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Large-scale projects and production of new landscapes: from conflict to socio-ecological negotiation

I grandi progetti e la produzione di nuovi paesaggi: dal conflitto alla concertazione socio-ecologica

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ABSTRACT AND KEYWORDS

Large-scale projects and production of new landscapes

Large-scale transformation projects can trigger conflicts concerning landscape protection and management. However, territorial conflicts can also create a "space" for interaction, allowing for the engagement of opposing stakeholders in the practice of coordination and compromise. Using the trading zone approach, applied to spatial planning, this contribution aims to explore how social movements can influence the quality of these transformations in a proactive rather than obstructive manner, steering them towards new socio-ecological equilibria. We examine two large-scale transformation projects of water landscape – the expansion of the port and airport in the Llobregat Delta valley (Barcelona) and the case of the 2008 Zaragoza Expo – carried out over a span of thirty years. These cases allow us to address a series of crucial social, environmental, and technical-design issues that shape the dynamics of conflict, shifting them towards more proactive forms of negotiation. The analysis allows for an in-depth investigation of the design processes involved in producing new landscapes, which result from a trading zone of transaction between actors, even those in conflict.

Keywords: large-scale projects, conflicts, trading-zone, new water landscape

I grandi progetti e la produzione di nuovi paesaggi

I grandi progetti di trasformazione possono innescare conflitti dal basso per la tutela e gestione del paesaggio. Ma i conflitti territoriali possono anche produrre uno spazio di interazione per il coinvolgimento del pubblico in opposizione in cui praticare la concertazione e il compromesso. Utilizzando l'approccio della trading zone, applicato alla pianificazione spaziale, il contributo si propone di indagare in che modo i movimenti sociali possono incidere sulla qualità delle trasformazioni in forma proattiva e non ostativa, verso nuovi equilibri socio-ecologici. Utilizziamo due grandi progetti di trasformazione di paesaggi dell'acqua – l'ampliamento del porto e aeroporto nella valle del Delta del Llobregat (Barcellona) e l'Expo 2008 di Saragozza – realizzati nell'arco di trent'anni poiché in questi casi possiamo intercettare le dimensioni sociali, ambientali e tecnico-progettuali del mutamento delle dinamiche di conflitto verso forme proattive di concertazione. L'analisi permette di indagare a fondo i processi progettuali di produzione di nuovi paesaggi come esito di una trading zone di transazione fra attori anche in conflitto tra loro.

Parole chiave: grandi progetti, conflitti, trading-zone, nuovi paesaggi dell'acqua

1. Introduction

The process of social adaptation to large-scale transformation projects (infrastructure and facilities, quarries, waste treatment, production activities, residential and tourist settlements, energy production) is increasingly characterized by dynamics of "territorial conflict" (Fregolent, 2014). In addiction to multiple trigger (Nel-lo, 2014), conflicts can also depend on the opacity of decision-making processes and the and planning choices, these latter being often erroneous or approximate in evaluating social, economic, and environmental consequences (Basso, 2014). Moreover, the conflict may concern the "clash" between new planning tools for the environment and landscape and the locational decisions stemming from legacy projects, plans, and territorial policies inherited from the past, each carrying a vision of economic and employment development that is often relevant to policy-makers and the community. These aspects may hinder new ecosystem strategies, such as those related to ecological restoration (Gann et al., 2019) pursued at the European level by the Nature Restoration Law. The implementation of these objectives is complex due to conflicting land-use interests, unstable political contexts and poor stakeholder engagement (Aronson et al., 2017).

However, territorial conflicts triggered by large-scale projects can also create a "space" for interaction, allowing for the engagement of opposing stakeholders in the practice of coordination and compromise. We adopt the concept of the "trading zone" (Galison, 1999), applied to the field of spatial planning (Balducci & Mäntysalo, 2013), as an analytical-interpretative framework to explore opportunities to produce partial innovations ascribable to strategies which may even be conflicting, within the conflicts generated by large-scale projects. These innovations can coincide with "boundary objects", that are operational tools or spatial solutions that may carry different meanings for the involved parties and depend on the level of homogeneity of objectives and the degree of cooperation achieved (Collins et al., 2007).

Furthermore, we believe that large-scale projects in water landscapes provide a privileged a key context for the coordination of diverse interests, due to certain cultural and disciplinary aspects that have characterized recent decades and which are crucial in shifting conflict dynamics toward proactive forms: the values associated with the use and symbolisation of water, which foster the rooting of communities in their localities (Osti, 2023); the resocialization of water (Linton, 2014) where the hydraulic control paradigm has increasingly given way to adaptive governance approaches; the reinterpretation of watercourses as "generators of territoriality" (Magnaghi, 2012: 259), (Gambino, 2007); and spreading of a new "Culture of Water" in the landscape design (Ercolini, 2010; Magnaghi, 2020)).

This contribution seeks to investigate how social movements can influence the quality of transformations in a proactive rather than obstructive manner (Nel-lo, 2014), by infusing large-scale transformation projects with new value orientations aimed at environmental and landscape protection, while still pursuing supra-local economic interests capable of producing new socio-ecological balances. Specifically, the research hypothesis focuses on the possibility of pursuing ecological and river restoration, not as the primary objective of land-use transformations, but as the outcome of compromise and negotiation between economic, environmental, and social interests within the landscape projects.

