

Moreover, relatively new research has chosen London and New York to examine the capacity of universities as analysts and producers of urban spaces (Addie, 2019). Different datasets, strategic plans, and goals for universities in the two cities were collected and analyzed. Results of this research revealed that university "engagement" has different meanings for different stakeholders. Therefore, developing a comprehensive urban engagement, mainly between cities' local governments as a key stakeholder and academic institutions through scientific research, would open new approaches for maintainable urban development in cities (Addie, 2019). Universities may also serve communities that lie outside their urban context as well if financial and political limitations permit such action (Addie, 2019). Alternatively, stakeholders' engagement with universities could occur in an indirect way. For example, the housing sector is considered as one of the main markets that benefit greatly from the high demand that is usually accompanied by universities' existence in the city. This has been reflected in a study that analyzed the impact of universities in five cities of UK on housing markets (Morisson and Szumilo, 2019). Results of this study illustrated that the relationship between the university and city's economy based on housing demand is interrelated. That can be seen clearly through business spillover that occurs in cities with global research centres such as Cambridge City (Morisson and Szumilo, 2019). Therefore, stakeholders in the housing sector require sound planning and housing policies that benefit both: the university and the city.

In some situations, coordination between university, city and stakeholder is essential not optional, especially when it concerns employment. Qualitative research was conducted to find out the types of issues that university students face during their study (Kiraz, 2014). Results of this qualitative research expose that anxiety employment turns out to be the main issue faced by students, especially if they are studying in one of the lower ranking universities. Therefore, coordination and cooperation between the university and other stakeholders is necessary to offer a higher potential of employment for students. Furthermore, to harness innovation in new communities, collaboration and planning between the university and other stakeholders is essential. This was the conclusion of Abdelaal and Abdelaal (2019), who studied on the relationship between campuses and new cities for innovative communities. The authors of the study also concluded that comprehensive development of innovation is required on all scales: city-scale, urban context scale, campus scale, and individual or group scale, as it is extremely difficult to build an innovative driven environment without institutional, political, and socio-economical amendments, which requires the cooperation and coordination between all stakeholders, especially when building new cities (Abdelaal and Abdelaal, 2019). This confirms that universities and stakeholders of different markets and scales need to work together for better outcomes not only for the city but also for the economy.

3.7. Community engagement

According to Nye (1999), there are 3 models that describe how university-community engagement could be implemented. The first model views communities as laboratories for university related research; the second model considers universities as problem solvers for community needs; and the last model introduces how universities empower communities and build local competence (Nye, 1999). However, available funds may limit such an engagement between the university and the surrounding community. Therefore, financial resources available for private colleges and universities allow them to be more engaged than public ones. However, a study on the efforts of Portland State University to engage with the surrounding community has shown that public universities could engage with communities through urban planning and urban studies programs (Bunnell and Lawson, 2006). These planning programs allow universities to bring influential and powerful public agencies together to put new action plans and policies for local communities (Bunnell and Lawson, 2006). Another related research took Emory University as a case study and illustrated that universities develop in a similar way as cities from village to metropolis to global city (Frost et al., 2004). As a result, the organizing principles when planning for universities should come from the people, but not the artificial needs of bureaucracy (Frost et al., 2004). This confirms the necessity of university-community engagement even in the early stages of any university's existence.

To view universities' ability to improve the regional quality of education, Theodora (2008) examined the regional universities in Greece and concluded that universities in cities with high regional significance can strengthen their quality of education easier

compared to universities in cities with lower regional significance. Unless the required infrastructure facilities and technologies are available, otherwise it would be difficult for universities to act as a catalyst for the city (Theodora, 2008). A similar study reviewed the role of the University of Catania in engaging local communities in city development (Piazza, 2018). Results of the study demonstrated that research centres in the university are not able to show a concrete engagement with the region due to the lack of coordination on institutional levels. Additionally, lack of local and national funds made social engagement voluntary and marginalized (Piazza, 2018). Another related research from a case study of the Department of Urban and Regional Planning, Jackson State University and its involvement in the planning process of e-City initiative focused on the role of historically black colleges and universities in university-community engagement and partnership (Lowe, 2008). Results of this research showed that, Jackson State University provided greater participation and decision-making opportunities with e-City inhabitants. The research also suggested that the existing physical and symbolic barriers between the town and gown need to be broken for a more feasible university-city engagement (Lowe, 2008). The book entitled "The University and the City" has also analyzed different economic and non-economic forms of interaction between the university and its city (Höyssä, 2014). The book has concluded that the existence of demonstration sites and joint research creates an environment where the city and its population become objects of scientific research. Such demonstration sites provide inspiration and feedback for academic activities (Höyssä, 2014). This demonstrates the importance of university-city partnership for the benefit of the academic realm. This has also been confirmed in a study about campus-city dynamics in the inner city of East London, South Africa (Bank and Sibanda, 2018). Findings of the study have shown that place-based opportunities offered by the city for universities play an instrumental role not only in shaping the economy, but also in building the urban environment (Bank and Sibanda, 2018).

