




## From metropolitan rivers to civic corridors: assessing the evolution of the suburban landscape

Pere Vall-Casas, Marta Benages-Albert, Pablo Elinbaum, Xavier Garcia,  
Carmen Mendoza-Arroyo & Álvaro Rodrigo Cuéllar Jaramillo


To cite this article: Pere Vall-Casas, Marta Benages-Albert, Pablo Elinbaum, Xavier Garcia, Carmen Mendoza-Arroyo & Álvaro Rodrigo Cuéllar Jaramillo (2018): From metropolitan rivers to civic corridors: assessing the evolution of the suburban landscape, *Landscape Research*, DOI: [10.1080/01426397.2018.1519067](https://doi.org/10.1080/01426397.2018.1519067)

To link to this article: <https://doi.org/10.1080/01426397.2018.1519067>

 View supplementary material [↗](#)

 Published online: 11 Oct 2018.

 Submit your article to this journal [↗](#)

 Article views: 23

 View Crossmark data [↗](#)



# From metropolitan rivers to civic corridors: assessing the evolution of the suburban landscape

Pere Vall-Casas<sup>a</sup>, Marta Benages-Albert<sup>a</sup>, Pablo Elinbaum<sup>b</sup>, Xavier Garcia<sup>c</sup>,  
Carmen Mendoza-Arroyo<sup>a</sup> and Álvaro Rodrigo Cuéllar Jaramillo<sup>a</sup>

<sup>a</sup>School of Architecture, Universitat Internacional de Catalunya (UIC), Barcelona, Spain; <sup>b</sup>Centro de Estudios Urbanos y Regionales (CEUR), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Buenos Aires, Argentina; <sup>c</sup>Departament de Geografia, Universitat de Girona (UdG), Girona, Spain

## ABSTRACT

The sustainability of metropolitan regions is closely related to the transformation of rivers into civic and ecological corridors. While river rehabilitation in the inner city has been widely reported, ongoing river rehabilitation processes in non-central city parts remain under-researched. We analysed the socio-spatial evolution of a 10-km suburban stretch of a river in the Metropolitan Region of Barcelona by means of a review of planning regulations and municipal newsletters. We observed that, in the course of over 40 years, a system of public open spaces and facilities was incrementally created on the riverbanks, in keeping with a progressive reinforcement of the everyday relationship between local communities and the river. Today, a common political determination on the river's future, in conjunction with enhanced citizen activism, is paving the way for comprehensive, participatory river management.

## KEYWORDS

Suburban landscape; open space system; civic corridor; river rehabilitation; river social use

## 1. Introduction

The sustainability of metropolitan regions is closely related to the rehabilitation of rivers that have become de-naturalised after decades of intense degradation due to urban pressure. In developed countries, the implementation of water and flood management policies has enhanced the ecological integrity of riparian ecosystems and reduced the risk they pose to residents. These improvements have changed the general perception of rivers from polluted, dangerous environments to places for leisure and meeting (Åberg & Tapsell, 2013; Everard & Moggridge, 2012; Özgüner, Eraslan, & Yilmaz, 2012). Authorities and the general public alike are recognising the socio-ecological value of urban rivers and consequently demanding their rehabilitation (Findlay & Taylor, 2006; Lundy & Wade, 2011; Stanton, 2007) in order to enhance citizens' well-being and regional regeneration (Foley & Kistemann, 2015; Jiang, Shi, & Gu, 2016). The rehabilitation of urban rivers is also gaining momentum in the Global South in response to diverse needs, such as vulnerability mitigation of chronic flooding in densely occupied basins (Vollmer, Prescott, Padawangi, Girot, & Grêt-Regamey, 2015), urban upgrading of informal settlements in riverbanks (Costa et al. 2010), or tourism development in riverfronts (Damanik & Patriv, 2017).

Many metropolitan regions have progressively included rehabilitated river corridors in their park systems (Chou, 2016; Knaap & Lewis, 2011; Prominski, Stokman, Zeller, Stimberg, & Voermanek, 2012). In this context, cities have played a key role in removing obstacles and providing facilities for

public access and social use of riverbanks. The cities have taken advantage of the river as a brand that may attract residents, jobs and business in the face of international competition. Thus, river rehabilitation led by cities can be found worldwide and, despite the diversity of metropolitan regions in terms of scale and context, the same pattern repeats characterised by emblematic urban projects on riverbanks and prior large-scale visions of the city riverfront (Brown, Dixon, & Gillham, 2009; Chang & Huang, 2011; Hartig & Wallace, 2015).

A different situation is observed outside cities where dwellers' demand for quality of life has also triggered the use of rivers as living spaces in some stretches. We refer to low-density river corridors that contain urban functions (residence, industries, shopping centres, social facilities and parks) scattered along riverbanks and display urban intensity without the concentration of the compact city. This type of development represents a major footprint in contemporary metropolitan regions, as a result of the recurrent accumulation of sprawl along rivers that have traditionally acted as channels of communication and urban growth. These corridors are arranged around former rural roads that evolved into axes of self-sufficient agglomerations made up of historic urban centres and built-up areas intermingled with open spaces. With the progressive rise in density, diversity and connectedness of the whole corridor, the river is transforming into a blue and green infrastructure worth fronting, and improving the cohesion of urban fabrics by means of riverside parks and greenways is emerging as a retrofitting strategy (Dunham-Jones & Williamson, 2009; Novotny, Ahern, & Brown, 2010; Tachieva, 2010).

In this context, rather than prior visions and long-deliberated urban projects, river rehabilitation should be understood in the framework of suburban landscape evolution, between inner cities and rural areas, explored in the 1990s by authors such as Rowe (1991), Sieverts (1997), and Boeri (1993). Retrospective analyses of North American and European examples enabled these authors to observe the emergence, after lengthy transition periods, of an intermediate urbanisation that evolved gradually from initial scattered, single-function subdivisions to mature compact, mixed-use urban fabrics. In the process, public open spaces were consolidated as by-products of the densification, diversification and interconnection of surrounding grids. In this respect, the transformation of rural roads into major streets and of watercourses into urban parks has been reported in studies on metropolitan peripheries (Holcomb, 2008; Vall-Casas, Koschinsky, & Mendoza, 2011).

An analysis of the suburban landscape in a broad timeframe could aid an understanding of ongoing socio-spatial transformation processes, crucial when planning river rehabilitation outside city centres. However, unlike the case of inner-city, river rehabilitation in non-central city parts of metropolitan regions has not yet been specifically investigated, despite its potential to alleviate or meet many of the daily needs of their inhabitants. This article explores the rehabilitation of suburban river stretches, focusing on the consolidation of public open spaces on riverbanks, and its effects on the river's social relevance. The research has two specific objectives: (1) to describe the accumulation patterns of public land with civic use on the riverfront and (2) to assess the evolution of social use and perception of the river during the accumulation process.

The research uses the Caldes River, a tributary of the Besòs River in the Metropolitan Region of Barcelona (MRB), Spain, as a case study of metropolitan river rehabilitation outside cities. The discussion focuses on the physical and social dynamics of this case, and the practical implications of the evolutionary approach for decision-making in suburban river rehabilitation.

