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The Controversial Issues of Megalopolis and Megalopolis-like Clusters

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Summary

Jean Gottmann proposed the concept of Megalopolis and Megalopolis-like cluster (MMLC) in 1957. However, he did not provide an exact definition of the MMLC. As a result, a series of controversial issues has emerged in the related research. This article systematically explores the practical controversies faced by MMLC from multiple perspectives, including the confusion of concepts, disputes over spatial categories, and differences among stakeholders. Then, it analyses the causes of these controversies. Moreover, this paper carries out philosophical reflections and puts forward effective ways to deal with the controversies. Finally, it is not difficult to see that, although the MMLC describe cities with a relatively dominant level of socio-economic development, there are always differences among different urban areas in the MMLC and the tendency for different types of people to form distinct groups continues to exist. Essentially, the specific geographical phenomenon referred to as MMLC does not constitute a fully coherent or stable geospatial

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system. Rather, it should be understood as a complex geographical region with boundaries that remain inherently vague.

Keywords: Megalopolis, megalopolis-like cluster, metropolis, megaregion, mega-urban region, mega-city region, urban agglomeration, conurbation

Zusammenfassung

UMSTRITTENE FRAGEN BEI DER DEFINITORISCHEN FASSUNG UND KONZEPTIONELLEN EINORDNUNG DER BEGRIFFE „MEGALOPOLIS“ UND „MEGALOPOLIS-ÄHNLICHER CLUSTER“

Jean GOTTMANN schlug 1957 das Konzept der Megalopolis und des Megalopolis-ähnlichen Clusters (MMLC) zur Analyse und Beschreibung von räumlich ausufernden Stadtlandschaften, in denen mehrere Millionenstädte weitgehend zusammengewachsen sind, vor. Er lieferte jedoch keine genaue Definition des MMLC. Infolgedessen kam es in der Fachliteratur zu einer Reihe unterschiedlicher Auffassungen zum Konzept der MMLC. In diesem Artikel werden die in diesem Zusammenhang entstandenen Kontroversen aus verschiedenen Perspektiven systematisch untersucht, darunter in Bezug auf die Verwirrung hinsichtlich der Konzepte, auf Streitigkeiten über räumliche Kategorien und Unterschiede zwischen den Interessengruppen. Anschließend werden die Ursachen dieser Kontroversen analysiert. Darüber hinaus enthält dieser Artikel grundsätzliche Überlegungen und schlägt wirksame Wege zum Umgang mit den Kontroversen vor. Schließlich ist es nicht schwer zu erkennen, dass die MMLC zwar Städte mit einem relativ dominanten sozioökonomischen Entwicklungsniveau beschreiben, es jedoch immer Unterschiede zwischen verschiedenen Gruppen innerhalb der MMLC gibt und die Tendenz, dass sich verschiedene Arten von Menschen zu unterschiedlichen Gruppen zusammenschließen, weiterhin besteht. Im Wesentlichen stellt das spezifische geographische Phänomen, das als MMLC bezeichnet wird, kein vollständig kohärentes oder stabiles georäumliches System dar. Vielmehr sollte es als komplexe geographische Region mit Grenzen verstanden werden, die von Natur aus vage bleiben.

Schlagwörter: Megalopolis, Megalopolis-ähnlicher Cluster, Metropole, Megaregion, Stadtagglomeration, Conurbation

1 Introduction

Before GOTTMANN, the term *“megalopolis”* referred specifically to the name of an ancient Greek city (RICHARDS 1945). In 1957, Jean GOTTMANN reintroduced the term in a new geographical context. He observed that a series of metropolitan areas, each organised around a substantial urban nucleus, had expanded and gradually merged along the northeastern seaboard of the United States. The super-metropolitan character of this vast and functionally interconnected region, he argued, required a distinctive designation, which he termed *Megalopolis*. The coastal corridor stretching from Boston to Washington

was presented as a representative example (Gottmann 1957). Furthermore, as additional metropolitan areas continued to expand outward through suburbanisation, Gottmann anticipated that similar but smaller formations would emerge elsewhere; these he referred to as *megalopolis-like clusters*.

Gottmann emphasised that a megalopolis is spatially extensive, often spanning hundreds of kilometres and integrating multiple metropolitan regions. He described it as the largest form of urban cluster in the world at that time (Gottmann 1957). In contrast, a megalopolis-like cluster is smaller in scale, though it shares similar structural characteristics. Importantly, Gottmann implied that there exists a continuum between megalopolis and megalopolis-like clusters rather than a rigid categorical distinction. Nevertheless, subsequent scholarship has tended to focus primarily on the concept of the megalopolis, while paying comparatively limited attention to the megalopolis-like cluster. To address this imbalance, the present study discusses the two concepts together under the abbreviation MMLC (*Megalopolis and Megalopolis-like Cluster*), thereby drawing attention to their conceptual interrelationship.

However, Gottmann did not provide explicit quantitative criteria for defining either the megalopolis or the megalopolis-like cluster. Nor did he establish standardised methodological procedures for their identification. This lack of formalised standards has generated considerable controversy in subsequent research. For instance, the U.S. Census Bureau defines an "urban cluster" as a settlement with a population of at least 2,500 and fewer than 50,000 residents (Ratcliffe et al. 2016). Clearly, this official definition differs substantially from Gottmann's conception of a megalopolis or megalopolis-like cluster. The two are neither equivalent in scale nor comparable in theoretical intent.

As early as 1910, the U.S. Census Bureau introduced the concept of the *metropolitan area*, defined as a region containing at least one central city or urbanised area of a specified size (Gardner 2021). Yet the criteria for delineating metropolitan areas have not remained fixed; they have been revised repeatedly in response to demographic and socio-economic changes. Consequently, even the foundational concept of the metropolitan area lacks absolute stability. This inherent flexibility further complicates efforts to define and delimit MMLC in a consistent manner.

In recent decades, a substantial body of research has examined MMLC from various perspectives. Much of this literature concentrates on development strategies, policy coordination, and lessons drawn from particular cases, such as the Tokaido Megalopolis in Japan (Sorensen 2019). However, the deeper theoretical and practical controversies embedded in the concept of MMLC have received comparatively limited systematic attention. Indeed, certain studies contain internal inconsistencies or unresolved contradictions.