3.8. Cityness and globalization

Urban universities and metropolitan ones have been proved to play an important role in the production of cities, which is known as "cityness" (Balducci and Fedeli, 2014). Cities also have much to offer to harness a successful university-city engagement. This has been illustrated in the study of van Geenhuizen and Soetanto (2012) that examined types of resources needed for university spin-off firms. Findings of this study have shown that cities need to act as proactive connectors of knowledge and ideas. City governments also need to offer adequate land, accommodation, incentive, and education to attract university spin-off firms to invest in their local economy (van Geenhuizen and Soetanto, 2012). However, the lack of coordination between the city and the university could be harmful for both. A study on infill projects near to university campuses in Ctiy of Colorado Springs has shown that a phenomenon known as "placelessness" would occur without a proper planning between different stakeholders (Harner and Kinder, 2013). Instead of satisfying students' needs, some infill projects in Ctiy of Colorado Springs became placeless generic landscapes that are considered as automobile-oriented big-box shopping centres. This could be avoided if there is a coordination between the university and stakeholders in the planning and development process (Harner and Kinder, 2013). Therefore, universities need to consider stakeholders' participation, community engagement, and citywide planning as essential measures for better outcomes.

The means of interaction between the campus and the city vary greatly. The campus-city relationship is recognized as an evolving one that changes overtime due to various factors including economic situations, urban growth trends, historical events, or socio-economic changes. Therefore, the campus and the city have been acknowledged for being in a constant negotiation (Haar, 2011). Moreover, by understanding the role of the university in the city that could enrich our understanding of cities, as the university plays an auxiliary role in the urban growth of its city (Molotch, 1976). Furthermore, a university is one of the main causes of the development and the revitalization (Stoker et al., 2015). By exploring the role of campuses and universities across different eras of history, a vibrant vision of city's urbanization process could be defined. In a recent research study, Seoul and Singapore were selected as case studies to explore how colonial experiences affected universities as well as the surrounding urban environments (Oh, 2022). Findings of this research pointed out that colonial interests, globally and locally, shaped universities and their surrounding environments not only in the two cities, but also in a wider area of East Asia.

There are various case studies on how cities work on integrating their universities physically and socially to achieve the optimum goal of the existence of universities (Perry and Wiewel, 2005; Bakken, 2012). This type of interaction between the city and the university has brought the attention of different researchers. Research from Norway on how the governance systems affect university development revealed that a delay in campus development could be due to university's neglect toward the power of the local government (Gohari and Holsen, 2016). Therefore, a city's interaction, in the form of its local government, with the university is essential for campus development. Other examples of campus development can be seen in the growth of universities in Europe over history. Research on the role of architectural concepts in changing the vision of campus development has noted that campuses nowadays are envisioned as urban life more than rural scenery and landscape (Bott, 2018), which could explain the shift occurring from historical campuses to a more contemporary ones affecting the image and the productivity of the city.

Not only cities can shape their universities, but also universities can shape their own cities in many ways. If we examine the two main missions of universities, we will discover that they are usually based on education and scientific research. However, according to Moscati et al. (2010), the third mission is about the diffusion brought by the university outside the academic boundaries. "CampUS-on" and "CampUS-off" initiatives are considered as two of the recent applications of the third mission of universities. CampUS-on refers to the teaching activities in campus with external actors, the campus is the main object of interest; and CampUS-off refers to teaching activities held partially on-campus and off-campus, with the city as the main actor. Both of them bring numeral outcomes for the city on different levels (macro, meso, or micro) (Fassi, 2020). CampUS-on and CampUS-off are existing examples on how universities with its third mission could help the city shaping its community. Another study demonstrated that the impact of campuses in a city can go beyond city transformation to a deeper makeover (Soares et al., 2020). The accessibility of city-university could be considered as

Table 2

Perspectives and lessons for a sustainable campus-city relationship.

