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Dominant discourses framing the reuse of industrial heritage in the context of mega-events: a relationship matrix approach

Florence Graezer Bideau[1]* , Huishu Deng[2] and Helena Roux[2]

Abstract

The reuse of industrial heritage sites has become increasingly prevalent in the context of hosting mega-events. This paper aims to investigate this trend, specifically in the context of Olympic Games or World Expos, and its impact on urban regeneration strategies. It introduces a methodological tool, namely, the relationship matrix, to identify key factors from 'best practices' criteria for managing industrial sites and planning mega-event legacies. We use this matrix to address two research objectives, namely, to determine the role of industrial heritage reuse in mega-event urban projects and to evaluate whether this creates a favourable environment for place-making. This matrix enables us to compare and analyse the Shanghai 2010 World Expo and the London 2012 Summer Olympic Games as illustrative case studies. While guidelines and strategies for mega-events and industrial heritage have evolved towards a pro-active people-centred approach, our findings still reveal a bias towards material renewal in dominant discourses during the planning phase. This bias often overlooks or even excludes the memories and experiences of local communities.

Keywords Industrial heritage, Best practices, Mega-event legacy, Dominant discourse, People-centred approach, Relationship matrix

1 Introduction

This paper explores the links between cultural heritage, industrial heritage and mega-events.[1] The impact of mega-events on urban revitalisation has already been discussed by scholars (Gold and Gold 2008; Roche 2000; Kassens-Noor et al. 2015), as has the shift in favour of the existing environment over new buildings and infrastructure in cities with rich heritage (Jones and Ponzini 2018). This stream of literature focuses mainly on historical city centres but overlooks outlying areas and industrial heritage. However, if we look at the last few editions of the Olympic Games over the past thirty years, we can see that they involved industrial sites that needed to be renovated, requalified, or rebuilt. These editions provided opportunities for cities to address industrial brownfields, and there was an evolution in how these sites were enhanced and valued from 1992 to 2022. Barcelona (1992) has been praised for the requalification of its Docklands (Kennett and Moragas 2006), although industrial heritage was not integrated into the reconstruction process. Following this example, Torino (2006) used the Games to regenerate the area around Lingotto (Colombino and Vannolo, 2019), the famous Fiat factory, which embodied the car industry's monopoly over the city until its economic decay

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*Correspondence:
Florence Graezer Bideau
florence.graezerbideau@epfl.ch
[1] College of Humanities, Heritage, Anthropology and Technologies Research Group, Digital Humanities Institute Heritage, EPFL, CM 2 270 - Station 10, 1015 Lausanne, Switzerland
[2] College of Humanities, Heritage, Anthropology and Technologies Research Group, Digital Humanities Institute Heritage, EPFL, GCD2 384 – Station 10, Lausanne, Switzerland

Bideau *et al. Built Heritage* (2024) 8:45

Page 2 of 17

in the 1990s (Bondonio and Guala, 2011). The London Olympics (2012) have been praised as the 'Regeneration Games', resulting from the former Mayor Ken Livingstone's strategy to redevelop and enhance the industrial brownfield of Lower Lea Valley into a new urban pole on the capital's east side (Brownhill 2010). In 2022, some of the Beijing Winter Olympic Games were staged in the former steel factory of Shougang (Deng et al. 2020), serving as a trigger for long-term regeneration.

This paper aims to explore this trend of using industrial heritage sites to host mega-events such as the Olympic Games or World Expos and its role in urban regeneration. It seeks to understand the development of this strategy within a dominant discourse that values 'best practices' and legacy planning and to identify the stakeholders involved in the process. The idea of 'best practices'[2] in managing industrial heritage involves connecting heritage reuse with broader urban and sustainability concerns. Similarly, the 'legacy' concept in the realm of mega-events focuses on aligning the hosting of these events with cities' long-term development goals.

We develop a relationship matrix to thoroughly evaluate the connection between these two key criteria in the development of urban transformation and the types of urban spaces they help create. In a context that claims a people-centred approach, emphasising heritage, memory, and local values have a more significant social and cultural impact. Traditional assessments typically overlook these connections, resulting in commercial spaces serving private interests rather than public interests, as shown by our two case studies of Shanghai 2010 World Expo and the London 2012 Summer Olympics. Indeed, the long-term strategies that institutional stakeholders use to legitimise mega-event-led regeneration projects also perpetuate and even reinforce the exclusion of the voices and needs of marginalised groups.

2 Towards a comprehensive understanding of industrial heritage

Over the past few decades, repurposing former industrial brownfields into industrial heritage sites to establish new places or urban hubs has emerged as a prevalent planning strategy in urban regeneration. In particular, in areas affected by deindustrialisation, heritage values and the potential to enhance the urban landscape are paramount (Oevermann and Mieg 2021). The two following sections outline the key discourses related to cultural heritage and urban development planning, emphasising the transition from traditional conservation practices of architecture to a more comprehensive approach focused on transforming and managing heritage sites from a people-centred

perspective (Pendlebury et al. 2004; Oevermann 2020; Smith 2006). This transition is particularly significant within the context of mega-events, with the incentive to bring a long-term legacy on spatial, economic, and social stakes to the hosting sites (Kassens-Noor et al. 2015).

Global conservation practices for cultural heritage are rooted in respecting the authenticity of ancient monuments, as outlined in the 1964 Venice Charter for the Conservation and Restoration of Monuments and Sites.[3] The charter's objective, as articulated in Article 9, is 'to preserve and reveal the aesthetics and historic value of the monument and is based on respect for original material and authentic documents'. Endorsed by the International Council on Monuments and Sites (ICOMOS), the charter's guidelines have been recognised and applied to a broader range of cultural heritage, including industrial sites. Despite its Eurocentric architectural perspective, the Venice Charter remains the primary framework for establishing global historic conservation and restoration standards, advocating minimal intervention. Its principles align with those of the 1972 UNESCO Convention,[4] which prioritised authenticity, integrity, and the importance of management plans for preserving cultural heritage for future generations. One year later, the International Conference for the Conservation of Industrial Heritage occurred in Ironbridge, England, marking the initial effort to acknowledge and explore industrial heritage from an interdisciplinary perspective, albeit restricted to nine Western countries. It paved the way for recognising industrial sites on the UNESCO World Heritage List, such as Ironbridge in 1986 and New Lanark in 2001.

The 1979 Burra Charter for Places of Cultural Significance[5] (revised in 1999) was formulated by the Australia ICOMOS to align Western conservation practices with the local context, advocating for minimal intervention and formulating management plans. In this framework, the term 'place' takes precedence over 'site' or 'monument', enabling the incorporation of various cultural heritage types, ranging from tangible to intangible aspects, including spiritual values. The document highlights the importance of community involvement, acknowledging diverse interests, including social values in conservation and the cultural diversity associated with the place, which is particularly relevant in the Australian context due to the presence of different minorities or cultural groups

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[2] Oevermann (2020) also refers to them as 'good practices'.

[3] https://www.icomos.org/en/participer/179-articles-en-francais/ressources/charters-and-standards/157-thevenice-charter, last accessed on March 13, 2024.

[4] https://whc.unesco.org/archive/convention-fr.pdf, last accessed on March 13, 2024.

[5] https://australia.icomos.org/publications/burra-charter-practice-notes/, last accessed on March 13, 2024.

