Research

Crisis and reorganization in urban dynamics: the Barcelona, Spain, case study

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ABSTRACT. We use adaptive cycle theory to improve the understanding of cycles of urban change in the city of Barcelona, Spain, from 1953 to 2016. More specifically, we explore the vulnerabilities and windows of opportunity these cycles of change introduced in the release (Ω) and reorganization (α) phases. In the two recurring cycles of urban change analyzed (before and after 1979), we observe two complementary loops. During the front loop, financial and natural resources are efficiently exploited by homogenous dominant groups (private developers, the bourgeoisie, politicians, technocrats) with the objective of promoting capital accumulation based on private (or private-public partnership) investments. During the back loop, change is catalyzed by heterogeneous urban social networks (neighborhood associations, activists, squatters, cooperatives, nongovernmental organizations) whose objectives are diverse but converge in their discontent with the status quo and their desire for a "common good" that includes social justice, social cohesion, participatory governance, and well-being for all. The heterogeneity of these social networks (shadow groups) fosters learning, experimentation, and social innovation and gives them the flexibility that the front loop's dominant groups lack to trigger growing pressures for transformation, not only within, but also across spatial and temporal dimensions, promoting panarchy. At the end, the reorganization phase (α) becomes a competition or negotiation between potential directions and outcomes (including conservative leanings and intentional bottom-up change) to restore the former system.

Key Words: *adaptive cycle theory; back loop; Barcelona urban planning; Barcelona's urban (sustainable) design era; crisis; panarchy; release (Ω) and reorganization (α) phases; social innovation; social justice; urban change dynamics; urban resilience*

INTRODUCTION

Since the mid-2000s, resilience has become increasingly central to international and domestic urban policy making. Climate change, recessions, overpopulation, or migration flows resulting from systemic environmental, economic, or social crises have affected the evolution of the urban quality of life. With these short- and long-term stresses to urban systems' sustainability, gradual, adaptive or transformational changes occur (Chaffin et al. 2016). Importantly, a city's resilience lies in its capacity to adapt and transform itself to meet the needs and aspiration of its citizens, rather than in its ability to return to its precrisis form. Hence, there is a need to generate new strategies that transform the city through resilient processes. However, prior to managing resilience, urban experts ought to understand urban cycles of change and the vulnerabilities and windows of opportunity these cycles introduce. To put it differently, they must understand how periods of gradual change interplay with those of rapid change and how such dynamics interact across temporal and spatial dimensions promoting panarchy (Gunderson and Holling 2002). This is the main objective of our paper.

Taking the city of Barcelona in Spain as an example, we analyze two recurring cycles of urban change (from 1953 to 1979, and thereafter) using Holling's (1986) adaptive cycle theory. This theory examines the dynamics and resilience of ecological and social-ecological systems using a four-phase adaptive cycle, which can be divided in two distinct loops. The front loop includes "exploitation" or growth (the r phase), and "conservation" or consolidation (the K phase). The back loop includes "collapse" or release (the Ω phase), and "innovation" or reorganization (the α phase).

Our focus is on the socioeconomic dimension of Barcelona's real estate multiscale system dynamics and associated policy. During the two front loops, financial and natural resources are efficiently exploited by homogeneous dominant groups (private developers, the bourgeoisie, politicians, or technocrats), with the objective of promoting capital accumulation based on private or private-public partnership (PPP) investments. During the two back loops, change is catalyzed by Barcelona's heterogeneous urban social networks (neighborhood associations, professional bodies, activists, squatters, cooperatives, and nongovernmental organizations), who exert discontent with the status quo of conservation (the K phase) and desire a "common good" that includes social justice and cohesion, participatory governance, and well-being for all. At the end, the reorganization phase (α) becomes a competition or negotiation between potential directions and outcomes (including conservative leanings and intentional bottom-up change) to restore the former system. Hence, the back loops are more a step-wise transition in which the direction is foreseen and occurs cumulatively, rather than a collapse that may have not been foreseen by many in power.

Through our analysis, we identify the key role of small, fast-responding systems (the urban social networks) in the resilient development of the city of Barcelona, and bring to light the relevance of the intra- and cross-scale linkages between the city's institutional networks, local neighborhoods, and urban social movements, as well as the key actors, in achieving sustainable development. In particular, we observe that the heterogeneity of the urban social movements (shadow groups) fosters learning and social innovation (Parés et al. 2017; M. Parés, R. Martínez, and I. Blanco, *unpublished manuscript,* http://www.univ-paris-est.fr/

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pdf) and gives them the flexibility that the front loop's dominant groups lack to trigger growing pressures for transformation, not only within, but also across spatial scales and time dimensions, promoting a cross-scale process of revolt and stabilization, also known as panarchy (Gunderson and Holling 2002).

Since the mid-2000s, research on urban resilience has flourished. From the theoretical perspective, several authors have highlighted that, because cities are social-ecological adaptive complex systems managed by humans and organizations, ecological models analyzing urban ecosystems ought to include social interactions (Alberti et al. 2003, Marzluff et al. 2008). Consistent with this, other authors have modeled cities as heterogeneous, multiscale social-ecological systems with heavily intertwined spatial dimensions (Pickett et al. 2004, Grimm et al. 2008, Ernstson et al. 2010). Interestingly, Bristow and Healey (2014) emphasize that urban policies' success or failure in promoting sustainable development relies on the knowledge and preferences of the city's diverse composition of agents, entities, and networks; and Marcus and Colding (2014) argue for the need to use the adaptive cycle theory as a tool of analysis for urban systems. Most recently, Herrmann et al. (2016) use the adaptive cycle theory and panarchy to compare the growth and collapse of cities, highlighting the complementarities of the two phases, as well as their temporal and spatial dimensions.

Despite these recent developments in urban resilience, urban studies have seldom used Holling's adaptive cycle theory to examine the dynamics and resilience of urban planning (Schlappa and Neill 2013, Marcus and Colding 2014) and urban environments (Chaffin et al. 2016). This is our main contribution. In particular, the novelty of our analysis is to focus on real estate dynamics and associated policy when analyzing a city's adaptive cycle. In doing so, we merge urban dynamics with the adaptive cycle of the social-ecological complex systems (Holling and Goldberg 1971). As with others, our use of "the adaptive cycle model is not intended as a predictive or quantitative model, rather as a conceptual tool and approach focusing on system behavior" (Soane et al. 2012). Despite these challenges, the panarchy model can offer a powerful narrative with practical implications for better understanding the vulnerabilities and windows of opportunity of real estate dynamics. To the best of our knowledge, our study complements work from Pelling and Manuel-Navarette (2011), who use the adaptive cycle to analyze the vulnerability of two coastal cities in Mexico to climate change; Bures and Kanapaux (2011), who analyze Charleston's (USA) urban cycles of change to wars and climate change; Abel et al. (2006), who explore processes of release and reorganization in cattle and wildlife ranching in Zimbawe and an Aboriginal hunter-gatherer system and a pastoral one in Australia; and Chaffin et al. (2016), who explain how transformative governance of Cleveland (USA) watersheds can help manage the social-ecological resilience of Lake Erie.

TWO URBAN ERAS
Our focus is on the adaptive cycle's Ω and α phases of two urban eras from Barcelona (1953–1979 and 1980–2016). Appendix Tables A.1 to A.3 summarize the evidence discussed below by subsystem type.