Aspect of campus-city relationship	Sustainability perspective and lesson	Implication	Reference
Safety and security	On the campus-city level, more attention should be paid to security procedures around campus as well as in campus.	Areas around campuses are prone to higher rates of burglary and robbery due to the high foot traffic of students.	Cundiff (2021)
	On the campus level, a balance between privacy and security on-campus should be maintained.	Routes on-campus with high degrees of privacy are shown to be less supervised which in turn threatens safety on-campus.	Aqli (2019)
Design and spatial configuration	The more integrated the campus with the city, the more benefits the university gains.	Integrating campuses with the city could create more opportunities for students as well as for the staffs. The closer the campus to the city, the more research grants a university can get and the more space choices students can have.	Kim et al. (2018); Namvar et al. (2019); Li and Wang (2020)
	The location of the campus should be carefully chosen to stimulate student's social and academic life.	Locating a university campus in a site surrounded by public open spaces with greenery in a comfortable climate helps students to achieve higher targets and become more active socially.	Robertson (2013); Hodson and Sander (2017); Hamlin (2021)
	The more open the campus, the higher the degree of university's publicness is.	University's publicness is dependent on the campus relation to city's downtown and surrounding public spaces.	Adhya (2009); Yaylali-Yildiz et al. (2022)
Transportation mode	Students and staffs should be encouraged to walk or bike to their campuses.	Walking or biking to university campuses has been proven to help students to integrate more efficiently with local communities, which reduces any chance of social segregation. Open campuses would be a potential solution to encourage such a travel behaviour.	Sun et al. (2018); Yu et al. (2018)
	University communities need to depend more on transit fare policies.	Public transit has been shown to be the most common mode of transportation among students. Therefore, more public transit policies should be formed and adopted by university administrators.	Daggett and Gutkowski (2003); Etminani-Ghasrodashti et al. (2018); Alexander and Massaro (2020)
Smartness and greenness	University campuses provide the grounds needed for a smart city concept.	Due to the similarities in the social and spatial structure between the campus and the city, the smart city concept can be initiated from the building level to the campus level and then the city level. Thus, adopting low-carbon green policies in university buildings can accelerate the development of smart city concept.	Yang (2015); Verstaevel et al. (2017); He et al. (2020)
Residential pattern	Citywide residential polices should take into consideration issues related to highly populated student areas.	Negative impact results from studentification occurrence in neighbourhoods surrounding university campuses can cause segregation and disruption between original residents and students.	Munro et al. (2009); Muslim et al. (2013); Bonal et al. (2019); Moos et al. (2019)
Stakeholders' partnership	Universities need to seek stakeholders' partnership by adopting student-friendly city approaches.	Cooperation between stakeholders and universities has been proven to be crucial for students' prospects. Universities need stakeholders to ensure more employment opportunities, internships, and education services to cover students' capacity.	Russo et al. (2007); Kiraz (2014); Ngo and Trinh (2016); Morisson and Szumilo (2019)
	Cities need to encourage a university-stakeholder partnership to come over challenging hardships.	Cities need to maintain an innovative environment to achieve institutional, political, and socio-economic resolutions that can be feasible through university-stakeholder driven initiatives.	Hoyt (2010); Abdelaal and Abdelaal (2019); Addie (2019)
Community engagement	Universities can engage more deeply with local communities by adopting citizen participatory education programs.	Urban studies and planning programs can help in bringing the influential and powerful local communities and public agencies together. By doing so, physical, and symbolic barriers between town and gown can be broken for a more feasible university-city engagement.	Frost et al. (2004); Bunnell and Lawson (2006); Lowe (2008); Höyssä (2014)
	Local community engagement is quite limited by other external factors such as city's regional significances and available funds.	Limited funds have been proven to hinder university's engagement with local communities. Moreover, universities in cities with regional significance have more potentials to engage with local communities. Available funds and city's regional significance could lead to marginalized and voluntary engagement with local communities.	Theodora (2008); Bank and Sibanda (2018); Piazza (2018)

Table 2 (*continued*)