Bideau *et al. Built Heritage*   (2024) 8:45

Page 3 of 17

within the multicultural society. These new concepts and the underlying philosophy anticipate the framework of the UNESCO 2003 Convention for the Safeguarding of Intangible Cultural Heritage,[6] thereby enhancing not only practices but also representations, artefacts, associated cultural spaces and the role of community participation in identification and transmission to future generations. As Ginzarly et al. (2019, 5) noted, 'the holistic conceptualisation of heritage assets was formulated to include not only the tangible aspects of a place but also the practices and experiences of a place accompanied by personal perceptions that result from the human–environment relationship'. The 2003 Nizhny Tagil Charter on Industrial Heritage,[7] which was jointly initiated by ICOMOS and TICCIH, further defines the social, technological, scientific and aesthetic values of industrial heritage. In contrast with the UNESCO Convention on Intangible Cultural Heritage that was published in the same year, the abovementioned charter still focuses primarily on tangible artefacts from a Western-centric perspective, emphasising the effect of the Industrial Revolution. In 2011, the Dublin Principles,[8] once again initiated by ICOMOS and TICCIH, aimed to address this bias by focusing on the importance of technical expertise, the organisation of work and workers, and the profound social and cultural impacts that shaped communities and societies globally. This expanded definition also underscores two essential aspects when considering the transformation of industrial heritage sites. First, it recognises the ongoing influence of the more recent industrial past on contemporary communities, which is manifested through local memories translated into everyday practices, serving as an acknowledgement of the 'active processes' bridging the past and present. Second, it highlights the deep connection between industrial heritage and its cultural and natural environment, spanning material extraction, transformation, and distribution. This approach promotes a greater emphasis on environmental issues in industrial heritage management, although officials may sometimes exploit the reuse and greening of existing buildings to advance a sustainability narrative.

The year 2011 was also the year in which UNESCO's Recommendation on the Historic Urban Landscape[9] (HUL) was published, which achieved the transition towards considering both tangible and intangible aspects of the urban environment. This approach aims to blend the objectives of urban heritage conservation with those of economic and social development. Described as a 'tool to integrate policies and practices of conservation of the built environment' (Bandarin and Van Oers 2012, xvi), the HUL seeks to streamline the process-oriented management of heritage through a value-based approach that considers the diverse array of stakeholders and their demands (Oevermann 2020). This emphasis on the role of local people and their know-how as 'parts of an integrated complex' is also underlined in the 2012 Taipei Declaration for Asian Industrial Heritage.[10] Considering that the first document officially acknowledges regional specificities for industrial heritage, it contributes to the questioning of the dominant narrative of industrial heritage's homogenous definition proposed by Western countries and the valorisation of local intangible aspects of heritage. The people-centred approach[11] has become prominent, as it advocates the holistic consideration of heritage and the recognition of the role of the local community in its framing and management.

The Charter for Mega-events in Heritage-Rich Cities[12] is particularly relevant from this perspective, as it seeks to bridge the gap in research and practice between mega-event hosting and heritage management or reuse. As demonstrated by Jones and Ponzini (2018), there has recently been a significant shift in mega-events, which has reframed the role that heritage might play. This shift favours the existing built environment over new buildings and infrastructures. The charter provides recommendations for adjusting policies, emphasising four principles (2021, 10–11). First, it considers the context by reusing existing facilities and adapting the bid to the urban environment. Second, cultural heritage experts and local communities should be integrated for inclusive governance. Third, mega-events should be aligned with long-term planning legacies to avoid overuse and overcrowding ('festivalisation'). Fourth, heritage criticalities should be addressed, and communities' identities should be strengthened, thereby enabling the exploration of lost or dissonant heritage.

In recent years, heritage management has integrated the guidelines and principles of UNESCO, ICOMOS, and TICCIH to steer conservation or reuse projects, as mentioned by Kalman and Létourneau (2020). 'Best practices',

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[6] https://ich.unesco.org/en/convention, last accessed on March 13, 2024.

[7] https://ticcih.org/wp-content/uploads/2013/04/NTagilCharter.pdf, last accessed on March 13, 2024.

[8] https://ticcih.org/wp-content/uploads/2013/10/GA2011_ICOMOS_TICCIH_joint_principles_EN_FR_final_20120110.pdf, last accessed on March 13, 2024.

[9] https://whc.unesco.org/uploads/activities/documents/activity-638-98.pdf, last accessed on March 13, 2024.

[10] https://ticcih.org/about/charter/taipei-declaration-for-asian-industrial-heritage/, last accessed on March 13, 2024.

[11] https://www.iccrom.org/section/people-and-heritage/people-centred-approaches

[12] The Charter is a series of principles and guidelines to foster a better synergy between mega-event hosting, and sustainable reuse of historic centre. Launched in 2021, it results from a joint initiative, the HOMEE project: https://www.heritageresearch-hub.eu/app/uploads/2021/07/HOMEE-Charter_FINAL.pdf, last consulted on March 6, 2024.

which can be defined as identified successful projects in specific areas that are used as examples from which to learn, have become globally adopted, including for industrial heritage (World Heritage Centre 2012; Oevermann 2021). Additionally, 'best practices' involve considering the interests of different stakeholders and actors, particularly in urban contexts (Bandarin and van Oers 2012; Labadi and Logan 2016). On the basis of a literature review, Oevermann (2020) developed a 'wheel of best practices criteria' that combines sustainable approaches, inclusivity and community engagement, heritage conservation and reuse, research, education, and urban development. These criteria resonate with the legacy approach recently emphasised by the International Olympic Committee (IOC) regarding mega-events. Best practices and legacies shape the dominant discourses displayed in the frame of mega-event hosting, the current implementation of which remains to be discussed.

3 Legacy as a primary target for Olympic Games and World Expos

The development of storytelling or dominant discourses advocating the long-term benefits of hosting mega-events as catalysts for urban transformation is rooted primarily in what Lauermann (2019) calls 'grand promises'. These promises revolve around mega-event legacies, indicating that the investments made for hosting events can be repurposed afterwards for tangible or intangible outcomes. Nevertheless, legacy planning requires thorough evaluation. Its implementation helps to enhance city branding and create appealing urban spaces as commercial strategies.

The IOC defines the concept of the Olympic legacy as 'the long-term benefits that the Olympic Games create for the host city, its people, and the Olympic Movement before, during and long after the Olympic Games'.[13] This definition results from almost two decades of reflections and concerns about the Game's aftermath. In November 2002, the 'Symposium on the Legacy of the Olympic Games from 1984 to 2000' initiated discussions between academic and institutional stakeholders. Although first added to the 2007 version of the Olympic Charter, in 2021, the legacy became a requirement of the Olympic movement for candidate cities at the bidding stage.[14] As Leopkey and Parent (2012) demonstrated, promises related to the Olympic legacy, including various cultural, economic, and social aspects, have become criteria for evaluating a host city's ability to organise a successful event. London (2012) set a precedent for legacy planning by establishing the Olympic Park Legacy Company,

which later became known as the London Legacy Development Corporation (LLDC). This illustrates the general concern for cities to ensure long-term impacts for the Games, which the IOC then institutionalises through policies and guidelines.

In 2014, the IOC published its Agenda 2020, which is a strategic roadmap that aims to support cities for a more sustainable organisation of the Games.[15] The document emphasises the integration of sustainability into all aspects of the Games, from planning and staging to the aftermath. It advocates for lower building costs and footprints and long-term plans for Olympic-related infrastructures (IOC, 2014, recommendation 4). As Lopes do Santos et al. (2021) noted, 'ensuring best practices' has emerged as one of the five major focal points of Agenda 2020 and its 40 recommendations. The 2017 Legacy Strategic Approach[16] further defines the multiple aspects of the expected long-term benefits from the Olympic Games, including organised sports development (grassroots sports development, upgraded venues); social development through sport (health, well-being, inclusiveness); human skills, networks, and innovation; culture and creative development (intangible cultural heritage, visibility of national culture, artistic activities); urban development (transportation, urban infrastructure); environment enhancement (air and water quality); and economic value and brand equity (global profile, tourism, long-term investments). In 2014, the successful bid for the Beijing 2022 Winter Olympic Games was the first edition to be entirely planned using this approach.