Urban planning era: 1953–1979
After two decades of autarchy and economic stagnation, the Spanish dictator, Francisco Franco, drastically changed his economic policy by opening the economy. Economic liberalization, substantial U.S. economic aid, soaring tourism, and remittances from Spaniards working abroad paid for the country's industrialization and economic expansion. Between 1950 and 1970, the share of the Spanish labor force working in the industrial sector grew from 23.5% to 34.6%, with a heavy concentration in the industries in Bilbao, Barcelona, and the capital, Madrid (Ferrer and Nel·lo 1998). At the same time, the use of land and natural resources soared, with the construction of rainwater reservoirs and nuclear plants. During this expansion, Spain was in the r phase, a phase of growth and exponential change, with its gross domestic product (GDP) growing an average of 8.6% from 1961 to 1966, and 5.8% from 1967 to 1972.

The mid-1950s industrialization of Barcelona, a city in the northeast of Spain, attracted an impressive inflow of rural immigrants from all over Spain. As a consequence, Barcelona's population grew from 1.28 million inhabitants in 1950 to 1.75 million in 1970 (Ferrer and Nel·lo 1998), generating a huge housing deficit (Tatjer and Larrea 2010). To stimulate new housing construction, the Spanish government liberalized housing policy by offering loans, subsidies, and fiscal exemptions to developers, transferring most housing production to the private sector (Díaz Hernández and Parreño Castellano 2006). At the metropolitan level, the government approved in 1953 the *Plan Comarcal de Barcelona* (Barcelona District Plan; BDP53 hereafter), with the objectives of densifying the existing urban fabric in the suburban areas of Gràcia, Sarrià, Sants, and Sant Andreu, and replacing the 1920s shantytowns with housing superblocks (*polígonos de viviendas*) in the periphery of the city (Oyón 1998, Busquets 2005). As a result, Barcelona's housing stock tripled from 1950 to 1975 (Ferrer and Nel·lo 1998). As in the rest of Spain, Barcelona was in the entrepreneurial exploitation phase (r phase) in which social capital positions and coalitions were being consolidated, generating fewer but more marked differences (Pelling and Manuel-Navarette 2011).

As Barcelona moved from the r to the K phase, dominant social actors under the influence of higher scales of power established a new social, organizational, and institutional equilibrium (Pelling and Manuel-Navarette 2011). A loophole allowed municipalities to override the BDP53 plan with "partial plans," to the advantage of private developers well connected to the regime's power structure (Calavita and Ferrer 2000, Herce 2013). During the 16-year mandate of Mayor Porcioles (1957–1973), residential housing was constructed in areas initially reserved for green spaces and public facilities, and housing densities frequently exceeded the maximum threshold of 400 units/ha (Ferrer and Nel·lo 1998, Solans 1996). During the K phase, organizations and institutions consolidated but lost flexibility. At the same time, overexploitation and overdensification built up social pressure and increased the system's vulnerabilities.

Urban real estate development and urban social movements
Barcelona's urban planning practice led to formal and functional conflicts that spawned its urban social movements (Busquets 1992, Solà-Morales 1997). A meager supply of green spaces and public facilities, and deficient lighting and sanitation conditions

accompanied the heavy densification of the suburbs (Huges 1993). The social and well-being conditions in the housing superblocks and shantytowns were considerably worse than elsewhere because these settlements emerged in isolated, poorly built, and deficiently developed areas in the periphery of the city. The extreme densification of Barcelona mixed with the meager supply of public goods generated poor living conditions, social segregation, and deep social conflicts that spawned urban social networks (Calavita and Ferrer 2000).

In the late 1960s, and despite the lack of social freedom, these networks led Barcelona's neighborhood associations (*comisiones de barrios*) through different forms of protests, including rallies, urban actions, marches, and traffic interruptions. At the same time, unions, (illegal) political parties, university students, and professional associations contributed to a wider city-level protest movement against the political regime. Social networks were becoming essential in connecting different sources of information and, hence, bringing together different forms of knowledge across Barcelona's neighborhoods.

What caused the first creative destruction (Ω) phase?
The following events encouraged the decline of natural resources and political, industrial, and real estate capital, and exacerbated the socioeconomic vulnerability of Barcelona.

- *Natural capital collapse:* The 1950s to 1970s urban development also caused an environmental crisis because of the rising demand of resources and the massive emission of air, soil, and water pollution. Examples of such crises include the collapse of the Can Clos landfill in Montjuïch; the failure of the Besos waste-water treatment plant and subsequent pollution of the Mediterranean; the elevated flooding risks of many suburbs; and the high levels of air, soil, and groundwater pollution resulting from industrial production and the extraction of minerals from the Creueta del Coll quarry.

- *The strength of Barcelona urban social networks:* By the late 1960s, the urban social networks spread across the new local neighborhood commissions, influencing the neighborhood associations that were heavily involved in both social and urban city planning issues. For example, the urban social networks occupied the city hall to protest against a "partial plan" that would have destroyed 4730 homes in 1973. As a result of their success, mayor Porcioles was demoted (Calavita and Ferrer 2000). At the same time, printed media such as *CAU (Construcción, arquitectura, urbanism), Quaderns,* and *Novatecnia* "established a rigorous, critical discussion of Barcelona's urban problems during the 1970s," building social networks and contributing to Barcelona's human and cultural capital (Busquets 2005).

- *End of the dictatorship in 1975:* At a higher level of governance, the fight against the dictatorship unified the urban social movements by giving them a common target for dissention. As the society sensed that Franco's regime was arriving to its end, its harshness decreased (Castells 1983). The dictatorship's weakening was apparent in many facets of life such as the normalization of imported foreign books and journals and the frequent and broad-scale social protests and objecting initiatives.

- *Industrial sector crisis:* During the 1960s, the industrial sector was restructured and relocated outside the city as industries occupying high-value land became obsolete (Soja et al. 1983). At the same time, investments flew from industrial to real estate capital, further reducing Barcelona's industrial growth potential. With the 1973 crisis, Barcelona's industrial crisis worsened and expanded to the construction sector (Ferrer and Nel·lo 1998). Soon thereafter, Barcelona's unemployment rate soared to > 20%, further deepening the housing and public infrastructure crises, worsening living conditions, increasing social segregation, and raising social conflict (Trullén 1988). By bringing the price of land down, the economic recession exacerbated developers' access to capital (Calavita and Ferrer 2000).

- *The Barcelona Metropolitan Master Plan:* The new Barcelona Metropolitan Master Plan (BMMP76) replaced an obsolete BDP53. Its objectives were twofold: "to reduce the allowable densities by half" and "to reclaim land for public use by designating various parcels of land for parks, schools and other public facilities" (Calavita and Ferrer 2000). Its architect explained that "for the first time, there was a coherent plan that established intensities and densities of development (...) based on the introduction of legal controls that regulated the city growth" (Solans 1996).

What was the nature of the first creative destruction (Ω) phase?
Despite its breakthrough in urban planning, a first version of the BMMP76, released in 1974, was disliked by both neighborhood associations and the private sector. The former criticized the proposed thoroughfares, which divided neighborhoods and affected thousands of homes, and the insufficient public-use land. The latter feared downward pressure in land prices and profit losses. In all, 32,000 allegations were presented, and the plan was revised thoroughly before its final publication in 1976.