## 2. Case study

### 2.1. River rehabilitation in the River Besòs Basin (RBB)

The RBB lies to the north of Barcelona (Figure 1), has a surface area of approximately 1000 km<sup>2</sup> with over a million inhabitants, and is a representative example of a Mediterranean basin with occasional intense floods and scarce flow during much of the year. In the 1960s and 1970s, its six main watercourses, formerly devoted to providing irrigation, energy and raw materials in a rich agrarian

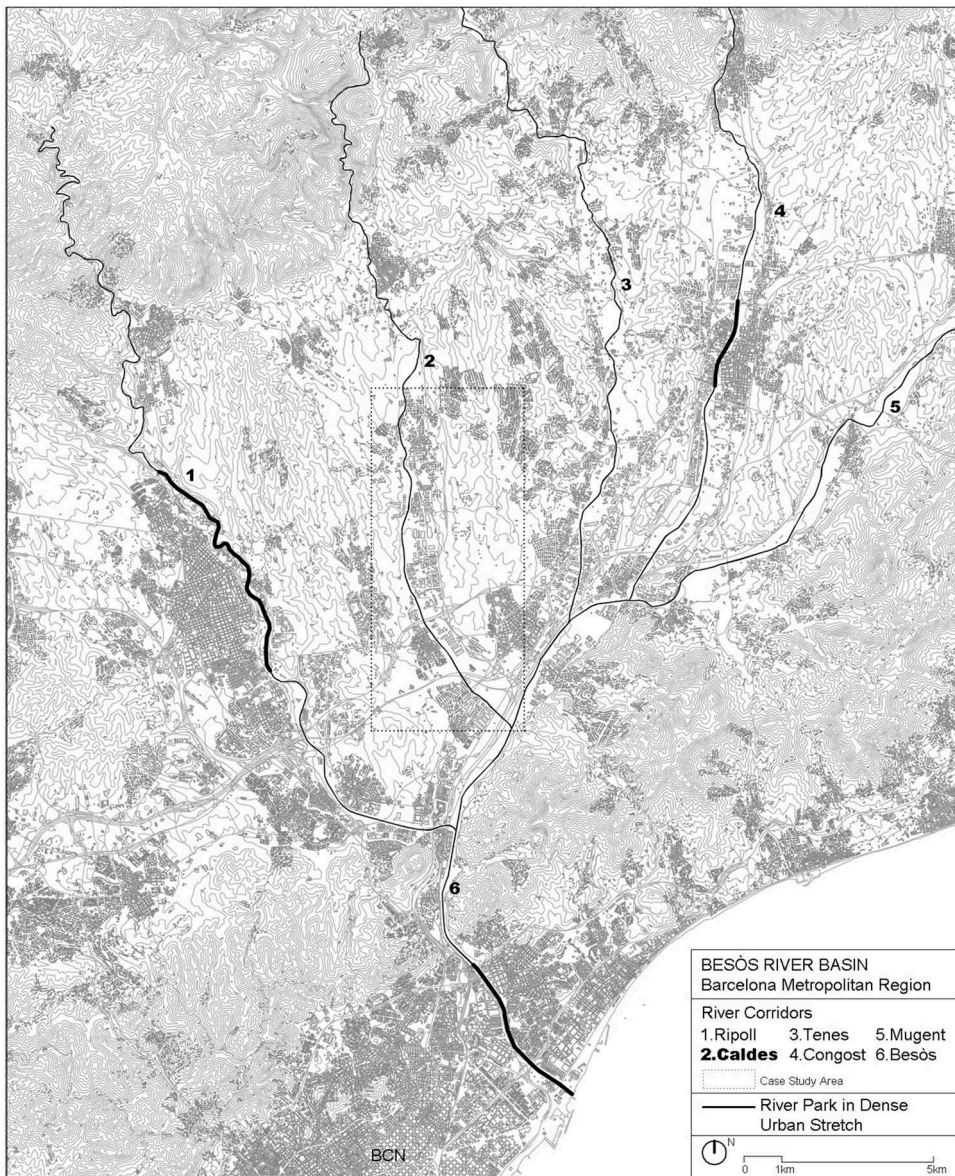


Figure 1. Besòs River basin. River parks in central urban stretches. MRB, Catalonia, Spain.

landscape, were subject to overexploitation of water resources, contamination of ecosystems and flooding due to the uncontrolled development of riverbanks (Gordi, 2005). The Besòs River and floodplains became: (1) areas of growth; (2) spaces for road and railway communications; and (3) channels for drainage, waste, and energy supply. Major stretches of the riverbanks were neglected and left to decline, leading to the dwindling of local riverside residents' feeling of belonging (Panareda, 2009). However, this condition underwent a reverse in the 1980s as a result of significant efforts to reappraise social and environmental assets (Benages-Albert & Vall-Casas, 2014), such as the creation in 1988 of a specific agency devoted to preserving the Besòs watercourses, in tune with transformations taking place in the most urbanised European basins (RNRW, 1989).

Most rehabilitation efforts to date have centred on stretches of watercourses closest to the major urban centres (Figure 1). As an example, the lower stretch of the Besòs River, 5.5 km long meeting the city of Barcelona, was transformed in the late 1990s as part of an emblematic urban project based on smart water management. The result benefits 300 000 people living nearby and exemplifies the social contribution of the revitalised river to an urban area with a shortage of public spaces (DB, 2014). Likewise, the 7.5-km stretch of the Ripoll River, rehabilitated as a river park (AS, 2014) in the city of Sabadell (208 246 inhabitants in 2017), illustrates the large-scale riverbanks improvement associated with downtowns in keeping with urban marketing goals and supported by powerful municipal governments.

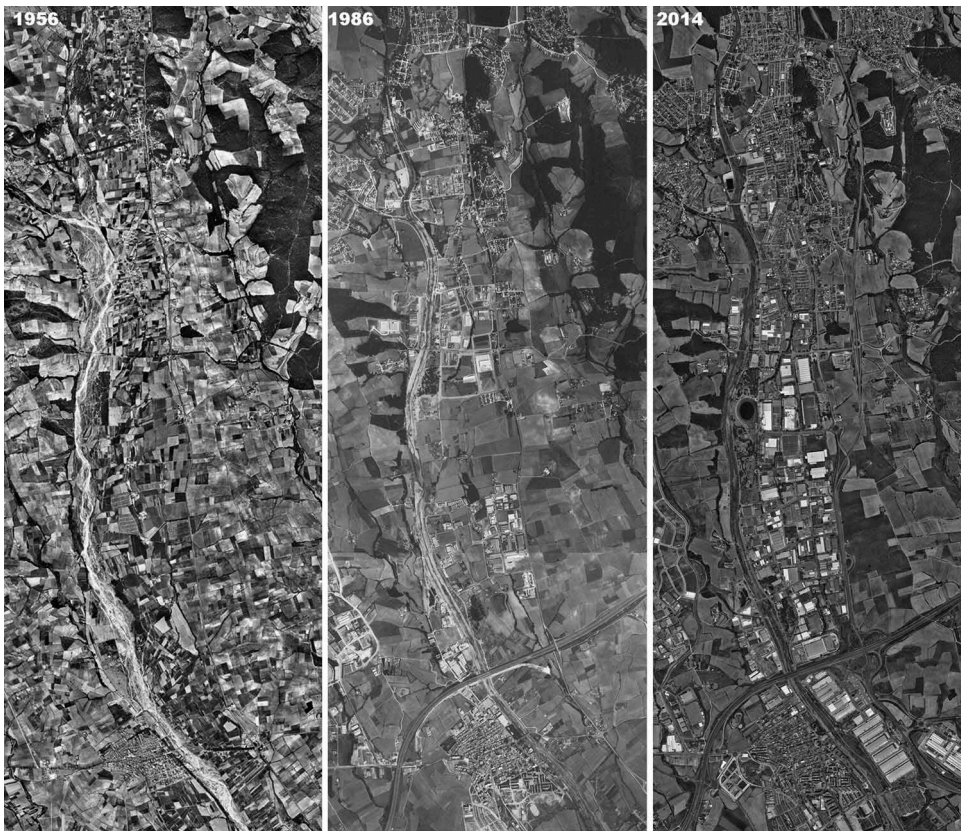
However, stretches of river with high urban intensity, as those of Barcelona or Sabadell, are scarce in the RBB (Figure 1). Low-density river corridors comprising towns with limited financial and managerial resources prevail in the five tributaries of the Besòs River (Ripoll River, Caldes River, Tenes River, Congost River and Mogent River). In these cases, river rehabilitation has been slow and fragmented, consisting in the accumulation over decades of public open spaces, recreational pathways and amenities, in a sort of silent process, much less evident than in large cities. The social effects of this accumulation can be seen in the success of cycling events that mobilise thousands of people along trails between the upper basin and the river mouth. The annual celebration of the Besòs Cycling Tour that started in 2003 and now has 1500 participants is worth particular mention. These long-term cumulative processes and the resulting intensification of riverbanks' social use are not yet fully consolidated, and the understanding of ongoing socio-spatial transformations is required in order to leverage their civic potential. Since all RBB tributaries keep significant physical and socio-economic commonalities, the analysis of one particular case may provide results of general validity.

