

Emerging strategies for regeneration of historic urban sites

Citation for published version (APA):

Pulles, K., Conti, I. A. M., de Kleijn, M. B., Rous, T., Havinga, L. C., & Ikiz Kaya, D. (2023). Emerging strategies for regeneration of historic urban sites: a systematic literature review. *City, Culture and Society*, 35, Article 100539. <https://doi.org/10.1016/j.ccs.2023.100539>

Document license:

CC BY

DOI:

[10.1016/j.ccs.2023.100539](https://doi.org/10.1016/j.ccs.2023.100539)

Document status and date:

Published: 01/12/2023

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

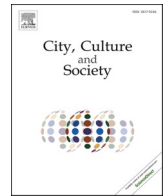
www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.



Emerging strategies for regeneration of historic urban sites: A systematic literature review

K. Pulles^{*}, I.A.M. Conti, M.B. de Kleijn, B. Kusters, T. Rous, L.C. Havinga, D. Ikiz Kaya

Department of the Built Environment, Eindhoven University of Technology, the Netherlands

ARTICLE INFO

Handling Editor: Prof. Andy Pratt

Keywords:
Heritage
Historic site
Adaptive reuse
Regeneration
Renewal
Strategy

ABSTRACT

The importance and effectiveness of adaptive reuse as an alternative to the demolition of cultural heritage is well-studied. However, increasing demand in cities to redevelop larger scale urban historic sites requires new strategies to benefit from their inherent values. This paper focuses on strategies of regeneration for historic urban sites. The paper presents a systematic literature review of 45 papers, with case studies geographically concentrated in Europe and Asia, and a focus on residential, commercial, and industrial areas. From the case studies, 46 different regeneration strategies have been deduced. The various strategies are, via content analysis, dissected into a select number of drivers to find commonalities. These key drivers are user participation, top-down, genius loci, sustainability, and conversion. Based on the reflections of the reviewed authors, a performance evaluation assesses the outcomes of these strategies. Further data analysis is conducted at the level of individual drivers as well as their combinations to deduce the most positive-evaluated strategies. Findings show that genius loci contributes to the most positive-evaluated strategies, while top-down driven strategies contribute to the most negative-evaluated strategies. Furthermore, strategies are assessed positively when three or more drivers are considered regardless of their combination. This paper acts as a starting point for further research into the formation of regeneration strategies and into the specific drivers and their combinations or underlying relations. Moreover, it can be of contribution to the practice, to support decision makers and urban planners in developing the appropriate regeneration strategy for historic urban sites.

1. Introduction

Mass destruction of historic cities in World War II and the criticised ‘tabula rasa’ method of the Modern school, where architects aspired to develop buildings completely different from traditional buildings (B. Plevoets & Van Cleempoel, 2011) are developments that contributed to an appreciation of older city districts and to subsequent creative (re)use of them, whereby both built environment and traditional social systems gained importance (Dhingra et al., 2017). The conservation of historic or heritage buildings has proven to be a key factor in revitalizing such districts that may suffer from neglect and abandonment (Zhang et al., 2019). Here, underused or vacant historic sites are increasingly being recognized as cultural, economic, and environmental assets that are potential focal points within urban regeneration projects (Tan, 2014). After revitalization, these renewed districts and their buildings reflect the economic, industrial, and cultural riches of their past, while serving as a backdrop for new cultural activities (Lempert, 2015; Yung et al., 2017) and tourist destinations (Vardopoulos, 2023).

Local societies can directly or indirectly be positively affected by regeneration of a historical site by improving their quality of life or through empowering the cultural dimension (Vardopoulos, 2022). Preservation of cultural and historical values engenders a sense of continuity and attachment for the community which proves vital in heritage protection (Bullen & Love, 2011; Esad Muminović et al., 2020). Such involvement of communities increases creativity and cultural diversity within plans which helps to enliven public and social life (Galdini, 2019; Shaw, 2014).

Regeneration can also bring environmental benefits: demolition leads to copious amounts of waste material, subsequent new construction can require more materials (Foster, 2020), energy consumption and transport than a renovation project (Misirlisoy & Günçe, 2016). Through regeneration, the building’s environmental performance through its entire life cycle can be simultaneously improved (Conejos et al., 2016).

Extensive research has been conducted to understand why transformation of historic buildings and sites have a wide range of benefits for both the city and its users and which adopted strategies are effective to

^{*} Corresponding author. Eindhoven University of Technology, Groene Loper 3, 5612 AZ, Eindhoven, the Netherlands.

E-mail address: pulleskevin@gmail.com (K. Pulles).

support the sustainable development of these areas. Proper management and planning can drastically increase the likelihood of a regeneration project having the desirable performance instead of being halted or failing (Turgut, 2011). Other literature reviews have focused on making planning frameworks to aid in decision making during the planning process (Dogruyol et al., 2018). However, it is still unclear which strategies for urban planning have a positive influence on the performance evaluation of the transformation area.

In the literary field of regeneration, many case studies show the benefits and disadvantages of the used strategy for regeneration (Kim & Jang, 2017; Liu et al., 2021), but only focus on singular monuments. Large(r) scale redevelopment projects and their strategies are often underrepresented (Ferretti & Grosso, 2019). Literature reviews on the evaluation of regeneration projects have been conducted (Kim & Jang, 2017), but are often found to be limited in scope as they solely compared case studies from the same region or country. For example, Albanese et al. (2021) studied the local effects of urban regeneration, but only compared cities in the centre and north of Italy. The identification of trends within the regeneration field (Owojori et al., 2021) and/or the typification of regeneration strategies (Plevoets & Van Cleempoel, 2011), can act as starting points for evaluation but are not included within the respective works. It may be concluded that this field lacks a comprehensive study that adopts the perspective of regeneration on an urban scale, and which tries to classify and prioritize existing and potential strategies (Lak et al., 2020).

In literature, numerous methods can be found for transforming abandoned or underused buildings into a better functioning urban fabric. The work of Plevoets and Van Cleempoel (2019) illustrates that these architecturally-driven strategies can be categorized into five different approaches (typological, architectural, technical, programmatic, and interior). However, not all of these categories are transferable to the urban scale. This paper, therefore, aims to present new theoretical insight, perspectives, and recommendations that address considerations for further research on (forming) such (design) strategies for urban regeneration when approached from an urban planning/design perspective. Every regeneration case is unique in terms of its characteristics, barriers, drivers, and resources. It will, therefore, not be possible to generate a one-size-fits-all development strategy that is applicable to every case. The aim of this research is therefore to find emerging drivers occurring across multiple positively evaluated regeneration cases, which can help in the formulation of effective strategies on an urban scale.

A systematic literature review is employed to answer the research questions posed in this research:

- (1) What are the characteristics of the case studies for transformations of historical sites?
- (2) What are the emerging drivers amongst the strategies of urban regeneration on historical sites?
- (3) What are the relations between the drivers and their impact on the performance evaluation of the transformation?

To answer (1), case studies are analysed, compared, and categorized for their strategies. To answer (2), the similarities from these case studies are assessed against their respective performance evaluation based on a set of performance analysis tool/indicators. To answer (3), the similarities and key factors are generalized, and their correlations are further analysed.

Findings of the research contribute to the field of urban regeneration. The relevance for the urban perspective lays in the beauty of heritage caused by the picturesque interplay of urban elements, houses, canals, trees and bridges. Monuments and its surroundings should be considered as a cohesive ensemble (Corten et al., 2014). Furthermore, regeneration has increasingly become an important topic in historic neighbourhoods and cities, as it is seen as way to contribute to a sustainable community (Lehmann, 2019). Planning strategies for heritage neighbourhoods and

city parts are not only relevant for that specific area, but they play a role within the overarching planning strategy and organization of a city (Bonfantini, 2015) and the benefits of the regeneration of a historic core are seen to enhance the social and economic status of said city as a whole (Eyüboğlu et al., 2007). On a global scale, reducing the throughput and total amount of resources are seen as an important way to reduce environmental impacts and circularity strategies for adaptive reuse have been proven to achieve this (Foster, 2020). Perspectives, conclusions, and recommendations drawn from this research can be used in further academic exploration on the topic of regeneration strategies.

For clarity, some recurring terms are defined to provide consistency. A variety of articles and case studies have been incorporated, in which the terminologies may vary on a detailed level, but the core meaning remains the same.

- *Development strategies*: policies, actions, guidelines and/or design decisions (to be) implemented to foster urban development and regeneration. Strategies are composed out of one or a multitude of driver(s) that have been defined through a content analysis.
 - o *Drivers*: factors that stimulate, and/or approaches that facilitate the implementation of regeneration projects such as user participation or sustainability, which are deemed important in that specific project.
- *Cultural Heritage*: can be defined on three different scales: monuments, groups of buildings, and sites. Of which these two are relevant within this paper:
 - o *Groups of buildings*: groups of separate or connected buildings which, because of their architecture, their homogeneity, or their place in the landscape, are of attached value and meaning from the point of view of history, art, or science;
 - o *Sites*: works of man or the combined works of nature and man, and urban areas including archaeological sites which are of value from the historical, aesthetic, ethnological or anthropological point of view (ICOMOS, 1972).
- *Regeneration*: the transformation of built spaces in a sustainable manner. Urban regeneration is closely connected to the emphasis placed on culture as driver for redevelopment (Schuurmans et al., 2018). The key issues of urban regeneration are financing, governance, the relationship between the plan and the project, and the goal of conservation in relation to other regeneration goals (Swensen & Berg, 2018). Synonyms: *development*, *renewal*.