These allegations signal the beginning of the creative destruction (Ω) phase, which was fueled by the urban social movements. To put it differently, the strength of the revolt of Barcelona's urban social movements promoted the first window of opportunity for change. The neighborhood associations' constant protests at different spatial scales (neighborhoods), i.e., from the destruction of the Plaça Lesseps because of the construction of the first beltway, to the sewer line demands in the shantytowns of Torre Baró, generated a city-wide intangible network that released social capital, which was scarce after 35 years of political repression.

The turmoil that accompanied the 32,000 allegations also brought about political upheaval at the municipal level, weakening the regime's political capital and eventually restructuring it. Because of the wide social opposition to the 1974 BMMP, an intransigent Mayor (Viola), well connected to the regime's power structure, replaced a benevolent one (Masó). However, the persistent neighborhood associations' complaints regarding real estate speculation caused Viola's quick demotion and replacement by yet another mayor (Socias) in 1976.

The political uncertainty that accompanied the transition to democracy and fears of socialism and property expropriation further pushed land prices downward (Calavita and Ferrer 2000). Overall, the economic slowdown led to an appreciable change in

population dynamics, with decreases in both fertility and immigration (Ferrer and Nel·lo 1998).

In addition to the neighborhood associations, other urban social movements released social capital, generating cross-system linkages. For instance, local initiatives involving transdisciplinary participatory processes, including architects, sociologists, journalists, and neighbors, developed Social Plans (*Planes Populares*), with the objective of compiling their multiple objections to the 1974 BMMP (Magro 2014). The delivery of the Social Plans to the local administration set the beginning of the reorganization (α) phase.

What was the nature of the first reorganization (α) process?
With Franco's death in 1975, parliamentary elections and the restoration of the Generalitat de Catalunya in 1977, and the implementation of the BMMP76, reorganization was on its way. Reorganization was facilitated by: (1) leaders and transformational agents of change who emerged in the neighborhoods and organized through neighborhood associations, (2) urban development protests that became a common platform action against speculation, (3) a sincere attempt from political leaders to turn the protests of the urban social networks and local community-led organizations into effective technical proposals such as the Social Plans, (4) a larger than expected funds transfer from the Spanish government allowing the city to buy close to 221 ha for public use for 3 billion pesetas (~USD $20 million; Solans 1979), and (5) broad-scope debates regarding Catalan culture, spanning from language to theater, architecture, and regional planning (Congrés de Cultura Catalana 1978).

With democracy, newly acquired public-use land, and a democratically elected (progressive) mayor in 1979, many young architects (led by the new urban planning director, Oriol Bohigas) designed almost 200 parks, plazas, and other public facilities during the 1980s (Buchanan 1984) with two objectives. The first objective was to respond promptly to citizens' demands by efficiently designing and building what was most needed, including public spaces for civic and political participation. The second objective was to obtain both local and international recognition that would fuel local enthusiasm, build a reinvented local culture and urban identity (McNeill 1999), and advance a new Barcelona style (Julier 1996, Narotzky 2007).

According to the engineer of the BMMP76, Albert Serratosa, the neighborhood associations "were the real protagonists (...) in resisting the attacks on the most essential aspects of the plan [the BMMP] on the part of powerful pressure groups" (Huertas 1997). He also credited citizens for defending the BMMP76 by "building cross-scale interactions between citizens, experts, practitioners and politicians." Hence, the revolt of the urban social networks fostered the adaptive capacity of multiple neighborhood community-led actions, generating a cross-scale nested set of system dynamics (panarchy). In other words, the actions of both small- and intermediate-scale systems triggered a critical change to a larger scale system (the government of Barcelona) through a bottom-up process.

Although the transition from the BDP53 to the BMMP76 triggered the creative destruction (Ω) phase, the preconditions for the reorganization (α) phase were in place when the stress accumulated, and the system transformed into an exploitation (r)

phase, with new social and political capital replacing the old regime's political capital, and young technocrats and architects developing and regulating another real estate growth in the city. Despite the long-lasting economic recession (1974–1985), public infrastructure in Barcelona soared, correcting a long-lived deficit. The new r phase of growth and exponential change had begun.

Urban (sustainable) design era: 1980–2016

The second r phase: redressing Barcelona's imbalances in the midst of an economic recession: 1980–1985
"The critical discussion of the 1970s that spoke out against speculative urban development projects" guaranteed that "the major intervention projects [of the 1980s and early 1990s] were seen as a strategy to redress balance" (Busquets 2005), foster social cohesion, and create a "sense of belonging to the city" (García-Ramon and Albet 2000). Furthermore, "Barcelona's urban regeneration program coincided with a wider program of building democratic citizenship in Spain with the implementation of national welfare policies favoring education, training and health" (Degen and García 2012). At the same time, to confront the economic recession and demographic stagnation, the local administration covered basic services and improved the poor living conditions inherited from the Porcioles era (Ferrer and Nel·lo 1998).

To address Barcelona's former urban deficits, its first two democratic mayors, Serra (1979–1982) and Maragall (1982–1997), prompted a massive relaunch of Barcelona at different, highly intertwined scales of action (Busquets 2005). Initially, these actions targeted small-scale problems brought up by the neighborhood associations, such as the lack of green areas and the need for urban rehabilitation alternatives compatible with the distinct fabrics in the Ciutat Vella (old town), Eixample, and the suburban areas of Barcelona.

European Union integration and Barcelona's nomination to host the Olympic Games: 1986–1995
With the 1981 liberalization of the mortgage market and the 1986 Spanish integration to the European Union, Spain underwent radical economic changes, improving economic confidence, boosting corporate investment and employment, and increasing household income and consumption. Barcelona led the country's economic expansion, thanks to its 1986 nomination to host the 1992 Olympic Games, boosting public regional and national investment to finance the city's large-scale public works (García and Claver 2003) and attracting private investment. Subsequently, the price of land escalated housing prices in certain sought-after neighborhoods and resumed the gentrification process that had stalled during the economic recession. Within a year (from 1987 to 1988), housing prices increased by 51% in Eixample and 100% in the neighborhoods of Diagonal and Pedralbes (Calavita and Ferrer 2000). Barcelona was again in the r phase of growth and exponential change.

In 1988, the "Plan for Hotels" laid the foundation for converting Barcelona into a tourist attraction. It was the beginning of a new economic growth model for Barcelona based on construction, tourism, and service sectors (Degen and García 2012). The construction of new public spaces as well as the celebration of cultural events in different neighborhoods connected segregated areas of the city and gathered residents from different

neighborhoods on common ground, enhancing social cohesion and citizen involvement. As Degen and García (2012) explain, social diversity replaced social and spatial segregation, urban identity was built around "Barcelonity" and the "discourse of class was replaced with one of municipal citizenship" (McNeill 2003), generating "a common democratic culture" (Mascarell 2007). At the same time, to implement education, health, and social services, Barcelona built a complex multilevel governance model, integrating the municipal government with other local administrations (regional and provincial) as well as social partners (business and trade unions) and nongovernmental organizations, and financed with funds from regional, national, and European institutions (Truñó 2000).