## 2.2. *Rehabilitating the Caldes River*

The Caldes River is a prime example of incremental rehabilitation of riverbanks in the low-density river corridors of the RBB. Along its 22 km of riverfront, it connects an urban system of some 70 000 people and has become a significant place in the everyday life of riverside residents, as well as people from the metropolitan region who engage in leisure activities at weekends. At the same time, the sequence of industrial estates along its course forms an emblematic productive cluster of the MRB. The social and economic importance of the Caldes River has been acknowledged by the existing regional plan of the MRB (GENCAT, 2010).

In particular, we analysed the 10-km stretch between the municipalities of Palau-solità i Plegamans (14 494 inhabitants in 2017) and Santa Perpètua de Mogoda (25 556 inhabitants in 2017), shown in Figure 1. The relevance of this study area, 25 km from Barcelona, lies in the continuity of low-density residential and industrial fabrics along the watercourse. Development began in the 1960s due to intense growth and urban speculation in rural areas of the MRB (Font, Llop, & Vilanova, 1999). Between the 1960s and the 2010s, the populations of Palau-solità i Plegamans and Santa Perpètua multiplied by seven and eight, respectively; the floodplain, originally occupied by scattered farms and small towns at a distance from the river, underwent fragmentary occupation of its more accessible riverbanks, becoming a compact urban corridor as shown in Figure 2. During this development process, which is still ongoing, a significant number of civic spaces, such as vegetable plots, paths and industrial river parks have accumulated along the riverfront.

Note that the intensified civic use of the riverfront would have not been possible without previous measures taken to improve water quality and reduce the risk of flooding. In this respect, two infrastructures deserve special attention: the water treatment plant of Caldes de Montbui, to the north of the studied stretch, which became operational in 1994; and the river channelisation between 1998 and 2003 in the town of Palau-solità i Plegamans, where a flood caused two deaths and considerable material damage to more than 190 families in 1994 (APP, 1994). These



**Figure 2.** Historic evolution of the Caldes River corridor. MRB, Catalonia, Spain. Aerial photographs: 1956, 1986, 2014. Source: Institut Cartogràfic de Catalunya, <http://www.icc.cat/vissir3/>

infrastructures paved the way for local projects aimed at riverbank rehabilitation and accessibility carried out between 2008 and 2010. These projects in turn promoted river-related activities, such as walking, cycling, tree-planting, and clearing of riparian areas, led by grassroots non-profit organisations. This increasing civic use fostered the reconnection between citizens and the river. In 2014, the Association of Municipalities along the Caldes River Axis was created as a pluri-municipal platform to promote the river basin and support the economic interests of the industrial cluster. However, its scope has recently expanded towards the environmental and social dimensions of the river.

### 3. Methods

Analysis of the Caldes River rehabilitation process was based on a revision of the planning in the two municipalities, from the restoration of democracy (1975) to the present day (2016), complemented by a review of news items published in municipal newsletters since they were founded, in the late 1980s, up until the present day. Interviews with the mayors and technical staff of both municipalities were conducted in the spring of 2016 to piece together an understanding of local expectations of the river. The analysis focused on a 250-m strip to either side of the riverbed. This area includes the historic town centres and the first line of residential and industrial development. In total, we consulted 24 planning documents available at the Catalan Planning Register (CPR) of the Catalan Government (Generalitat de Catalunya, GENCAT), including two municipal plans (APP,

2013; ASP, 1998), three pluri-municipal plans (DPB, 1978; GENCAT, 2005, 2010), and 19 particular development plans.

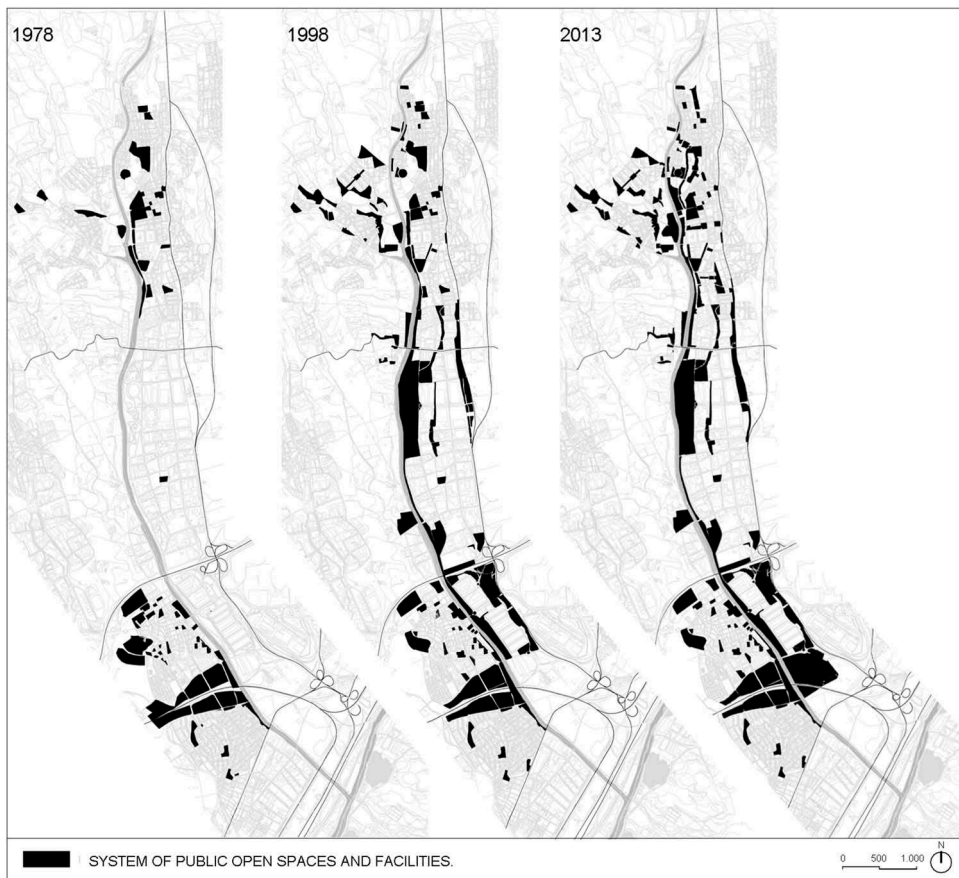
To describe the accumulation patterns of publicly owned land with civic use (objective 1), a morphological analysis by historical layers of the suburban landscape was conducted, following the approach of Boeri et al. (1993) and Font (1999) in their analysis of the metropolitan regions of Milan and Barcelona, respectively. This evolutionary cartography served to monitor the incremental creation of networks of public open spaces set aside by successive developments according to Arendt's approach (1996). The following types of land were represented: (1) public urban land for open spaces and facilities and (2) public rural land for allotments. They were mapped by the dates of approval of the three municipal plans for the study area (1978, 1998, 2013), which represent significant changes of cycle in the development of the civic corridor, as follows: (1) the Urban Plan of Sabadell Area (DPB, 1978) marks the end of the speculative developments of the last years of the Franco regime (Casso, 1994); (2) the Urban Plan of the Municipality of Santa Perpètua de Mogoda (ASP, 1998) coincides with the consolidation of industrial development, characteristic of the river corridor; and (3) the Urban Plan of the Municipality of Palau-solità i Plegamans (APP, 2013) is the first recognition of the river's importance in structuring scattered residential fabrics. We described the patterns that induced the accumulation of open spaces, facilities and allotments along the watercourse, focusing on issues such as trigger, time, leadership and strategic vision. In addition, the contribution of the patterns to reconnecting citizens and river was assessed by measuring the length of the riverfront for civic use provided by each. For both purposes, written and graphic documentation of the plans was analysed.