More broadly, controversy is not unusual in geographical research, as geographical phenomena are often characterised by ambiguity and indeterminacy. Fisher (2000) argues that the formal recognition of vagueness in geographic phenomena is long overdue and should be welcomed in geographical analysis, including geographic information systems. The inherent ambiguity of spatial phenomena easily gives rise to conceptual and methodological disputes. Despite this, there has been no comprehensive and systematic examination of the controversies specifically surrounding MMLC. Therefore, this paper begins

by identifying the major practical controversies associated with MMLC and proceeds to analyse their underlying causes.

2 Analysis of the Controversial Issues of the MMLC

Chaotic Concepts

Since GOTTMANN first articulated the concept of the megalopolis, an increasing number of related terms have emerged in academic and policy discourse. These concepts have multiplied over time, and their meanings have continuously evolved – and will likely continue to do so. As illustrated in Table 1, a wide range of terminologies are associated with MMLC, reflecting both theoretical diversification and conceptual fragmentation.

In 1976, GOTTMANN further identified six major megalopolitan systems around the world, including the Northeast United States, the Great Lakes region of the United States, England in the United Kingdom, the Tokaido corridor in Japan, the Amsterdam–Ruhr–Northern France axis in Northwestern Europe, and the urban constellation centred on Shanghai in China (GOTTMANN 1976). These formations were also described as *metropolitan systems*. Subsequently, scholars have continued to employ the term "megalopolis" to describe various large-scale geographical spaces, sometimes extending its meaning beyond GOTTMANN's original framework (MA 2022; VELAZQUEZ et al. 2025).

As metropolitan regions expanded throughout the latter half of the twentieth century, and their boundaries became increasingly blurred, new conceptual labels were introduced. The U.S. Regional Plan Association proposed the concept of the "*megaregion*" (HAGLER 2009), which has since been widely adopted in multiple countries (ZHANG et al. 2018). Meanwhile, the U.S. Census Bureau introduced the notion of the "megapolitan area," which extends beyond Gottmann's original conception of the megalopolis (LANG and DHAVALE 2005). Closely related to this is the term *"megapolitan region"*, and in practice the two are often used interchangeably despite subtle conceptual differences (LENG et al. 2023). Building upon the megapolitan area, the idea of the *"megapolitan cluster"* emerged, defined as a spatial formation larger than a single megapolitan area (NELSON and LANG 2011), and this terminology has also been applied in various national contexts (DOU et al. 2025).

In response to the distinctive pattern of mega-city expansion observed in ASEAN countries, MCGEE (1995) introduced the concept of the "mega-urban region." This term was subsequently extended to other national and regional settings (YEUNG et al. 2020). Furthermore, HALL and PAIN (2006) proposed the concept of the *"mega-city region,"* emphasising networked polycentric characteristics, and this formulation has been widely cited (HALBERT 2008; YEH and CHEN 2020). In addition, similar expressions such as *"megacity cluster"* have appeared in more recent studies (NARITA 2021; HU et al. 2024).

Despite the proliferation of terminology, scholars have not reached a unified conceptual consensus. From the perspective of regional cooperation driven by government planning and centre–periphery structural dynamics, terms such as *"economic zone"* (Nica et al. 2023) and *"economic circle"* (WAN et al. 2024; GUO et al. 2020) have been employed. In

order to move beyond Gottmann's emphasis on the "largest urban cluster" and to adapt the concept to broader contexts, expressions such as *"urban cluster"* and *"city cluster"* have been widely adopted in practice (Zhang et al. 2012; Tselios 2020; Li et al. 2017).

Similarly, the term "urban agglomeration" has been used to describe interconnected cities located in relative proximity to a core city, characterised by comparatively high levels of spatial integration (Frankhauser 1998; Fang and Yu 2017). The concept of "conurbation" has also been applied to denote the expansion and merging of neighbouring cities across administrative boundaries (Zhou and Wu 2000; Kassa 2013). Additionally, "city belt" is used to describe linear urban formations extending along rivers or major transportation corridors (Hitz et al. 1994; Wan et al. 2013).

In Japan, large-scale urban formations are commonly referred to as "metropolitan areas" or "metropolitan regions" (Getis and Ishimizu 1986). The Tokyo metropolitan area, for example, is also described as the "Tokyo megalopolis" (Umezaki et al. 1999). Nakanishi and colleagues (2021) have suggested that the development of maglev rail connections between Tokyo and Osaka, reducing travel time to approximately seventy minutes, signifies the emergence of a mega-region. Earlier, Rimmer (1986) argued that Japan's three major metropolitan areas have effectively been welded together by high-speed transport infrastructure, forming what can be termed the "Tokaido megalopolis". In China, some scholars similarly refer to MMLC using the terminology of "metropolitan areas" (Zhou and Wang 2018).

Since the 1990s, related conceptual frameworks have also been applied extensively in the Chinese context, including "metropolitan interlocking region" (Zhou 1991; Rimmer 2002) and "extended metropolitan region" (Ginsburg 1991; Sit 1996). At present, many Chinese scholars translate terms such as megapolitan area, megapolitan region, megaregion, mega-urban region, mega-city region, megacity cluster, city cluster, urban cluster, conurbation, and urban agglomeration into a single Chinese concept – "Chengshiqun." In practice, these translated terms are often endowed with similar connotations and are frequently used to describe large-scale formations such as the Yangtze River Delta and the Pearl River Delta. Notably, the term "urban agglomeration" has become particularly prevalent in Chinese academic discourse.

However, the spatial scales implied by these terms differ considerably across countries. For example, the U.S. Census Bureau defines an "urban cluster" as a settlement with a population between 2,500 and 50,000 residents, which differs significantly from the usage of "urban cluster" within the Chinese academic community. Likewise, although the term "urban agglomeration" is used in both Western and Chinese contexts, the spatial scale in European and American usage is typically much smaller than the formations that Gottmann described as megalopolises.

In 2010, when revising urban area criteria, the U.S. Census Bureau consulted 65 experts regarding possible population thresholds. Among them, six suggested a threshold of one million residents, thirty supported a threshold of 250,000, and eleven advocated retaining the 2000 standard. Ultimately, the 2000 definition was maintained, defining an urbanised area as having more than 50,000 residents (U.S. Census Bureau 2011). This example illustrates the absence of unified standards even within a single national context.