To test this hypothesis, in section 2 we illustrate the outcomes of two well-known cases in the literature: the expansion of the port and airport in the Llobregat Delta valley (Barcelona) and the Expo 2008 site on the banks of the Ebro (Zaragoza). These are exemplary cases for the socio-ecological conflict dynamics concerning the

protection, management, and transformation of the landscape, with alterations to surface waters. As they are largely concluded, they allow us to interpret the environmental and social effectiveness of the processes, as well as the different forms of the trading zone.
Reading and comparing these cases through the lens of the trading zone approach seems to reveal some changings (section 3) and implication for future projects in water landscapes (section 4).

2. Cases

The analysis of the case follows the methodological phases described below.

- Describing the main territorial transformations from the second half of the 19th century to the present day, using bibliographic sources and planning documents. It allows us to understand: the hydro-geomorphological and environmental criticalities; the landscape and environmental values as recognised by local communities; the conflict dynamics underlying the large-scale transformation projects, adopting the categorisation[1] proposed by (Nel-lo, 2014).
- Identifying the characteristics of the processes using an analytical sheet composed of the following fields: the planning tools (policy, regulatory plan, sectoral plan, strategic plan, programmes, etc.); the proposed project and/or its variants, identifying the main technical and spatial solutions for the management of water, the environment, and settlements; the actors involved (government authorities at different levels, economic categories, associations, and organised groups); the decision-making processes adopted in order to clarify the horizontal and/or vertical form of governance.
- Qualitatively analyse land use changes through a regressive-reconstructive method (Stahlschmidt et al., 2017) of diachronic comparison of historical orthophotos, with which we identified the increase, loss, or relocation of natural areas.

2.1 Expansion of port and airport infrastructure in the Llobregat Delta Valley

The first case concerns the expansion of the large platforms of the port and airport of Barcelona in the Llobregat river valley (Figure 1) – a floodplain area used for agriculture – which involved the canalisation and diversion of the river in the early 2000s. The floodplain was transformed during the 19th century through the reclamation of marshy areas with a dense network of drainage channels, the removal of sandy material from coastal dunes, and the planting of coastal pine forests as protection against tides. The wetland landscape was transformed for agricultural use, triggering the urbanisation of the valley with settlements arranged in a ring.
Given the high hydrogeological instability, the river diversion was first proposed in 1890. The project was resumed in 1962, after a major flood event, when the Spanish government announced its intention to divert the river to expand Barcelona's port facilities, in response to the decades-long demands of the port's economic sectors (Casals, 2023).
In the 1970s, the Spanish government developed a new project. The plan consisted in the Llobregats's diversion 6 km from its mouth to foster the urban, industrial, and port development of Barcelona (Pratsoler, 1994). This provoked the largest environmental demonstration in Spanish history, in which local authorities, residents, and farmers demanded the preservation of the valley's agricultural and coastal landscape. It was precisely during this historical period, when awareness of

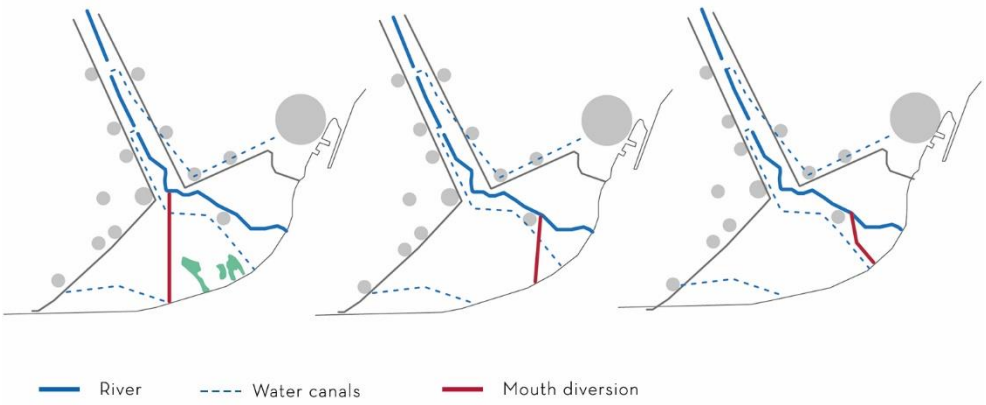
the impacts of uncontrolled groundwater extraction and the pollution of surface and underground waters due to industrial discharges (Prat et al., 2009) was growing, that a sharp dissent emerged between residents and economic operators, which can be categorised as conflicts over the use and management of resources, as well as over the management and transformation of the landscape.

Figure 1. The Llobregat Delta Valley

Source: Google Maps, 2024

Subsequently, in 1984, the Catalan regional authority developed a new study for the river's diversion 4 km from its mouth, with a downsizing of the port areas; the proposal was not accepted by the sub-regional and municipal authorities, partly due to pressure from environmental movements on political decision-makers (Figure 2).

Figure 2. Deviation hypotheses in 1890 (left), 1962 (centre), 1984 (right)



Source: Original drawing by O.G. Paparusso, adapted by (Pratsoler, 1994)

Between 1990 and 1994, an extensive negotiation process took place between regional, sub-regional, and municipal entities, leading to the development of the "Interinstitutional Cooperation Agreement for Infrastructure and the Environment", commonly known as the Delta Llobregat Plan. This plan provided for the diversion and regulation of the river's final stretch, the expansion of the port and airport area, and the construction of road and rail infrastructure, each of which was associated

with a series of environmental compensations benefiting peri-urban spaces, peri-fluvial and coastal areas (Sans Margenet, 2009). These measures were: partial maintenance of peri-urban agriculture; compensation for the river's diversion with the creation of new wetlands and public spaces; the recovery of part of the degraded coastal areas; a new inter-municipal ecological connectivity scheme, the implementation of which was the responsibility of the economic actors of the infrastructure platforms (Casals, 2023). Among the environmental compensations, the choice of the location for the water treatment plant infrastructure on the left bank of the new river mouth and part of the port platform is the most relevant. The treatment plant, through various wastewater reuse techniques, enables to this day the supply of water to the wetland on the right bank of the river mouth, provides water for irrigation, and recharges the groundwater, creating a barrier to the intrusion of the saline wedge (Ortuno et al., 2010).