To tackle the evolution of the river's social use and perception (objective 2), media content analysis was carried out, using a quantitative technique (Neuendorf, 2002). The frequency of messages about the river in the local press was used as a proxy indicator of its relevance in riparian communities' daily life. We reviewed news related to the Caldes River published in the municipal newsletter of Santa Perpètua de Mogoda (*L'Informatiu*, 1988–2016), and in the municipal newsletters of Palau-Solità i Plegamans (*Palau Informatiu*, 1989–2012 and *Bulletí Municipal Palau-Solità i Plegamans*, 2013–2016). These newsletters, edited by the town councils, report systematically on all the activities carried out by neighbours in diverse facets (social, politics, culture, economics, leisure) thus offering a reliable source for tracking issues of local interest.

After a preliminary reading, news about specific activities connected with and conducted beside the river were grouped by social use of the river, and classified according to three main themes: (1) environmental (tree planting, litter collection, workshops, roundtables, exhibitions and guided tours), (2) sociocultural (art competitions and exhibitions, guided tours and exhibitions about cultural heritage, the opening of public works related to the river, concerts, fairs, meetings and celebrations), and (3) sport (treasure hunts, walks, cycle races and runs). The rest of the news (items about contents, events and projects associated with the river corridor) covered social perception of the river and were classified according to four main descriptors: (1) the river as a threat, including water treatment and flood risk mitigation (sanitary drainage, wastewater disposal, flood risks and effects, channelisation), (2) the river as a meaningful landscape, including protection and restoration (awareness and maintenance of natural and cultural heritage), (3) the river as a public space, including enhancement for social use (pedestrian accessibility, public open spaces and social facilities), and (4) the river as a scenario for an industrial park, including industrial environment improvement.

#### 4. Results

The three chronological assessments (1978, 1998, 2013) allowed us to verify the incremental development of a pluri-municipal system of public land with civic use that currently occupies two-thirds (60.97%) of the riverfront studied, with the possibility in time of reaching 84.54% as the current metropolitan regional plan is gradually implemented (GENCAT, 2010). This process is mapped in [Figure 3](#), and a description of underlying patterns of accumulation is provided in



**Figure 3.** Evolution of the system of public open spaces and facilities in the Caldes River corridor. Data source: CPR, GENCAT, Spain.

**Table 1.** In addition, the morphological details of the system in each stage are shown in Supplementary Figures S1–S3; and the lengths of riverfront with civic use contributed by each pattern are presented in Supplementary Table S4.

The system of public open spaces and facilities is the result of the combination of five patterns which overlap and coexist, though corresponding roughly to a chronological sequence.

#### **4.1. Pattern 1. Regularisation of early residential and industrial developments**

The small-scale compact growth characteristic of the historic cores of Palau-solità i Plegamans and Santa Perpètua de Mogoda was substituted in the 1960s and 1970s by rapid, scattered development as a result of the relocation of factories from the city of Barcelona and the growing popularity of second homes (Font et al., 1999). This first phase of growth, in a context of scant planning discipline and fragile municipal government, did not comply with the transfer of public land established by the 1956 Land Act. However, the forthcoming democracy and a new legal and urban planning framework (Terán, 1978) were to correct this anomaly. The new municipal government led the regularisation of the pending land transfers in the 1980s and 1990s in order to mitigate the lack of public spaces, facilities and urban services in developments built in the Francoist period. With this objective, a minimum of 10% of developed land was set aside for public open spaces. However, these land transfers lacked a structural role and tended to be



**Table 1.** Patterns of accumulation of land with civic use characteristics.

Pattern	Trigger	Time	Leadership	Strategic vision	Contribution
Initial land reserve <sup>a</sup>		1978			15.55%
P1. Regularisation of early residential and industrial developments	Piecemeal growth (PG)	1980s–1990s	Municipal government	-	7.03%
P2. Infill residential developments	PG	1980s–1990s	Municipal government	-	1.78%
P3. Industrial riverside developments	PG	1980s–1990s	Regional government	Economic vision: the river as an attractive scenario for quality industrial developments	23.65%
P4. Residential riverside developments	PG	2010s–present	Municipal government	Social vision: the river as a civic connector of scattered neighbourhoods	2.80% <sup>b</sup> (13.31%) <sup>c</sup>
	Total PG				35.26% <sup>b</sup> (45.77%) <sup>c</sup>
P5. Agricultural parks	Land protection (LP)	2000s–present	Regional government	Environmental vision: the river as a bio-highway with high ecological value	3.80% <sup>b</sup> (16.86%) <sup>c</sup>
LLA. Leftover land added to the system of public open spaces by the municipal plans					6.36%
Total current contribution <sup>b</sup>					60.97%
Total planned contribution <sup>c</sup>					84.54%

<sup>a</sup>According to first planning of democracy (DPB, 1978).

<sup>b</sup>According to current municipal planning (ASP, 1998; APP, 2013).

<sup>c</sup>According to regional planning forecasts for 2026 (GENCAT, 2010).

concentrated in areas that were unsuitable for development due to insufficient size or inappropriate conditions. Nonetheless, the new land acquired for civic use adjacent to the riverfront in the six residential and three industrial developments regularised represented an increase of 50% of the initial land reserve of 1978.

#### 4.2. Pattern 2. Residential infill developments

Between 1980 and 2000, the majority of low-density residential growth in the MRB was located in the agrarian municipalities of Barcelona's hinterland (Muñoz, 2005). This included the municipality of Palau-solità i Plegamans, with the development of the residential areas stipulated by the Urban plan of Sabadell Area (DPB, 1978). Residential infill areas were developed in the spaces left between the historic towns and the erratic fabrics created in the years of the dictatorship. For this purpose, the municipal government established a relationship of mutual interest with private developers with a view to assuring continuity of the residential fabrics, optimising the network of urban services, and supporting public finance with the new revenue. Five urban developments of this type were found. The transfer of public open space in these cases ranged between the 10% legal minimum and the 25% of development land. The public land gained by these transfers was arranged according to the internal logic of each sector and connected with the existing system of open spaces along the watercourse, thus enhancing the linkage between the riverfront and residential fabrics.

### **4.3. Pattern 3. Industrial riverside developments**

Proximity to Barcelona and flat topography led to the creation of an industrial strip in the Caldes River valley of approximately 4 km by adding together five areas developed in the late 1980s and completed in the late 1990s (Font & Vecslir, 2010). The occupants were mainly medium- to large-scale companies in the electronics, information technology and pharmaceutical sectors. To attract these production sectors, quality industrial land was offered with a transfer of 20–30% of the development land for open spaces (GENCAT, 1988). The open spaces took the form of large river parks which enhanced the industrial location. Today, after three decades of residential development, the original scenic function of these river parks has been overtaken by an intense social use due to the scarcity of open spaces in the adjacent residential fabrics (Figure 2). The regional government played an important role in guaranteeing the continuity of these parks across municipal borders. Overall, the industrial river parks occupied nearly a quarter of the riverfront and almost doubled the land set aside for open space in 1978.