Concepts	Geospatial Examples	Some Representative Experts
"Megalopolis" or "Metropolitan system" or "Biggest urban cluster	Northeast, USA Great Lakes, USA England, UK Northwestern Europe (from Amsterdam to the Ruhr area and to Northwestern France) Tokaido, Japan Urban constellation centred on Shanghai, China	Jean GOTTMANN
Metropolis-like cluster	Smaller than megalopolis	Jean GOTTMANN
Megalopolis	Pearl River Delta, China Beijing – Tianjin – Hebei, China Yangtze River Middle, China Chengdu – Chongqing, China Mexico City, Mexico	Minda MA Alejandro VELAZQUEZ
Metropolitan interlocking region	Yangtze River Delta, China Pearl River Delta, China	Yixing ZHOU Peter RIMMER
Extended metropolitan region	Pearl River Delta, China Lower Yangtze Valley, China	Victor Fung SHUEN SIT Norton GINSBURG
"Metropolitan area" or "Metropolitan region"	Tokyo, Japan Osaka, Japan Nagoya, Japan Yantze River Delta, China	Arthur GETIS Jun ZHOU
"Megapolitan area" or "Megapolitan region"	Northeast, USA Midwest, USA Yangtze River Delta, China Pearl River delta, China	Robert LANG Ranhao SUN
Metropolitan cluster	Great Lakes, USA Northeast, USA Mountain, USA Yangtze River Delta, China	Arthur NELSON Dou YIN
Megaregion	Northeast, USA Great Lakes, USA Texas Triangle, USA Yangtze River Delta, China Pearl River Delta, China Beijing – Tianjin – Hebei, China	Yoav HAGLER Yanning GUAN
Mega-urban region	Johor – Singapore – Riau Growth Triangle Kuala Lumpur – Klang Valley, Malaysia Bangkok, Thailand Metro Manila Mega Region, Philippines Yangtze River Delta, China Pearl River Delta, China Beijing – Tianjin – Hebei, China	Terry MCGEE Pak Shing YEUNG

Concepts	Geospatial Examples	Some Representative Experts
Mega-city region	Paris Basin, France Rhine-Main-Region, Germany South East England, UK Yangtze River Delta, China Pearl River Delta, China Lanzhou – Xining, China	Peter Hall Anthony Gar-On Yeh
Megacity cluster	Yangtze River Delta, China Pearl River Delta, China Beijing – Tianjin – Hebei, China	Run Liu Dan Narita
City cluster	Yangtze River Delta, China Pearl River Delta, China Beijing – Tianjin – Hebei, China Central Yunnan, China Okyo-Kyoto, Japan Guangdong – Hong Kong, China Singapore – Johor Bahru – Bintan	Xueliang Zhang KyeongAe Choe
City belt	Yangtze River Delta, China North of Zurich, Switzerland	Zhong Zhong Hansruedi Hitz
Urban cluster	Lower Yangtze River Valley, China Pearl River Delta, China Beijing – Tianjin – Hebei, China Chengdu – Chongqing, China London, UK Île-de-France, France	Yunfeng Hu Vassilis Tselios
Urban agglomeration	Yangtze River Delta, China Pearl River Delta, China Beijing – Tianjin – Hebei, China Tianshan Montains Northern Slopes, China Franche-Comté Region, France Besançon, France	Chuanglin Fang Pierre Frankhauser
Conurbation	Yangtze River Delta, China Addis Ababa, Ethiopia	Lingqiang Zhou Fekadu Kassa
"Economic circle" or "Economic zone"	Yangtze River Delta, China Pearl River Delta, China Beijing – Tianjin – Hebei, China Chengdu – Chongqing, China Tirana – Durres, Albania	Mengyao Han Chunchi Ma Kriselda Sulcaj Gura

Table 1: Different concepts related to MMLC (Megalopolis and Megalopolis-like cluster). Own compilation.

The divergence between American and Chinese understandings of "urban agglomeration" further underscores the extent of conceptual inconsistency.

In summary, the numerous terms associated with MMLC have all been influenced, directly or indirectly, by GOTTMANN's original formulation. However, their English designations do not share identical connotations, and their practical applications vary significantly. The result is a persistent state of logical confusion. It becomes exceedingly difficult to assert that any given concept must correspond to a specific and universally accepted set of criteria. Instead, interpretations are often shaped by disciplinary orientation, methodological preference, and regional context, leading to a conceptual paradox at the theoretical level.

Uncertain Geographical Spaces

The conceptual confusion surrounding MMLC is directly reflected in the instability of their corresponding geographical spaces. Ambiguity at the level of terminology inevitably manifests as divergence in spatial delineation. GOTTMANN once analysed the evolutionary trajectory of the megalopolis and divided it into four developmental stages: isolation and dispersion, formation of an urban system, embryonic megalopolis, and mature megalopolis (GOTTMANN 1987). This framework implies that a megalopolis does not emerge instantaneously; rather, it is the outcome of socio-economic development reaching a particular stage across multiple cities.

In 1976, GOTTMANN speculated that, beyond the six megalopolises he had identified worldwide, three additional cases might soon emerge: the Rio de Janeiro–São Paulo complex in Brazil, the northern Italian triangle centred on Milan–Turin–Genoa, and the California corridor extending from Los Angeles to the San Francisco Bay Area (GOTTMANN 1976). However, he could not precisely determine how many megalopolises would ultimately exist globally, nor could he define their definitive geographical boundaries. His conclusions were necessarily probabilistic and inferential. In subsequent research, an increasing number of regions have been classified as MMLC. For example, some scholars consider Beijing–Tianjin–Hebei, the Yangtze River Delta, the Pearl River Delta, the Middle Reaches of the Yangtze River, and the Chengdu–Chongqing region in China to be megalopolises (MA et al. 2022). VELAZQUEZ (2025) regarded Mexico City as a megalopolis in the State of Mexico.

Furthermore, certain concepts were initially limited to specific regional contexts but were later generalised. For instance, the term "mega-urban region" originally referred to distinctive urbanisation patterns observed in ASEAN countries, including the Johor–Singapore–Riau Growth Triangle, Kuala Lumpur–Klang Valley, the Bangkok region, Metro Manila, Jabotabek, and Bandung (MCGEE and ROBINSON 1995). Similarly, the concept of the "mega-city region" was first applied primarily in Northwestern Europe, where HALL and PAIN (2006) identified eight such regions, including the Paris Basin, Rhine–Main, and South East England. Over time, however, these concepts were extended to other countries and continents, thereby broadening their spatial applicability.