2. Methodology

2.1. Data collection

A systematic literature review was conducted, meaning that a systematic paper selection, data extraction and analysis process are employed as part of the review, visualized in the flowchart (Fig. 1)

The scholarly database Scopus is used to search for articles with the given search string displayed in Fig. 1. The initial publication date of papers included in the search was not determined, with an end date of May 2020, which is when the search was executed. Review of the literature was performed in the following month. The search terms include the following keywords: adaptive reuse, strategies, and historical sites and their respective synonyms.

The search yielded 331 relevant papers. First, the titles and keywords were reviewed, in which papers were selected on whether they focused on the urban scale, historical sites, and redevelopment. In addition, non-English papers and review papers were excluded. As a result, 103 articles were selected for further review. The inclusion and exclusion criteria can be found in Table 1. Then, the abstracts were reviewed, in which papers focusing on strategies for the redevelopment of heritage were selected. The inclusion and exclusion criteria for the review of the abstracts can be found in Table 2.

This resulted in 67 articles being selected. Only papers with open

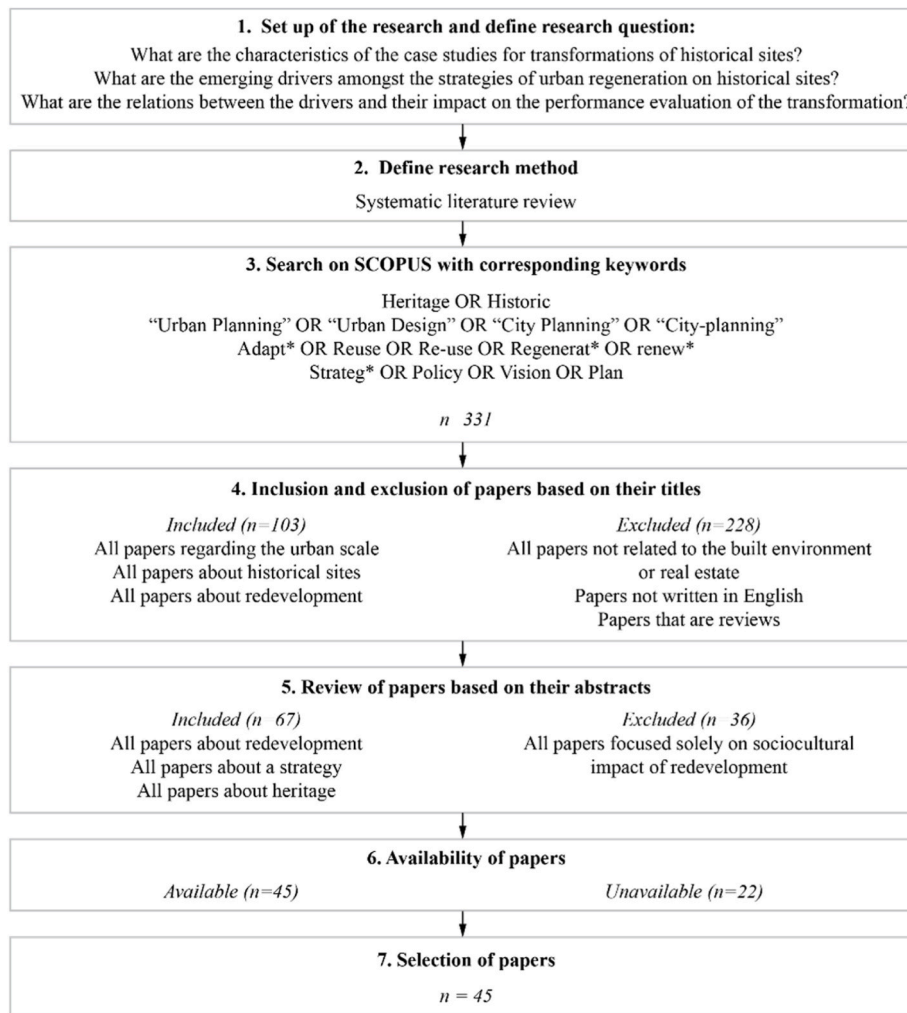


Fig. 1. Flowchart of the paper selection process.

Table 1
Inclusion and exclusion criteria based on titles with relevant examples.

inclusion	all papers should be written regarding the urban scale	example: <i>“Regeneration of part of the historic fortified town of Monção, Portugal”</i> title by Delgado and SáMachado (2011)
	all papers should be written about historical sites	
	all papers should be about redevelopment	
exclusion	all papers that are not related to the built environment or real estate	example: <i>“Recapturing erased histories: Ethnicity, design, and cultural representation - A case study of Independence National Historical Park”</i> title by Low et al. (2002)
	papers that are not written in English	
	papers that are reviews	

access or accessible via journal subscriptions available to the authors were included, resulting in 45 papers. On these 45 papers, a full paper review was conducted. Relevant data was extracted from the papers, such as research methodology, approach, location of research, and more detailed data related to the specific case study (location, scale, timeframe, strategy of regeneration).

2.2. Data analysis

2.2.1. Content analysis

After initial data extraction of the 45 articles, certain (common) drivers could be derived via content analysis (Bryman, 2004). The definitions of these drivers are thus based on the reviewed literature and are discussed further in section 3.2.1 *Definition of drivers*. While the exact terminology of the drivers is based on individual papers, not all papers (and respective strategies) use the same phrasing and their presence is thus determined at the hand of the driver definition. As a strategy is seen as a combination of drivers, multiple drivers can be present. The presence of a certain driver is recorded as: not present, mentioned, or elaborated. The distinction between the categories is based on the amount of information the authors of the reviewed papers dedicate to a driver:

- Not present: Based on the information provided by the authors, the driver has not been (consciously) used within the discussed strategy and is thus considered to not be part of the strategy.
- Mentioned: Based on the information provided by the authors, the driver has been considered and used within the discussed strategy but the exact extent of the driver within said strategy remains uncertain. *Within a paper only a few sentences describe or allude to the driver.*
- Elaborated: Based on information provided by the authors, the driver has been considered and used within the discussed strategy and its

Table 2
Inclusion and exclusion criteria based on abstracts with relevant examples.

inclusion	paper is about redevelopment paper is about a strategy paper is about heritage	example:	“After a rather long silence, in the last fifteen years, heritage has progressively returned to urban agendas, and not just in Europe. The following pages reflect on the possible updated “structural” function of the historic parts of contemporary cities through the examples provided by two medium-sized Italian cities-Genoa and Bologna-characterized by the presence of an important urban heritage and specific urban policies and plans focused on renewing their possible role.” abstract by Bonfantini (2015)
exclusion	paper is focused solely on sociocultural impact of redevelopment	example:	“Modernity has been antithetical to heritage conservation in the twentieth century. The value of inherited buildings was not widely acknowledged by government officials, politicians, architects, planners and the broader community until the’ 1970s. From the turn of the century, a coalition of pioneering preservationists in Sydney confronted a formidable growth mentality, which linked preservation with economic and cultural stasis. This article explores the objectives, composition, ideology, modus operandi and record of the fledgeling preservation movement against the backdrop of modernisation.” abstract by Freestone (1999)

extent within said strategy is clear. *Within a paper at least one paragraph describes or alludes to the driver.*

Furthermore, the disposition of the authors towards the outcomes of their described strategies are recorded as a positive, negative, or mixed evaluation. Whereas the first two categories are seen as being predominantly one or the other, the latter is used when the authors evaluate the outcome as equally positive and negative.

2.2.2. Descriptive statistics and meta-analysis

To compare the papers, a mixed methodology of qualitative and quantitative analysis is conducted through content analysis and descriptive statistics. Several datasets are compared to one another in terms of:

2.2.2.1. General findings. Data about the location and scale of the case studies is extracted, to be able to draw a conclusion between the geographic location of the regeneration projects and the drivers that are used in the strategy applied, as well as to illustrate the scale at which they have been conducted at. Besides these factors, the functional change of heritage and the reason for regeneration are extracted from the articles. The old function of the heritage buildings is compared to the new function to show what kinds of old functions are suitable at all for potential new functions, as well as why this change was required or done in the first place.

2.2.2.2. Strategies used for transformation of heritage. The analysis of the strategic drivers focuses on two levels: driver level and strategy level. On

driver level frequency and impact on a positive performance evaluation is analysed per driver based on whether a driver was not present, mentioned, or elaborated. Then, driver occurrence is related to the period of the study and of the development. Finally, frequency and evaluation of the drivers is grouped on geography on continental level.

On strategy level a combination of drivers is considered. Here the strategies are assessed according to both the number of drivers as well as specific combinations of drivers that went into the consideration of the strategy. Here consideration means both mentioned and elaborated are viewed as the same to reduce the number of possible combinations from 243 (=3⁵) to 32 (=2⁵) in order to facilitate the analysis.

To analyse the driver combinations (and in turn the strategies), a coding method is used to distinguish between different combinations of drivers. The Simplified Strategic Driver Code (SSDC) used in this paper is explained in Table 3. Every digit of the 5-digit code stands for the presence (denoted by a 1) of a specific driver with the first digit corresponding to user participation, the second for top-down, etc. The SSDC provides an overview of the drivers considered in a strategy. The Strategic Driver Code (SDC) not used in this section but present in Appendix A works the same yet encompasses more detailed information on the elaboration of a specific driver within the strategy (1 is mentioned, 2 is elaborated). As discussed, this additional layer of information introduces a larger variety of possible combinations and a more complex analysis. Therefore, the SSDC is used.

3. Results

3.1. General findings

From the 45 papers that have been identified in this research, 39 of them address one or more case studies. The selected articles are explored according to the location of the case studies, the function of the heritage building or site before and after the transformation, and the purpose of regeneration.