Aspect of campus-city relationship	Sustainability perspective and lesson	Implication	Reference
Cityness and globalization	Universities' contribution to the production of cities depends mainly on two factors: off-campus initiatives and university-influenced urban landscapes.	Universities have credibility in producing the knowledge economy. Creating integrated places where the university and the city meet also plays an important role in the production of cities.	Benneworth et al. (2010); Balducci and Fedeli (2014); Bott (2018); Brennan and Cochrane (2019); Fassi (2020); Soares et al. (2020)
	The Internationalization and globalization of universities vary greatly depending on universities' efforts rather than cities' role.	Universities need to make great effort to internationalize. Some universities focus on growing their international students' capacity. Other universities tend to act as international actors by building museums, conducting conferences, or being an influential member of city's local economy.	Wallace (2000); Veltz (2001); Ransom (2018)
	Stakeholders' partnership and community engagement are considered essential aspects for a university to have prior to cityness or globalization.	Universities cannot act on international levels unless there is concrete support from the city's local government. Furthermore, the positive and negative impacts would occur to universities by governmental planning policies. Therefore, building bridges between the university and city's local government are considered crucial prior to any trials for globalization.	van Geenhuizen and Soetanto (2012); Harner and Kinder (2013); Gohari and Holsen (2016); Borsi and Schulte (2018); Oh (2022)

creative solution for human needs, which facilitates the interaction between individuals and the built environment (Soares et al., 2020). This could also enrich sustainability in the city as creativity is considered as the fourth dimension of sustainability (Soares et al., 2020).

Benneworth et al. (2010) examined the relationship between universities and the city through the spatial development of five case universities: Queensland University of Technology, Massachusetts Institute of Technology, Harvard University, University of Twente, and Newcastle University, and concluded that the universities can contribute to the production of university-influenced urban landscapes as integrated places where the university and the city can contribute to the knowledge economy. The five case studies also illustrated that collaboration between a university and its city can occur on different levels ranging from local community engagement to citywide engagement, which is necessary not only for the university's capacity, but also for the city's economy. Sometimes, the impact of university existence in a city goes beyond its borders and then, university starts to address a wider context of problem that is usually referred as globalization. A study on the role of universities in globalization has concluded that to allow universities to be more global, the connection between the city and the university should take place on three different planes: economically, socially, and politically (Veltz, 2001). Consequently, universities can gain the most from local, national, and international communities, which in turn allow for better integration with the city locally and globally (Veltz, 2001).

Like globalization, internationalization is considered as a cross-cutting theme when planning for universities. Lots of urban universities are working nowadays alongside with their cities to align their international activity. This has been illustrated in a study that examined the forms of university-city relationship towards internationalization. Two narratives explain the shift to internationalized universities in this study. First, there is a growing acceptance of the importance of the local environment, so universities can attract more students and staffs. Second, cities are becoming more and more influential as international actors (Ransom, 2018). Therefore, universities can help cities to internationalize faster through museums. A study conducted in Australia has shown how university museum contributes to the heritage of Australian cities and the internationalized image of the city (Wallace, 2000).

In summary, we can conclude that the dynamism between the university and the city is complex, interconnected, and overlapped. However, research has illustrated that what is considered more important than universities' urban development is the urban landscape of knowledge and innovation, which requires the collaboration of the university and different actors including the city (Borsi and Schulte, 2018). Universities operate in cities where they are located in; therefore, they need to be understood in the place in which they find themselves and of the place where they interact with the surroundings. That makes each university in each city unique on its own path as universities negotiate their roles within the urban setting reflecting their own distinctive priorities (Brennan and Cochrane, 2019).

4. Perspectives and lessons for a sustainable campus-city relationship

As explained earlier, university-city relationship could be defined as any form of engagement, cooperation, or partnership that connects the university with its respective city. However, based on the reviewed literature, we can define university- or campus-city sustainable relationship as any form of engagement that is considered essential for the benefit of both the university and the city. As illustrated earlier, some aspects of university-city relationship cannot be ignored or marginalized. The university needs its city, and the city needs its university. In some cases, a university cannot function without the needed support from its respective city, especially when it comes to housing demands, employment opportunities, and transportation services. Similarly, the city needs its university to achieve better economic and social resolutions driven by university. Therefore, this paper reviewed different aspects of campus-city relationship with the intention of discovering how to maintain this relationship in a sustainable way for the benefit of both. Table 2 summarizes

different perspectives and lessons retrieved from the selected literature to reach a more sustainable campus-city relationship. Furthermore, to maintain a sustainable relationship between the campus and the city, an active participation and decision-making process needs to occur to achieve mutual goals and ambitions. However, due to decision makers' personal values and visions, challenges that could stand in the way of achieving such a sustainable relation between the campus and the city may appear. Moreover, due to the unclear borders of the city, the boundaries that define different types of stakeholders may be unclear as well. This could lead to a fragile engagement between university's decision makers and other parties. Therefore, this review provides clear aspects and factors that define university-city relationship in its adequate context followed by lessons learned for a more sustainable relationship.