Even within a single country, there is no consensus regarding the number or spatial scope of MMLC. In the United States, according to criteria proposed for defining "megapolitan areas," it has been projected that by 2050 there could be as many as ten such areas,

including the Midwest, Northeast, Piedmont, and others (Lang and Dhavale 2005). Nelson and Lang (2011), by contrast, identified two megapolitan areas and eight megapolitan clusters, such as the Sierra Pacific megapolitan area, the Twin Cities megapolitan area, the Great Lakes megapolitan cluster, and the Northeast U.S. megapolitan cluster. Additionally, the "America 2050" strategic spatial framework proposed by the Regional Plan Association identified eleven megaregions in the United States, including the Great Lakes and Northeast regions originally described by Gottmann (Hagler 2009). These varying classifications illustrate how different methodological approaches yield divergent spatial outcomes.

Population scale further complicates the issue. Papaioannou (1998) argued that with technological advancement and economic transformation, both megacities and megalopolises exhibit unstable population thresholds. He suggested that megacities may contain populations of around ten million, while megalopolises may exceed one hundred million inhabitants. Such expansionary logic increases the uncertainty of MMLC classification and intensifies disagreement among scholars, research institutions, and governmental agencies regarding spatial boundaries. Nevertheless, a common tendency persists: MMLC are generally used to describe regions with relatively high levels of socio-economic development or strong development potential. Even so, it remains difficult to determine precisely how many MMLC exist globally.

The ambiguity is particularly evident in China, where planning and policy discourses place strong emphasis on MMLC development. In 2021, the National People's Congress approved the 14th Five-Year Plan and the Long-Range Objectives Through 2035, which emphasised the optimisation, upgrading, and cultivation of 19 urban clusters nationwide. Yet substantial academic debate persists regarding how many MMLC actually exist in China. Zhou (1991) proposed that China had only two metropolitan interlocking regions: the Yangtze River Delta and the Pearl River Delta. Other scholars identified nine urban clusters, including the Pearl River Delta, the Middle Yangtze River Valley, the Lower Yangtze River Valley, and Beijing–Tianjin–Hebei (Zhang et al. 2012). Still others suggested that China has five megalopolises – Beijing–Tianjin–Hebei, the Yangtze River Delta, the Pearl River Delta, the Middle Reaches of the Yangtze River, and Chengdu–Chongqing (Ma et al. 2022). Alternatively, based on government planning documents, Yeh and Chen (2020) identified 19 mega-city regions. These divergent interpretations reveal the absence of a stable national consensus.

Even when the same term is employed, the spatial scope it denotes may vary considerably. Chinese scholars frequently use the term "urban agglomeration" to describe MMLC, yet the number and classification differ substantially across studies. Fang and Yu (2017; 2020), for example, proposed a "5+9+6" framework consisting of five national-level urban agglomerations, nine regional urban agglomerations to be cultivated, and six smaller local agglomerations to be guided in development. By contrast, Gao et al. (2017) argued that only five national-level urban agglomerations should be recognised, contending that existing strategic plans significantly exaggerate both the number and spatial extent of such formations. These discrepancies demonstrate that controversy is not incidental but structural.

In practice, the spatial boundaries of specific MMLC are frequently adjusted over time. The Yangtze River Delta provides a representative example. In 2010, following approval by the State Council, the National Development and Reform Commission issued the "Yangtze River Delta Regional Plan," which encompassed 16 cities, including Shanghai, Nanjing, Suzhou, Wuxi, Hangzhou, Ningbo, and others. In 2016, the "Development Plan for the Yangtze River Delta" expanded the region to 26 cities, incorporating additional municipalities such as Hefei, Wuhu, and Yancheng. In 2019, the "Outline of the Development Plan for Regional Integration in the Yangtze River Delta" further expanded the scope to 27 cities with the inclusion of Wenzhou. This pattern of progressive expansion illustrates the fluidity of spatial delineation in response to policy priorities and development strategies. Similar phenomena can be observed in many other cases.

Clearly, the geographical scope of "Megalopolis and Megalopolis-like Cluster" (MMLC) remains highly uncertain. Although urban expansion may generate new forms of spatial connectivity rather than discrete separations (LANG and KNOX 2011), the configuration before and after expansion is not directly comparable. Changes in boundary definition involve not only adjustments in territorial coverage but also transformations in spatial structure and regional differentiation. Consequently, the geographical space of MMLC is not a stable container but a dynamic and continually redefined construct.

Non-Organic Whole

Under conditions of chaotic concepts and uncertain geographical space, MMLC is not a natural organism but rather the result of subjective human judgment. Within an MMLC, different geographical spatial units do not necessarily experience prosperity or decline simultaneously. In other words, the various geographic units that constitute an MMLC are not inherently or consistently closely connected. GOTTMANN (1976) proposed that the concept of the megalopolis applies to very large polynuclear urbanised systems endowed with sufficient continuity and internal interconnections. By contrast, for any MMLC characterised by different scales and levels of development, it does not form a complete whole, let alone an organic one. This remains true even for a megalopolis, which is often regarded as having evolved into a higher-order state.

For example, PLATT pointed out that the megalopolis is essentially a semantic and graphical concept representing a vast collection of political units that have little in common and may not significantly care about one another. The Boston–Washington megalopolis in the United States ("BosWash") is physically fragmented by watersheds and mountains, economically divided between rich and poor areas, and culturally differentiated by newspaper circulation patterns, political ideologies, religious traditions, and vernacular cuisines. According to PLATT (2010), the internal differences appear to outweigh those forces that bind it into a single entity. In other words, any MMLC is itself a fragmented geographical space. Indeed, this remains the case for all MMLC formations.

Therefore, the so-called MMLC does not constitute a fully integrated cluster with converging interests. These super-regions typically exist in a relatively loose structural state.

For example, the commonly referenced Beijing–Tianjin–Hebei region is described as a loosely defined area (Gao et al. 2017). Despite ongoing regional integration efforts and peripheral development strategies, issues of spatial exclusion and core–periphery structures persist in the Yangtze River Delta (Qin et al. 2023). Even when delineated by national governments, future development continues to face distinctive challenges, including fragmented jurisdictions, socio-spatial inequality, and environmental externalities (Yeh and Chen 2020). Other related MMLC also generally have similar problems.