3.1.1. Geographic distribution of the case studies

In all the case studies that are selected for this research, a group of buildings are redeveloped within an urban context. Most of the case studies are in Europe (n = 24), followed by Asia (n = 11), visible in Table 4. In the continent of Europe, the case studies are spread across the continent but concentrated more on Western and Northern Europe: most case studies are in Italy and the United Kingdom. In Asia, most case studies can be found in China.

3.1.2. Scale level case studies

The scale levels of the case studies were categorized into five levels increasing in scale: building, neighbourhood, district, city and national. Whereas the scales of the building, the city, and the national are clearly demarked, the scales of the neighbourhood and districts are prone to local customs and or authoritative structures. Within this paper the neighbourhood scale was defined as a set of (cohesive) streets that are identifiable as a single unit within a city, a district was then defined as an area that encompasses multiple neighbourhoods and thus represents a larger portion of a city but not the city as a whole. Other intermediate

Table 3
Explanation of the Simplified Strategic Driver Code (SSDC) that codifies whether a driver is not present (0××××), or present (mentioned or elaborated) (1××××).

driver nr.	SSDC
1	1××××
2	×1×××
3	××1××
4	×××1×
5	××××1

Table 4
Geographic distribution of the case studies.

	Strategy ID	Paper	Number of papers	Number of strategies		Strategy ID	Paper	Number of papers	Number of strategies
Africa			2	2	Europe			23	24
Kenya	29	Hoyle (2001)			France	15	Appendino (2017)		
Morocco	31	Harrouni (2018)			Italy	3	Bonfantini (2015)		
						34	Canevaro et al. (2019)		
Asia			11	14		38	Villacampa and Villacampa (2011)		
China	4	Abramson (2007)				42	Boeri and Longo (2012)		
	9	Wang (2011)				43	Mondaini et al. (2011)		
	18	Zhai and Ng (2013)			Norway	6	Swensen and Berg (2018)		
	19	Zhai and Ng (2013)				10	Nyseth and Sognnaes (2013)		
	37	Zhang et al. (2019)			Poland	45	Szymański (2017)		
	38	Zhang et al. (2019)			Portugal	8	Delgado and SáMachado (2011)		
	35	Berta et al. (2018)				20	Moniz et al. (2019)		
Hong Kong	11	Yung et al. (2017)				32	Natividade-Jesus et al. (2019)		
Iraq	21	Soave and Hawizy (2020)			Romania	46	Francesca Prada et al. (2019)		
	30	Owied (2018)			Russia	22	Bakhareva and Kordonchik (2019)		
Taiwan	16	Shih and Yen (2009)			Serbia	39	Muminović et al. (2020)		
	17	Shih and Yen (2009)				40	Muminović et al. (2020)		
	28	Wang & Lee (2008)			Spain	25	Rubio Bellido et al. (2011)		
Singapore	27	Tan (2014)			Turkey	5	Eyüboğlu et al. (2007)		
North America			2	1		33	Turgut (2011)		
United States of America	14	Rivero (2017)			United Kingdom	23	Pendlebury (2002)		
						24	Madgin (2010)		
						26	Caroupapoullé (2019)		
						44	Baker et al. (2017)		
						27	Tan (2014)		

scale levels (such as for instance street level or provincial level) were not observed within the case studies. The case studies were divided almost equally amongst the neighbourhood, district, or city scale (see Fig. 2). The case study focusing on the building scale focussed on building information modelling of multiple historic buildings to assess their value for regeneration (Bakhareva & Kordonchik, 2019). The case study focusing on the national scale took place in Taiwan and focused on regenerating the land of the large-scale sugar industry across the country (Shih & Yen, 2009). Despite being classified on the building or national scale, they thus fit within the urban context described within this paper.

3.1.3. Functional change of heritage

In over half of the case studies (54%), the function of the buildings was changed as part of the regeneration process. The functions that were assigned to a specific case, were classified by the function that was most prevailing for that area. Most of the case studies focused on buildings

that previously had a residential function (n = 4), commercial function (n = 7) or an industrial function (n = 9). Seaports were defined as being an industrial function, because of their large-scale characters and close ties to production. Mixed functions encompassed low-occurring combinations, like a composition of residences, commercial buildings and temples. It should be noted that the cultural function (n = 5), such as a museum or religious site, often coincides with a tourism draw.

The projects most often had a commercial (n = 7) or residential (n = 7) function after regeneration. Often the commercial and residential are combined with other functions. For example, they were regularly combined with cultural and office functions. Notable is the small number of cases redeveloped to accommodate a new industrial function. Industrial sites were most often transformed into commercial or residential functions and very few (n = 2) of them kept their original function (Table 5).

3.1.4. Reason of regeneration

As can be seen in Table 6, the most prevalent reason to initiate regeneration was to improve the poor conditions the building currently has (n = 17). Poor building conditions encompassed either damage (Szymański, 2017) or deterioration (Soave & Hawizy, 2020), or the old building did not meet contemporary requirements for living (Zhai & Ng, 2013). Also old-fashioned buildings, that seem repetitive and not appealing to the eye, later became associated with the idea of degradation (Boeri & Longo, 2012). Notable is that cultural functions and fortifications were never regenerated for having poor building conditions. In the case of fortifications their redundancy led to vacancy (Delgado & SáMachado, 2011; Rubio Bellido et al., 2011). Regeneration

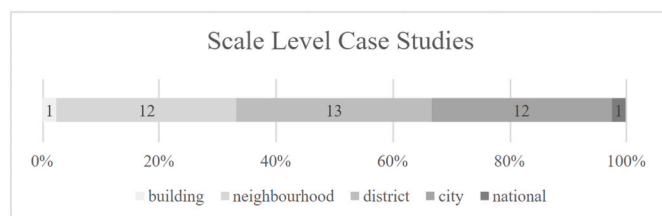


Fig. 2. Distribution of scale levels of the case studies.

Table 5
Functional change of heritage.

<i>old function</i>	<i>new function</i>											
	commercial	commercial & cultural	commercial & office	commercial & residential	cultural	industrial	residential	residential & office	mixed	unspecified		
commercial & cultural										1	1	3%
commercial & office			1									3%
commercial & residential	1			3						1	5	13%
cultural										1	1	3%
fortifications	1								1		2	5%
industrial					3	2	2		4		9	23%
residential	1							1	1		4	10%
residential & office										3	1	3%
mixed							1				3	8%
unspecified										11	12	31%
	1	2	1	3	3	2	3	1	9	14		
	3%	5%	3%	8%	8%	5%	8%	3%	23%	36%		

Table 6
Reason of regeneration.

<i>old function</i>	<i>reason for development</i>				
	poor image of the city	poor building conditions	desire for preservation of heritage	need for urban growth	vacancy
commercial & cultural					
commercial & office	1				1
commercial & residential	1				1
cultural	3			1	5
fortifications					1
industrial				1	3
residential			2		2
residential & office					9
mixed					4
unspecified					1
	1			2	3
	1				12
	3%	44%	5%	8%	36%
					2
					5%

Table 7
Distribution of 7 drivers that were used in the strategies in the literature, their definitions and examples.

driver	not present	present	definition	context within literature
1. user participation	29	17	Within user participation the collective wisdom, identity, and/or local attachment of residents are regarded as valuable elements when establishing a (local) regeneration plan	<ul style="list-style-type: none"> - Natividade-Jesus et al. (2019): the establishment of solid commitments and shared responsibilities in the implementation of the design. - Harrouni (2018): a wide array of stakeholders like households were asked to contribute several ideas. - Berta et al. (2018): user participation does not have the aim of defining the 'best' design, but instead it tries to find the most shared solution. - Vroom (1991): encouraging residents and users of the city to guarantee the future of a historic building.
2. top-down	14	32	The government, or relevant administrative bodies, as well as private initiatives, control the decision-making process	<ul style="list-style-type: none"> - Abramson (2007): the municipal government decided which monuments were chosen for protection of cultural heritage. - Swensen and Berg (2018): the development was based on a public-private partnership between municipality and the site owner. - Owied (2018): the leadership of large actors is perceived viable when trying to raise more awareness for cultural heritage as a key target, resulting in improvement of cities and highlighting the values in a historic centre.
3. genius loci	10	36	In strategies that incorporate genius loci, buildings are preserved for their intrinsic worth	<ul style="list-style-type: none"> - Tan (2014): preservation of heritage can be seen as a way to guarantee the connection between the past, the present and the future. - Zhai and Ng (2013): connected with the collective memory of a city's residents and essential part of their culture - Moniz et al. (2019): sometimes criticized for the superficial motives based on a monument's prestige rather than its architectural setting, - Nyseth and Sognnaes (2013): or motives based solely on their historical and cultural value.
4. sustainability/reuse	21	25	A process, or a building for that matter, can be called sustainable when it meets the demand for the present without compromising the ability of future generations to meet their own (Appendino, 2017)	<ul style="list-style-type: none"> - Madgin (2010): industrial buildings are often built to last a long time, with a strong bearing structure and an open floor plan which can be renewed for contemporary demands - Appendino (2017): the reuse of materials in architecture would be a natural step towards a sustainable future, because the emissions of the generation of building materials are reduced.
5. conversion	21	25	The introduction of new functions creates a diverse environment, mixes social classes and a synergy between the fields of activity (Francesca Prada et al., 2019)	<ul style="list-style-type: none"> - Yung et al. (2017): the building visibly undergoes a transformation to make it fit for its new function. It requires flexible and secure zoning plans and building regulations for promoting the reuse of a building. - Caroupapoullé (2019): existing fabric is transformed into social, domestic, and commercial buildings: The old factory was converted into a museum, whereby the character of the area was to be preserved.
6. urban tissue	42	4	Conversion focuses on the position heritage has within the urban tissue	<ul style="list-style-type: none"> - Rivero (2017): with a perspective from urban planning, the building or a group of buildings is conserved because it has an essential role in keeping connections between different parts of a city. It is to safeguard an urban experience, rather than maintaining a merely material artifact. - Baker et al. (2017): some of the old, industrial buildings were maintained, to provide an anchor for the master plan design.
7. quality of life	44	2	Urban tissue focuses on improving the quality of life of the residents of heritage.	<ul style="list-style-type: none"> - Tanrikul and Hoşkara (2019): healthy living environments need to be established in order to conclude as a successful project. - Muminović et al. (2020): the basis of the project was the demographic and social parameters to ensure quality of life.

of vacant buildings was most dominantly implemented in former industrial buildings that lost their original functions once the industry moved away ($n = 6$) as, for example, described by [Canevaro et al. \(2019\)](#) and [Villacampa and Villacampa \(2011\)](#). Sometimes, heritage was transformed for the sole purpose of conservation ($n = 2$).