### **4.4. Pattern 4. Residential riverside developments**

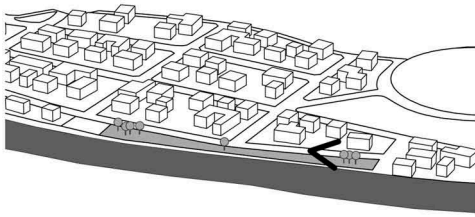
In the early 2000s, the second home developments of the 1960s and 1970s on both sides of the river became primary residential areas. This increased the need to improve connectivity with the historic urban cores where all the facilities and commerce are located. To this end, the recent urban plan of the municipality of Palau-solità i Plegamans envisages a safe, attractive river park throughout the municipality that interconnects the scattered surrounding neighbourhoods. This proposal addresses the improvement of residents' quality of life and has their support verified through a citizen participatory planning process (APP, 2013). Three residential developments illustrate this pattern. In these areas, the remnants of rural land adjacent to the river will become urban land with river parks that will solve existing spatial discontinuities in the system of public open spaces and facilities. Despite the limited quantitative contribution of these parks, they will represent an increase of almost 100% of the initial land reserve of 1978 in keeping with growth expected by the current metropolitan plan for the western riverbank of the Caldes River (GENCAT, 2010).

### **4.5. Pattern 5. Agricultural parks**

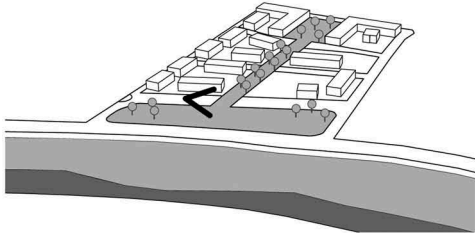
In the early 2000s, the river corridor was densely occupied and in need of a new ecological and social approach (Font, 2000). The regional planning office of the Catalan Government accordingly decided to protect publicly owned rural land with special value adjacent to the Caldes riverbank, under the umbrella of the Gallecs Agricultural Park regulated by a specific plan to coordinate pluri-municipal efforts (GENCAT, 2005). This area had acquired a civic function due to the growth of surrounding towns as well as the increasing social interest in vegetable gardening and self-provisioning. Grassroots non-profit organisations had demanded its protection and some of the riverfront spaces traditionally used for irrigated farming were rehabilitated as allotments with an intense social use. The protection of riverbanks as part of agricultural parks is a pattern that will increase in importance in keeping with the gradual implementation of metropolitan planning (GENCAT, 2010). Specifically, Gallecs Agricultural Park is expected to be included in a regional agricultural park, in line with large agricultural parks throughout Europe (Lohrberg, Licka, Scazzosi, & Timpe, 2015). This will guarantee the complete preservation of valuable rural land in the Besòs basin, allowing civic use of the western Caldes riverfront.

Each pattern has contributed a specific type of open space (Figure 4), with its particular structural role, amenities and dimension. Urban open spaces planned to address the needs of growth (P1, P2, P3, P4) coexist with protected rural open spaces (P5). The structural role of each type of open space within the pluri-municipal system is different: irrelevant and coincidental in leftover tracts (P1), connecting residential developments to the river (P2), or providing parks next

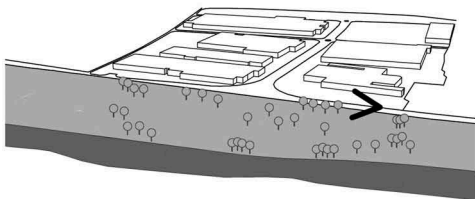
P1. LEFTOVER NEXT TO THE RIVER



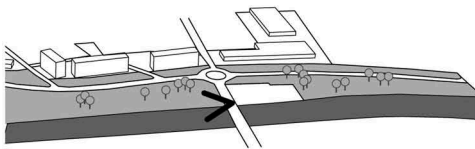
P2. CONNECTOR TO RIVER



P3. RIVERPARK IN INDUSTRIAL AREA



P4. RIVERPARK IN RESIDENTIAL AREA



P5. AGRICULTURAL PARK NEXT TO THE RIVER

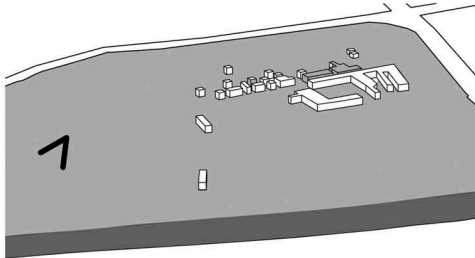


Figure 4. Types of open spaces contributed by each pattern of land accumulation: (P1) leftovers, (P2) connectors, (P3) industrial river parks, (P4) residential river parks, and (P5) agricultural parks. MRB, Catalonia, Spain.

to the river in industrial (P3), residential (P4) or agricultural (P5) environments. As regards amenities, fully equipped (P3) and poorly equipped (P2) public spaces exist side by side, together with public spaces pending development, either because urban growth has not yet taken place (P4) or because public investment has been postponed (P1). Finally, there is a striking diversity in size, ranging from 0.1 ha in leftover lands (P1) to 25 ha in agricultural parks (P5). However, beyond the heterogeneity of open spaces, two features of the resulting system are strategic for conferring unity and civic character to the river corridor: (1) the continuity of open space, creating citizen accessibility to the river and walkable interconnection of scattered riparian communities and (2) the public ownership of riverbanks, paving the way for future implementation of public space projects in keeping with a large-scale vision for the riverfront.

The analysis of the media content provided 279 news items displayed in [Figure 5](#) by category (use, perception and relevance) and year. First, we observe an upsurge in the river's social relevance over the last 25 years in the local press, with 6 news items per year on average from 1989 to 1993 and 21 items per year from 2012 to 2016. The breaking point in the mid 2000s coincides with the consolidation of the open space system and the completion of most residential developments close to the river. Second, media results show that the relevance of the river in neighbours' daily life grows as the social use and positive perception of the river increase. These findings are in agreement with the dual model of appropriation of space theorised by Vidal and Pol (2005), where behavioural (e.g. social use) and symbolic (e.g. social perception) dimensions interact. In the Caldes River case, the social use transforms the riverbanks and attributes new meanings to the river at the same time than the symbolic identification with the used riparian landscape activates bonds between people. Third, and in relation to social use, environmental activities along the riverbank such as litter-collection or tree-planting were more prominent during the first years and gradually complemented with sociocultural activities such as meetings and celebrations. Sport, too, though to a lesser extent, forms part of a varied range of activities taking place alongside the river. Finally, a negative perception of the river as a threat to citizens' health and safety, prevalent during the 1990s, has clearly evolved towards a more positive perception since water treatment plant and river channelisation came into play. Although issues related to flood risk mitigation remain, the river is increasingly viewed as a landscape and a public space that deserve to be protected and maintained. The river is also positively perceived, though with less intensity, as the emblem of a quality industrial cluster. In conclusion, the previous environmental traumas have been offset over time by the re-appropriation of the river that is reintegrated to the riparian communities' identity.

## 5. Discussion and practical implications

The evolutionary approach of this study allows an improved understanding of the Caldes River rehabilitation process and the significance of the present moment, offering useful conceptual and methodological indications for decision-making. The convergence of two global phenomena—the densification of river corridors in metropolitan peripheries and the increasing demand for eco-social river rehabilitation (EEA, 2016)—makes the findings of general interest.