While there is no separate legacy policy document for World Expos similar to that used for the Olympic Games, the Bureau International des Expositions (BIE) assists host cities in planning and implementing legacy programs tailored to their specific contexts. Therefore, the BIE's Annual Bulletin is the primary source for understanding the relationship between World Expos and broader urban issues.[17] Bulletin 2023 proposed a review of 'the planning and management of Expos in their legacy phase' (2023, 7). While the BIE does not clearly define legacy as the IOC does, this bulletin specifies that legacy has been placed 'at the heart of each project' since the 1990s. The themes have varied from physical aspects (urban greening and eco-friendly systems in 2017) to spatial perspectives (the making of a city in 2018 and the formation of creative spaces in 2021

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[13] https://olympics.com/ioc/olympic-legacy, last accessed on April 5, 2024.
[14] 'To promote a positive legacy from the Olympic Games to the host cities, regions, host countries' (IOC 2021:14).

[15] https://stillmed.olympic.org/Documents/Olympic_Agenda_2020/Olympic_Agenda_2020-20-20_Recommendations-ENG.pdf, last accessed on February 28, 2024.
[16] https://stillmed.olympics.com/media/Document%20Library/OlympicOrg/Documents/Olympic-Legacy/IOC_Legacy_Strategy_Full_version.pdf, last accessed on March 13, 2024.
[17] https://www.bie-paris.org/site/en/publications/annual-bulletin/annual-bulletin-archive, last consulted on March 13, 2024.

Bideau *et al. Built Heritage*   (2024) 8:45

Page 5 of 17

and 2022) and social dimensions (a focus on quality of life in 2018 and on social capital in 2020).[18] Case studies on Word Expos held in Shanghai in 2010 (Deng et al. 2016), Milan in 2015 (Wilson 2016), and Dubai in 2020 (Taha and Allan 2019) have provided critical insights into the planning and organisation of such mega-events. The studies also emphasise the idea of legacy to understand the lasting impacts and changes on host cities.

Despite being considered elusive and problematic (Cashman 2003), organisers of the Olympic Games and World Expos tend to link the concept of legacy with positive outcomes and overlook negative aspects. The legacy concept provides opportunities for local governments to communicate essential messages, whether reinforcing the current direction of their economic, urban, social, and sports policies or reframing them for future use. Consequently, the concept serves as a vehicle for legitimation and mirrors specific 'ideas of the state' (Black 2007).

The legacy of mega-events and the heritage management framework are key components in shaping physical and social spaces in the urban landscape. This legacy, in turn, impacts the memories of local communities and helps to connect them to the past. Ferrari and Guala (2017) emphasised that space representations and branding play crucial roles in cultural heritage and should be considered. As Mosler (2019: 769) suggested, 'it also represents the culmination of the historic and contemporary urban environment evolved through morphological and sociospatial change and adaptation, creating new functions, meanings, and narratives within the context of the heritage'. The Shanghai 2010 World Expo and the London 2012 Summer Olympics called into question the importance of heritage reuse, particularly in the case of large industrial brownfields.

4 Establishing the relationship matrix

Both industrial heritage management and hosting the Olympic Games promote a holistic approach in their dominant discourse, emphasising a people-centred perspective. Such a perspective would ideally enable place-making processes. Scholars (Richards 2017; Pendlebury and Porfyriou 2017) have defined place-making as a multifaceted concept of urban planning that integrates people's representations and lived experiences to promote broader human–environment interactions in economic, ecological, and social aspects as fundamental guidelines for urban transformation. This concept goes beyond creating attractive spaces solely for event visitors, as it should also align with 'additional objectives' concerning long-term urban and societal development for citizens

(De Brito and Richard 2017). However, place-making is, in fact, used as a tool to broadcast and sustain dominant discourses resulting from a particular vision encouraged over other alternatives.

We use the relationship matrix method to break down the complex urban and social factors embedded within these discourses. This approach enables us to identify two key research objectives, namely, to determine the role of industrial heritage reuse in mega-event urban projects and to evaluate whether this practice creates a favourable environment for place-making.

The relationship matrix, which is presented in the form of a chart or diagram, is a visualisation and evaluation tool that helps clarify and categorise the characteristic elements of a concept or system and enables the compilation and comparison of the relationships between two or more groups of elements (Tague 2023). This tool has already been used in the field of urban studies, for example, to analyse the characteristic elements of urban cultural landscapes (Ziyaee 2018), assess the key influencing factors shaping smart cities (Branchi et al. 2014), and understand public demands in urban management (Shiehbeiki et al. 2014). In this study, we extract and compare key information from the raw data via the relationship matrix method. The raw data comprises institutional documents, including policies, guidelines, and approaches, with a focus on the Charter for Mega-events in Heritage-Rich Cities. We also examine the scientific literature on the 'best practices' in industrial heritage management and mega-event legacies.

4.1 Data source: Criteria of 'best practices' in industrial heritage management

The literature we mobilise in this study encompasses systematic summaries of the assessment criteria for the best practices of industrial heritage conservation and adaptive reuse. As mentioned above, Oevermann (2020) developed eight criteria and 24 indicators on the basis of expert interviews and literature reviews on institutional guidelines and principles. Andrade et al. (2024) established a relationship matrix that integrated and compiled five significant perspectives to assess the reuse of industrial heritage site practices. These perspectives include the HUL approach, the impact assessments and management guidance of world heritage sites, the principles of heritage adaptive reuse within the circular economy framework, and multiple dimensions of industrial heritage values based on the Nizhny Tagil Charter. They propose six criteria: management, urban development, space/function, image/landscape, identity, and community engagement. Furthermore, UNESCO's 2015 World

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[18] Bulletin 2023, p. 7: https://www.bie-paris.org/site/en/publications/annual-bulletin, last consulted on March 13, 2024.

Heritage and Sustainable Development Policy[19] is a crucial institutional document linking heritage with external sustainability perspectives. It introduces four core dimensions: environmental sustainability, inclusive social development, inclusive economic development, peace and security (Table 2 in Appendix).

4.2 Data source: Measurements of mega-event legacy

The literature on mega-event legacies discussed in this study includes the 2017 Legacy Strategic Approach of the IOC, the BIE's Annual Bulletins from 2017 to 2023 (Table 3 in Appendix), and academic works that have designed frameworks to measure mega-event legacies. On the basis of systematic literature reviews, case studies, and the practical experiences of experts, these studies (Jago et al. 2010; Li and MaCabe 2013; Mair et al. 2023) highlight methodologies used to parse complex and multifaceted indicators of legacy measurement, such as economic, social, environmental, and regional branding dimensions (Table 4 in Appendix). Preuss (2019), for example, categorised event legacy in terms of its object of action, including two space-targeted indicators (urban development and environment enhancement) and four people-targeted indicators (policies, governance, human development, intellectual property, and social development related to people's beliefs and behaviour).

4.3 Extracting and categorising key indicators from the data sources

We identify various indicators from the main documents on 'best practice' evaluation criteria for industrial heritage and the measurement of mega-event legacies. Figure 1 outlines the data sources for these indicators and categorises 18 intentions (e.g., climate change, urban development, and local identity) on the basis of their corresponding indicators. These intentions are further classified into five classes, namely, global issues, urban issues, architecture/landscape issues, community issues, and individual issues, providing a comprehensive overview.