3.2. Strategies used for transformation of heritage

From the 39 found case studies, 43 strategies were retrieved from the papers through content analysis. Some papers encompassed more than one strategy, for instance, when a paper covered case studies in multiple cities. 3 strategies not tied to a case study were also found. A range of drivers were noted through content analysis that contributed to

regeneration approaches. The five drivers that were most often cited in the articles, are explored according to their frequency, degree of elaboration and performance. A comparison is made between different combinations of the drivers. A timeline is constructed to represent the possible differences in time periods that the drivers have been implemented in. Also, possible geographical differences are investigated.

3.2.1. Definition of drivers

The drivers of strategies are manually extracted from the articles through content analysis. The seven drivers that were retrieved were user participation ($n = 17$); top-down ($n = 32$); genius loci ($n = 36$); sustainability ($n = 25$); conversion ($n = 25$); urban tissue ($n = 4$); and quality of life ($n = 2$), as presented in [Table 7](#).

Table 8

Frequency of drivers on whether they are not present (0), mentioned (1), or elaborated (2) and how their presence affects the authors' performance evaluation.

driver	user participation	top-down	genius loci	sustainability	conversion
not present	29 63%	14 30%	14 30%	21 46%	21 46%
mentioned	8 17%	14 30%	11 24%	9 20%	12 26%
positive evaluation (+)	7	14	8	5	9
negative evaluation (-)	0	0	2	4	2
mixed evaluation (+/-)	1	0	1	0	1
elaborated	9 20%	18 39%	21 46%	16 35%	13 28%
positive evaluation (+)	9	8	18	15	11
negative evaluation (-)	0	8	2	0	1
mixed evaluation (+/-)	0	2	1	1	1

3.2.2. Performance evaluation

After defining the drivers, a performance evaluation of the strategies was conducted. The performance of the strategies was assessed according to whether the authors of the reviewed papers deemed the transformations to have a positive, negative, or mixed evaluation. For example, in one project, the project was given a positive performance evaluation because the project was assessed to be economically feasible

Table 9

Frequencies of mentioned or elaborated drivers and their positive evaluation grouped per continent.

continent	number of strategies	strategies assessed positive (+)	user participation	top-down	genius loci	sustainability	conversion	average number of drivers
Africa	2	2 100%	1 50%	1 50%	2 100%	1 50%	1 50%	3
mentioned			0	1	1	0	1	
elaborated			1	0	1	1	0	
Asia	14	7 50%	4 29%	10 71%	9 64%	5 36%	7 50%	2,36
mentioned			1	2	3	3	6	
elaborated			3	8	6	2	1	
Europe	25	21 84%	11 44%	18 72%	19 76%	15 60%	19 76%	3,29
mentioned			8	11	7	5	6	
elaborated			3	7	12	10	13	
North America	2	1 50%	0 0%	2 100%	1 50%	0 0%	0 0%	1,5
mentioned			0	0	0	0	0	
elaborated			0	2	1	0	0	

(Mondaini et al., 2011). Shih and Yen (2009) and Zhai and Ng (2013) provide examples of negative evaluations as their described strategies, respectively, failed to assure the liveability of the district's citizens or were delayed and reconsidered.

3.2.3. Frequency of the drivers

The following five most frequently used strategy drivers are further explored. The two least used drivers (urban tissue and quality of life) were not mentioned frequently enough and hence were not further analysed.

1. User participation
2. Top-down
3. Genius loci
4. Sustainability
5. Conversion

Of the 46 strategies mentioned in the papers, user participation was the least mentioned driver of the five further analysed drivers (Table 8). Genius loci was the driver that was elaborated the most. Furthermore, 33 strategies (72%) are evaluated positively. The complete dataset can be found in Appendix A.

From Table 8 and it can be noted that genius loci contributes (both mentioned and elaborated) to more positive evaluations (57%) than top down (48%) does. The table also shows that the top down approach contributes to the most negative evaluations (17%) While user participation appears the least of all drivers (n = 17), it features one mixed assessment for which the drivers was only mentioned.

In Table 9 the drivers and their positive evaluations are related to the four different continents where the case studies of the research were located. In Asia-based strategies the top-down driver was the most frequent with genius loci as second (64%). These were also the two most elaborated drivers in all cases. Half of the case studies in Asia had a positive evaluation. In Europe, the focus was more on genius loci and conversion (both 79%). User participation was the least present and elaborated driver, being only present in 44% of the cases. 21 of the 25 case studies in Europe had a positive evaluation (84%). When comparing Asia with Europe, top-down appeared at the same frequency (71%) but was predominately elaborated within Asia (57%), and in

Table 10
Frequency of drivers linked to the reason for redevelopment.

	user participation	top-down	genius loci	sustainability	conversion	number of cases
heritage preservation	1	2	1	1	1	2
improve image of the city	1	1	1	1	1	1
poor building conditions	9	12	13	7	10	19
urban growth	0	3	2	0	0	3
vacancy	4	10	11	11	12	15
unspecified	1	1	2	1	0	3
total	16	29	30	21	24	

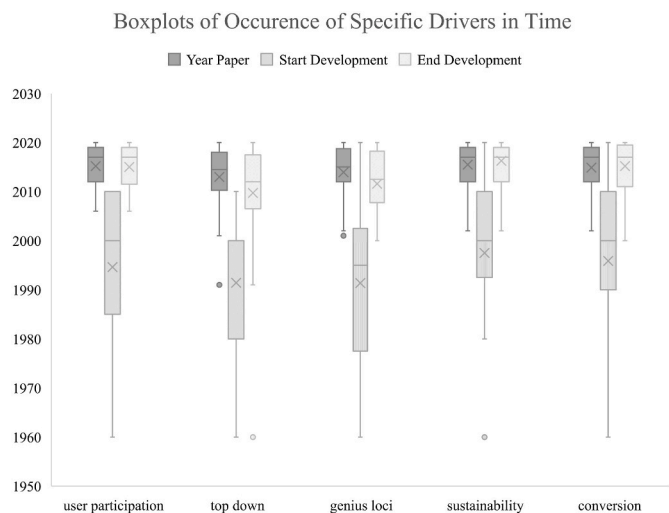


Fig. 3. Boxplots of occurrence of specific drivers in time per year of publication of the paper, start of the regeneration process of the case study and end of the regeneration process of the case study.

strategies in Europe this driver was more often mentioned (46%). Overall, Europe-based strategies incorporated more drivers than Asia-based strategies (3,29 against 2,36) and were regarded more positively (83% against 50%).

Linking the reason for redevelopment with the application of a driver (see Table 10) showed that for ‘poor building conditions’ the application of top-down (n = 12) and genius loci (n = 13) drivers were deemed more important than the other drivers, most noticeably the sustainability driver. For ‘vacancy’ user-participation (n = 4) appeared the least where the other drivers were reported between n = 10 and n = 12. Urban growth was not mentioned frequently to be the reason of development, but when it did, it was linked to the top-down (n = 3) and genius loci (n = 2) drivers. Strategies employed for ‘poor building conditions’ consisted on average of 2,68 drivers, whereas those strategies employed for vacancy consisted out of 3,2 drivers.

3.2.4. Occurrence of drivers in time

From the boxplot in Fig. 3, the differences between the occurrence of the various drivers when focusing on the year of the paper appeared to be minimal. Focusing on the distribution of the start and end years of the described developments of the case studies showed that the top-down and genius loci drivers could be attributed to older developments. Likewise, the start development year for the driver of sustainability appeared to have occurred much later starting at 1980 with one outlier in 1960.

3.2.5. Combination of drivers

In Table 11, the drivers of a certain strategy are combined into a code, called the SSDC (Simplified Strategic Driver Code). Here the distinction between mentioned and elaborated is of a lesser importance

and thus they are bundled as the presence of a driver. Most strategies (63%) incorporated at least three or more drivers in their overall strategy, with 39% of the strategies incorporating exactly three drivers. Strategies that contained less than three drivers appear to be assessed less positive than those with equal or more than three drivers, with zero, one, and two drivers respectively having a positive evaluation rate of 0%, 33%, and 46%. Strategies with three or more drivers were almost always positively evaluated (one negative against twenty-four positives and two being assessed as mixed).

Despite the possibility of 32 unique combinations with five drivers (being either not present, or present), only 21 combinations were found within the selected strategies. The most occurring unique combination was 01100 or the combination of top-down and genius loci (n = 5). Only the top-down driver was used on its own (01000), which occurs in three strategies with a positive evaluation rate of 33%.