The Delta Llobregat Plan represents a compromise between the economic interests of logistics and transport and the demands of environmental movements, at least partly conveyed by local authorities. This resulted in the downsizing of the platforms and in the subsequent increase in natural areas through compensatory mechanisms.

Despite the 1994 agreement, which was in some ways a win-win outcome for the parties involved, protests over the loss of agricultural land and the fragmentation of the landscape (Pratsoler, 1994) led to a new phase of conflict in which dissenting voices demonstrated proactive cooperation with the government and institutions. Various actors, including sub-regional authorities, municipalities, and trade associations, gradually established management bodies for agricultural promotion, landscape protection, and the restoration of the river's valley:

- The Consortium for the Agricultural Promotion of Baix del Llobregat (1994), supported by the LIFE project (1996-98) "Studies for the Agricultural Park of Baix del Llobregat"[2]. These studies led to the approval of the Protection and Improvement Plan for the Agricultural Park of Baix Llobregat (2002), which would be revised in 2015 in the form of a special land use plan.
- The Consortium for the Protection and Management of Natural Spaces of the Llobregat Delta (2006) promoted the creation of the Llobregat River Park (2013). The Consortium coordinated all levels of government responsible for the implementation of landscape rehabilitation and ecological restoration projects along the river[3].
- The Aturem Eurovegas Platform (2012) – which brought together 280 organisations, including environmental associations, cultural, sports, and neighbourhood associations, trade unions, political parties, citizens and farmers, consumer cooperatives, cultural and sports centres – carried out actions aimed at stopping further urbanisation on lands used for agriculture or forestry[4].

The infrastructural interventions, the treatment plant infrastructure, and the wetland restoration provided for by the Delta Plan were carried out between 2000 and 2005; subsequently, the main river restoration interventions were promoted by the planning tools of the Consortia.

This combination of environmental project actions, triggered by compensations for the major infrastructures and fuelled by the demand for the protection of local identity, has led to a new trend in transformation, where we observe an overall increase in restored or relocated natural areas (Figure 3), although with a still significant degree of fragmentation.

However, in a general assessment of the conflict, the policies and performative planning tools used by multi-actor and multi-level organisations, together with the

imposition of environmental constraints in coastal areas (Declaration of Nature Reserves and Special Protection Areas), seem to have led to a reversal in the values initially assumed in strategic visions and in the transformations of the valley (Table 1).

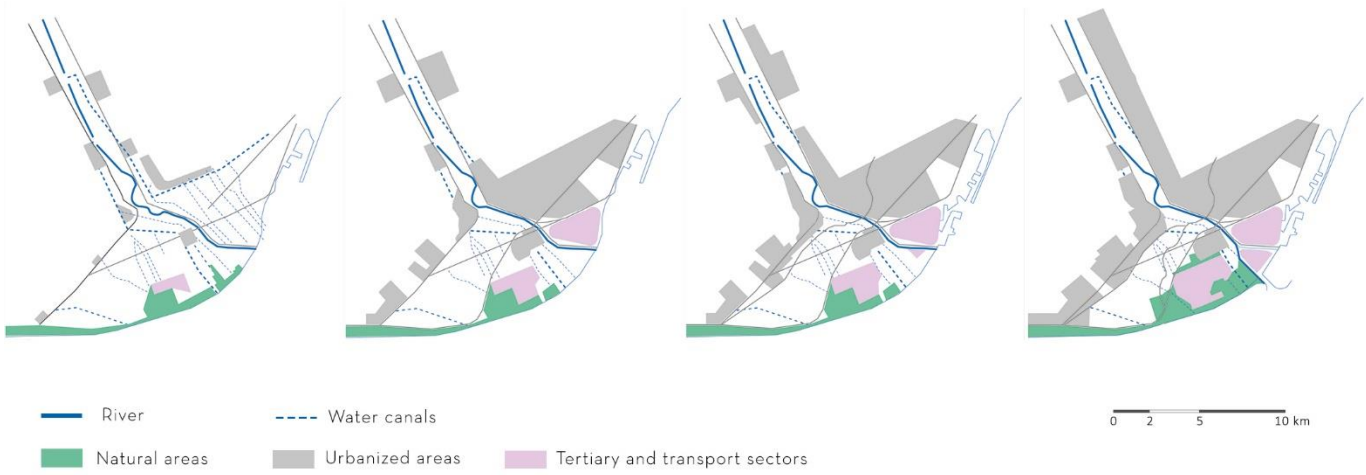
Table 1. Evolution of conflicts in the Llobregat Delta Valley