On the basis of the abovementioned analysis, we can establish a relationship matrix (see Table 1) that outlines the hierarchical correspondence between objects, intentions, and indicators. The matrix also categorises the source data into industrial heritage-related (IH) data, mega-event-related (ME) data, or both (IH; ME).

Through the matrix, we can compare and analyse the similarities and differences among the dominant discourses in the urban transformation of these two processes. Both discourses draw upon global narratives such as climate change, inclusion, and security but differ in

their focus. Industrial heritage emphasises the outstanding universal value (OUV) concept and global cultural diffusion, assessing these sites' significant values for humanity. In contrast, mega-events aim to enhance or redefine national cultures for global recognition. While urban and economic development are central to both processes, mega-events prioritise destination rebranding and promote this new image's global visibility. Additionally, architecture and landscape issues come into play under the shared goal of improving quality of life. Mega-events often concentrate on building new or upgraded existing venues. In contrast, heritage sites focus on the historical and aesthetic values of the location, welcoming new functions within existing buildings. Heritage sites highlight the social, technological, and scientific value of the past in the local community, whereas mega-events focus on the emotions and memories associated with hosting events, aiming to strengthen a new local identity. Mega-events have an explicit top-down perspective that enhances social capital, including civic pride, soft power, and social cohesion, whereas these factors are more implicit in the heritage discourse.

Finally, when the matrix is examined from a place-making perspective, the primary focus is on improving the physical environment to enhance the overall quality of life. However, the importance of the local population's lifestyle is largely overshadowed by the economic and diplomatic objectives driving mega-events. The dominant discourses on industrial heritage valorise the lived experiences of local communities, which should receive increased attention when large-scale events take place.

5 Implementation of the relationship matrix

To address these commonalities and differences that are enhanced in the matrix and gain insight into the factors that play a role in urban planning within a realistic context, we examine the dominant discourse of two case studies, namely, the Shanghai 2010 World Expo and the London 2012 Summer Olympic Games. The content analysis of their 'persuasive storytelling' (Throgmorton 2003; Ameel 2017) provides insights into the cities' vision and the main developmental goals outlined in urban planning texts (Norton 2008; John 2015).

5.1 World Expo: Shanghai 2010

The Shanghai 2010 World Expo was held on formerly industrial docklands located along both sides of the Huangpu River, south of the central business district. Initially used for steel and manufacturing from the 1950s to the 1970s, the area was chosen to host the mega-event based on the slogan 'Better City, Better Life' The historic Jiangnan shipyard and a coal-fired power plant were repurposed into World Expo pavilions and future

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Bideau *et al. Built Heritage* (2024) 8:45

Page 7 of 17
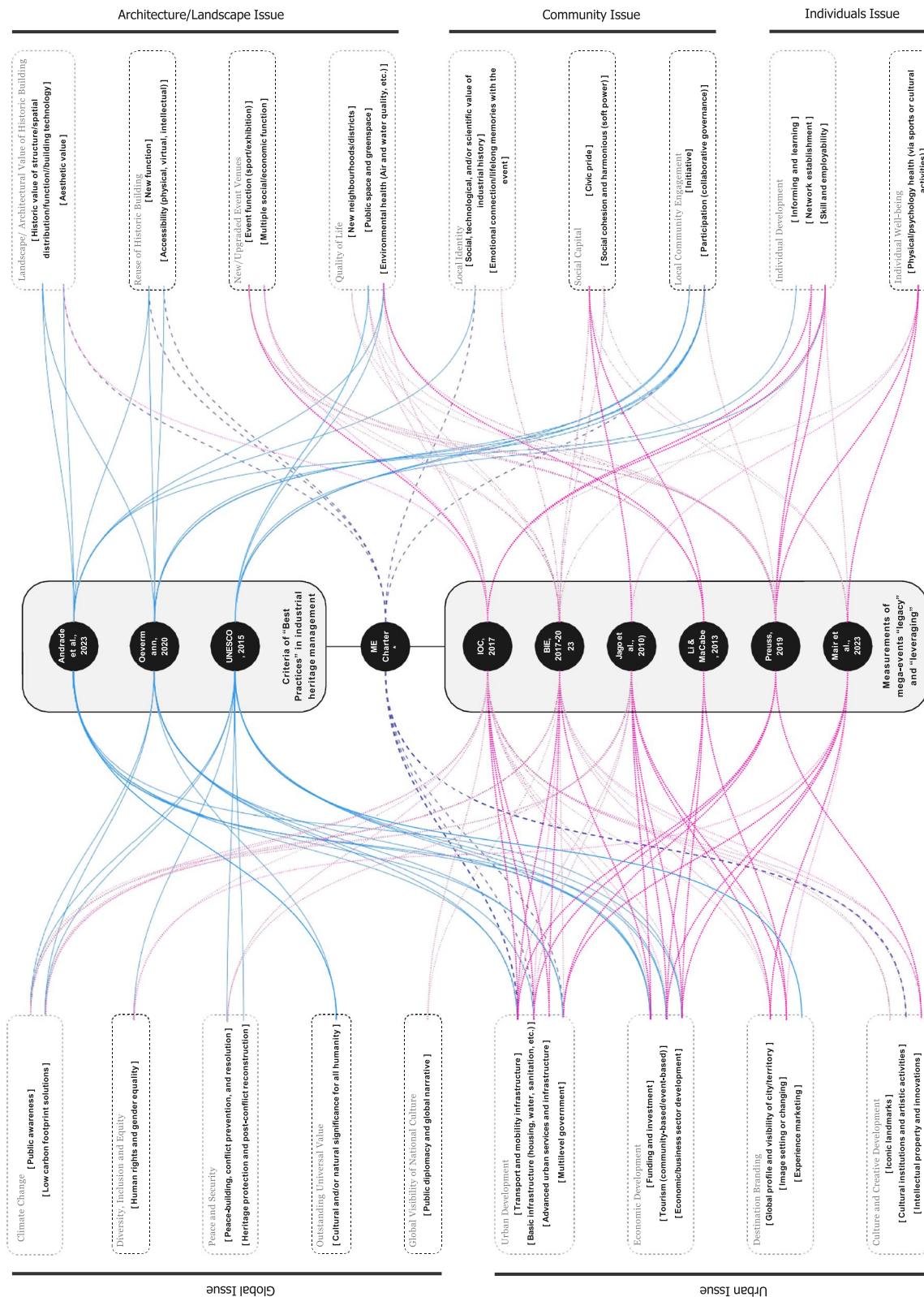
Fig. 1 Compilation of references on the criteria of industrial heritage 'best practices' and mega-event legacies to extract matrix indicators (Source: Huishu Deng)

*ME Charter. Charter for Mega-events in Heritage-Rich Cities

*Details of the references in this figure can be found in the Appendix A, B, and C

Table 1 The relationship matrix and its implementation through evaluating the two cases (source: the authors)