There were 13 different combinations of drivers that incorporated three or more drivers. From these combinations only two were assessed as mixed namely 01101 (top-down, genius loci, conversion) and 11111 (all five drivers). 01101 featured one negative and one mixed against two positive evaluations, while 11111 featured one mixed and three positive evaluations.

Out of the possible ten combinations where only two drivers are present in the selected strategies, only six were present amongst the strategies (see the right side of Table 11). Since a set of two drivers was also included in every driver that has three or more drivers, they are included in this table. The combination of top-down and genius loci (×11××) was the most occurring, both as a standalone strategy (n = 5) as well as in a further combined approach (n = 21). The combination of user participation and top-down (11×××) was the least frequent (n = 10). It does, however, have a high positive evaluation rate of 90%.

4. Discussion

The case studies were equally divided amongst the three urban scales (neighbourhood, district, and city) meaning that the results offer a diverse cross-section of urban redevelopments. They mostly accommodated either a residential, commercial, or industrial function in the past. From this, it can be assumed that these functions are the most suitable or desired former functions for transformation and reuse. Often, projects were developed into a combination of mixed residential and commercial facilities (51%). This may, for example, correspond with the rise in housing crises in many European countries since 2015 (Pittini et al., 2015) as well as a move towards sustainable urban forms that favour mixed land-uses (Jabareen, 2006). The relative low occurrence (8%) of cultural functions (and to an extent heritage tourism) as functions after redevelopment appears to be in contrast with the role tourism usually plays within preservations strategies: cultural functions such as museums offer employment and economic development to sustain the redevelopment and preservation effort (Madgin, 2010; Owied, 2018; Ripp & Rodwell, 2015). It could be that the large number of unspecified functions (36%) may be able to explain such underreporting.

Industrial functions were most often transformed into a different function which can be related to vacancy being an often-cited reason for redevelopment. High rates of vacancy amongst industry may be

Table 11
Combination of drivers and their performance evaluation.

nr. of drivers	SSAC	total	positive	negative	mixed	1×1××			11××			×××11			××1×1			×1×1×			×11××		
			(+)	(-)	(+/-)	positive	negative	mixed	positive	negative	mixed	positive	negative	mixed	positive	negative	mixed	positive	negative	mixed	positive	negative	mixed
0	00000	1	0	1	0																		
1	01000	3	1	2	0																		
2	10100	1	1	0	0	×																	
	11000	1	1	0	0		×																
	00011	1	0	1	0						×												
	00101	1	0	1	0									×									
	01010	4	1	3	0												×	×					
	01100	5	3	2	0																×	×	
3	10101	1	1	0	0	×									×								
	10110	3	3	0	0	×																	
	11100	2	2	0	0	×	×															×	
	00111	4	4	0	0						×			×									
	01011	2	2	0	0						×							×					
	01101	4	2	1	1									×	×	×					×	×	×
	01110	1	1	0	0																×		
	10011	1	1	0	0						×												
4	10111	1	1	0	0	×									×								
	11011	1	1	0	0													×					
	11101	2	2	0	0	×																×	
	01111	3	3	0	0																	×	
5	11111	4	3	0	1	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	
			33	11	2	13	0	1	9	0	1	15	1	1	16	2	2	9	1	1	15	3	2
			72%	24%	4%	93%	0%	7%	90%	0%	10%	88%	6%	6%	80%	10%	10%	82%	9%	9%	75%	15%	10%
			positive (+)	negative (-)	mixed (+/-)	positive (+)	negative (-)	mixed (+/-)	positive (+)	negative (-)	mixed (+/-)	positive (+)	negative (-)	mixed (+/-)	positive (+)	negative (-)	mixed (+/-)	positive (+)	negative (-)	mixed (+/-)	positive (+)	negative (-)	mixed (+/-)

10

explained by deindustrialization and/or outsourcing to other countries (Baldwin & Okubo, 2019). The suitability for other functions than industry within industrial areas is often attributed to the durability of the buildings in both materiality as well as in structure (Madgin, 2010).

From the 43 strategies, 5 main drivers were found (user participation, top-down, genius loci, sustainability, and conversion). These represent the shared main factors or thematic approaches that shape the analysed regeneration strategies. They are not all-encompassing as their sum does not constitute a fully-formed strategy, as they are more closely aligned with the focal points or 'DNA' of a strategy. While a driver can be a strategy on its own, this has been exclusively observed in 3 cases with the top down driver. In most cases multiple drivers constitute to a strategy.

User participation was the least incorporated driver in the identified strategies. This may be due to the added complexity introduced by participatory design which includes more stakeholders and/or opinions (Harrouni, 2018; van der Velden & Mörtberg, 2015). Furthermore, current governance models (and their public officials) may not allow room or lack the motivation for including different end-users citing their inexperience in working and engaging with end-users to be insufficient. There may also be some scepticism amongst officials towards the quality of knowledge and understanding of relevant issues by the end-users (Van Herzele et al., 2005, pp. 207–228) which is tied to the socioeconomic status of these users (Vardopoulos, 2022). Linking the reason for development to the application of a driver, the other drivers appear thrice as much when heritage is redeveloped due to vacancy. Due to vacancy, the lack of current-users may explain the lack of user-participatory processes. This does not explain the absence of possible-future users, as vacancy-fuelled redevelopments are primarily developed into cultural or mixed functions. Nevertheless, the exact nature of the low frequency falls outside the scope of this paper. Nonetheless, when used, it contributed often to a positively evaluated strategy. Multiple papers noted that the knowledge of the local residents helps to identify what needs to be preserved (and in turn regenerated) beyond tangible attributes. Incorporation of this knowledge within regeneration schemes eventually leads to identification by the residents with their (regenerated) environment and a sense of commitment to maintaining that environment (Esad Muminović et al., 2020; Nyseth & Sognnæs, 2013; Soave & Hawizy, 2020; Wang & Lee, 2008; Zhai & Ng, 2013).

Noteworthy is the absence of an economical related driver. As discussed by Plevoets and Van Cleempoel (2011), owners and developers appear to be primarily concerned with the economic aspects of preserving their buildings. Vardopoulos et al. (2021) highlight the pivotal role of costs in decision-making processes, and that their consideration is vital for attaining urban redevelopment. Nevertheless, economic aspects are only discussed in a few cases regarding the evaluation of a strategy (Mondaini et al., 2011; Shih & Yen, 2009) or as a tool for funding (Rosato et al., 2010; Zhang et al., 2019). It may be that monetary concerns are unimportant within the observed strategies or that authors of the reviewed papers often omit them to focus on social, cultural, and/or material factors.

In general, strategies have been found to become more frequently evaluated as positive, when three or more drivers are incorporated. It appears that the exact combination of drivers becomes less relevant for the outcome. It may be that the various drivers are analogous to different angles, themes, or fields of knowledge. The coverage of more drivers thus leads to a more diverse strategy that is better tailored to the case study at hand which is in line with findings by Vardopoulos et al. (2021) and Misirlisoy and Günçe (2016) who discuss adaptive reuse as requiring a holistic approach.

Despite the specific combinations becoming seemingly irrelevant, investigating specific combinations remains useful for assessing the distribution of drivers. The top-down approach and genius loci are equally often used in transformation strategies. Genius loci is, however, evaluated more positively whereas top-down contributes to a large share

of negative evaluations. Nevertheless, the combination of the two drivers is the most frequent and has a positive evaluation rate of 76%. The least frequent discussed combination combines user participation with top-down and has a high positive evaluation rate of 90%. While the incorporation of more drivers appears to correlate with a positive evaluation as discussed earlier, the change in performance of the top-down driver when combined with these specific drivers is noteworthy. It appears that the top-down driver can be interpreted as being a large, distant, or detached actor and that it requires locality either in the physical form of genius loci (Madgin, 2010; Ripp & Rodwell, 2015) or in the (intangible) knowledge of residents through participatory processes (Nyseth & Sognnæs, 2013; Soave & Hawizy, 2020) in order to thrive. On the other hand, the two 'local' drivers benefit from the top-down actor. Through policy-making and the larger scale of handling, a more thorough assessment can be done of the genius loci and the appropriate tools to handle it are more readily available (and can be wielded) (Ryberg-Webster & Kinahan, 2014; Ryberg, 2013; Wang & Lee, 2008; Wang, 2011). Likewise, the sharing of (institutional) knowledge by employed experts (Madgin, 2010), the provision of funding (Zhang et al., 2019), and the ability to raise awareness and public support (Vardopoulos et al., 2021) facilitate the formation and the functioning of user-participatory groups.

From the geographical analysis of the case studies, it can be concluded that a higher number of studies on regeneration were reported from Europe (24) and Asia (14). Therefore, this review is most applicable to these two continents, especially Europe. Underrepresentation of other geographical regions can be attributed to language restriction (English) in the database search or limited reporting of regeneration practices at the urban scale. With top-down being the most dominant driver for Asian strategies, this translates into the overall positive evaluation rate of these strategies (50%) being relatively low. The number of drivers the Asia-based strategies incorporate is on average less than 3 which likewise correlates with a lesser number of positive evaluations. Europe-based strategies on the other hand appear to have a more positive outcome (83%) which can be attributed to incorporating more drivers. Furthermore, genius loci and conversion are the two most dominant drivers in European strategies. Differences between two continents might be attributed to differences in governance structures.

In examining the distribution of drivers across time within the (indirect) reporting of them across literature, no significant trend was found. This might be due to the broad nature of the drivers as taken within this review. It might be possible that there is a shift in focus point within a driver but that has not been researched within this paper.