Year	Plan's tool	Project	Proponents	Opponents	Decision-making processes
1976-1984	Metropolitan Land Use Plan Port Land Use Plan	Diversion of the river's mouth, port expansion	Central government Economic sectors	Environmental movements	Top-down (narrow vertical relations between central and metropolitan governments)
1985-1993	Integrated Strategic Transport Study	Diversion of the river mouth and expansion of the port, airport, and access infrastructure	Central government Economic sectors	1 Provincial Authority 2 Municipalities Environmental movements	Top-down (narrow vertical relations between central and metropolitan governments)
1994	Strategic Spatial Plan of the Llobregat Delta (Cooperation Agreement for Infrastructures and Environment)	Diversion of the river mouth and expansion of the port, airport, and access infrastructure Restoration of coastal wetlands, construction of a water reclamation plant	Ministry of Public Works Regional authority, 2 sub-regional authorities, 2 Municipalities Port authority	Authority for the Promotion of Agriculture of Baix Llobregat Environmental movements	Top-down (broadened vertical relations between central, metropolitan, and municipal governments)
1996-2004	Protection and Improvement Plan for the Baix Llobregat Agricultural Park	Consolidation and protection of agricultural space and sustainable business development	Consortium of the Baix Llobregat Agricultural Park (2 sub-regional authorities, Farmers' Union, 14 Municipalities)	Environmental movements	Top-down (vertical and horizontal relations) Bottom-up (farmers and environmental associations)
2005-2016	Metropolitan Land Use Plan in the Baix Llobregat Agricultural Park Area	Landscape and ecological management project for the diversion of the Llobregat River	Consortium for the Protection and Management of the Natural Spaces of the Llobregat Delta (Regional Authority, 2 sub-regional authorities, 16 Municipalities)	Coordination of environmental, cultural, neighbourhood associations, economic sectors, etc.	Top-down (vertical and horizontal relations) Bottom-up (farmers and environmental associations)

Source: Authors' own elaboration

At the same time, we also observe a change in governance, from a vertical and restricted form to broad and hybrid forms that embrace horizontal and bottom-up relationships. The management of transformations through forms of broad governance has proven effective at consolidating ecological restoration and water protection through compensatory mechanisms practised within planning processes and has become a widespread standard practice of government action[5].

Figure 3. Changes in natural land cover in 1945, 1985, 2000, 2017



Source: Original drawing by O.G.Paparusso, adapted by historical orthophoto series of the ICGC (Geological Cartographic Institute of Catalonia)

2.2 Expo 2008 and the redevelopment of the Ebro River (Zaragoza)

The second case concerns the significant urban renewal of Zaragoza (Figure 4) carried out through the extensive programme of interventions for Expo 2008, whose theme specifically addressed "Water and Sustainable Development." This was a transformation project resulting from a collective demand for the reappropriation of peri-fluvial spaces for public use.

Figure 4. Zaragoza and the Ebro River valley

Source: Google maps, 2024

The urbanisation of the area is the outcome of the long process of canalisation undertaken in the 18th century through the construction of water distribution channels – as well as that of a dense network of smaller channels for irrigating agricultural fields – along the edges of the Ebro River valley. The urban expansion of Zaragoza mostly occurred along the right bank of the river, through a progressive process of covering the channels and ditches. The expansion on the left bank and only began in the mid-20th century, according to the land-use municipal plans of 1943 and 1957. Both plans prescribed industrial development areas along the north-western edge of the river valley and a concentric urban development limited by road infrastructure and public facilities.

An integral part of the new urban design was the diversion of the river at the north-

western meander of the city. The proposed diversion aimed to "cut" the meander, shortening the river's course and moving the Ebro's waters away from the meander areas and adjacent lands. The areas, freed from flooding, could then accommodate the urbanisation of a sports citadel (De la Cal, 2019).

The urbanisation process that occurred between the 1960s and 1980s generated numerous critical issues in the implementation and management of transformations (De la Cal, 2019). The functioning of irrigation systems for agricultural lands within or beneath the new urban grids provoked caused flooding and pollution problems. This, in turn, led to property and management conflicts over the channels and ditches between the municipal administration and the Irrigation Communities. Such conflict resulted in prolonged delays in covering the water infrastructure, with neighbourhood committees protesting over the safety and health of the areas. Management conflicts arose between the municipal administration and the river management authority (Ebro Hydrographic Confederation) over the regulation of the central section, which were further exacerbated by the damages caused by the river's periodic floods. Concerns were raised by neighbourhood committees who demanded the preservation of green and riverside spaces. Finally, environmental movements campaigned for the defence of the Ebro forests, which were destroyed during the river regulation works.

These conflicts were undoubtedly related to the use and management of resources, as well as the management and transformation of the landscape, but to some extent, they also touched on issues regarding the organisation of collective space consumption.

The aforementioned conflicts brought forth a rethinking of urban development, and in part, they were reconciled by the 1986 land use plan, which aimed to correct the issues in terms of basic urbanisation, green spaces, and neighbourhood facilities, by reducing the building areas and promoting citizen participation (Gonzalez, 2014). This plan definitively abandoned the diversion of the Ebro and developed the first guidelines for the reconfiguration of peri-fluvial areas, through the tool of design competitions (1987 and 1992). The outcomes of the two competitions were debated among the municipal administration, competent authorities, experts, and citizens, but all the proposals were rejected by these actors as they were incompatible with river mobility and still too closely tied to urban expansion rather than the development of the river's fluvial space (De la Cal, 2019).