The decline in bottom-up participatory democratic governance
With the democratization of the Spanish political system, the political opposition dimmed, and Barcelona's urban social networks and local community-led organizations progressively lost their potential and connectedness (explained in Appendix Table A.4). The neighborhood associations and trade unions also became less influential in Barcelona's governance. The system had again reached highly institutionalized stability (K), "in which dominant social structures and social agency were well aligned and reinforcing" (Pelling and Manuel-Navarette 2011).

Importantly, the strong influence of technical experts in the city's strategic planning combined with the loose or indirect public involvement left little room for democratic control of changes in urban development. Marshall (2000) underscores that the municipal regulation whose objective was to give voice to the neighborhood associations in the municipal meetings (*ordenanza municipal de Calidad de Vida y de Participación Ciudadana*) was never applied because of fears that it would slow down the implementation of urban projects.

Barcelona's governance model was "only consensual or collaborative because certain power elites were in effect deciding" (Marshall 2000), as the organization of Barcelona's Olympic Games exemplifies. The authoritarian tradition from the Porcioles era (remember process) combined with the exceptionality and grandiosity of the Olympic project and the pressing deadline of July 1992 "justified" rigid, inflexible, and top-down decision making in the implementation of the Olympic infrastructure.

Neoliberalism and the housing bubble: 1996–2008
Starting in 1995, Spain experienced a decade of loose lending and falling interest rates as a result of both Spain's entry into the European Monetary System and fierce competition across financial institutions (Rodríguez-Planas 2018). Households' willingness to take on mortgage debt soared, with mortgages representing from 40% of disposable income in 2000 to 92% in 2007 (Henn et al. 2009). The increased housing demand, coupled with the underdeveloped rental market, further boosted the real estate demand, developing a housing bubble, with housing prices increasing 175% between 1998 and 2008 (Henn et al. 2009). At the political level, the conservative party (*Partido Popular*) won the Spanish general elections in 1996, setting the ground for a shift toward more neoliberal policies such as liberalizing the land in 1998.

The construction of the Olympic Village initiated a new phase of housing development led by private developers and resulting in high market prices (Degen and García 2012). PPPs marked a change in urban planning priorities because they limited urban planners' potential to include social and environmental goals that could discourage developers. With the new century, this new model consolidated, especially after the arrival of the new conservative (*Convergencia i Unió*) Mayor Trias in 2011. Despite the major economic slowdown that followed the 2008 financial crisis, Barcelona's local government continued to pursue a growth model that sought international investment through making Barcelona a reference for "smart cities" and a center for tourism (Degen and García 2012). Long forgotten were the days when Barcelona's urban regeneration had, as its main objectives, reaching social cohesion, reducing income inequality, and addressing the growing city's welfare problems.

What caused the second creative destruction (Ω) phase?
The following elements resulted in the creative destruction (Ω) and reorganization (α) phases:

- *Breakdown of the internal consensus model between the governing coalition and citizens:* With the Forum 2004 and Diagonal-Mar projects, the Barcelona Model gave way to a model of aggressive entrepreneurial urban regeneration that disregarded citizens' needs and voices (Mascarell 2007, Miles 2008, and Borja 2010). The criticism that economic considerations and developers' greed rather than citizens' needs were driving Barcelona's urban planning became frequent and widely shared among residents, local newspapers, and academics (von Heeren 2002, Union Temporal d'Escribes 2004, Delgado 2007, Parés et al. 2017).

- *Rising house prices and urban sprawl:* Because of the real estate boom, young people seeking more affordable housing began moving out of Barcelona, generating urban sprawl. Urban planning of the metropolitan region had been overlooked and did not follow a general plan, and thus, the region's development was chaotic (Monclús 2003). This situation, added to an inefficient network of public transportation, generated massive citizens' objections and frustration (Muñoz 2008).

- *Weakening of the inclusive governance model:* Several highly criticized projects (Forum, Barça 2000, El Forat de la Vergonya, and El PERI de la Barceloneta) brought to light the municipality's governance crisis (Capel 2010). The agony of Barcelona's inclusive governance model became apparent with the referendum to reform the Diagonal fiasco in 2010, and the demission of the Ciutat Vella council, Itziar González, because of mafia threats regarding municipal real estate licenses. Both citizens and the local press denounced the weakening of the inclusiveness of the governance model, as well as Ciutat Vella's gentrification and the unaffordable housing prices in the periphery (La Vanguardia 2007, Pellicer 2008).

- *Rising conflicts between different social groups:* As Barcelona developed a booming tourist industry, its citizens became increasingly frustrated with the uses and meaning of public spaces (García and Claver 2003). Barcelona's soaring overnight stays, from 3.8 million in 1990 to 12.4 million in 2008 (Turisme de Barcelona 2015), generated escalating tensions over the local residents' "right to sleep" vs. tourists' "right to enjoy a Mediterranean nightlife" (Degen 2004). In

addition, Spain experienced a major inflow of international labor-based immigrants, who were quick to find jobs in the thriving economy (Rodríguez-Planas 2012); however, with the 2008 recession, they were among the first to lose their precarious jobs (Rodríguez-Planas and Nollenberger 2016). Thereafter, both tourism and immigration competed for the municipalities' attention at a time when local citizens' needs rose, increasing social conflict and threatening social cohesion (Delgado 2007). Partly as a response to the austerity measures from both the regional Catalan and Spanish governments, a leftist proindependence party, CUP, gained momentum and citizens' support.

· *Global financial crisis and bursting of the Spanish real estate bubble:* After the international financial crisis, the Spanish economy suffered a major reverse with the bursting of the Spanish real estate bubble in 2008 (García 2010). Subsequently, small and medium-sized firms found it extremely difficult to obtain credit, and households' consumption plummeted. GDP growth collapsed, the unemployment rate soared to 23%, income inequality rose, and poverty escalated. In Barcelona, construction work stopped, and lots and many buildings were left vacant or idle, creating a window of opportunity for shadow networks to occupy the empty spaces.

· *New urban social networks:* Squatters began settling in Barcelona in the mid-1980s, and later, spread across the city. They created Squatters' Social Centers (*Centros Sociales Okupas*) that offered alternative infrastructure and services in occupied spaces (Martínez 2007, Capel 2010). The cooperative movement, with a long tradition in Spain, reemerged in Barcelona in the 1990s with Coop57, a cooperative created by workers displaced by the closing of the Editorial Bruguera publishing house in Sants. During 2005–2009, this movement expanded across the city (Magrinyà and De Balanzó 2015). After 2006, an important new urban social movement emerged, requesting decent and affordable housing for all.

What was the nature of the second creative destruction (Ω) phase?
The 15M movement, a wave of social mobilization that started on 15 May 2011 and "featured some of the largest occupation of public plazas since the country transitioned to democracy" (Fuster Morell 2012), set the beginning of the release (Ω) phase. In Barcelona, the occupation of Plaça Catalunya lasted more than two weeks, and thereafter moved to neighborhood plazas across the city. While many participants had no previous political experience and were mobilized through social networks, others came from the urban movements, bringing with them their former mobilization trajectories as well as their accumulation of knowledge (Fuster Morell 2012, Nel·lo 2016). Social knowledge and behavior, as well as social memory, learning, and communication strongly influenced social resilience and shaped public opinion first, local neighborhood community-led organizations second, and municipal and governmental agencies later. According to Fuster Morell (2012) and Magrinyà and De Balanzó (2017), the urban movements that became most relevant during the 15M movement were: the Squatters' Social Centers

(created in 1986), the Cooperative movement (Coop 96, running since 1996), the Housing movement (Observatori DESC and V de Vivienda, existing since 2004), the Platform for People Affected by Mortgages (PAH, founded in 2009), and the left-wing pro-Catalan independence assembly-based political organization, CUP (created in 2002). The latter two movements would eventually shape governmental institutions by becoming key players in both the municipal (2015) and regional (2012 and 2015) governments.