The qualitative nature of most reviewed papers (87%) introduced a level of subjectivity both in their content as well as in the interpretation of the reviewers. Regarding the strategies, especially the assessment of the disposition of the authors of the reviewed papers is prone to this subjectivity. While the assessments reflect the professional opinions of the authors, in most cases these were not quantified or backed up by objective parameters. Therefore, future literature must introduce/include objective parameters to verify the performance of a strategy to both complement as well as verify/clarify the authors' professional opinions. Furthermore, a subjective element is introduced by the reviewers in extracting and quantifying this data for comparison: the reviewed papers discuss a wide range of topics, each with their own set of terminologies. To reduce this subjectiveness, each paper has been reviewed by two reviewers.

The large variety of papers, case studies and strategies, raises questions on the generalizability of the results. On average a combination represents 2,2 strategies therefore, the sample size can become too small. Especially the two drivers (urban tissue and quality of life) that were not further analysed, are lacking an in-depth explanation. A positively evaluated combination found in this review might, thus, be the result of chance. Therefore, the results should lead to further research into specific drivers and combinations wherein their full extent and role

is further explored via the inclusion of larger datasets.

5. Conclusion

Reappreciation of historic urban sites as cultural, economic, and environmental assets has generated widespread interest in their redevelopment. Strategies for redevelopment have been well documented, but their comparison on an urban scale is lacking. This paper aims at providing a synthesis of urban redevelopment strategies through a series of shared drivers (user participation, top-down, genius loci, sustainability, and conversion) and whether a strategy composed by a combination of these drivers will result in a positive assessment of regeneration. Further research by taking these drivers as a starting point can aid in the formulation of strategies for urban regeneration that can inform urban planners and other decision-makers.

The assessed 43 strategies show similarities across five drivers: user participation (17), top-down (32), genius loci (36), sustainability (25), and conversion (25). Of these, user participation has contributed to the most positive evaluated strategies, whereas top-down to the most negative evaluated strategies. However, when the top-down driver is paired with either the genius loci driver or the user participation driver, it becomes part of positively evaluated strategies. The incorporation of three or more drivers (and thus applying a type of multidisciplinary approach) yields almost exclusively positive results. This subsequently implies that the exact combination of drivers becomes subordinate amongst the reviewed strategies.

The driver analysis offers a thematic approach to the formulation of strategies. Further research into the corresponding interventions that invoke these drivers will help to concretise these strategies. Such interventions may transcend specific drivers and can thus benefit from the observed synergetic relationships between them. The driver analysis can be employed to group and select appropriate interventions to achieve the desired outcome.

As the drivers within this research were derived *a posteriori*, taking them as a starting point for future research will allow for a further exploration of their contents as well as the underlying quality and extent of the relationships amongst the various drivers. Insight into the contents of drivers may reveal subtopics whose importance may shift over time. This may allow for the deduction of future trends to allow the driver and strategy-formation to become future-proof, but can also aid in identifying underlying synergy. More importantly, any type of driver-specific research should include more (driver-specific) case studies to allow for a higher generalizability and/or validity of the outcomes. Eventually, increased insight in the drivers, the interventions associated

with them as well as the underlying synergy could culminate in a strategy assessment tool to evaluate potential strategies.

Using the conclusions and recommendations of this study, decision-makers, urban planners, and policy makers can further research specific drivers and make more informed choices to develop their strategies for the regeneration of urban historic sites.

CRediT authorship contribution statement

K. Pulles: Conceptualization, Methodology, Investigation, in the form of literature review with a double process including, Data curation, by one of the other authors, Writing – original draft, Formal analysis, to produce data from the literature review, All authors, Writing – review & editing. **I.A.M. Conti:** Conceptualization, Methodology, Investigation, in the form of literature review with a double process including, Data curation, by one of the other authors, Writing – original draft, All authors, Writing – review & editing. **M.B. de Kleijn:** Conceptualization, Methodology, Investigation, in the form of literature review with a double process including, Data curation, by one of the other authors, Writing – original draft, Visualization, of the data in tables, All authors, Writing – review & editing. **B. Kusters:** Conceptualization, Methodology, Investigation, in the form of literature review with a double process including, Data curation, by one of the other authors, Writing – original draft, All authors, Writing – review & editing. **T. Rous:** Conceptualization, Methodology, Investigation, in the form of literature review with a double process including, Data curation, by one of the other authors, Writing – original draft, All authors, Writing – review & editing. **L.C. Havinga:** Visualization, of the data in tables, Supervision, during the draft process, All authors, Writing – review & editing, Writing – original draft. **D. Ikiz Kaya:** Supervision, during the draft process, All authors, Writing – review & editing, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing interests or personal relationships that could have appeared to influence the work reported in this paper. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements

The authors of this papers would like to thank the authors of the reviewed papers for their work and professional perspective.

Appendix A

Table A.1

Complete overview of the strategies and their dissemination along drivers

Strategy ID (SID)	paper reference	strategy name	drivers					author evaluation	Strategy Driver Code (SDC)	SimplifiedStrategy Driver Code (SSDC)
			1	2	3	4	5			
1	Abramson (2007)	Chinese preservation policy	0	2	2	0	0	–	02200	01100
2	Appendino (2017)	The sustainable development’s pillars	2	1	2	2	2	+	21222	11111
3	Baker et al. (2017)	Transformation Meter	0	1	1	2	2	+	01122	01111
4	Bakhareva and Kordonchik (2019)	Building Information Modeling	0	0	2	2	1	+	00221	00111
5	Berta et al. (2018)	Urban regeneration	0	1	0	1	1	+	01011	01011
6	Boeri and Longo (2012)	Retrofitting	1	1	1	2	2	+	11122	11111
7	Bonfantini (2015)	Planning by actions, UNESCO 2011 ‘Recommendation on the historic urban landscape’, historic urban landscape, open-ended and people-driven approach to conservation	0	0	2	2	2	+	00222	00111
8	Canevaro et al. (2019)	Adaptive re-use	0	1	0	2	1	+	01021	01011

(continued on next page)

Table A.1 (continued)

Strategy ID (SID)	paper reference	strategy name	drivers					author evaluation	Strategy Driver Code (SDC)	SimplifiedStrategy Driver Code (SSDC)
			1	2	3	4	5			
9	Caroupapoullé (2019)	Palimpsestuous Design	0	0	2	2	2	+	00222	00111
10	Delgado and SáMachado (2011)	Renewal of a fortified site	0	1	2	1	1	+	01211	01111
11	(Eyüboğlu et al. (2007))	Spatial Syntax	0	1	1	0	0	+	01100	01100
12	Foster (2020)	CE (comprehensive circular economy)	0	2	0	2	0	+	02020	1010
13	Francesca Prada et al. (2019)	Conversion and Urban Acupuncture	1	0	2	1	2	+	10212	10111
14	Harrouni (2018)	Alleviate the constraints through a sustainable conservation program, user participation	2	0	1	2	0	+	20120	10110
15	Hoyle (2001)	Waterfront redevelopment	0	1	2	0	1	+	01201	01101
16	Madgin (2010)	Constant Reconceptualising	1	2	1	2	2	+/-	12122	11111
17	Mondaini et al. (2011)	Deferred planning	1	0	0	2	2	+	10022	10011
18	Moniz et al. (2019)	Barredo Urban Renewal Study	0	1	2	0	0	+	01200	01100
19	Muminović et al. (2020)	Protection and the development of historic urban landscapes	2	1	2	0	2	+	21202	11101
20	Muminović et al. (2020)	Plan of Detailed Regulation of the Historic Center	0	0	0	1	1	-	00011	00011
21	Natividade-Jesus et al. (2019)	Urban regeneration methodology	1	2	0	0	0	+	12000	11000
22	Nyseth and Sognnaes (2013)	Preservation of built heritage	1	2	2	0	1	+	12201	11101
23	Owied (2018)	RehabiMed	0	2	2	0	1	+/-	02201	01101
24	Pendlebury (2002)	The Conservation Practice and Grainger Town Regeneration Strategy	0	1	1	1	2	+	01112	01111
25	Ripp and Rodwell (2015)	Recovery of shared spaces	2	0	2	2	0	+	20220	10110
26	Ripp and Rodwell (2015)	UNESCO historic urban landscape approach	0	2	0	1	0	-	02010	01010
27	Rivero (2017)	The experience strategy	0	2	0	0	0	-	02000	01000
28	Rubio Bellido et al. (2011)	Preservation	0	0	2	0	2	-	00202	00101
29	Ryberg (2013)	Historic preservation mixed with redevelopment	0	2	2	0	0	+	02200	01100
30	Shih and Yen (2009)	Culture and history over industry	0	0	2	2	1	+	00221	00111
31	Shih and Yen (2009)	Maximalise sugar industry	0	2	0	0	0	-	02000	01000
32	Soave and Hawizy (2020)	Rebuilding Tajeel	2	0	2	0	1	+	20201	10101
33	Swensen and Berg (2018)	Cultural Heritage Management	1	2	0	1	2	+	12012	11011
34	Szymański (2017)	Recognition of heritage value	2	1	2	0	0	+	21200	11100
35	Tan (2014)	Romanticised Heritage	0	1	2	0	1	+	01201	01101
36	Tanrikul and Hoşkara (2019)	Urban regeneration planning process	0	1	1	2	0	+	01120	01110
37	Turgut (2011)	Urban Renewal	0	2	1	0	0	-	02100	01100
38	Villacampa and Villacampa (2011)	Nuova Bovisa	1	2	1	2	2	+	12122	11111
39	Vroom (1991)	Urban Renewal	0	2	0	0	0	+	02000	01000
40	Wang & Lee (2008)	Government-funded projects with a bottom-up approach	2	2	2	0	0	+	22200	11100
41	Wang (2011)	Commercial Gentrification	0	2	0	1	0	-	02010	01010
42	Yung et al. (2017)	District-based urban renewal and people-first approach	0	2	1	0	1	-	02101	01101
43	Zhai and Ng (2013)	Participatory regeneration	2	0	1	0	0	+	20100	10100
44	Zhai and Ng (2013)	Urban regeneration	0	2	0	1	0	-	02010	01010
45	Zhang et al. (2019)	Conservation Planning of 25 Historic Areas in Beijing Old City	2	0	2	2	0	+	20220	10110
46	Zhang et al. (2019)	Preservation Planning of the Family Historical and Cultural City of Beijing	0	0	0	0	0	-	00000	00000
47	Zhang et al. (2019)	Conversion and Urban Acupuncture	1	0	2	1	2	+	10212	10111