Beyond the dissatisfaction with the proposed transformations of the Ebro's banks, the drought periods of the 1990s and the environmental protection of some river meanders triggered a comprehensive reassessment of the water management system, leading to the formation of *ad hoc* decision-making bodies and cultural events:

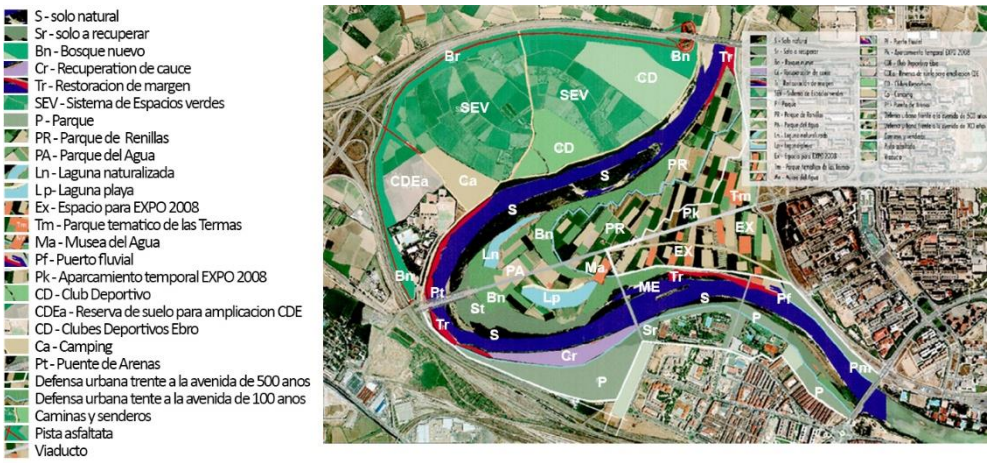
- The conference series "Ríos y ciudades: aportaciones para la recuperación de los ríos y riberas de Zaragoza" (1996) involved municipal departments, academia, experts, and citizens' associations. The actors discussed urban and landscape visions, culminating in the first proposal for the Ebro River Park, entitled "Aportaciones para la recuperación de los ríos y riberas de Zaragoza" (De la Cal & Pellicer, 2002);
- The municipal commission for water management and monitoring (1996), supported by the LIFE project (1997-99) for a water consumption reduction strategy. Among the commission's main initiatives were[6]: (i) the Zaragoza Water Saving City Programme, with awareness campaigns leading to specific commitments by citizens and economic sectors for water conservation; (ii) the reform of water tariffs with incentives for efficient water use; (iii) investments to

reduce water pipeline losses (Julien, 2002).

A cultural convergence on the issue of water catalysed public and civic attention towards an alternative urban development vision, which would then be formalised through technical studies, economic quantifications, awareness-raising activities, and design competitions. Given the economic scale of the extensive environmental measures, the municipal administration used the 2008 International Exposition as an opportunity to attract financial resources from the State and the Autonomous Community, serving as a catalyst for the necessary political and institutional consensus and local societal support (Pellicer, 2015). The strategy for the river park thus included the construction of the Expo site in the northern meander of the Ebro, infrastructural and environmental works aimed at reshaping and naturalising the riverbanks along the entire urban stretch of the river to improve the usability of the peri-fluvial public spaces.

A consortium of public bodies (Ministry of Public Works, Ebro Hydrographic Confederation, General Council of Aragon, and Zaragoza City Council) developed the Expo Accompanying Plan (2000) and the preliminary project (2001); subsequently, the new urban plan incorporated these tools (2002) to allow for land-use variations and expropriation for the Expo (Figure 5).

Figure 5. Urban planning revision of the Municipal Plan (2002)



Source: Municipality of Zaragoza
https://www.zaragoza.es/ciudad/urbanismo/planeamiento/pgouz/riberas_ebro.htm

Between 2000 and 2005, the consortium of public bodies further developed the levels of design, submitting them for consultation with associations, economic sectors, and universities, thus ensuring effectiveness and fluidity in decision-making processes up until its realization in 2008. After the Expo's closure, many of the buildings constructed were left underutilised and abandoned, raising considerable concerns about the sustainability of the construction projects. However, the the multifunctional role of the landscape infrastructure and water-saving policies remained at the forefront of the political agenda: the municipal administration continued to develop planning and programming tools for Climate Change Adaptation and for the re-naturalisation of the eastern meander with the Green Infrastructure Master Plan (Tab. 2).