Analysis of the rehabilitation process offers two main lessons. First, the emergence of plurimunicipal public open space systems in keeping with increasing citizen appreciation of suburban riverbanks reinforces the need for big-picture thinking centred on urban growth. In this respect, together with the biophysical vision at basin level prescribed by the European Water Framework Directive (Directive 2000/60/EC) to improve the ecological health of rivers, more local approaches are required that take urban development into account. As shown in [Table 1](#), in the context of regional planning anticipated up to 2026, urban growth is the main trigger for public land that accumulates civic use on riverbanks. The system of public open spaces will be a result of the combination of urban growth and land protection in a 3:1 proportion. Twenty-two separate housing and industrial developments in the form of specific plans (P1, P2, P3, P4) were the first

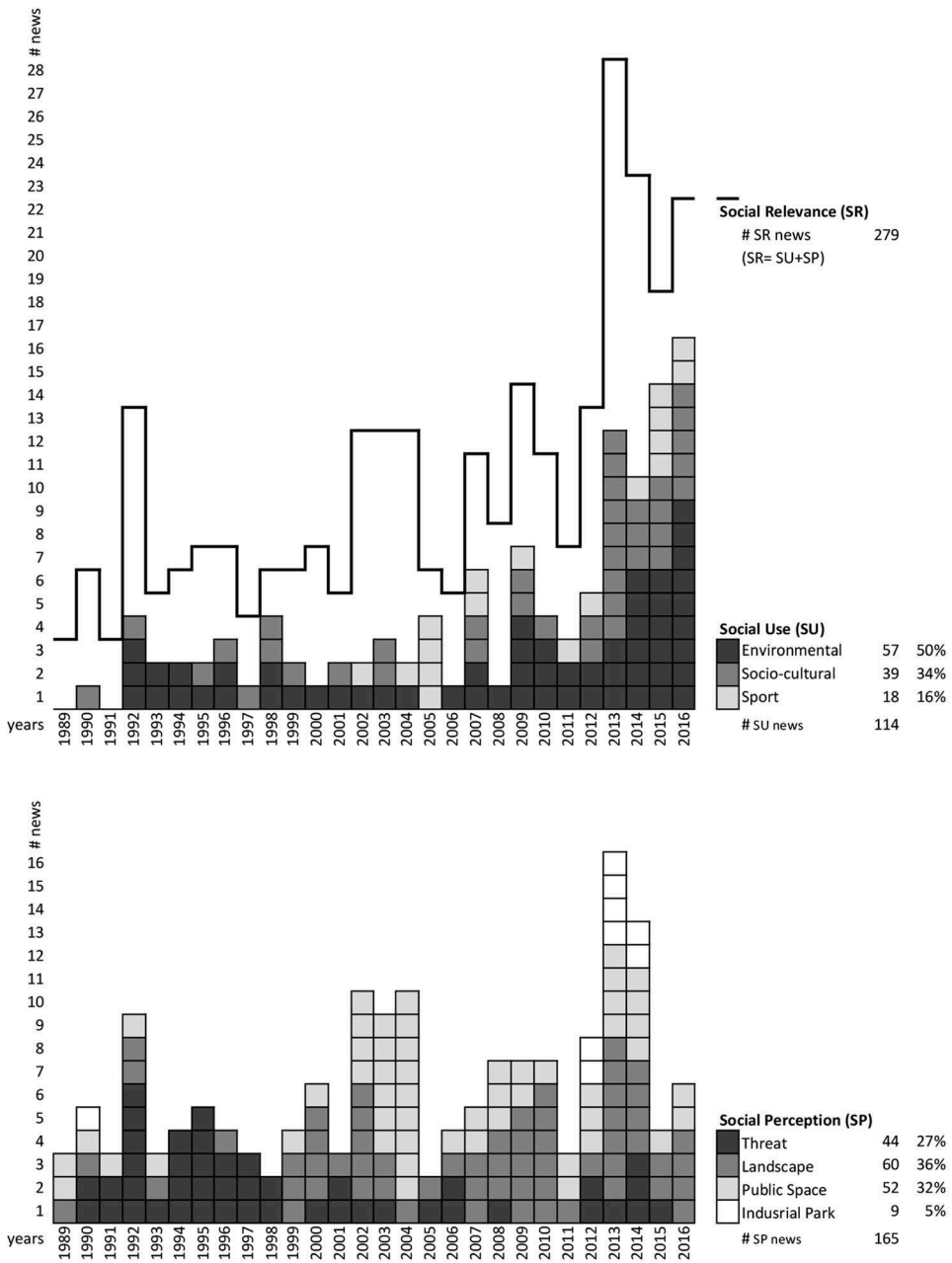


Figure 5. Evolution of the social relevance, use and perception of Caldes River, from the end of 1980s until today. Data source: municipal newsletters of Palau Solità i Plegamans and Santa Perpetua de Mogoda.

active principle in the transfer of riverfront land to the public open space system. Conversely, the preservation of non-development riverside land as part of agricultural parks (P5) appeared much later as a corrective response to growth. Accumulation of public open spaces, mainly planned to solve the needs of growth, has facilitated citizen accessibility to the river, thus becoming a fundamental driver of river rehabilitation. For this reason, enhancing eco-social values of the river necessarily calls for combined biophysical- and urban-based visions.

Second, the overlapping of various patterns of public land accumulation increases complexity in the domains and institutional levels involved in river rehabilitation. As shown in [Table 1](#), the evolution of strategic vision and leadership highlights the need for a multi-dimensional approach to efficient suburban river rehabilitation. The significant contribution of the regional government with the creation of large-scale riverside industrial developments (P3) and agricultural parks (P5), according to economic and environmental strategic visions, has been supplemented by the modest contribution of local governments. Town councils promoted residential growth and small-scale industrial development (P1, P2, P4) and have recently integrated the social dimension of the river. Consequently, multi-domain (economic, environmental and social) and multi-level (local and regional) coordination has gained momentum, and actions of agencies with different responsibilities and jurisdictions should be synchronised to be mutually reinforcing by means of ad hoc governance platforms in keeping with the current paradigm of river management (Warner, Van Buuren, & Edelenbos, 2013).

As regards significance at the present moment, the following phases of river rehabilitation should be considered ([Figure 6](#)): (1) 1978–1998. Urban growth was the main trigger of accumulation, and only the regional government expressly transferred rural land to the public open space system in the form of industrial river parks (P3). These transfers were based on an economic vision, unconnected with local needs, and intended to turn the river into a safe, attractive setting for quality industrial developments. (2) 1998–2013. This phase, though much less important than the others in terms of land contribution, marked a change of cycle in two fundamental aspects: (i) accumulation related to urban growth (P4) and land protection (P5) reached a point of balance, as did the leadership of regional and municipal administrations; and (ii) environmental and social visions were enhanced as the river's social use expanded in intensity and diversity. In this new cycle, perception of the river as a meaningful landscape and a relevant public space for communities' quality of life prevails. (3) 2013–2026. Residential riverside developments and agricultural parks will increase in importance, together surpassing the contribution of industrial river parks and potentially extending the system of public open space with civic use to nearly 85% of the riverfront. At the same time, comprehensive pluri-municipal planning, emerging coalitions for river basin promotion, and increased citizen activism in rehabilitation are expected to help communities, stakeholders, and municipal and regional governments to share their visions and become involved in participatory river governance.

Against this backdrop, the present moment is a significant turning point due to its political implications. This is the first time that local and regional governments are aligned in a strategic vision of the river that brings together local- and regional-level economic, ecological and social interests. Common strategic vision and shared political determination, along with the increased relevance and positive perception of the river, are paving the way for a concerted effort to consolidate the civic corridor in keeping with a 'new regionalism' that centres on local communities' quality of life (Scott, 2007). At this point, together with the physical, social and political dynamics involved in the rehabilitation process, the interpersonal dynamic described by environmental psychologists may also play a crucial role. Concretely, recent research on the Caldes River has shown how the repeated use of riverbanks increases people's capacity to identify the riparian landscape as a single valuable entity, over and beyond the appreciation of particular sites, and can boost citizen awareness and activism in defence of the river (Benages et al., 2015). From this perspective, increased citizen reconnection with the river may lead to a transition from the mere accumulation of public open spaces and facilities according to planning to a more community-based rehabilitation project. To this end, the instrumental role of traditional planning that provides technical solutions according to top-down government decisions should be counterbalanced by a communicative role (Innes, 1995) aimed at achieving consensus and broad social acceptance.