References

- Abramson, D. B. (2007). The aesthetics of city-scale preservation policy in Beijing. *Planning Perspectives*, 22(2), 129–166. <https://doi.org/10.1080/02665430701213531>
- Albanese, G., Ciani, E., & de Blasio, G. (2021). Anything new in town? The local effects of urban regeneration policies in Italy. *Regional Science and Urban Economics*, 86. <https://doi.org/10.1016/j.regsciurbeco.2020.103623>
- Appendino, F. (2017). Balancing heritage conservation and sustainable development - the case of bordeaux. *IOP Conference Series: Materials Science and Engineering*, 245(6). <https://doi.org/10.1088/1757-899X/245/6/062002>
- Baker, H., Moncaster, A., & Al-Tabbaa, A. (2017). Decision-making for the demolition or adaptation of buildings. *Proceedings - Institution of Civil Engineers: Forensic Engineering*, 170(3), 144–156. <https://doi.org/10.1680/jfoen.16.00026>
- Bakhareva, O., & Kordonchik, D. (2019). Investments in preservation and development of regional cultural heritage: A library of bim elements representing national architectural and urban-planning landmarks. *Architect and Engineer*, 4(3), 39–48. <https://doi.org/10.23968/2500-0055-2019-4-3-39-48>

- Baldwin, R., & Okubo, T. (2019). GVC journeys: Industrialisation and deindustrialisation in the age of the second unbundling. *Journal of the Japanese and International Economies*, 52, 53–67. <https://doi.org/10.1016/j.jjie.2019.02.003>
- Berta, M., Bottero, M., & Ferretti, V. (2018). A mixed methods approach for the integration of urban design and economic evaluation: Industrial heritage and urban regeneration in China. *Environment and Planning B: Urban Analytics and City Science*, 45(2), 208–232. <https://doi.org/10.1177/0265813516669139>
- Boeri, A., & Longo, D. (2012). High density suburbs redevelopment and social housing retrofitting for cities regeneration. *WIT Transactions on Ecology and the Environment*, 155, 133–144. <https://doi.org/10.2495/SC120121>
- Bonfantini, G. B. (2015). Historic urbanscapes for tomorrow, two Italian cases: Genoa and Bologna. *European Spatial Research and Policy*, 22(2), 57–71. <https://doi.org/10.1515/esrp-2015-0025>
- Bryman, A. (2004). Content analysis. In *Social research methods* (2nd ed., pp. 288–308). Oxford University Press.
- Bullen, P. A., & Love, P. E. D. (2011). Adaptive reuse of heritage buildings. *Structural Survey*, 29(5), 411–421. <https://doi.org/10.1108/02630801111182439>
- Canevaro, E., Ingaramo, R., Lami, I. M., Morena, M., Robiglio, M., Saponaro, S., & Sezenna, E. (2019). Strategies for the sustainable reindustrialization of brownfields. *IOP Conference Series: Earth and Environmental Science*, 296(1). <https://doi.org/10.1088/1755-1315/296/1/012010>
- Carouppoullé, A. (2019). Creating balance between transformation and preservation within UNESCO World heritage sites: A case study of belper, UK. *WIT Transactions on Ecology and the Environment*, 238, 395–405. <https://doi.org/10.2495/SC190351>
- Conejos, S., Langston, C., Chan, E. H. W., & Chew, M. Y. L. (2016). Governance of heritage buildings: Australian regulatory barriers to adaptive reuse. *Building Research & Information*, 44(5–6), 507–519. <https://doi.org/10.1080/09613218.2016.1156951>
- Corten, J.-P., Geurts, E., Meurs, P., Rypkema, D., & Wall, R. (2014). *Heritage as an asset for inner city development. An Urban Managers' Guidebook*. nai010.
- Delgado, J. P., & SáMachado, A. (2011). Regeneration of part of the historic fortified town of Monção, Portugal. *WIT Transactions on The Built Environment*, 123, 149–160. <https://doi.org/10.2495/DSHF120121>
- Dhingra, M., Singh, M. K., & Chattopadhyay, S. (2017). Macro level characterization of historic urban landscape: Case study of alwar walled city. *City, Culture and Society*, 9, 39–53. <https://doi.org/10.1016/j.ccs.2016.10.001>
- Dogruiyol, K., Aziz, Z., & Arayici, Y. (2018). Eye of sustainable planning: A conceptual heritage-led urban regeneration planning framework. *Sustainability*, 10(5). <https://doi.org/10.3390/su10051343>
- Eyüboğlu, E., Kubat, A. S., & Ertekin, Ö. (2007). A new urban planning approach for the regeneration of an historical area within Istanbul's central business district. *Journal of Urban Design*, 12(2), 295–312. <https://doi.org/10.1080/13574800701306179>
- Ferretti, V., & Grosso, R. (2019). Designing successful urban regeneration strategies through a behavioral decision aiding approach. *Cities*, 95, Article 102386. <https://doi.org/10.1016/j.cities.2019.06.017>
- Foster, G. (2020). Circular economy strategies for adaptive reuse of cultural heritage buildings to reduce environmental impacts. *Resources, Conservation and Recycling*, 152. <https://doi.org/10.1016/j.resconrec.2019.104507>
- Francesca Prada, I., Bungau, C., & Zsak, I.-G. (2019). Regeneration of the industrial heritage in the central area of Oradea, Romania. *IOP Conference Series: Materials Science and Engineering*, 603(4). <https://doi.org/10.1088/1757-899X/603/4/042005>
- Freestone, R. (1999). Preserving Sydney's built heritage in the early twentieth century. *Australian Historical Studies*, 29(112), 44–60. <https://doi.org/10.1080/10314619908596086>
- Galdini, R. (2019). Urban re-use practices in contemporary cities: Experiences in Europe. *Cities*, 87, 103–105. <https://doi.org/10.1016/j.cities.2018.12.026>
- Harrouni, K. E. (2018). Sustainable urban conservation and management of historical areas. Come back to thirty five years (1981–2016) of observation in Fez medina, Morocco. In *Lecture notes in civil engineering* (Vol. 6). https://doi.org/10.1007/978-3-319-63709-9_44
- Hoyle, B. (2001). Urban renewal in East African port cities: Mombasa's old town waterfront. *Geojournal*, 53(2), 183–197. <https://doi.org/10.1023/A:1015704101663>
- ICOMOS. (1972). *Cultural heritage*.
- Jabareen, Y. R. (2006). Sustainable urban forms: Their typologies, models, and concepts. *Journal of Planning Education and Research*, 26(1), 38–52. <https://doi.org/10.1177/0739456X05285119>
- Kim, H. R., & Jang, Y. (2017). Lessons from good and bad practices in retail-led urban regeneration projects in the Republic of Korea. *Cities*, 61, 36–47. <https://doi.org/10.1016/j.cities.2016.11.004>
- Lak, A., Gheitsai, M., & Timothy, D. J. (2020). Urban regeneration through heritage tourism: Cultural policies and strategic management. *Journal of Tourism and Cultural Change*, 18(4), 386–403. <https://doi.org/10.1080/14766825.2019.1668002>
- Lehmann, S. (2019). *Urban regeneration*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-04711-5>
- Lempert, D. (2015). Classifying heritage by states of decay, restoration, and transformation for tourism, teaching, and research: 'Un-freezing' sites in time to reveal additional meanings. *Journal of Heritage Tourism*, 10(4), 378–398. <https://doi.org/10.1080/1743873X.2014.994637>
- Liu, B., Lu, X., Hu, X., Li, L., & Li, Y. (2021). *What's wrong with the public participation of urban regeneration project in China: A study from multiple stakeholders' perspectives*. Engineering, Construction and Architectural Management. <https://doi.org/10.1108/ECAM-03-2020-0175>
- Low, S. M., Taplin, D., Scheld, S., & Fisher, T. (2002). Recapturing erased histories: Ethnicity, design, and cultural representation - a case study of Independence National Historical Park. *Journal of Architectural and Planning Research*, 19(4), 282–299.
- Madgin, R. (2010). Reconceptualising the historic urban environment: Conservation and regeneration in Castlefield, Manchester, 1960–2009. *Planning Perspectives*, 25(1), 29–48. <https://doi.org/10.1080/02665430903421726>
- Misirlişoy, D., & Günçe, K. (2016). Adaptive reuse strategies for heritage buildings: A holistic approach. *Sustainable Cities and Society*, 26, 91–98. <https://doi.org/10.1016/j.scs.2016.05.017>
- Mondaini, G., Carluccio, C., & Panariello, R. (2011). RE-URB/ARCH: Urban and architectonic regeneration strategies: Sustainability models. *WIT Transactions on Ecology and the Environment*, 155, 145–156. <https://doi.org/10.2495/SC120131>
- Moniz, G. C., Correia, L. M., & Gonçalves, A. (2019). Fernando távora oporto's urban renewal: A changing moment in urban rehabilitation policy debate. *Journal of Urban History*, 45(4), 765–785. <https://doi.org/10.1177/0096144216688453>
- Muminović, E., Radosavljević, U., & Beganović, D. (2020). Strategic planning and management model for the regeneration of historic urban landscapes: The case of historic center of Novi Pazar in Serbia. *Sustainability*, 12(4). <https://doi.org/10.3390/su12041323>
- Muminović, E., Radosavljević, U., & Beganović, D. (2020). Strategic planning and management model for the regeneration of historic urban landscapes: The case of historic center of Novi Pazar in Serbia. *Sustainability*, 12(4). <https://doi.org/10.3390/su12041323>
- Natividade-Jesus, E., Almeida, A., Sousa, N., & Coutinho-Rodrigues, J. (2019). A case study driven integrated methodology to support sustainable urban regeneration planning and management. *Sustainability*, 11(15). <https://doi.org/10.3390/su11154129>
- Nyseth, T., & Sognnaes, J. (2013). Preservation of old towns in Norway: Heritage discourses, community processes and the new cultural economy. *Cities*, 31, 69–75. <https://doi.org/10.1016/j.cities.2012.05.014>
- Owied, H. S. (2018). Urban transformations of historical cities centers: Urban renewal projects of Alnajaf city center. In *International conference on advances in sustainable engineering and applications* (pp. 159–164). ICASEA 2018 - Proceedings. <https://doi.org/10.1109/ICASEA.2018.8370975>
- Owojori, O. M., Okoro, C. S., & Chileshe, N. (2021). Current status and emerging trends on the adaptive reuse of buildings: A bibliometric analysis. In *Sustainability (Switzerland)* (Vol. 13). <https://doi.org/10.3390/su132111646>. Issue 21.
- Pendlebury, J. (2002). Conservation and regeneration: Complementary or conflicting processes? The case of grainger town, Newcastle upon tyne. *Planning Practice and Research*, 17(2), 145–158. <https://doi.org/10.1080/02697450220145913>
- Pittini, A., Ghekiere, L., Dijol, J., & Kiss, I. (2015). *The state of housing in the EU 2015 A housing Europe review*. <https://www.housingeurope.eu/resource-468/the-state-of-housing-in-the-eu-2015#>.
- Plevoets, B., & Van Cleempoel, K. (2011). Adaptive reuse as a strategy towards conservation of cultural heritage: A literature review. *WIT Transactions on The Built Environment*, 118, 155–164. <https://doi.org/10.2495/STR110131>
- Plevoets, B., & Van Cleempoel, K. (2019). Adaptive reuse of the built heritage: Concepts and cases of an emerging discipline. In *Adaptive reuse of the built heritage: Concepts and cases of an emerging discipline*. <https://doi.org/10.4324/9781315161440>
- Ripp, M., & Rodwell, D. (2015). The geography of urban heritage. *The Historic Environment: Policy and Practice*, 6(3), 240–276. <https://doi.org/10.1080/17567505.2015.1100362>
- Rivero, J. J. (2017). "Saving" Coney Island: The construction of heritage value. *Environment and Planning*, 49(1), 65–85. <https://doi.org/10.1177/0308518X16663014>
- Rosato, P., Alberini, A., Zanatta, V., & Breil, M. (2010). Redeveloping derelict and underused historic city areas: Evidence from a survey of real estate developers. *Journal of Environmental Planning and Management*, 53(2), 257–281. <https://doi.org/10.1080/09640560903529550>
- Rubio Bellido, C., Gallego Pérez, P., & Llácer Pantión, R. (2011). The future of fortifications in the city of Cadiz: Opportunities and strategies for an urban regeneration. *WIT Transactions on The Built Environment*, 123, 135–147. <https://doi.org/10.2495/DSHF120111>
- Ryberg, S. R. (2013). Historic preservation's urban renewal roots: Preservation and planning in midcentury Philadelphia. *Journal of Urban History*, 39(2), 193–213. <https://doi.org/10.1177/0096144212440177>
- Ryberg-Webster, S., & Kinahan, K. L. (2014). Historic preservation and urban revitalization in the twenty-first century. *Journal of Planning Literature*, 29(2), 119–139. <https://doi.org/10.1177/0885412213510524>
- Schuurmans, A., Dyrbol, S., & Guay, F. (2018). *Buildings in urban regeneration* (p. 32). Intech. <http://www.intechopen.com/books/trends-in-telecommunications-technologies/gps-total-electron-content-tec-prediction-at-ionosphere-layer-over-the-equatorial-region%0AInTec>.
- Shaw, K. (2014). Melbourne's creative spaces program: Reclaiming the "creative city" (if not quite the rest of it). *City, Culture and Society*, 5(3), 139–147. <https://doi.org/10.1016/j.ccs.2014.07.002>
- Shih, C.-M., & Yen, S.-Y. (2009). The transformation of the sugar industry and land use policy in Taiwan. *Journal of Asian Architecture and Building Engineering*, 8(1), 41–48. <https://doi.org/10.3130/jaabe.8.41>
- Soave, A., & Hawizy, B. (2020). Rebuilding tajeel: Strategies to reverse the deterioration of cultural heritage and loss of identity of the historic Quarters of Erbil, Kurdistan, Iraq. In *Urban book series*. https://doi.org/10.1007/978-3-030-22762-3_6
- Swensen, G., & Berg, S. K. (2018). Use of redundant industrial buildings as injections into the cultural sector in Norway. *Planning Practice and Research*, 33(3), 344–358. <https://doi.org/10.1080/02697459.2017.1378861>