Table 2. Evolution of conflicts over the transformation of the Ebro river

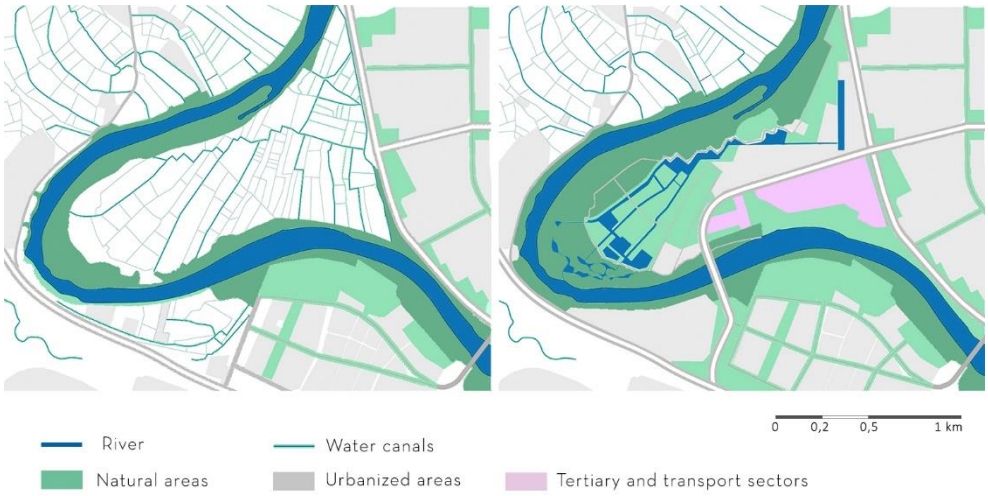
Year	Plan's tool	Project	Proponents	Opponents	Decision-making processes
1960s-1980s	Municipal Land Use Plan	Diversion of the river mouth, urban expansion	Municipal Administration	Irrigation communities River Management Authority Neighbourhood Committees Environmental movements	Top-down (narrowed vertical relations between municipal administration and economic sectors)
1986-1995	Municipal Land Use Plan Design competitions	Containment of expansions, green areas, infrastructure, riverbank areas	Municipal Administration	River Management Authority Professional Associations Neighborhood Committees Environmental movements	Top-down (narrowed vertical relations between municipal administration and economic sectors)
1996	Zaragoza Water Saving City Program Feasibility Project for the Ebro River Park	Water savings and efficiency in water networks Recovery of the western meander and reshaping of riverbanks	Municipal Administration Professional Associations Neighborhood Committees Environmental movements		Top-down (broadened vertical relations between municipal administration and civil society)
1997-2008	Expo Accompaniment Plan Municipal Land Use Plan Design Competitions	Metropolitan Water Park Parks and gardens along the riverbanks Construction of bridges and roads Construction of expo buildings	Consortium of Public Entities (Central Government, River Management Authority, Regional Authority, Municipality)		Top-down (broadened vertical relations at all levels of territorial governance and civil society)
2008-2016	Climate Change Adaptation Plan / Green Infrastructure Master Plan	Park in the eastern meander Urban forestry Water savings	Municipal Administration		Top-down (broadened vertical relations at all levels of territorial governance and civil society)

Source: Authors' own elaboration

The Metropolitan Water Park in the northern meander of the city represents one of the most significant environmental infrastructures created for Expo 2008. The park's design, while meeting the logistical and settlement needs of a major international event (areas for roads, car parks, facilities, etc.), adapted landscape elements to new settlement and ecological needs and reinterpreted the rural, geographical, historical, and territorial characteristics (Alday Sanz et al., 2008). It used the water canals shape of the meander, widening and reshaping them with multi-stage sections, producing a landscape adaptable to different flooding conditions (Figure 6). The network of channels is as a water purification system for water drawn from the Ebro, allowing its reuse both for the park's functions and to support the habitats of the peri-fluvial forest during drought periods.

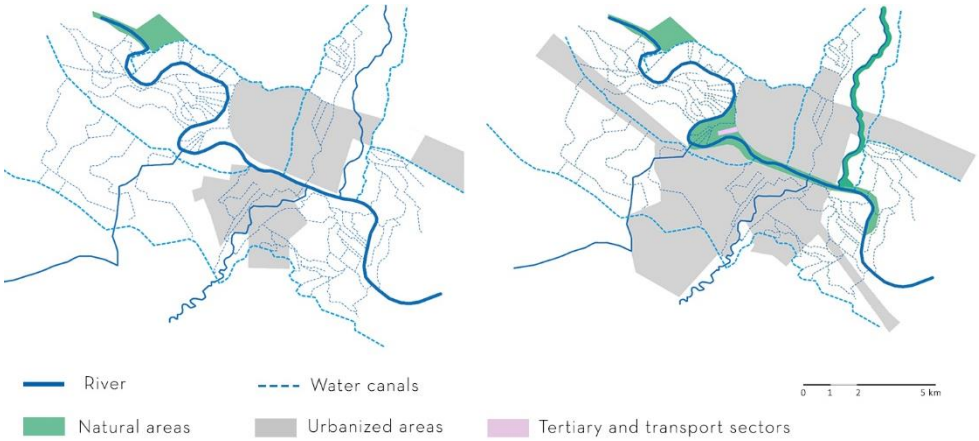
The set of landscape infrastructures funded by Expo 2008 and the subsequent re-naturalisation interventions have reconfigured the ecological and recreational continuity of the interface between the river and the city, with an increase in natural areas and public spaces adaptable to different flooding conditions (Figure 7).

Figure 6. Pre-operam (left) and post-operam (right) comparison of the Zaragoza Water Metropolitan Park



Source: Original drawing by O.G. Paparusso, adapted by (Alday Sanz et al., 2008)

Figure 7. Changes in natural land cover between 2001 and 2024



Source: Original drawing by O.G. Paparusso, adapted by orthophoto series of Google Earth

3. Tools and techniques in 'trading zone' processes

The comparative analysis of the cases allows us to examine two sets of issues. The first concerns how a trading zone perspective can be useful in terms of understanding and interpreting different ways to achieve ecological restoration.

In Table 3, we summarise the key metrics of the cases (main conflict, key stakeholder, transformation, ecological restoration outcome). We relate these to the trade zone perspective, which we used as a research hypothesis.

Although the territorial transformations in both cases appear to follow common trends (increase in urbanized and natural areas, decrease in agricultural land), there are some differences in the type of trading zone. According to (Collins et al., 2007)'s model, these typologies depend on the homogeneity and heterogeneity of the objectives and the type of collaboration, whether collaborative or coercive.

In the case of Zaragoza, the socio-ecological transition depended on the convergence of institutional, social, and technical-design frameworks in the same direction (Geels, 2002), with the integration of river dynamics (water protection and river restoration) into urban functioning. The restoration of the river forest, urban

ecological connectivity, and water purification and reuse are the results of an "interlanguage trading zone" practiced during the large Expo event. This kind of trading zone is characterized by "homogeneity" of objectives and high levels of "collaboration". There are few elements of negotiation, the boundaries of the trading zone are clear and limited, and it produces spatially extensive and continuous design solutions.