Object	Intention	Indicator	Related area	Shanghai	London
Global Issue	Climate Change	Public awareness	IH; ME	●	
		Low carbon footprint solutions	IH; ME		●
	Diversity, Inclusion and Equity	Human rights, gender equality	IH; ME		●
	Peace and Security	Peace-building, conflict prevention, and resolution	IH; ME		
		Heritage protection, postconflict reconstruction	IH		
	Outstanding Universal Value	Cultural and/or natural significance for all humanity	IH		
	Global Visibility of National Culture	Public diplomacy, global narrative	ME	●	●
Urban Issues	Urban Development	Transport, mobility infrastructure	IH; ME	●	●
		Basic infrastructure (housing, water, sanitation, etc.)	IH; ME	●	●
		Advanced urban services, infrastructure (technology, telecommunications, smart city grids, etc.)	ME	●	
		Multilevel government	IH; ME		●
	Economic Development	Funding, investment	IH; ME		●
		Tourism (community-based/event-based)	IH; ME	●	●
		Economic/business sector development	IH; ME	●	●
	Destination Branding	Global profile, visibility of city/territory	ME	●	●
		Image setting or changing	ME	●	●
		Experience marketing	IH; ME		
	Culture and Creative Development	Iconic landmarks	ME	●	●
		Cultural institutions, artistic activities	ME; IH	●	●
		Intellectual property, innovations (new design, art, technology, etc.)	ME	●	
Architecture/Landscape Issues	Landscape/Architectural Value of Historic Building	Historic value of structure/spatial distribution/function//building technology	IH	●	
		Aesthetic value	IH, ME	●	●
	Reuse of Historic Building	New function	IH	●	●
		Accessibility (physical, virtual, intellectual)	IH	●	●
	New/Upgraded Event Venues	Event function (sport/exhibition)	ME	●	●
		Multiple social/economic function	ME	●	●
	Quality of Life	New neighbourhoods/districts	ME	●	●
		Public space, greenspace	IH; ME	●	●
		Environmental health (Air and water quality, etc.)	IH; ME	●	●
Community Issues	Local Identity	Social, technological, and/or scientific value of industrial history	IH		
		Emotional connection/lifelong memories with the event	ME	●	●
	Social Capital	Civic pride	ME	●	●
		Social cohesion, harmonious (soft power)	ME	●	●
	Local Community Engagement	Initiative	IH		
		Participation (collaborative governance)	IH; ME		●
Individual Issues	Individual Development	Informing, learning	IH		
		Network establishment	ME	●	●
		Skill, employability	IH; ME		●
	Individual Well-being	Physical/psychology health (via sports or cultural activities)	ME	●	●

IH industrial heritage-related data, *ME* mega-event-related dat, *IH; ME* data related to both

Fig. 2 Retained crane and new residential and office buildings located along the river in Shanghai (Source: llee_wu, January 2010, https://flic.kr/p/9brV4R [CC BY-ND 2.0])

museums. The western area became a cultural and creative industry zone based on the 'UBPA-Urban Best Practice Area' concept, and old industrial buildings that covered more than half the area were reused (Liu and Chu 2012). Extensive construction transformed the eastern area (Fig. 2), preserving several industrial remnants but leading to industrial relocations and residential resettlements, shifting towards a younger, educated 'new middle class' (Chan and Li 2017).

National, municipal, and district planning policies guided the development of the site. The Bureau of Shanghai World Expo Coordination (SEB) managed operations and published documents. Moreover, seven heritage buildings were protected or adaptively reused under the principles of Shanghai's Second Batch of Heritage Architecture List (Liu 2008).

In 2002, Shanghai secured the right to host the World Expo, selecting a site along the Huangpu River. This site was part of the Comprehensive Development of Both Banks of the Huangpu River by the Shanghai Municipal Government,[20] with the aim of transforming the riverbanks into a renowned waterfront. Key strategies included shifting from production to services, improving the ecological environment, creating public spaces, and renovating historic districts. Afterward, the urban development goals for the Shanghai 2010 World Expo were refined at the municipal level and gained national prominence. The

11th Five-year Economic and Social Development Framework Plan for Shanghai Municipality (2006)[21] defined the event as crucial for implementing national strategies, enhancing urban civilisation, and improving the city's service functions. The plan aimed to promote Shanghai as a 'Harmonious City' and a 'Modern International Metropolis' and to showcase national culture and history. A government report from the State Council[22] highlighted the World Expo as a platform through which to demonstrate China's reform achievements and public diplomacy. At the regional scale, the Yangtze River Delta Regional Plan 2009–2015[23] saw the Shanghai 2010 World Expo as a chance to boost the region's global influence, particularly in regard to international economic cooperation. The hosting site was envisioned as a multifunctional urban event centre with public cultural infrastructure. Meanwhile, the Civilisation Action for the World Expo aimed to enhance citizenship quality and spiritual civilisation, reflecting national policies on 'soft power' and 'socialist spiritual civilisation with Chinese characteristics' (Zhang 2010).

The World Expo registration documents filed by the SEB with the BIE echo the content above. They emphasise the historical and scenic value of the Huangpu River, highlighting it as the 'mother river' of Shanghai and the

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[20] https://www.shanghai.gov.cn/nw4665/20200905/0001-4665_310.html (in Chinese) and https://www.shanghai.gov.cn/nw9822/20200906/0001-9822_27222.html (in Chinese), last accessed on March 13, 2024.

[21] https://fgw.sh.gov.cn/resource/d7/d73bef4724c9467a9be4d802a258b057/a28b7fb90d6471fdfb23042be0dfb73d.pdf (in Chinese), last accessed on March 13, 2024.

[22] https://www.gov.cn/2010lh/content_1559807.htm (in Chinese), last accessed on March 13, 2024.

[23] https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/201006/W020190905497606019854.pdf (in Chinese), last accessed on March 13, 2024.

Fig. 3 'Legacy is built' on the 10th anniversary of the Games, London (Source: Helena Roux, April 2022)

birthplace of China's national industry (Huang 2007). The Shanghai Manual for Better Cities underlined its role in envisioning sustainable future cities with global wisdom, featuring the UBPA as a laboratory for urban innovation (UN-Habitat, BIE, and SHG, 2011).

In this case, the dominant discourses in urban transformation favoured reshaping the area's new identity. At the microscale, this new identity was investigated onsite, mainly through the design of riverfront public spaces and the exploration of new urban models. At the macro scale, the site was defined as a representation of the country's culture under a global narrative. Under these discourses, the UBPA, which was identified as a 'best practice', repurposed old industrial buildings into a creative cluster for China's new 'coffee-drinking' middle class. However, Den Hartog (2017) noted a disconnect between not only the Expo site and the surrounding urban environment but also site visitors and local residents. The absence of appropriate place-making led to the underutilisation of much of the site during the postevent period.

5.2 Olympic Games: London 2012

The London 2012 Summer Olympics enabled the implementation of regeneration policies in the Lower Lea Valley, which was once designated 'London's manufacturing powerhouse' (Evans 2016). The site's industrialisation

intensified during the nineteenth century (Powell 2012) due to heavy, polluting industries, and deindustrialisation started in the 1970s. Described as an area of deprivation, East London embodies the capital city's unbalanced level of development, which is why the Olympic bid aimed to catalyse investments for its regeneration (Davis 2011). Postevent legacy strategies oriented the site's transformation, with Queen Elizabeth Olympic Park (QEOP) opening in 2013. The first phase led to the demolition of more than 200 buildings in the QEOP area under the Olympic Delivery Authority's motto of 'demolish, dig, design' (Gardner 2017). Most of the industrial urban layout still exists at the fringe of the park.

London 2012 was one of the first Olympics organised through legacy planning (Fig. 3), with the LLDC acting as a planning authority for the event between the Olympic boroughs and the Mayor of London. While the Games occurred before the publication of the IOC's Agenda 2020 and Legacy Strategic Approach, they aligned with the long-term vision and objectives proposed by the London Plan (Mayor of London 2011). The winning bid, which was written in 2003, targeted the East End's regeneration under the slogan 'Inspire a generation' (LOCOG 2004, 11). The Games aimed to open a new chapter for East London through the creation of a new 'hub' (LOCOG 2004, 19) and the transformation of degraded land into a 'magnificent legacy park' (2004, 23). The London Plan aimed to use the event to 'deliver fundamental economic, social and environmental change' in the area (Mayor of London 2011, 43). QEOP welcomed major sports facilities such as the Olympic swimming pool and the Olympic Stadium, as well as the Olympic Village, which was developed to leave a 'newly built, highly sophisticated neighbourhood' (LOCOG 2004, 201), to address the high residential pressure faced by the city (Mayor of London 2011, 17). This area was also targeted to be a 'high-quality media and creative industry cluster' (Mayor of London 2011, 44), leaning on Hackney Wick and Fish Island's creative identity.