Such conditions inevitably generate paradoxical tensions among different stakeholders. Certainly, an MMLC is composed of multiple cities, numerous townships, and countless villages; therefore, it does not constitute a single "super city" or a unified large city in a literal sense. Different cities, as well as different districts (counties) and towns, remain independent geographical spaces within the MMLC. These geographic units may engage in cooperative collaboration or, alternatively, intense competition. For example, there may be fierce competition for political performance achievements within MMLC contexts. In addition, different industries and various organisations involve distinct stakeholders. Even within the same occupational category, different units maintain divergent interests. Furthermore, differentiation persists even within a single organisational unit.

At the micro level, individuals of different ages, identities, and social positions experience varying degrees of benefit. Consequently, no policy measure or public service within an MMLC can produce identical effects for all stakeholders. Some policies may prove useful or even highly beneficial for certain groups, yet it is difficult to ensure that they generate comparable advantages for others.

Ultimately, various groups or sub-clusters will emerge within an MMLC. In any MMLC, the diverse and evolving relationships among stakeholders render social dynamics increasingly complex and variable, including shifting boundaries, divisions, alliances, struggles, and processes of selective survival. Where the total volume of available benefits is limited, some actors will gain more while others receive less; indeed, not everyone benefits. For those who successfully obtain advantages, life within an MMLC may represent a highly favourable experience. However, for those who do not benefit, the outcome may be far less positive.

In order to provide geographic spaces at different scales with more effective mechanisms for collaboration within an MMLC, coordinated development and spatial integration have attracted significant attention. In theory, MMLC can be constructed as a new form of spatial organisation capable of promoting coordinated regional development (Li et al. 2022). However, the integrated development characteristics of MMLC do not emerge naturally. Rather, they must be continuously emphasised through deliberate policy design and supported by effective intervention measures, which are inherently difficult to implement.

In other words, any MMLC can be further subdivided into multiple relatively unrelated geographic spaces. Geographic space is not homogeneous, and individuals cannot all function as harmonious partners. Ultimately, every MMLC will continue to differentiate into various groups or clusters, rather than forming a completely unified geospatial entity.

3 Discussions on the Causes of Controversial Issues

No Unified Standard for MMLC

At present, there is no unified conclusion regarding the standards for measuring MMLC. Typically, each study employs its own evaluation indicators, reflecting a strong degree of initiative and subjectivity. Consequently, this inevitably leads to conceptual confusion and divergence in the delineation of geographic space. GOTTMANN never standardised the criteria for defining MMLC in the course of his extensive research. By 1987, he had only systematically analysed characteristics of the megalopolis such as industrial structure, population size, labour force composition, land use, and transportation infrastructure. He described features including a core composed of several metropolitan areas, surrounding areas with strong socio-economic linkages to those metropolitan centres, a residential population exceeding 25 million, relatively high average densities of more than 250 persons per square kilometer, at least one-fifth of the national population concentrated within the region, and highways, railroads, waterways, telephone lines, pipelines, water supply, and sewage systems crisscrossing the entire area (GOTTMANN 1976; GOTTMANN 1987).

However, the 2000 census data indicated that the population of the Northeast megalopolis and the Great Lakes megalopolis in the United States accounted for only 17.68 percent and 19.18 percent of the national population, respectively. By 2025, the population shares of both megalopolises are projected to decline to around 17 percent (HAGLER 2009). This empirical reality deviates significantly from GOTTMANN's earlier prediction that the growth of the megalopolis throughout its history would be more rapid and continuous than that of many other urban areas (GOTTMANN 1957).

Moreover, with the advancement of urbanisation, improvements in infrastructure, and socio-economic development, an increasing number of regions worldwide have exceeded or diverged from GOTTMANN's original standards. As a result, more regions can potentially be categorised as MMLC. With the expansion of mega-cities in ASEAN countries beyond national borders and the establishment of new towns, industrial zones, and housing projects in formerly rural areas, household incomes and employment opportunities have increased. At the same time, however, environmental protection issues, land-use conflicts, and inadequate housing and services have emerged. Under such circumstances, the concept of the mega-urban region was proposed (MCGEE and ROBINSON 1995). Similarly, HALL and PAIN (2006) used indicators such as development around one or more global cities, the clustering of cities and towns, and physical separation combined with intensive networking within a complex spatial division of labour to delineate the mega-city region in Northwestern Europe.

Some experts and scholars in the United States have argued that MMLC are based on metropolitan areas and that new MMLC emerge through the extension and integration of adjacent metropolitan areas. As SHORT (2009) contends, these neighbouring metropolitan areas may be defined as a megalopolis. The U.S. Census Bureau has proposed as many as ten criteria for defining megapolitan areas, two of which emphasise the presence of at least two metropolitan areas and contiguous metropolitan and micropolitan areas (LANG and DHAVALE

2005). Another view holds that a megapolitan cluster is larger than a megapolitan area and must contain two or more key anchor urban cores (Nelson and Lang 2011). In addition, the Regional Planning Association in the United States has developed five county-level criteria to define megaregions, including core basic statistical areas, population density, population growth rate, total population, and employment growth rate (Hagler 2009).

A relatively common approach to defining MMLC relies on combinations of economic and social indicators. However, the specific indicators selected vary considerably across studies, and their selection is often shaped by subjective preferences. For example, Zhou (1991) identified metropolitan interlocking regions using indicators such as cities with populations exceeding one million, foreign ports, convenient transportation routes, dense populations, and strong economic linkages between urban and rural areas, concluding that the Yangtze River Delta and the Pearl River Delta met these criteria. Sit (1996) regarded the Pearl River Delta as an extended metropolitan region, characterising it as an exo-urbanisation region driven by foreign investment and rapid urbanisation.