Leaders from these movements were the transformational agents from the shadow networks that led the 15M movement. The 15M movement became particularly relevant to the creative destructive (Ω) phase once it migrated to the different neighborhoods because this implied the creation of solidarity exchange networks (such as the time bank), the sharing of knowledge, new public-space uses, the exchange of goods, and the creation of energy cooperatives, as well as cooperatives of agro-ecological consumption (Ubasart et al. 2009). As Fuster Morell (2012) explains, "the plazas were like living cities, and managing the squares involved many skills." Most importantly, the 15M movement reenergized neighborhood networks by connecting old neighborhood associations with social networks associated with specific environmental initiatives or urban and housing projects, hence engaging those who had participated in the first urban social movements and generating synergies and conversational flows.

What was the nature of the second reorganization (α) process?
The 15M process culminated on 11 June 2011 with the municipal council offering Can Batlló (bloc 11), one of the plants of an obsolete textile factory, to the Neighborhood Association of La Bordeta and the Social Center of Sants so they could use it as a social center (Subirats 2015, Parés et al. 2017, Eizaguirre and Parés 2018). This victory created a unique comprehensive social center with a start-up of nongovernmental organizations (Coópolis), a public housing project, and a library. Can Batlló became an inspiration to Barcelona's neighborhood associations, social centers, and the cooperative movement, and provoked many other emerging urban actions. All together, these actions translated into the Neighborhood Platforms and Assemblies created by the 15M movement, as well as bottom-up projects such as the Vallcarca strategic social plan "The Neighborhood We Want" (*el Barri que Volem*) in 2013 and 2014 (Observatori de Vallcarca 2015). Additionally, the 2013 top-down municipal initiative Pla BUITS, aiming at temporarily allowing the use of Barcelona's empty lots by neighbors and nongovernmental organizations, metamorphosed into network bottom-up experiences such as the one in Germanetes. Crucially, Pla BUITS transferred rights to local communities so they could develop emergent actions in tactical urbanism at 50 empty spaces across the city (Magrinyà 2015). All of these local initiatives converged and interacted, creating a common framework for articulating actions through social networks and generating multidimensional synergies that multiplied citizens' social support and engagement, as reflected by several research projects and urban academic studies from universities and research centers, such as "Observatorio Urbano del Conflicto Urbano," "Movement Transition Towns," "Barrios en Crisis," "BCN Comuns," and "POLURB 2015" (De Balanzó 2017).

With these emerging initiatives, the reorganization (α) phase was on its way. It was facilitated by: (1) leaders and transformational agents of change who emerged in the neighborhoods and generated, thanks to the 15M movement, synergies and networks that opened a window of opportunity for change; (2) protests against housing evictions and in favor of decent and affordable housing metamorphosing into a platform against real estate speculation (DPH 2006); (3) a sincere attempt from local assemblies to turn the urban social movements' protests into effective urban planning proposals such as the "new version" of Social Plans, "The Neighborhood We Want" plans; (5) broad-scope debates regarding collective Catalan patrimony and public assets (Forum Veïnal); and (6) rising popular support for Catalan self-determination led by the left-wing local CUP assemblies.

Hence, these local social networks' revolt fostered the adaptive capacity of multiple community-led local actions, generating social capital within and across spatial scales (panarchy). Actions of small- and intermediate-scale systems triggered a transformational change into larger scale systems (the city government) through a bottom-up process. In 2014, a new party that emerged from the shadow networks, *Barcelona en Comú,* was created, marking the end of the reorganization (α) phase. As in the 1970s, when the new democratic government absorbed transformational leaders, the transformational leaders of the second α phase entered the municipal administration when the spokesperson of PAH was elected Mayor of Barcelona in 2015. In these same elections, CUP entered Barcelona's local government with 7.4% of the votes. Mayor Colau and her team are currently leading the new transformation of Barcelona's urban dynamic. Whether they will succeed in achieving a new urban "common good" remains to be seen.

BARCELONA'S ADAPTIVE CYCLES
Both adaptive cycles of Barcelona's social-ecological system conform to the basic sequence of change in the adaptive cycle theory: a growth phase (r), followed by a consolidation phase (K), prior to a release (Ω) event, that leads to the reorganization (α) phase. The novelty of our analysis has been to focus on Barcelona's real estate dynamics and associated policy. Below, we summarize the main analysis (Fig. 1).

Front loop
In the case of Barcelona's real estate adaptive cycles, the front loop is long. Financial and natural capital is plentiful, and fast-growing entities (private developers, politicians, and technocrats) take advantage of these resources to dominate the system efficiently. During the 1960s and 1970s, abundant financial capital added to economic liberalization set the ground for Barcelona's massive urban sprawl and densification. In the 1980s and 1990s, the democratic transition funds and newly acquired public-use land, a well as the European Union and European Monetary Union entry and international investments, were the basis for PPP urban development. In the 1960s and 1970s, private developers abused their contacts with the dictatorial regime to develop massive urban sprawl and densification via "Partial Plans;" and in the 1980s and 1990s, technocrats and private developers pursued a growth model based on a knowledge economy and tourism industry (1–3 and 11–13, respectively, in Fig. 1).

As the adaptive urban complex system matured, several homogeneous social groups (private developers and the bourgeoisie well connected to the dictatorial regime in the first era; and national and international private investors and municipality technocrats in the second era) came to dominate the system. During the K phase, resources (land, housing, green spaces, public infrastructure, and wealth) became scarce for "new" (and old) entities such as youth, immigrants, the working and middle class, and industry, and the system lost its flexibility, as reflected by the rise in social injustice, discontent, and social conflict, increasing the likelihood of the system collapsing. The dark arrows (4 and 14 in Fig. 1) reflect the revolt process (panarchy) initiated by heterogeneous small- and intermediate-scale systems that take advantage of the vulnerabilities of the large-scale systems to generate windows of opportunity to trigger growing pressures for transformation.