At the city and Olympic levels (Mayor of London 2011; LOCOG 2004), local industrial heritage was rarely mentioned as an asset or a feature to be kept. It was only at the local level that heritage was recognised, with two labelled conservation areas and listed buildings occurring since 2009 (Hackney Council 2012). This shows that enhancing the industrial past and memory of the Lower Lea Valley through the Olympic process was not a priority, as the legacy vision promoted radical change instead (Gardner 2017). The site has since become a mixed-use area, reflecting a 'new focus on quality of life' (Mayor of London 2011, 28), which has led to several strategies, such as developing new-quality homes, tackling 'London's persistent problems of deprivation and exclusion', improving London's
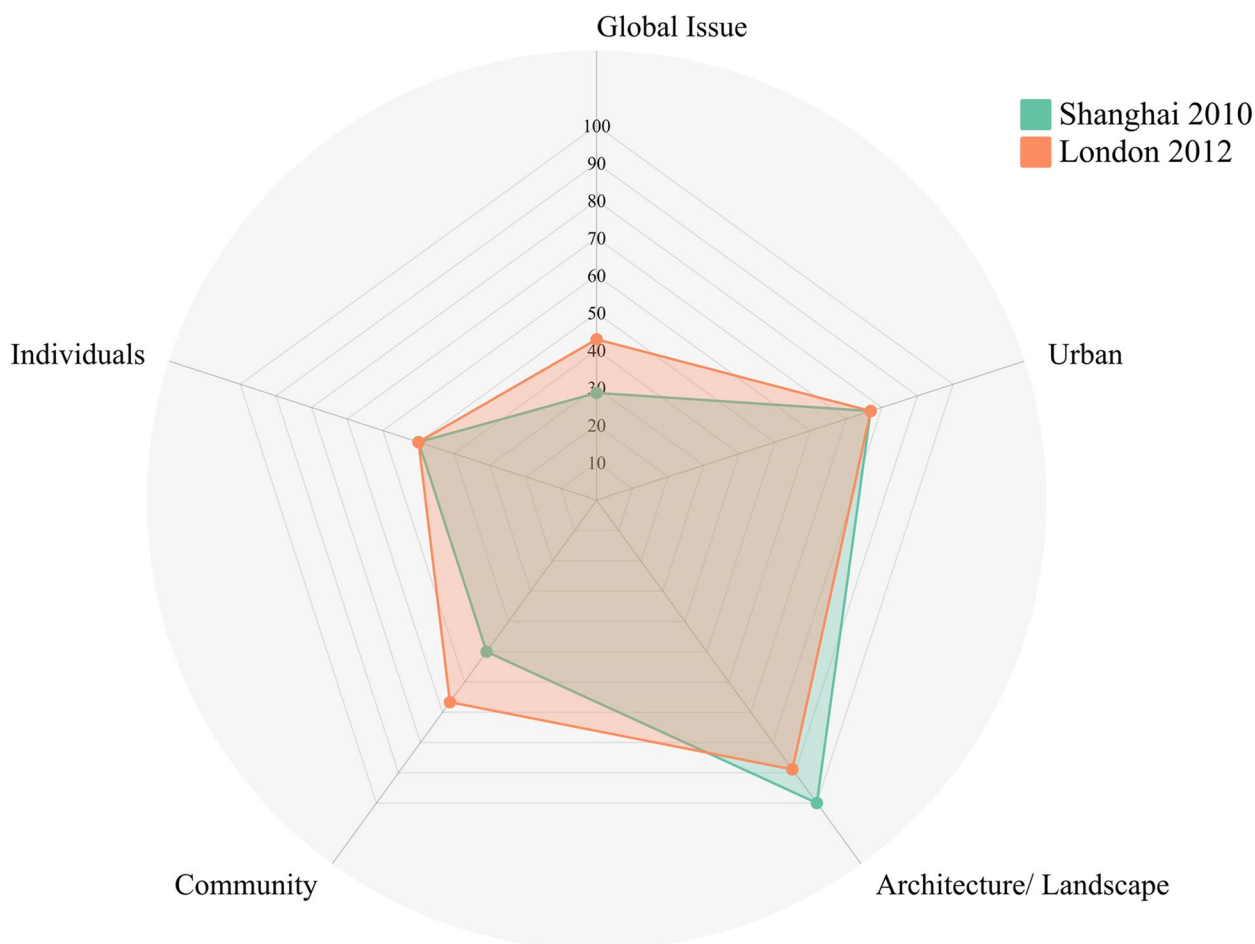
Fig. 4 Comparative graph of the study cases (Source: Huishu Deng)

environment and urban network, focusing on the feeling of safety, and enhancing 'what is distinctive about the city and its neighbourhoods, securing a sense of place and belonging through high-quality architecture' (Mayor of London 2011, 28). The distinctiveness in the neighbourhoods and the 'sense of a place' were underlined in the 2012 Hackney Wick Local Plans (Hackney Council 2012, 18) and Fish Island Local Plans (Tower Hamlets 2012, 19), which the built environment enhanced through quality architecture (Tower Hamlets 2012, 58). While Olympic Park drastically transformed the hosting area, the peculiarities of the surrounding neighbourhoods, whether from heritage preservation and reuse or new developments, were promoted to trigger people's attachment to the site.

The dominant discourse insists on focusing on transformations brought about by the Games, showcasing QEOP as an intervention needed to help reshape the site's identity and promote quality of life as key components for best practices. The narrative highlights the local heritage of the surrounding neighbourhoods, providing a 'sense of place' by preserving the built environment around the park. The

remaining industrial heritage has been used to make the site more attractive for people to visit and invest in; there is no true concern related to keeping the past memory alive. The question of who this approach targets and benefits remains unanswered. While the 2012 Olympic slogan reflects a people-centred approach by focusing on 'generation', redevelopment strategies advocating for exclusion perpetuated it through rapid gentrification processes (Weber-Newth 2019). Industrial heritage and memory were not used for social stakes but for commercial stakes instead. At the macro scale, the goal remained to reinforce London's status as a leading world city, thus radically transforming the urban areas that did not align with this image.

5.3 Assessing the two cases through a relationship matrix
The relationship matrix extracts and summarises the intentions of the dominant discourses articulated in the core urban planning documents of the two cases discussed above. These intentions help frame the implementation of industrial heritage reuse and mega-event legacies. Table 1 shows the indicators marked with dots

in the planning documents. We also create a radar plot (Fig. 4) to visually present the objects favoured by the two cases, indicating the proportion of labelled indicators to all indicators under these objects.

5.3.1 Global issues
The 2010 and 2012 mega-events did not prioritise global discourses around sustainable development, peace-building, or an inclusive society. Over time, these topics have been significantly promoted in recent mega-events and recognised industrial heritage. When considering the global diffusion of culture by hosting mega-events, the prominence of national cultures often overshadows the significance of industrial heritage in Shanghai and London.

5.3.2 Urban issues
The dominant discourses focused on various aspects, such as infrastructure upgrading, economic growth centred on tourism, destination branding, and cultural and creative development. Shanghai focused more on experimenting with new technologies and exploring advanced urban forms, whereas London centred on adopting a multilevel management structure and seeking to attract investment. These differences demonstrate the different paths the two cities used to promote urban and economic development.