Similarly, Zhang et al. (2012) selected transportation accessibility and eight additional indicators – including the number of cities, area, population density, urbanisation rate, per capita GDP, economic density, total population, and economic type – to measure urban clusters, identifying a total of nine such clusters. Fang and Yu (2017), Fang (2019), and Fang and Yu (2020) applied ten indicators to define urban agglomerations, identifying 20 urban agglomerations. These indicators included the number of cities and total urban population, total population volume, urbanisation level, economic density, the share of non-agricultural GDP, GDP per capita, total economic output of the central city, transportation conditions and commuting time, outward economic orientation, and cultural similarity. From the perspective of the mature stage of the pole–axis urban system, Gao et al. (2017) defined central cities, assessed the completeness of the urban system and socio-economic relationships, and evaluated the evolutionary stage of the urban system, concluding that China possesses five urban agglomerations.

In addition, more advanced methodological approaches have been employed. For example, complex fractal measurement techniques combined with digital mapping were used to define urban agglomerations in the Franche-Comté region and Besançon (Frankhauser 1998). High-technology methods have also been introduced. Remote sensing technologies have been applied to delineate spatial extents (Day et al. 2017), and nighttime light data from defense meteorological satellites have been used to identify urban clusters in London and Île-de-France (Tselios and Stathakis 2020).

Other scholars base their work directly on national policies and governmental planning documents. For instance, Yeh and Chen (2020) identified 19 mega-city regions based on China's 13th Five-Year Plan (2016–2020). Gura et al. (2023) analysed the Tirana–Durres economic zone using territorial planning strategies. Wan et al. (2024) examined the Chengdu–Chongqing twin-city economic circle.

Some experts and scholars do not provide strict or quantifiable criteria but instead use more flexible academic designations. For example, Ma et al. (2022) directly referred to Beijing–Tianjin–Hebei, the Yangtze River Delta, the Pearl River Delta, the Middle Reaches

of the Yangtze River, and Chengdu–Chongqing as megalopolises without specifying detailed criteria. Similarly, VELAZQUEZ et al. (2025) discussed the megalopolis of Mexico City; ZHOU and WU (2000) described the conurbation of the Yangtze River Delta; WAN et al. (2013) referred to the city belt of the Yangtze River Delta; HU et al. (2024) pointed out megacity clusters such as Yangtze River Delta, the Beijing–Tianjin–Hebei, and the Pearl River Delta; and GUO et al. (2020) examined economic zones such as Beijing–Tianjin–Hebei, the Yangtze River Delta, and the Pearl River Delta.

Evidently, substantial gaps exist among the various approaches used to define MMLC. The scientific results derived from these approaches can only be justified within specific analytical frameworks or regarded as reference points, but they inevitably remain subject to disagreement. In other words, definitional standards are often flexibly interpreted in accordance with researchers' professional orientations and methodological preferences.

Lack of Precision in Research on MMLC

Given the absence of a unified standard for defining Megalopolis and Megalopolis-like Cluster (MMLC), research in this field often reflects strong subjective perspectives, and consequently, research findings inevitably diverge. As WEBER (2001) notes, seemingly straightforward defining metrics – such as population size, area, behavioural characteristics, economic indicators, or commuting patterns – are not truly precise. Furthermore, MMLC are continuously evolving and transforming, which inherently complicates efforts to define them accurately.

GOTTMANN (1957) once observed that urban and suburban territories were expanding rapidly in the United States, and that without such expansion, a vast area such as the megalopolis would not have emerged. However, he was unable to determine precisely how large the megalopolis might ultimately become, nor could he clearly define its boundaries, let alone fully explain the dynamic mechanisms underlying its expansion. His observations were based on limited temporal perspectives, allowing him only to identify broad trends in land expansion and to infer possible developmental trajectories.

In practice, MMLC frequently evolve beyond prior expectations. For example, case studies of eleven megaregions (MMLC), including the Northeast United States and the Great Lakes region, indicate that economic fields do not fully correspond to the officially demarcated megaregions. TÓTH and KINCSES (2023) argue that the concept of the megaregion should be reconsidered in order to align more closely with actual spatial economic landscapes. Nevertheless, no study has been able to definitively determine the ideal or optimal spatial structure of such regions.

Moreover, a growing body of research shows that regional population decline has become increasingly widespread across many countries, posing significant challenges for the development of MMLC. In recent decades, shrinking cities have appeared worldwide, characterised by substantial population loss, economic stagnation, and deterioration in spatial quality. Cities experiencing population contraction are primarily located in Europe, East Asia, and the Northeastern United States, with China containing the largest number of shrinking cities

(Meng et al. 2021). From iconic cases such as Detroit in the Great Lakes region of the United States to small villages in Japan, population loss often occurs in unexpected locations and more frequently than previously assumed (Luescher and Shetty 2013).

Although China remains in a stage of rapid urbanisation, the future trajectory of urban development is difficult to predict, especially in the context of the new urbanisation strategy and rural revitalisation strategy. Since 2022, China has experienced continuous negative population growth, and the reality of demographic decline has become increasingly evident. Under such circumstances, MMLC will inevitably be affected by depopulation pressures.

In addition, factors such as technological upgrading, shifts in the international geopolitical environment, national strategic adjustments, natural disasters, accidents, and resource and environmental constraints may pose substantial risks to the healthy development of MMLC. The excessive concentration of production and living factors within MMLC has generated massive volumes, high densities, and complex spatial configurations, making it more difficult to obtain accurate and reliable data and to capture meaningful details. This complexity not only increases potential risks and hidden dangers but also raises the difficulty of effective regional cooperation and hinders efforts to reduce regional disparities.

Furthermore, the spatial scale of MMLC is extensive, and disparities in natural and human geographic conditions, socio-economic development levels, and cultural backgrounds are inevitable among constituent regions. These differences make it extremely challenging to establish universally applicable definitional criteria. When multiple factors are superimposed, variations in research focus inevitably lead to divergent problem identification and differing expectations regarding outcomes. In short, research findings often generate controversy rather than achieving logical consensus.

Various Barriers in MMLC

The existence of multiple barriers renders the geographic space of MMLC incomplete and obstructs their capacity to form an organic whole. Gottmann (1957) viewed MMLC from a relatively optimistic perspective and suggested that different states within a megalopolis might be more integrated in daily life than they were with more distant areas within the same "Commonwealth." In contrast, numerous studies have demonstrated that a variety of barriers persist within MMLC.

The scale of MMLC itself is not inherently problematic; rather, friction arises in the context of shared urban governance at large scales. Such barriers include transaction costs, the absence of a clear regional identity, the lack of a common formal institutional framework, and the reluctance of narrowly defined institutions to relinquish authority over cross-boundary issues. Additional structural obstacles include fragmentation, inequality, anti-metropolitan sentiment, racial segregation, urban–rural divides, and other related challenges (Davidson 2023).