Back loop
Economic and governance disruption (1973 crisis and Franco's death during the first era; the Great Recession, the bursting of the real estate bubble, and Barcelona's model of aggressive entrepreneurial urban regeneration during the second era) increased the system's vulnerabilities by releasing capital. Crucially, in both eras, the Ω phase was triggered by a disturbance in the social domain: the 1974 revision of the BDP53 (5 in Fig. 1) and the 15M movement (15 in Fig. 1). In both cases, shadow groups (urban social networks) led by transformational agents (neighborhood associations and new democratic political groups in the former case; squatter, cooperative, public space, PAH, housing, and CUP movements in the latter case) depleted the political capital that had accumulated during the Barcelona of Porcioles and the PPP–urban-development era (6 and 16 in Fig. 1). In addition, in both cases, political leaders or local assemblies turned the urban social movements' protests into effective urban planning proposals such as the Social Plans in 1976–1979 or "The Neighborhood We Want" plans in 2012–2015 (7 and 17 in Fig. 1). It is noteworthy that enough social capital (social networks, trust, and human capital) was retained during Barcelona's back loops for the following adaptive cycles. For instance, the neighborhood associations' social capital from the 1970s built "cross-scale interactions between citizens, experts, practitioners and politicians" most relevant in "resisting the attacks on the most essential aspects of the [BMMP] plan on the part of powerful pressure groups" (Serratosa 1996), and hence, enabled Barcelona's urban regeneration and social cohesion during the late 1970s and 1980s (8–10 in Fig. 1). The dark arrows (9 and 19 in Fig. 1) reflect the "remember" process (panarchy) from large-scale systems that restores stability and dominance of conservative leanings through the creation of new municipal institutions.

CONCLUSION
We used adaptive cycle theory to improve the understanding of Barcelona's real estate dynamics and related policy. Specifically, we explored the vulnerabilities and windows of opportunity these cycles of change introduced in the release and reorganization phases. In the two recurring cycles of urban change analyzed, we observe two complementary and opposing loops. During the front loop, resources are efficiently exploited by homogenous dominant groups with the objective of promoting capital accumulation based on private or PPP investments. During the back loop, change is catalyzed by Barcelona's heterogeneous social groups (urban social networks and the third sector), whose objectives are diverse and uncertain but converge in their discontent with the

Fig. 1. Barcelona's adaptive cycles from 1953 to 2016.
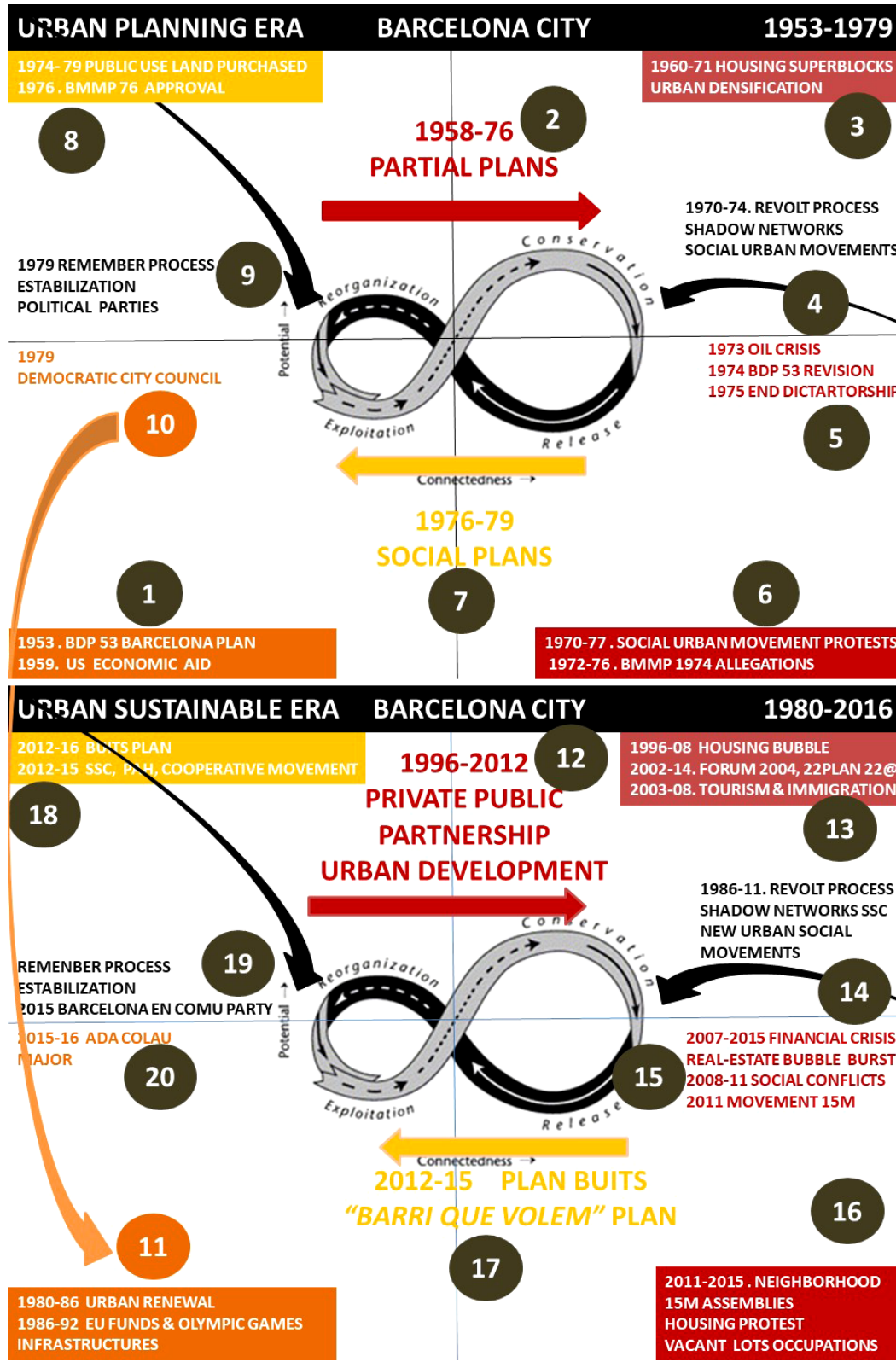
status quo of the conservation (*K*) phase and their desire for a "common good" that aims at social justice, social cohesion, participatory governance, and well-being for all. At the end, the reorganization phase (α) becomes a competition or negotiation between potential directions and outcomes, including conservative leanings, that restores the former system.

In our analysis, we observed that disturbances at the smallest scale (rallies, marches, urban actions, participatory processes, and litigations) affect the intermediate scale (neighborhood community-based organizations) and may well have a bottom-up influence on larger, slow-responding scales (municipal and regional institutions), especially when multiple revolts from smaller and intermediate systems destabilize and erode the apparent stability of the larger systems. We also observed that disturbances of larger scale systems (city's political changes, economic crisis, dictator's death) can have a top-down influence on smaller scale systems. Smaller and nested systems reorganize under the influence of larger scale systems, and social memory and hierarchical constraints determine the way societies reorganize.

Finally, it is noteworthy that the heterogeneity of shadow groups fosters learning and innovation and gives them the flexibility that the front loop's dominant groups lack to trigger growing pressures for transformation, not only within, but also across spatial and temporal dimensions, promoting a cross-scale process of revolt and stabilization, also known as panarchy. As such, the local neighborhood experiences (Can Batlló, "The Neighborhood We Want," and Pla BUITS) escalated to network bottom-up experiences and became city-wide emergent and social-innovation experiences (De Balanzó 2015, 2017).

Responses to this article can be read online at:
http://www.ecologyandsociety.org/issues/responses.php/10396

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Appendix Table A.1. Society Sub-System of Urban Planning and Urban (Sustainable) Design Eras

	URBAN PLANNING ERA: 1950-1979		URBAN (SUSTAINABLE) DESIGN ERA: 1980-2016	
	1950-1970	1970-1980	1981-1995	1996-2016
	Society			
Social system	Barcelona's population soared from 1,280,179 inhabitants in 1950 to 1,557,863 in 1960 and 1,745,142 in 1970. Most of this growth—79% in the 1956-1960 period, 90% in the 1961-1965 period, and 57% in the 1966-1970 period—was driven by the arrival of rural immigrants (Ferrer and Nel.lo 1990).