- Szymański, T. (2017). Cultural identity of the industrial heritage in Gdansk. *IOP Conference Series: Materials Science and Engineering*, 245(8). <https://doi.org/10.1088/1757-899X/245/8/082034>
- Tan, Y. H. (2014). Palimpsests of the past: Invoking heritage in the redevelopment of post-war housing estates. *WIT Transactions on Ecology and the Environment*, 181, 345–360. <https://doi.org/10.2495/EID140301>
- Tanrikul, A., & Hoşkara, S. (2019). A new framework for the regeneration process of Mediterranean historic city centres. *Sustainability*, 11(16). <https://doi.org/10.3390/su11164483>
- Turgut, S. (2011). Site management process and urban renewal in Istanbul: Historical Peninsula. *WIT Transactions on Ecology and the Environment*, 155, 859–868. <https://doi.org/10.2495/SC120722>
- Van Herzele, A., Collins, K., & Tyrväinen, L. (2005). *Involving people in urban forestry — a discussion of participatory practices throughout Europe*. Urban Forests and Trees: A Reference Book. https://doi.org/10.1007/3-540-27684-X_9
- Vardopoulos, I. (2022). Industrial building adaptive reuse for museum. Factors affecting visitors' perceptions of the sustainable urban development potential. *Building and Environment*, 222(August), Article 109391. <https://doi.org/10.1016/j.buildenv.2022.109391>
- Vardopoulos, I. (2023). Adaptive reuse for sustainable development and land use: A multivariate linear regression analysis estimating key determinants of public perceptions. *Heritage*, 6(2), 809–828. <https://doi.org/10.3390/heritage6020045>
- Vardopoulos, I., Tsilika, E., Sarantakou, E., Zorpas, A. A., Salvati, L., & Tsartas, P. (2021). An integrated swot-pestle-ahp model assessing sustainability in adaptive reuse projects. *Applied Sciences*, 11(15). <https://doi.org/10.3390/app11157134>
- van der Velden, M., & Mörtberg, C. (2015). In J. van den Hoven, P. E. Vermaas, & I. van de Poel (Eds.), *Participatory Design Design participatory and design for values BT - handbook of ethics, values, and technological design: Sources, theory, values and application domains* (pp. 41–66). Springer Netherlands. https://doi.org/10.1007/978-94-007-6970-0_33
- Villacampa, A., & Villacampa, Y. (2011). Re-Use of the industrial heritage of bovisa: A model for urban and cultural regeneration. *WIT Transactions on Ecology and the Environment*, 155, 869–880. <https://doi.org/10.2495/SC120732>
- Vroom, K. (1991). Antwerp: A modern city with a significant historic heritage. *GeoJournal*, 24(3), 277–284. <https://doi.org/10.1007/BF00189028>
- Wang, S. W.-H. (2011). Commercial gentrification and entrepreneurial governance in Shanghai: A case study of taikang road creative cluster. *Urban Policy and Research*, 29(4), 363–380. <https://doi.org/10.1080/08111146.2011.598226>
- Wang, H.-J., & Lee, H.-Y. (2008). How government-funded projects have revitalized historic streetscapes - two cases in Taiwan. *Cities*, 25(4), 197–206. <https://doi.org/10.1016/j.cities.2008.04.007>
- Yung, E. H. K., Zhang, Q., & Chan, E. H. W. (2017). Underlying social factors for evaluating heritage conservation in urban renewal districts. *Habitat International*, 66, 135–148. <https://doi.org/10.1016/j.habitatint.2017.06.004>
- Zhai, B., & Ng, M. K. (2013). Urban regeneration and social capital in China: A case study of the drum tower muslim district in Xi'an. *Cities*, 35, 14–25. <https://doi.org/10.1016/j.cities.2013.05.003>
- Zhang, Y., Kang, S., & Koo, J.-H. (2019). What is the critical factor and relationship of urban regeneration in a historic district?: A case of the Nanluoguxiang area in Beijing, China. *Sustainability*, 11(23). <https://doi.org/10.3390/su11236772>