Moreover, ambitious growth trajectories are constrained by material scarcity, climatic conditions, circadian rhythms, and the spatial dispersion of resources and labour. At the global scale, planetary urbanisation aimed at integration is limited by constraints related

to social interaction, cultural preferences, and political-administrative structures (GOMEZ 2017). Natural environmental hazards also present significant risks. For example, aging infrastructure in the Northeast U.S. megalopolis is highly vulnerable to climate-related hazards (POURMOKHTARIANET al. 2022).

Other forms of socio-economic risk also exist. Research indicates that proximity to casinos in the Northeastern United States may generate gambling-related problems, negative socio-economic consequences, and even increased crime within urban communities. The primary beneficiaries of such developments are legislators, community workers, social service professionals, academics, and the casino-gambling industry (O'GILVIE 2022).

In summary, the megalopolis in the Northeast United States faces a wide range of mobility, climate, economic, and social challenges (YARO 2021). Despite its abundant natural resources, well-developed transportation networks, and the prominence and vitality of its major cities, the Northeast has been losing competitive advantage relative to other regions within the nation and globally (YARO and CARBONELL 2017).

At the global level, there is no universal formula for achieving smooth regional integration. Relevant studies indicate that local protectionism and enclave phenomena are unavoidable within MMLC. In the case of foreign minorities, municipalities within a megalopolis often must adjust policies to accommodate and integrate immigrant populations (ROZANOVA 2014). Furthermore, significant cultural gaps may exist between traditional cultures and the culture associated with the megalopolis. Research suggests that traditional societies may resist or reject megalopolitan cultural forms (PROROKOVIĆ 2015).

Because cultures are inherently pluralistic, it is difficult to assert that a unified cultural identity has been achieved within MMLC. Ensuring a high degree of consistency in people's values and perspectives is inherently challenging. Consequently, experiences of MMLC vary widely: some individuals perceive them as spaces of opportunity and prosperity, while others encounter marginalisation or disadvantage, giving rise to a series of paradoxical tensions.

Even leading experts and scholars in MMLC research maintain distinct subjective perspectives. Although such views may represent minority positions, unanimous academic consensus is unlikely to be achieved. Disagreements regarding conceptualisation, definitional methods, and spatial evolution are inevitable. Nevertheless, even intense academic debate does not necessarily lead to serious negative consequences. The phenomenon of diverse schools of thought has long characterised the social sciences. Therefore, it is neither possible nor appropriate to render simplistic judgments about who is entirely correct or incorrect.

4 Reflections on Ways for Dealing with Controversial Issues

Fully Recognise the Ambiguity of Naming Forms Related to MMLC

MMLC is not a purely natural phenomenon; it is inevitably influenced by human intervention, and no one can accurately predict its development or future transformations. There-

fore, regardless of which subjective standard is adopted, it is difficult to derive a fully accurate and universally reliable geospatial law. This situation gives rise to controversial issues, particularly the ambiguity reflected in chaotic concepts and uncertain geographical spaces.

The understanding and application of related concepts vary across historical periods, research institutions, and individual scholars. In the process of employing different conceptual terms, professionals often seek similarities and differences among them in order to articulate their own distinctive perspectives. While the introduction of a new terminology may serve as a shortcut to theoretical innovation, it also contributes to increasing conceptual complexity. Since the emergence of theories related to MMLC, numerous associated terms have appeared, and the absence of unified standards has intensified ambiguity in both conceptualisation and empirical research. Consequently, the practical significance and developmental trajectory of this special geographical phenomenon frequently become subjects of controversy. Ultimately, such ambiguity may lead to logical tensions and a perceived lack of scientific precision. Therefore, it is essential to fully acknowledge that the naming of the megalopolis and related forms is characterised by flexibility and uncertainty – that is, inherent ambiguity. In the field of social sciences, similar ambiguities are often seen.

Although it is difficult to prove that this ambiguity represents subjective error within academia, there is also insufficient evidence to conclude that it results solely from inaccurate understanding of the concept's connotation. Nor can it be definitively determined whether misunderstandings arise from translation discrepancies in professional terminology across domestic and international contexts. At the very least, however, it can be stated that these concepts function as ambiguous naming forms for a particular type of a geographical phenomenon.

In theory, an MMLC should not be the product of forced administrative consolidation; rather, it should emerge as a designation when production and living factors have developed to a sufficiently advanced stage. MMLC represent distinctive geographical phenomena with unique attributes. After all, no one would casually label a small town as an MMLC. At the same time, MMLC are not entirely the result of spontaneous self-organisation, just as roads do not form naturally without human intervention. Their formation is always subject to human constraints and institutional arrangements. However, once subjective human intervention becomes significant, it becomes difficult to maintain unified concepts, stable geographical spaces, or consistent standard-setting methods. As a result, considerable ambiguity persists in related academic research.

Dynamically Viewing the Development and Changes of MMLC

In addition to the proliferation and evolution of related concepts, MMLC themselves continue to transform alongside economic and social development. They do not possess fixed or immutable geographical spaces. Historically, MMLC have not existed continuously. For example, before European colonisation in North America, there were no large cities in what later became the United States for extended periods. After the founding of the United

States in 1776, centuries of industrialisation and urbanisation were required before the Boston–Washington megalopolis identified by GOTTMANN emerged.

Similarly, the development of Tokyo originated from Edo Castle in the 1550s; prior to that, the area was merely a small fishing village. The Pearl River Delta in China, once geographically isolated by high mountains, had historically served as a remote frontier and even a place of exile. It was not until the Ming and Qing dynasties that gradual development occurred. Shanghai likewise rose during the Ming Dynasty. In particular, following China's reform and opening-up policies and the establishment of special economic zones, these regions experienced rapid growth. All of these developments represent outcomes of industrialisation and urbanisation reaching particular historical stages.

As socio-economic development advances and urbanisation levels increase, the phenomenon of MMLC emerges in response to contemporary needs. Throughout the development process, whether characterised by relative agglomeration or relative diffusion, changes involve not only the physical evolution of geographical space but also transformations in socio-economic indicators. Although the development of MMLC may appear to correspond to the collective advancement of multiple cities, in reality it is closely tied to the trajectory of individual cities, especially central cities that often play leading roles in shaping regional dynamics. Furthermore, the rise or decline of any city is influenced by broader national socio-economic conditions as well as macro-level policy interventions.