The construction of housing superblocks in isolated areas in the periphery of the city began in the 1950s and grew exponentially during the 1960s and early 1970s. Shantytowns in the outskirts of the city continued to multiply.

By the early 1970s, Barcelona had become one of the highest density cities in the world with 300 habitants per ha (Tatjer 2009), and an area per habitat as low as 34.5 square meters, a third of the minimum recommended (Camarasa 1977). | Barcelona's population stagnated during the 1970s as a result of both a decrease in fertility and a drop in immigration (Ferrer and Nel.lo 1990).

In the 1970s, Barcelona's unemployment rate soared to over 20 percent, further deepening the housing and public infrastructure crises, worsening living conditions, increasing the social segregation, and rising social conflict (Trullén 1988).

Starting in the late 1970s, construction of a program of democratic citizenship and implementation of national welfare policies favoring education, training and health. | Unemployment rate dropped from 17.75% in June 1986 to 11.6% in September 1989.

"*The city's major intervention projects* (of the 1980s and early 1990s) *were seen as a strategy to redress balance*" (Busquets 2005), foster social cohesion, and a "*sense of belonging to the city*" (García-Ramon and Albet 2000).

Social diversity replaced social and spatial segregation, urban identity was built around *"Barcelonity"*, and the *"discourse of class was replaced with one of municipal citizenship"* (McNeill 2003) generating "*a common democratic culture*" in the city (Mascarell 2007).

The gentrification process resumed. | International immigrants, grew to represent close to one fifth of the population by 2009 (up from less than 2% in 1996).

Aggressive entrepreneurial urban regeneration that disregarded citizens' needs and voices.

Gentrification in Old Town.

Over time, immigrants' low and irregular incomes prevented or excluded immigrants from accessing quality housing, segregating them in overcrowded sublet conditions in run-down parts of the inner city or the periphery of Barcelona (Pareja 2005; and Terrones 2007).

Increasing social conflict among the different groups and threatening social cohesion.

After 2008, the Spanish unemployment rate soared to 23 |

	While the bourgeoisie settled in the *Eixample* and around the *Diagonal*, the working class remained in *Ciutat Vella*, and the migrant workers were pushed to the peripheral neighborhoods. The dispersion of land prices further pushed industries to the periphery of the city, and segregated social classes to different areas of the city (Ferrer and Nel.lo 1990).			percent in 2011, income inequality rose, and poverty escalated. In Barcelona, unemployment more than doubled within 5 years from 7.4% in 2006 to 16.9% in 2011 (Observatorio Barcelona 2013).
Individual development	Starting in the late 1960s, the neighborhood associations (*comisiones de barrios*) led the urban social movements through different forms of protests. Despite the lack of social liberties, the neighborhood protests coincided with other group's clandestine activities against the political regime, contributing to a wider protest movement at the city level. The fight against the dictatorship unified the urban social movements by giving them a common dissenting target.	In 1973, Barcelona's neighborhood associations occupied the city hall to protest against a *Partial Plan* that would have destroyed 4,730 homes, resulting in the successful halt of the plan and the demotion of Barcelona's Mayor Porcioles the next day by the Spanish government (Calavita and Ferrer 2000). Beginning in 1975, local initiatives involving transdisciplinary participatory processes with architects, sociologists, journalists and neighbors developed the *Social Plans (Planes Populares)* whose objective was to collect the different groups' multiple objections to the 1974 BMMP	Urban social movements in Barcelona progressively lost their potential and connectedness. Political opposition dimed.	Urban sprawl generated massive citizens' objections and frustration in the metropolitan area. Downtown Barcelona's soaring overnight stays from 3.8 million in 1990 to 12.4 million in 2008 (Turisme de Barcelona, 2009) generated escalating tensions over the local residents' "*right to sleep*" versus tourists' "*right to enjoy a Mediterranean nightlife*" (Degen 2004). Squatters began settling in Barcelona in the mid-1980s, the cooperative movement re-emerged in Barcelona in the 1990s, and other activists and decent housing movements emerged demanding a solution to

				citizens' problems.
		Specialist magazines such as CAU, *Quaderns*, and *Novatecnia* "*established a rigorous, critical discussion of Barcelona's urban problems during the 1970s* (Busquets 2005)", hence also contributing to Barcelona's cultural, human and social capital.		The 15M movement. In 2014, *Barcelona en Común* (BEC) was created.
Government	Totalitarian system. Liberalization of housing policy. The 1953 Barcelona District Plan (BDP53) aimed at densifying the Barcelona. A loophole allowed municipalities to override the BDP53 plan with *Partial Plans* to the advantage of private developers well connected to the regime's power structure (Calavita and Ferrer 2000; and Herce 2013).	Because of the massive opposition to the 1974 BMMP, the Spanish government replaced a benevolent mayor (Masó) with an intransigent one (Viola), well connected to the regime's power structure. Franco died in November 1975. The 1976 BMPP aimed at reducing the allowable densities from a potential of 9 to 4.5 million people, and reclaiming land for public use. Viola was soon required to resign due to the constant neighborhood associations' complaints regarding real-estate speculation going on during the revisions of the BMMP. In December 1976, he was replaced by mayor Socias, who led the city through democratic	The municipality focused on broader and more ambitious projects, whose objective was to address the lack of facilities and services in Barcelona's periphery, and mitigate the social segregation and poor living conditions of the "*Barcelona of Porcioles*" To implement education, health, and social services, Barcelona built a complex multi-level governance model, integrating the municipal government with other local administrations (regional and provincial) as well as social partners (business and trade unions) and NGOs, and financed with funds from regional, national and European institutions (Truño 2000). Beginning in the mid-1980s,	Shift towards more neoliberal policies as a result of the conservative party (*Partido Popular*) winning the Spanish general elections in 1996. Further liberalization of land in 1998. Weakening of the inclusive governance model. The new elected conservative (*Convergencia i Unió*) mayor, Xavier Trias, in 2011. *Barcelona en Común* (BEC) wins municipal elections (in coalition) in 2014. Transformational leaders entered the municipal administration when Ada Colau was elected mayor of Barcelona in 2015.

		transition.	Barcelona's new economic growth model gave rise to ~~public-private partnership~~PPPs in the area of economic development, making Barcelona's urban planning and implementation heavily dependent on private funding (Marshal 2000).	
		In 1977, Parliamentary elections and the Generalitat de Catalunya were restaured, and in 1979, the democratic municipal election was celebrated.		
		Starting in the 1970s, the local administration began covering basic services, consequently, improving the poors' living conditions.		
		The new democratic government absorbed transformational leaders.		