From previous literature review, different research topics handled different aspects of university-city relationship. Research papers have approached this relationship through campus-city physical relationship, campus-city functional relationship, or both. However, most of research papers have discussed different aspects of university-city relationship through the functional relationship between the campus and the city. This illustrated that the effect of campus-city physical relationship on mentioned aspects has been moderately discussed. Moreover, Fig. 3 shows the number of research articles belonging to each aspect of university-city relationship and its relevance to the physical or functional relationship between the campus and the city. We have also categorized the selected articles to the corresponding aspect and category of the campus-city relationship based on the research theme of each article as shown in Table 3. Most of reviewed articles have assessed the relationship between the campus and the city from a functional point of view; however, less attention has been paid to the physical aspect of this relationship. Although the linkage between physical and functional relationship cannot be separated, the approach and the methodology used in each article have been focused on assessing either the physical linkage, the functional linkage, or both.

Some research papers focusing on investigating the physical connection between the campus and the city used quantitative computational research methodologies such as the space syntax, geographical information systems (GIS), or spatial statistical analysis. These mentioned methodologies approach the physical side of campus-city relationship rather than the functional side. For example, the space syntax methodology is a research methodology to analyze the urban street network, which is purely physical-related rather than functional-related, of course findings may be connected later to the functional part. Therefore, the methodology is focused on the physical side of campus-city relationship. Other papers may use different methodologies to address the functional side of campus-city relationship such as conducting interviews, questionnaires, and observations. In this paper, we highlight the significant research gaps between the physical and functional sides of campus-city relationship (Fig. 3). Succinctly, research approaches and methodologies are different from research findings. Approaches could be oriented and focused on the physical or the functional side of the relationship; however, the findings need to be connected to both. Therefore, this review article highlights the moderately discussed aspects of campus-city relationship to develop more comprehensive research-based perspectives and lessons for a sustainable campus-city relationship. With this approach, a more refined vision on how intercorrelated and overlapped the relationship between universities and cities is.

5. Conclusion and recommendations

University-city relationship has been explored in various research papers from different points of view. Previous researches have shown that aspects related to safety and security, design and spatial configuration, transportation mode, smartness and greenness, residential pattern, stakeholders' partnership, community engagement, and cityness and globalization affect university-city relationship
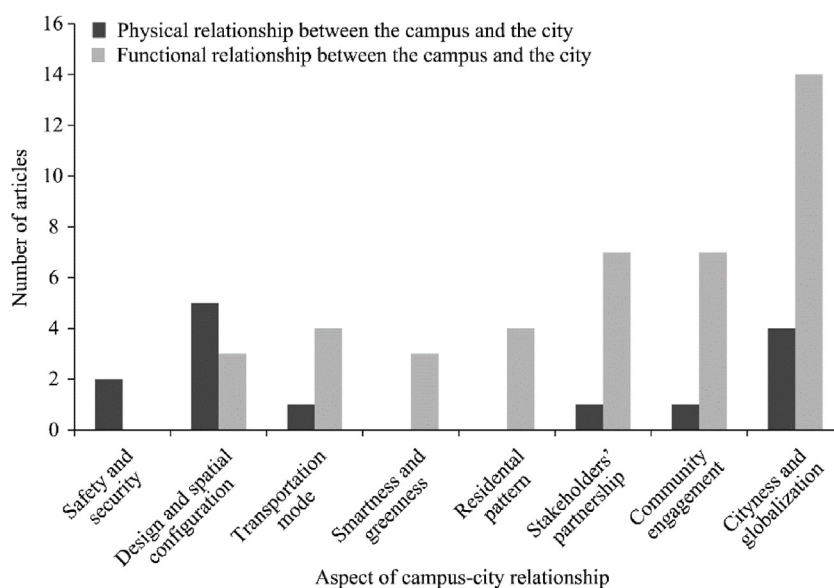
Fig. 3. Number of research articles belonging to different aspects of campus-city relationship.

Table 3
Categorization of the selected articles to the corresponding aspect and category of campus-city relationship.