The evolution of MMLC is marked by spatial irregularity and uncertainty regarding future directions. Development plans – whether at the level of MMLC, individual cities, or even individuals – are often only partially realised. That is, they tend to fulfill certain expectations while leaving others unmet. They may solve some practical problems while generating new ones. Similar patterns can be observed in various social organisations and urban–rural development plans. Therefore, any MMLC composed of countless individuals and multiple urban–rural areas will inevitably confront complex and interrelated challenges. In practice, the realities of development are rarely as straightforward or feasible as theoretical expectations suggest.

Distinguish Between Different Geographic Spatial Units in MMLC

At present, the geographical space of MMLC does not exhibit a unified or stable pattern. Because the spatial configuration of an MMLC is not fixed, and because different geospatial units within it do not necessarily constitute an organic whole, it is necessary to adjust boundaries dynamically according to practical circumstances. Such adjustments allow the geographical scope to better reflect actual developmental conditions. Strictly speaking, no MMLC forms a permanently fixed or complete group.

On the one hand, significant population mobility and factor flows constantly occur between MMLC and external regions, including the movement of labour, capital, and other production and living factors. On the other hand, within the context of global value chains, national cultural self-confidence, and localisation processes, MMLC must balance

local protection, regional integration, and international coordination. These trade-offs add complexity that extends beyond purely geographical considerations.

Then, any MMLC, composed of different cities, villages, industries, cohorts, and individuals, may not represent a truly unified collective entity. Rather, it can be viewed as an idealised spatial designation assigned by external observers. In this sense, MMLC function as speculative constructs within spatial planning discourse rather than as definitive explanations of underlying social reality. Within any MMLC, people and events cannot simply be merged into a single category; different actors and activities belong to different levels and forms of grouping.

Therefore, MMLC do not determine all common functions of cities or villages within the same geographic space, nor do they fully define the nature of interactions among them. Although MMLC aim to incorporate multiple individuals and sub-groups within a single framework, geospatial reasoning may sometimes be overly generalised or simplified. Under the influence of diverse individuals and groups operating at multiple levels, MMLC remain relatively vague frameworks – indeed, more ambiguous than the definition of a specific social group.

Even within a single city, substantial group disparities exist. For example, contrasts may be observed between central urban populations and suburban or rural residents; between law-abiding citizens and criminal organisations; between high-income groups and low-income groups; between healthy individuals and those facing illness; between law enforcement agencies and those subject to enforcement; between insiders within institutional systems and those outside them; between migrant populations and long-term local residents; and between distinct ethnic minorities and majority populations.

It is evident that MMLC do not constitute harmonious and homogeneous spaces. Instead, they function as relatively vague and idealised frameworks composed of diverse cities, villages, groups, and individuals. It remains unclear whether removing a specific geographic unit would necessarily disqualify a region from being considered an MMLC. Similarly, it cannot be conclusively verified that adding a specific spatial unit would automatically qualify it as such. For many spatial units that do not occupy central positions, their inclusion or exclusion may have limited impact on the overall structure. Therefore, within MMLC, it is essential to recognise the substantive differences among geospatial units and to evaluate them based on actual developmental conditions, rather than assuming that all units possess equal significance or desirability.

5 Conclusion

In the course of academic discussions among experts and scholars worldwide, the proliferation of similar terms related to Megalopolis and Megalopolis-like Cluster (MMLC) has generated considerable confusion. At present, a situation has emerged in which numerous related concepts coexist simultaneously within academic discourse. Fundamentally speaking, however, aside from the presence of central cities, any MMLC is composed of multiple cities, towns, villages, nature reserves, and undeveloped areas,

incorporating countless interest groups and individuals and involving diverse elements of production and everyday life. Within any MMLC, changes occurring in a single city, the transformation of a particular interest group, or shifts in specific production or living factors may contribute to broader regional changes, leading either to expansion or contraction. In short, MMLC encompass highly complex regional categories, and the geographical phenomenon they represent should be understood as a multidimensional and dynamic spatial system.

Within any MMLC, numerous groups and individuals coexist at different hierarchical levels. Significant barriers exist that hinder the integration of these diverse levels into a cohesive and unified collective. Differences in location, wealth, social status, access to resources, and life trajectories all reflect varying degrees of social and spatial distance. The phenomenon commonly described as "birds of a feather flock together" persists in such contexts, reinforcing internal segmentation. From the perspective of individual agency and differentiation, individuals possess both the possibility of joining certain groups and the possibility of leaving them. Consequently, stable and permanent group structures cannot be assumed within a city, let alone within a large and complex MMLC.

Internally, an MMLC may be subdivided into multiple geographic spatial units according to different zoning or classification methods. These units may include cities, districts (counties), townships, streets, communities, villages, or even individuals as the smallest units when viewed through administrative or analytical frameworks. When a number of such sub-geospatial units collectively constitute an MMLC, their relationships may vary considerably. Some units may exert profound mutual influence, while others may remain relatively isolated and demonstrate limited interaction, forming patterns that resemble an incomplete or unstable system.

The coexistence of similarity and difference in these relational patterns suggests an alternative logical framework for observing MMLC objectively. Accordingly, this relationship may be expressed conceptually as follows:

$$f_j(x_1, x_2, \ldots x_i) \begin{matrix} \neq \\ = \end{matrix} \frac{dx_i}{dt}$$

where the set ($x_1, x_2, \ldots x_i$) represents the overall geospatial space composed of multi-level spatial units, such as an MMLC. Each x_i denotes the *i-th* geospatial unit according to a specific hierarchical division, such as districts (counties), townships, streets, or individuals. The variable t represents time. Considering that certain geospatial units exert mutual influence and may even affect the overall spatial configuration, while other relatively isolated units may not exert comparable influence, both the equality sign (=) and inequality sign (≠) can be employed to symbolically represent similarities and differences in relational influence. In essence, within geospatial planning activities, the overall spatial space composed of multiple hierarchical units selected by planners or researchers may not always function as a fully integrated and complete system. Therefore, accurately defining the geographical scope of MMLC remains a topic deserving sustained and in-depth theoretical reflection.

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