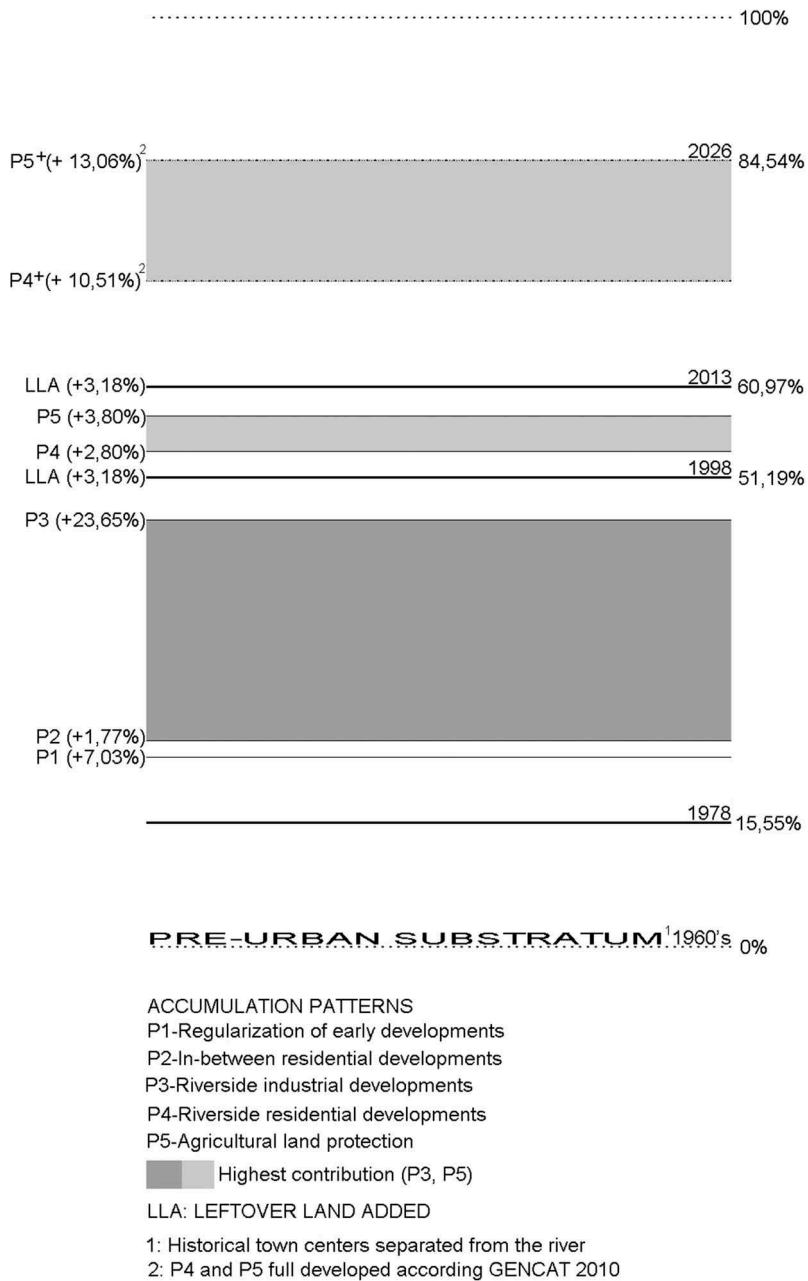


Figure 6. Patterns of accumulation of land with civic use in the development process of the Caldes River corridor.

## 6. Conclusion

The case of Caldes River exemplifies the consolidation of civic corridors along suburban rivers by means of the long-term accumulation of parks and sports facilities, vegetable plots and recreational pathways. This infrastructure has attracted a wide range of users and promoted active engagement with defence of the river as a valuable public space. Simultaneously, a common vision for the river's

future has gained momentum, and ad hoc cooperation frameworks supported by regional and local administration, business, and citizen advocacy groups are emerging.

This example shows the importance of the evolution of the suburban landscape as a less direct rehabilitation mechanism than city-led urban projects for riverbanks, but one that is just as relevant to rehabilitating metropolitan rivers. In particular, the evolutionary approach suggests the possibility of exploiting two intertwined dynamics, developed over time along suburban stretches: a physical dynamic consisting in the incremental production of large-scale systems of public open spaces, and a social dynamic consisting in the progressive reinforcement of the everyday relationship between local communities and rivers. At a time when pluri-municipal open space systems have achieved a certain level of continuity and expanded social use, comprehensive and participatory management of the accumulated public infrastructure becomes paramount for turning rivers into key elements in metropolitan civic geography.

## Acknowledgements

The authors are grateful to Dr Judith Garcia-Aymerich for her thorough revisions. The authors also thank the anonymous reviewers for their helpful comments.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

This work was supported by the Obra Social 'la Caixa'—ACUP [2015ACUP00184].

## References

- Åberg, E. U., & Tapsell, S. (2013). Revisiting the River Skerne: The long-term social benefits of river rehabilitation. *Landscape and Urban Planning*, 113, 94–103.
- APP (Ajuntament de Palau-solità i Plegamans). (1994, November 30). Ple de l'ajuntament. Els efectes dels aiguats [Plenary session of the town council. The effects of the floods]. *Palau Informatiu*, p. 4.
- APP (Ajuntament de Palau-solità i Plegamans). (2013). *Pla d'ordenació urbanística municipal de Palau-solità i Plegamans* [Urban plan of the municipality of Palau-solità i Plegamans]. Palau-solità i Plegamans: APP.
- Arendt, R. (1996). *Conservation design for subdivisions: A practical guide to creating open space networks*. Washington, DC: Island Press.
- AS (Ajuntament de Sabadell). (2014). Parc Fluvial del Ripoll [Ripoll River Park]. Retrieved December 2014, from [http://ca.sabadell.cat/Ripoll/p/ParcFluvial\\_cat.asp](http://ca.sabadell.cat/Ripoll/p/ParcFluvial_cat.asp).
- ASP (Ajuntament de Santa Perpètua de Mogoda). (1998). *Pla general municipal d'ordenació de Santa Perpètua de Mogoda* [Urban plan of the municipality of Santa Perpètua de Mogoda]. Santa Perpètua de Mogoda: ASP.
- Benages-Albert, M., Di Masso, A., Porcel, S., Pol, E., & Vall-Casas, P. (2015). Revisiting the appropriation of space: The case of the metropolitan river corridor of Caldes (Barcelona). *Journal of Environmental Psychology*, 42, 1–15.
- Benages-Albert, M., & Vall-Casas, P. (2014). Vers la recuperació dels corredors fluvials metropolitans. El cas de la conca del Besòs a la regió metropolitana de Barcelona [Towards the rehabilitation of metropolitan river corridors. The case of the Besòs basin in the metropolitan region of Barcelona]. *Documents d'Anàlisi Geogràfica*, 60(1), 5–30.
- Boeri, S., Lanzani, A., & Marini, E. (1993). *Il territorio che cambia. Ambienti, paesaggi e immagini della regione Milanese* [The territory that changes. Environments, landscapes and images of the Milan region]. Milano: Abitare Segesta Cataloghi.
- Brown, L. J., Dixon, D., & Gillham, O. (2009). Reclaiming the waterfront. In *Urban design for an urban century: Placemaking for people*. Hoboken, NJ: John Wiley & Sons.
- Casso, J. (1994). El planejament urbanístic vigent al Vallès Occidental [The current urban planning of the Western Vallès]. *Papers*, 17, 23–40.
- Chang, T. C., & Huang, S. (2011). Reclaiming the city: Waterfront development in Singapore. *Urban Studies*, 48(10), 2085–2100.