5.3.3 Architecture and landscape issues
In both cases, selected postindustrial sites served as anchor points for developing new neighbourhoods. They were increasingly recognised and adapted for new functions, particularly in conjunction with new buildings as event venues and to serve new groups of people after the events. Meanwhile, to improve the 'quality of life', another disused industrial layout was replaced by public spaces and green areas to clean up the polluted areas. In particular, Shanghai highlighted the historical and technological value of the industrial structures and facilities represented by the well-known Jiangnan Shipyard. London's remaining industrial buildings were integrated and commodified into new developments; however, their historical and technological heritage value could have been more institutionally supported.

5.3.4 Community issues
The dominant discourses barely mentioned the local identity shaped by industrial history, whereas the memories and emotions evoked by mega-events were more emphasised. To some extent, the latter overrode the former, and the civic pride brought about by the event reinforced this override. The people-centred approach is gradually underlined by residents' consultations, as seen in Shanghai and London. Nevertheless, this approach tends to favour new communities rather than existing communities in long-term planning. Local community engagement regarding industrial heritage results from grassroots processes, which are often developed after the Olympic Games rather than being supported by the local authority, despite an engaged consultative process.

5.3.5 Individual issues
Individual development benefits from the career skills gained from participating (volunteering) in mega-events while informing and learning from industrial heritage-related knowledge is lacking. Shanghai provided an opportunity for researchers and individuals involved in building an international social network by producing a joint manual with UN-Habitat and the BIE. The development of post-Games London aimed to advance a similar strategy for high-skilled talent to increase innovation and job opportunities. With respect to individual well-being, both mega-events and industrial heritage may support sports or cultural activities as part of public policies shaping new lifestyles.

Figure 4 summarises the preferences for the tangible values of industrial heritage in early 2010. In this figure, the proportion of elements objectified by cities and buildings is noticeably greater than that of people.

6 Concluding discussion
The reuse of industrial heritage sites has become increasingly prevalent in hosting mega-events. In this research, we develop a methodological tool that can be used to analyse the integration of industrial heritage sites within the context of mega-events. This tool examines the dominant discourses and assesses their impacts on urban development. We create a relationship matrix by examining the 'best practices' and legacy criteria derived from institutional documents, including policies, guidelines, and approaches. This matrix allows us to compare the similarities and differences between the dominant discourses and their implementation. We apply this method to case studies of the Shanghai 2010 World Expo and the London 2012 Summer Olympics to illustrate its purpose and evaluate its comprehensiveness.

Despite increased claims of a people-centred approach, the matrix reveals that in both case studies, planning efforts often overlooked both the existing residents and the historical memory of the sites. Industrial buildings were preserved on the basis of physical and economic criteria, which can significantly affect local memory within the spatial and temporal constraints of mega-events. The dominant discourses primarily emphasised material renewal, urban development, and

Bideau *et al. Built Heritage*   (2024) 8:45

Page 13 of 17

the architectural landscape. They favoured newly envisioned communities, potentially neglecting existing communities and their collective memory. The place-making strategies adopted in these two projects aimed to upgrade urban landscapes for 'high-quality' living, excluding diverse local communities and their complexities through gentrification processes.

The matrix is based mainly on the perspectives of event organisers, urban developers, and heritage experts. However, it does not include the voices of other essential stakeholders, particularly marginalised groups and established communities before the event. These voices are essential for creating public spaces that extend beyond purely commercial or socially exclusive perspectives. In the two large-scale projects examined herein, where industrial heritage sites were used for mega-events, the process of place-making in connection with local communities through heritage and memory was not properly evaluated. Dominant discourses on 'best practices' and legacy approaches tend to overlook or exclude former residents, such as workers, who may have deeper emotional attachments to the industrial site when long-term visions are considered instead of recognising their potential role in linking the past and the present. The voices of these individuals should be given

priority in strategies of transforming disused heritage sites into attractive physical and social spaces (Graezer Bideau and Yan 2021).

Although our paper is limited to two examples, this matrix could be a relevant case-study tool to further analyse the relationship between mega-events and industrial heritage for urban transformation. Indeed, in both Shanghai and London, mega-events were given more importance than industrial heritage in the dominant discourse. In contrast, this relationship was reversed in the case of the Shougang site used for the Beijing 2022 Olympic Games (Deng et al. 2020). The former steel factory is considered an essential part of the urban landscape; thus, it needed to be preserved to transform the entire area. Sports stadiums, including Big Air Shougang, which was constructed for mega-events, were integrated into industrial heritage sites (Roux 2022). Despite the expectation of new and wealthier communities settling down, old employees were included in the mega-event planning process and aftermath. As Cestaro (2022) noted, this approach emphasised the social value of industrial heritage and reflected local communities' experiences and emotional attachments to Shougang.

Appendix

Table 2 Criteria of best practices in heritage conservation and adaptive reuse

Reference	Reuse of port industrial heritage in tourist cities: Shipyards as case studies (Andrade et al. 2024)	Good practice for industrial heritage sites: systematisation, indicators, and case (Oevermann 2020)	World heritage and sustainable development (UNESCO, 2015)
Materials used in Reference	HUL (Historic Urban Landscape); WHS (World Heritage Sites); PESTEL–CA Analysis; 9Rs of the CE (Circular Economy), 12 principles of the CE, ReSOLVE framework; the Nizhny Tagil Charter	Expert interviews and the guidelines/principles of UNESCO, ICOMOS and the International Committee for the Conservation of the Industrial Heritage (TICCIH)	Draft policy for the integration of a Sustainable Development Perspective into the processes of the World Heritage Convention
Criteria and Indicators	**A. Management** A1. Integral management A2. Environmental management **B. Urban development** B1. Connections and mobility at city level B2. Local economy **C. Space/function** C1. Universal value and historical value C2. Architectural value	**A. Management** A1. Management system and management plan A2. Stakeholders and form of organisation A3. Organisation of processes A4. Funding A5. Legal compliance A6. Understanding what to manage **B. Conservation** B1. Outstanding universal value B2. Historical structure and function B3. Protected area B4. From preservation to adaptive reuse	**Core Dimensions** **A. Environmental sustainability** A1. Protecting biological and cultural diversity and ecosystem benefits A2. Strengthening resilience to natural hazards and climate change **B. Inclusive social development** B1. Contributing to inclusion and equity B2. Enhancing quality of life and well-being (availability; environmental health) B3. Respecting, protecting and promoting human rights

D.   Image/landscape
D1. Intrinsic aesthetic value to the Industrial Landscape
D2. Geometry and composition
D3. Architectural value
E.   Identity
E1. Social, technology and/or scientific value
F.   Community engagement
F1. Participation of local community

C.   Reuse
C1. New function
C2. Access and accessibility
D.   Community engagement
D1. Initiatives
D2. Participation
E.   Sustainability/climate change
E1. SDGs (sustainable development goals) \
E2. Responding climate change
E3. Up/downscaling: local and global relevance
F.   Education
F1. Information
F2. Learning
G.   Urban development
G1. Multilevel governance
G2. Aspects of urban development, including aspects of transport, housing, etc.
G3. Aspects of Historic Urban Landscapes (HUL)
H.   Research
H1. Basic research
H2. Evaluation research

B4. Respecting, consulting and involving indigenous peoples and local communities
B5. Achieving gender equality
C.   Inclusive economic development
C1. Ensuring growth, employment, income and livelihoods
C2. Promoting economic investment and community-based tourism
C3. Strengthening capacity-building, innovation and local entrepreneurship
D.   Peace and security
D1. Ensuring conflict prevention
D2. Protecting heritage during conflict
D3. Promoting conflict resolution
D4. Contributing to postconflict reconstruction