Appendix Table A.2. Support Sub-System of Urban Planning and Urban (Sustainable) Design Eras

	URBAN PLANNING ERA: 1950-1979		URBAN (SUSTAINABLE) DESIGN ERA: 1980-2016	
	1950-1970	1970-1980	1981-1995	1996-2016
Support				
Infrastructure	The share of the Spanish labor force working in the industrial sector grew from 23.5% in 1950 to 34.6% in 1970. Industrialization concentrated in the old industrial areas of Barcelona and Bilbao, and the capital, Madrid (Ferrer and Nel.lo 1990).	The economic recession also brought the scarcity of capital for developers bringing the price of land down (Calavita and Ferrer 2000). The industrial crisis and its expansion to other sectors further reduced Barcelona's industrial	In the 1980s, public infrastructures soared in Barcelona, replacing the city's deficiencies in public facilities, green spaces, public transportation, and public libraries and schools, and reusing the unoccupied or abandoned (frequently industrial) spaces	Housing prices increased 175% between 1998 and 2008 (Gonzalez and Ortega 2013). In Barcelona, the price hike was even greater with prices for new dwellings tripling (after adjusting prices for inflation) from €2,035 per square meter to €5,918 per square meter from 1996 to 2008 (Ajuntament

Barcelona's housing stock escalated from 282,952 to 1,028,634 units (Ferrer and Nel.lo 1990). Housing densities of 560 to 800 dwelling per ha were frequent, even though the maximum threshold was 400 (Solans 1997). Development of Barcelona's highway system. Between 1960 and 1970, the *Partial Plans* increased by 12% the areas for residential use, 53% those for industrial use, and 23% those for transportation infrastructures to the detriment of green spaces and public facilities, which lost 43% and 46% of the BDP53 originally assigned space, respectively (Ferrer and Nel.lo 1990). The concentration of services in *Ciutat Vella*, *Eixample* and the area of the *Diagonal*, added to Barcelona's radial public transportation system pushed up these areas' land prices and widened the dispersion in land prices across the different neighborhoods (Nel.lo 1987). According to Lluch and Gaspar	capital and considerably slowed down its private sectors' financial capital. The political uncertainty that accompanied the transition to democracy and fears of socialism and expropriation of property also pushed land prices down.	resulting from the industrial, economic and political crises. 1986 nomination to host the 1992 Olympic Games boosted public regional and national investment to finance the city's large-scale public works projects and attracted much private investment to the city. Housing prices soared. For instance, within a year (from 1987 to 1988), housing prices increased by 51% in l'*Eixample* and 100% in *Diagonal* and *Pedralbes* (Calavita and Ferrer 2000). In 1988, the *Plan for Hotels* laid the foundations for making Barcelona a tourist attraction and boosting its tourist industry. Municipal intervention aiming at connecting and rebalancing the different areas of the city, and included the infrastructure of the 1992 Olympic Games. It also implied reorganizing the road network and defining nine areas of new centrality, plus the arrival of the *Diagonal* thoroughfare to the sea, the use of large-scale buildings as museums and cultural	de Barcelona 2009). Unaffordable housing prices also expanded to the periphery. Barcelona's housing prices fell 12% between 2007 and 2009 (Idealista.com 2009). The bursting of the real-estate bubble and the halting of credit lending led to the collapse of Barcelona's urban land and capital as construction work stopped, lots were left vacant and many buildings idle.

	(1972), the land price in the area of the *Diagonal* (2,000 *pessetes el pam quadrat*) was more than 4 times that of the suburban area of the *Guinardó* (450 *pessetes el pam quadrat*) and 80 times greater that of the *Prat de Llobregat* in the periphery of the city (25 *pessetes el pam quadrat*).		infrastructure (theaters and the like), the role of Old Town (*Ciutat Vella)*, and Barcelona's seafront.	
Economic system	Economic liberalization. US economic aid and intense foreign direct investment. Thriving tourism. Remittances from Spaniards working abroad. Booming car industry. Spanish GDP grew an average of 8.6% from 1961 to 1966, and 5.8% from 1967 to 1972.	With the 1973 energy and economic crises, the industrial crisis affecting Barcelona worsened and expanded to other sectors, especially the construction sector (Ferrer and Nel.lo 1990). The economic recession lasted from 1974 to 1985.	Liberalization of the mortgage market in 1981. Spanish integration to the European Union (EU) in January 1986. Improved economic confidence, boosted corporate investment and employment, and increased household incomes and demand. Consumption soared as reflected by the doubling of new vehicles registration from 114,077 in 1986 to 237,000 vehicles in 1989, and the building of new housing units from 11,621 to 26,330 (Ferrer and Nel.lo 1990). From 1985 to 1988, Barcelona's commercial electric consumption increased by 15%, long-distance calls rose by 74%, and the demand of concrete escalated by 180%.	During the 1990s, Barcelona's (and Catalonia's) GDP per capita grew an average of 2.4% per year, and 2.8% from 2000 to 2005 (Parellada 2004). New economic growth model for Barcelona, based on construction, tourism and service sectors. Entry into the European Monetary System and loose lending result of fierce competition among financial institutions. Interest rates fell, down-payment requirements loosened and credit standards tanked. Immigrants were responsible for 20% to 25% of the gains in the Spanish GDP per capita (Bank of Spain 2006). After 2008, the real-estate bubble burst, credit lending stopped, the

				Spanish GDP growth collapsed. Barcelona's local government continued to pursue a growth model for Barcelona that sought international investment through making Barcelona a reference of "smart cities", on the one hand, and a tourism industry, on the other (Degen and García 2012).

Appendix Table A.3. Nature Sub-System of Urban Planning and Urban (Sustainable) Design Eras

	URBAN PLANNING ERA: 1950-1979		URBAN (SUSTAINABLE) DESIGN ERA: 1980-2016	
	1950-1970	1970-1980	1981-1995	1996-2016
Nature				
Resources	Massive use of land and natural resources with the booming construction of rainwater reservoirs beginning in the 1950s and the building of nuclear plants, result of the mid-1950s Spanish-US treaties.		Barcelona's natural capital downfall accelerated as domestic waste production increased by 32.5% in only three years (from 1985 to 1988).	2003 heat wave. 2007 energy black-out. 2008 water drough and the collapse of the sewage water system.
Environment	Environmental crisis due to the rising demand of resources, and the massive emission of air, soil contamination, and water pollutants.	The vulnerability of Barcelona's natural capital persisted up until the early 1990s.		Exponential growth of carbon emissions.

Appendix Table A.4. Reasons for Barcelona Urban Social Movements' Loss of Potential and Connectedness

1. The new democratic local government had effectively addressed most of the neighborhood associations' claims on specific urban issues, such as lacks in education, health services, and public spaces in the different neighborhoods.

2. The new administration hired many of the former leaders, members, and sympathizers of the neighborhood associations, incorporating their views in the city's governing coalition, but also absorbing them into the political system.

3. The local administration provided funds and offices to the Federation of Neighborhood Associations making their objections to the municipal power more difficult (Calavita and Ferrer 2000).

4. The 1977 *Social Compromises* (*Pactos Sociales*) between the Spanish government, the private sector and the labor unions set the grounds for minimum social conflict with the new democratic government at all levels of the administration.

5. The collective Catalan identity and new sense of place and city pride that accompanied the urban regeneration of Barcelona (Associació Pla Estratègic Barcelona 1994; Subiros 1999; Rodríguez Morató 2008) mitigated any objecting voices.

6. The economic expansion, the EU entry, and the Olympic host nomination set a tone of euphoria across the population that quiet any dissenting voices until the end of 1992.