Table 3. Case comparison

case	Main conflict	Key Stakeholder	Trasformed area	Ecological restoration outcome	Trading zone characters
Llobregat Delta (Barcellona)	Economic interests (tertiary and transport sector) Vs Landscape and agricultural protection	- Ministry of Public Works - Regional authority, 2 sub-regional authorities, - Municipalities - Port authority - Management Consortia for Agricultural Park and river protection - Environmental movements	- Increase: transport and natural areas - Decrease: agricultural area	- Coastal wetland restoration - Perifluvial ecological connectivity - Restoration of groundwater functionality	- Heterogeneity of objectives - Coercive collaboration
Ebro River (Saragoza)	Economic interests (tertiary sector) Vs River protection and water saving	- Consortium of Public Entities (Central Government, River Management Authority, Regional Authority, Municipality) - Professional Associations and Academics - Neighborhood Committees Environmental movements	- Increase: tertiary and natural areas - Decrease: agricultural area	- River forest restoration - Perifluvial ecological connectivity - Water purification and reuse - Public space	- Homogeneity of objectives - Organic collaboration

Source: Authors' own elaboration

In the case of the Llobregat, the socio-ecological transition appears more uncertain due to the complexity of vertical and horizontal relationships among the actors. The multiplicity of conflicting objectives required numerous compromises and "remedial" actions to address the territorial development visions of the 20th century. The restoration of coastal wetlands, riparian zones, and the functionality of the groundwater table constitute the result of a "fractionated trading zone"; it is characterized by the heterogeneity of objectives (logistical, infrastructural, agricultural) and coercive cooperation. In this case, there are many elements of negotiation, the boundaries of the trading zone are more opaque and complex. Il has produced a convergence toward a well-defined "boundary object" (Star & Griesemer, 1989), namely the construction of the wastewater treatment plant. It is an operational tool that can have different meanings for the involved parties: it is an infrastructure necessary for the metabolism of logistical activities and thus included in the economic balance of the transformations, while at the same time enabling various ecological restoration processes.

The second aspect of the discussion concerns the defining elements of these two socio-ecological transitions. In what follows, we will discuss the main changes observed over the past thirty years, with a specific focus on planning tools, design techniques, and governance.

The changes in the planning tools used in the two cases clearly illustrate the technical, cultural, and social convergence towards environmental issues, with specific tools for the implementation of strategic visions. Primarily, we observe the

use of masterplans, agreements, and strategic land-use schemes, progressively implemented and detailed through phases of negotiation and dialogue with the involved actors. Only after reaching an agreement was there a consolidation of the regulatory function within the land-use plans.

These tools demonstrate how «socio-ecological transformations are based on environmental assessment, flexible land use, and specific territorial and environmental design» (Voghera & Giudice, 2020:1). In fact, both cases show that implementation is closely linked to environmental compensation mechanisms for infrastructural and settlement transformations. These tools are capable of creating new environmental values, akin to the original ones, in a logic of restoring the transformed environment (Kuiper, 1997).

In the case of the Llobregat, most compensations were defined *post hoc*, following transformative choices (concerning logistics and transport) inherited from the planning of the 1970s-80s, as a result of the negotiation and dialogue process among various economic, institutional, and civil society actors. In this sense, compensation has a remedial and impact-control quality, but its effects are inscribed within a general design of ecological connectivity. In Zaragoza's case, the project for reshaping and re-naturalizing the riverbanks was an environmental compensation specifically tied to the 2008 Expo event. This was an original strategy, as it was the result of the convergence of various actors who found in the Expo the political and economic opportunity to implement a broad landscape infrastructure program.

The main changes in design techniques are attributable to the use of infrastructures for environmental purposes within the landscape project.

In the Llobregat case, the landscape was profoundly altered to adapt to the local settlement system. At the same time, this upheaval catalyzed the technical-economic capacities for the construction of the water reuse plant for irrigation and environmental purposes. This infrastructure is both the result of a compromise and the catalyst for a new ecological balance: it halts the intrusion of the saline wedge to the benefit of agricultural production and feeds the restored wetlands to the benefit of coastal habitats.

In Zaragoza's case, we observe a more nuanced approach to landscape design, where settlement needs adapted to the hydraulic, ecological, and recreational functions of the river, modifying land use zoning based on controlled flooding criteria. The reshaping of the riverbed and the construction of canals in the west meander park of the city involved significant spatial transformations (earthworks, excavations, and beach replenishment) integrated with chemical and natural purification systems. These structural measures, combined with public awareness campaigns for water conservation, closed the water cycle, enhancing the quality of water bodies, land safety, riparian vegetation restoration, and public space growth.

Lastly, we highlight a common change in governance, driven by the shift in the roles assumed by the actors.

We note that the evolution of conflict dynamics and solutions was determined by the changing roles of the actors involved. We observe a consistent shift from a position of dissent to one of integration and negotiation in decision-making processes among initially divergent actors. In both cases, the expansion of the decision-making audience accompanied the evolution of government action, enabling the development of a self-guiding society, where the public entity does not retreat but profoundly changes the nature of its action (Balducci A., 2000). We emphasize that decision-making processes are characterized by top-down decision-making, but with a shift: from narrow vertical relationships to expanded vertical and horizontal

relationships that intercept bottom-up movements and demands.