Table 3 Visions of mega-events Legacies and leveraging from institutions

Reference	Legacy Strategic Approach: Moving Forward (IOC, 2017)	Annual Bulletin of The Bureau International des Expositions (BIE, 2017-2023)
Issues (Objectives) and Subissues	**A. Organised sports development** A1. New generation of elite-level athletes A2. Organised grassroots sports development A3. New/upgraded sports venues **B. Social development through sport** B1. Health and well-being benefits B2. Olympic values and sport as a tool for education B3. Peace-building and international cooperation B4. Gender and inclusiveness **C. Human skills, networks and innovation** C1. New generation of talent in different fields C2. Human skills C3. New networks C4. Innovation in different fields **D. Culture and creative development** D1. Intangible cultural heritage of Olympism D2. Visibility of national culture D3. New design, brand and visual identity D4. Artistic activities D5. New cultural assets for the city/country (iconic buildings, cultural institutions, etc.) **E. Urban development** E1. Transport and mobility infrastructure development E2. Basic urban infrastructure (housing, water, sanitation, etc.) E3. Advanced urban services and infrastructure (technology, telecommunications, smart city grids, etc.) E4. Upgraded/new venues for multiple social/economic uses **F. Environment enhancement** F1. Air and water quality F2. Transition to low-carbon F3. Open-air leisure areas and greenspace F4. Biodiversity F5. Innovative environmental management solutions F6. sustainability and environmental awareness **G. Economic value and brand equity** G1. Global profile and visibility G2. Tourism and event industry development G3. Long-term investments G4. Competitiveness of economic sectors G5. New business/economic sector development G6. Enhanced Olympic movement brand equity	**2023. Postevent Expo transition in territories** - Testbeds for new forms of development or regeneration (neighbourhoods, urban districts, public spaces, etc.) - Lifelong memories - Emotional connection with the community **2021–2022. Architectural labs** - Innovation by the implementation of artistic, social and technological elements - Novel structures or spaces **2020. Citizens and social capital** - Inclusive and harmonious society - Shared experiences, new connections and pride of citizens - Civic engagement and collaborative governance - Citizen participation (volunteering) **2019. Country branding** - National image within a global community - Public diplomacy and global narrative - Experience marketing **2018. Urban change** - New neighbourhoods, landmarks, infrastructure, and public spaces - Local development and initiated new forms of urban dynamism - Investment - Intangible footprint on the quality of life - Citizen-focused policies **2017. Sustainable Innovation** - Environment (eco-friendly architectural forms, recycling systems, carbon-neutral transport options, and urban greening) - Urban fabric

Table 4 Measurements of the impacts of mega-event legacies from a literature review/case study

Reference	Optimising the potential of mega-events: an overview (Jago et al. 2010)	Measuring the socio-economic legacies of mega-events: Concepts, propositions and indicators (Li and MaCabe 2013)	Event legacy framework and measurement (Preuss 2019)	Social impacts of mega-events: A systematic narrative review and research agenda (Mair et al. 2023)
Impact factors and Indicators	A. Economic B. Business leveraging C, Destination branding D. Induced tourism E. Regional development F. Legacies (infrastructure, skill) G. Social (community pride, sports participation) H. Environment (awareness) I. Climate (carbon footprint) J. Security	**A. Economic legacies** A1. Induced tourism A2. Stadiums and facilities A3. Economic activities **B. Social legacies** B1. Awareness levels B2. Image level B3. Social benefits/costs **C. Compounding legacies** C1. Environmental politics (health)	A. Urban development (space) B. Environment enhancement (space) C. Policies, governance (people) D. Human development (people) E. Intellectual property (people) F. Social development (people: beliefs and behaviour)	**Social Impact:** **A. Direct impacts on residents** A1. Education, skills and employability A2. Social cohesion, civic pride and social capital A3. Inclusion and diversity A4. Sport and health **B. Impacts on the destination ecosystem** B1. Business and government networks B2. Destination branding B3. Accessibility and accessible tourism B4. Disaster preparedness

Abbreviations

BIE　　　　Bureau International des Expositions
ICOMOS　International Council on Monuments and Sites
IOC　　　　International Olympic Committee
HUL　　　　Historic Urban Landscape
LLDC　　　London Legacy Development Corporation
LOCOG　　London Organising Committee for the Olympic Games
QEOP　　　Queen Elizabeth Olympic Park
SEB　　　　Bureau of Shanghai World Expo Coordination
TICCIH　　The International Committee for the Conservation of Industrial Heritage
UBPA　　　Urban Best Practice Area
UNESCO　United Nations Educational, Scientific and Cultural Organisation

Authors' information

Florence Graezer Bideau is Senior Scientist and Senior Lecturer at the College of Humanities of the Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, where she has been employed since 2009. She leads the Heritage, Anthropology and Technologies Research Group, formerly known as Heritage, Culture and the City, focusing on the role of social actors in heritage making. She received her doctoral degree in History and Civilization from the Ecole des Hautes Etudes en Sciences Sociales (EHESS) in Paris. Between 2015 and 2022, she was also a visiting professor at the Department of Architecture and Design, Politecnico di Torino, Italy. Contributing to the field of critical heritage studies, her work delves into the complex interplay between culture and power through a comparative perspective. Her research investigates cultural policies, heritage management and governance, dynamics of resistance, and urban and territorial development, examining these issues from both top-down and bottom-up perspectives. She has published several books and articles on interdisciplinary projects related to urban anthropology and heritage, including post-Beijing 2008 Olympic Games, UNESCO World Heritage sites, or intangible cultural heritage. Her co-edited book *Porter le temps. Mémoires urbaines d'un site horloger* (MêtisPresses), received the Koos Bosma Prize in Planning History Innovation in 2022. Since 2020, she has led the SNSF project, "Uses of cultural heritage at the Beijing Winter Olympic Games of 2022".
Huishu Deng is a postdoctoral researcher in the Heritage, Anthropology and Technologies Research Group of EPFL, Switzerland, in collaboration with China Room, Department of Architecture and Design, Politecnico di Torino, Italy. She is also a core member of the Urban Ergonomics Lab at Tsinghua University, China. Trained as an architect and architectural researcher, she received her Ph.D. in Architecture from Tsinghua University with a thesis on the essential spatial conditions for spontaneous leisure physical activities through the methods of motion tracking and simulation. Since 2016, she has worked in the architectural design and planning group for the Beijing 2022 Olympic Winter Games. She is now conducting interdisciplinary research between architecture and digital humanities, focusing on analysing place attachment, spatial cognition, and aesthetic experience of public space through digital tools.
Helena Roux is a doctoral student in the Heritage, Anthropology and Technologies Research Group of EPFL. She joined the SNSF research project "Uses of cultural heritage at the Beijing Winter Olympic Games of 2022" in 2020. Trained as a geographer in urban studies at the University of Lyon, she worked as an intern for the research unit of WHITRAP Shanghai, in 2019. She now focuses on industrial heritage reuse in the frame of urban mega-projects, with a comparative perspective between London 2012 and Beijing 2022. Her research addresses the role given to the industrial built environment in regeneration practices and city-branding, the management of industrial heritage in urban contexts, and the increasing reception of industrial aesthetics in urban lifestyles and space practices.

Authors' contributions

Florence Graezer Bideau, Huishu Deng and Helena Roux are co-authors.

Availability of data and materials

Data for this research will not be shared because it rests mainly on empirical, qualitative data and their interpretation.

Declarations

Ethics approval and consent to participate

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Consent for publication

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Competing interests

The authors declare that they have no competing interests.

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