- Chou, R. J. (2016). Achieving successful river restoration in dense urban areas: Lessons from Taiwan. *Sustainability*, 8 (11), 1159–1181.
- Costa, L. M., Vescina, L., & Barcellos, D. (2010). Environmental restoration of urban rivers in the metropolitan region of Rio de Janeiro, Brazil. *Urban Environment*, 4, 13–26.
- Damanik, F. K., & Pratiwi, W. D. (2017). Consideration of tourism riverfront development elements for Pekanbaru City transformation. *Journal of Regional and City Planning*, 28(2), 140–150.
- DB (Diputació de Barcelona) (2014) Parc fluvial del Besòs [Besòs river park]. Retrieved December 2014 from <http://parcs.diba.cat/es/web/fluvial/el-parc-fluvial>.
- DPB (Diputación Provincial de Barcelona). (1978). *Plan general de ordenación municipal de la comarca de Sabadell* [Urban plan of Sabadell Area]. Barcelona: DPB.
- Dunham-Jones, E., & Williamson, J. (2009). *Retrofitting suburbia. Urban design solutions for redesigning suburbs*. Hoboken, NJ: John Wiley & Sons.
- EEA (European Environmental Agency) (2016). *Rivers and lakes in European cities. Past and future challenges*. Report 26/2016, Luxembourg: Publications Office of the European Union.
- Everard, M., & Moggridge, H. L. (2012). Rediscovering the value of urban rivers. *Urban Ecosystems*, 15, 293–314.
- Findlay, S. J., & Taylor, M. P. (2006). Why rehabilitate urban river systems? *Area*, 38(3), 312–325.
- Foley, R., & Kistemann, T. (2015). Blue space geographies: Enabling health in place. *Health & Place*, 35, 157–165.
- Font, A. (2000). La experiència reciente de Catalunya. Planeament urbanístic para el segle XXI [The recent experience of Catalonia. Urban planning for the XXI century]. *Urban*, 5, 60–82.
- Font, A., Llop, C., & Vilanova, J. M. (1999). *La construcció del territori metropolità. Morfogènesi de la regió urbana de Barcelona* [The construction of the metropolitan territory. Morphogenesis of the urban region of Barcelona]. Barcelona: Mancomunitat de Municipis de l'Àrea Metropolitana de Barcelona.
- Font, A., & Vecslir, L. (2010). Nuovi spazi della produzione, commercio e consumo: La RMB [The new space of production, commerce and consumption: The RMB]. *Urbanistica*, 141, 19–26.
- GENCAT. (2005). *Pla director urbanístic de l'ACTUR Santa Maria de Gallecs. Lliçà de Vall, Mollet del Vallès, Montcada i Reixac, Palau-solità i Plegamans, Parets del Vallès i Santa Perpetua de Mogoda* [Master plan of the ACTUR Santa Maria de Gallecs, Lliçà de Vall, Mollet del Vallès, Montcada i Reixac, Palau-solità i Plegamans, Parets del Vallès and Santa Perpetua de Mogoda]. Barcelona: GENCAT.
- GENCAT. (2010). *Pla territorial metropolità de Barcelona* [Metropolitan regional plan of Barcelona]. Barcelona: GENCAT.
- GENCAT (Generalitat de Catalunya). (1988). *Actuacions industrials de l'Institut Català del Sòl. 1988* [Industrial developments of the Catalan Land Institute. 1988]. Barcelona: GENCAT.
- Gordi, J. (Ed.). (2005). *El paisatge fluvial a la conca del Besòs. Ahir, avui... i demà?* [The riparian landscape in the Besòs basin. Yesterday, today... and tomorrow?]. Barcelona: Consorci per a la Defensa de la Conca del Riu Besòs.
- Hartig, J. H., & Wallace, M. C. (2015). Creating world-class gathering places for people and wildlife along the Detroit riverfront, Michigan, USA. *Sustainability*, 7(11), 15073–15098.
- Holcomb, E. L. (2008). *The city as suburb. A history of Northeast Baltimore since 1660*. Chicago: The Center for American Places at Columbia College Chicago.
- Innes, J. (1995). Planning theory's emerging paradigm: Communicative action and interactive practice. *Journal of Planning Education and Research*, 14(3), 183–189.
- Jiang, Y., Shi, T., & Gu, X. (2016). Healthy urban streams: The ecological continuity study of the Suzhou creek corridor in Shanghai. *Cities*, 59, 80–94.
- Knaap, G. J., & Lewis, R. (2011). Regional planning for sustainability and hegemony of metropolitan regionalism. In E. Seltzer & A. Carbonell (Eds.), *Regional planning in America. Practice and prospect*. Cambridge, MA: Lincoln Institute of Land Policy.
- Lohrberg, F., Licka, L., Scazzosi, L., & Timpe, A. (2015). *Urban agriculture Europe*. Berlin: Jovis.
- Lundy, L., & Wade, R. (2011). Integrating sciences to sustain urban ecosystem services. *Progress in Physical Geography*, 35(5), 653–669.
- Muñoz, F. (2005). La urbanització dispersa a la província de Barcelona: Dinàmiques residencials i territorials. 1985-2001 [Urban sprawl in the province of Barcelona. Residential and territorial dynamics. 1985-2001]. *Espais*, 50, 92–102.
- Neuendorf, K. (2002). *The content analysis guidebook*. Thousand Oaks, CA: Sage Publications.
- Novotny, V., Ahern, J., & Brown, P. (2010). *Water centric sustainable communities: Planning, retrofitting and building the next urban environment*. Hoboken, NJ: John Wiley & Sons.
- Özgüner, H., Eraslan, S., & Yilmaz, S. (2012). Public perception of landscape restoration along a degraded urban streamside. *Land Degradation & Development*, 23, 24–33.
- Panareda, J. M. (2009). Evolución en la percepción del paisaje de ribera [Evolution in the perception of riparian landscape]. *Boletín De La AGE*, 51, 305–324.
- Prominski, M., Stokman, A., Zeller, S., Stimberg, D., & Voermanek, H. (2012). *River space design: Planning strategies, methods and projects for urban rivers*. Basel: Birkhauser.
- RNRW (Regierung von Nordrhein-Westfalen). (1989). *IBA Emscher Park. Workshop for the future of old industrial areas. Memorandum on content and organization*. Gelsenkirchen: Gesellschaft Internationale Bauausstellung.
- Rowe, P. G. (1991). *Making a middle landscape*. Cambridge, MA: The MIT Press.

- Scott, J. W. (2007). Smart growth as urban reform: A pragmatic "recoding" of the New Regionalism. *Urban Studies*, 44 (1), 15–35.
- Sieverts, T. (1997). *Zwischenstadt. Zwischen Ort und Welt, Raum und Zeit, Stadt und Land* [Cities without cities. An interpretation of the zwischenstadt]. Braunschweig, Germany: Vieweg.
- Stanton, P. (Ed.). (2007). *Rivertown: Rethinking urban rivers*. Cambridge, MA: The MIT Press.
- Tachieva, G. (2010). *Sprawl repair manual*. Washington: Island Press.
- Terán, F. (1978). *Planeamiento urbano en la España contemporánea. Historia de un proceso imposible* [Urban planning in the contemporary Spain. Story of an impossible process]. Barcelona: Editorial Gustavo Gili.
- Vall-Casas, P., Koschinsky, J., & Mendoza, C. (2011). Retrofitting suburbia through pre-urban patterns: Introducing a European perspective. *Urban Design International*, 16, 171–187.
- Vidal, T., & Pol, E. (2005). La apropiación del espacio: Una propuesta teórica para comprender la vinculación entre las personas y los lugares [The appropriation of space: A theoretical proposal to understand the connection between people and places]. *Anuario De Psicología*, 36, 281–297.
- Vollmer, D., Prescott, M. F., Padawangi, R., Girot, C., & Grêt-Regamey, A. (2015). Understanding the value of urban riparian corridors: Considerations in planning for cultural services along an Indonesian river. *Landscape and Urban Planning*, 138, 144–154.
- Warner, J. F., Van Buuren, A., & Edelenbos, J. (2013). *Making space for the river. Governance experiences with multi-functional river flood management in the US and Europe*. London: IWA Publishing.