4. Conclusion

Understanding the socio-ecological transitions of the two cases required the investigation of multi-level and multi-phase dynamics over extended timeframes. The aspects discussed in the previous section allow us to draw some conclusive considerations on the changing processes and the implications of the results for future projects in water landscapes.

When correlating the results of ecological restoration with the different trading zones in the two cases, an inverse proportional relationship seems to emerge. As the perimeter and fragmentation of the trading zones increase, the continuity and extent of the restored areas decrease. Conversely, when the degree of fragmentation of the trading zones decreases, the continuity and extent of the restored areas increase.

Both models demonstrate the possibility of pursuing ecological and river restoration, not as the primary objective of land-use transformation, but as an outcome of negotiation and collaboration within the trading zone. Using the technical, economic, and preventive coordination capabilities of the large-scale transformation projects could accelerate large-scale restoration processes (Wohl et al., 2015) in contexts where new environmental goals are not shared or prioritized in the political agenda, or when they are still distant from the concerns of local communities.

We have highlighted how conflicts arising from rigid stances on spatial transformation have fuelled a shift in the strategic function of planning. This shift concerns both the definition of objectives and the policies to achieve them, as well as the construction of spatial frameworks for action (Mazza, 2009). This highlights a change in the system of spatial production and consumption, from large, rigid projects dictated by conformative planning to large, implementable, and integrated projects practiced in performative planning[7]. In the performative model, the transformative functions (strategic and design functions) and the regulatory function are clearly separated yet equally crucial for the implementation phases, where the control of transformations occurs through technical evaluations aimed at improving projects concerning the objectives of the collective strategy (Janin Rivolin, 2008).

Performative practices are not entirely programmable as they depend on the variations between the governance system and the spatial production and consumption system (Janin Rivolin, 2008) of a given context[8]. However, cultural and social convergence towards environmental issues, by impacting directly the spatial production and consumption system, becomes a crucial parameter for experimenting with performative approaches that «improve the environmental management and impacts of development» (Baker et al., 2006:397).

We have also observed the shift in the principles and techniques for transforming watercourses, as a process of transition towards a new water culture in landscape design. The initial projects regarded rivers as background elements, detached from the overall functioning of the settlement system. The underlying approach of such projects was purely sectoral, as it aimed to modify the flow, volume, and landscape characteristics of watercourses in order to adapt them to the settlement needs of urban expansion and the transport infrastructure system.

Conversely, projects resulting from negotiation were marked by an integrated system of spatial devices (canalization, reshaping of riverbeds) and water infrastructures (treatment plants, filtration, and water reuse systems), where urban drainage and hydraulic risk management are functional to water quality and the restoration of

rivers and wetlands.

In conclusion, we believe that the conflicts generated by large-scale transformation projects can represent a space for new socio-ecological relations capable of producing both “new landscape” and progressive forms of governance.

The change in the type of decision-making processes and the role of stakeholders can generate a «multi-level governance, which can be seen as an interactive version of vertical governance» (Torfing et al., 2012:87). In interactive governance forms, a plurality of social and political actors with divergent interests interact to formulate, promote, and achieve common objectives through the mobilization, exchange, and deployment of a set of ideas, rules, and resources (Torfing et al., 2012). Therefore, a governance capable of strengthening government actions (Mazza, 2009), as it can activate a search for creative and territorially differentiated solutions to emerging problems and challenges (Healey, 2007).

Notes

1. (Nel-lo, 2014) provides a classification of territorial conflicts into four categories: i) use and management of resources, management and transformation of the landscape; ii) image and identity of a place; iii) organization of the collective consumption of space; iv) configuration and functioning of territorial governance.
2. The strategic mission of the Agricultural Park is to consolidate and develop the territorial base and facilitate the continuity of agricultural activity by promoting specific programs that allow for the preservation of values and the development of the functions of agricultural spaces within the framework of sustainable agriculture integrated into the territory and in harmony with the natural environment. https://parcagrari.cat/ca.
3. The projects can be consulted on the website https://www.amb.cat/s/web/territori/espai-public/espais-fluvials/parc-riu-llobregat.html.
4. For example, thanks to this initiative, the project for further expansion of the airport was halted in 2021. The platform also advocates for an expansion of participatory processes for a complete reorientation of metropolitan urban planning in favor of an urban and territorial model that prioritizes quality of life and the conservation of landscape. https://sosbaixllobregat.cat/.
5. For example, the environmental compensations of the Urban Development Master Plan for the intermodal logistics terminal of the Port of Barcelona (2022) include: the landscape qualification of the edges of the old river mouth; the environmental restoration at the intersection between the old and new river mouths; and the creation of a park between the airport and the Agricultural Park.
6. The Commission is composed of representatives from municipal departments, citizen groups, and civil society, and has achieved significant results in terms of savings, continuing its initiatives to this day. https://climate-adapt.eea.europa.eu/en/metadata/case-studies/zaragoza-combining-awareness-raising-and-financial-measures-to-enhance-water-efficiency?set_language=en.
7. «In the ‘conforming’ model […], development rights are assigned in advance along with the design of the collective strategy, which is therefore translated into a binding zoning design. In the ‘performing’ model […], development rights may be assigned after the evaluation of projects, once they have been assessed to be in line with the collective strategy, as a non-binding policy reference» (Janin Rivolin, 2008:169).
8. Both cases have been testing grounds for the European Union’s LIFE programs, and thanks to them, innovative planning tools such as the Agricultural Park Plan of the Llobregat and the Zaragoza Water Saving City Program have been developed.

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