Aspect of campus-city relationship	Article	Category of campus-city relationship
Safety and security	Aqli (2019)	Physical relationship
	Cundiff (2021)	Physical relationship
Design and spatial configuration	Adhya (2009)	Physical relationship
	Robertson (2013)	Functional relationship
	Hodson and Sander (2017)	Functional relationship
	Kim et al. (2018)	Functional relationship
	Namvar et al. (2019)	Physical relationship
	Li and Wang (2020)	Physical relationship
	Yaylali-Yildiz et al. (2022)	Physical relationship
	Hamlin (2021)	Physical relationship
Transportation mode	Daggett and Gutkowski (2003)	Functional relationship
	Etminani-Ghasrodashti et al. (2018)	Functional relationship
	Sun et al. (2018)	Functional relationship
	Yu et al. (2018)	Functional relationship
	Alexander and Massaro (2020)	Physical relationship
Smartness and greenness	Yang (2015)	Functional relationship
	Verstaevel et al. (2017)	Functional relationship
	He et al. (2020)	Functional relationship
Residential pattern	Munro et al. (2009)	Functional relationship
	Muslim et al. (2013)	Functional relationship
	Bonal et al. (2019)	Functional relationship
	Moos et al. (2019)	Functional relationship
Stakeholders' partnership	Russo et al. (2007)	Functional relationship
	Hoyt (2010)	Functional relationship
	Kiraz (2014)	Functional relationship
	Ngo and Trinh (2016)	Physical and functional relationship
	Abdelaal and Abdelaal (2019)	Functional relationship
	Addie (2019)	Functional relationship
	Morisson and Szumilo (2019)	Functional relationship
Community engagement	Frost et al. (2004)	Functional relationship
	Bunnell and Lawson (2006)	Functional relationship
	Theodora (2008)	Physical and functional relationship
	Lowe (2008)	Functional relationship
	Höyssä (2014)	Functional relationship
	Bank and Sibanda (2018)	Functional relationship
	Piazza (2018)	Functional relationship
Cityness and globalization	Wallace (2000)	Functional relationship
	Veltz (2001)	Functional relationship
	Benneworth et al. (2010)	Functional relationship
	van Geenhuizen and Soetanto (2012)	Functional relationship
	Harner and Kinder (2013)	Physical and functional relationship
	Balducci and Fedeli (2014)	Physical and functional relationship
	Gohari and Holsen (2016)	Functional relationship
	Borsi and Schulte (2018)	Functional relationship
	Bott (2018)	Functional relationship
	Ransom (2018)	Functional relationship
	Brennan and Cochrane (2019)	Functional relationship
	Fassi (2020)	Functional relationship
	Soares et al. (2020)	Physical and functional relationship
	Oh (2022)	Physical and functional relationship

in numerous ways. The impact of these aspects depends on facilities, services, organizations, and stakeholders available in cities that could benefit universities or vice versa. The extent to which universities and cities can benefit each other depends mainly on their location and the physical connections between each other. Therefore, the functional and physical relationships between the campus and the city can be used to define university-city relationship to realize their interconnected visions and roles. Previous research has also demonstrated that the engagement of the university and the city could help the city get more potentials to achieve its goals and face local and global challenges. However, this engagement should be based on placing students as the core for better decision-making.

Moreover, findings of this review have shown that universities need to be understood in context of their respective cities, as universities are considered as "in the place" and "of the place". This has been clearly noted in the role of the contextual differences on the impact of the university on the city. For example, research has shown that studentification has been proven to have a negative impact in the western world especially Europe and the USA. However, in Asian cities especially in China, studentification has contributed to the development of the social and economic situation in neighbourhoods around university campuses. Furthermore, findings have also shown that campus openness contributes not only to the publicness of the university, but also to students' travel behaviour, which in turn plays a significant role in students' residential patterns. Therefore, the impact of the physical connection between the university and the city goes far beyond campus's accessibility as it deeply affects students' social life.

Lastly, this literature review provides grounds for different factors and aspects that could help or hinder university-city relationship based on the physical and functional relationships between the campus and the city. From these aspects, several perspectives and lessons were assessed for a more sustainable campus-city relationship. The main outcome of this study lies in addressing different aspects of university-city relationship and highlighting some perspectives that could be used as a guide for a more sustainable campus-city relationship. Expanding this review in future research by including more keywords may help addressing new aspects of university-city relationship. Furthermore, future research can cover gaps reported in this paper, as most previous research papers approached university-city relationship from the point of view of the functional relationship between the campus and the city. Therefore, future research may address the same aspects through the physical relationship between the campus and the city. This would help to understand more deeply the effect of universities' location and topology on their relationship with their respective cities.

Declaration of competing interest

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