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Flood-resilient redevelopment: Cincinnati's central riverfront

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Since the founding of Cincinnati on the banks of the Ohio River in 1788, the city's flood-prone central riverside area has been exploited in multiple waves of development, none of which were viewed a success – until now. Owing to floods, most minor but some severe, the riverside has not been very attractive or very productive in terms of employment, culture or recreation. However, this situation has now changed. This paper suggests that the current success in regenerating the riverside area is due to a fresh approach taken in the area's urban design master plan, drafted in 1997, which was based on flood resilience instead of the conventional wisdom based on flood resistance. The master plan enabled a mixed-use, environmentally friendly development on the riverside with minimal effect on the storage capacity of the river floodplain. Additionally, it has left the area well connected to the central business district, the Ohio River and the region.

1. Introduction

Flooding is an all too common natural disaster that regularly destroys lives and the built environment. Typical solutions on rivers and streams have involved capital-intensive levees or flood walls and attempts to modify stream flow characteristics. Climate change and its associated unpredictable weather have further exacerbated the situation worldwide. Fortunately, an increasingly sophisticated understanding of the situation has led to the development of resilient strategies to lessen the environmental, human and financial costs of these events and reduce the dependence on costly flood defence systems.

The redevelopment of Cincinnati's central riverfront (CRF) offers a demonstration that – if incorporated into a comprehensive plan – flood-resilient strategies can lead to an economically and aesthetically successful result. Although the idea of providing flood resilience to a building or even a cluster of structures is hardly a new idea, this redevelopment offers a new benchmark in its scale and in the depth of its master plan approach and implementation. The result was accomplished by incorporating flood-resilient strategies into a three-dimensional (3D) urban design plan that was mirrored in an innovative 3D property plan. This plan has been used to guide the redevelopment of the floodplain where the central business district (CBD) meets the Ohio River, an area that seemed impossible to develop in a satisfactory way because of its flood risk. Through following resilient concepts, it has kept the development safe from flooding while minimising the impact of that development on the storage capacity of the floodplain and maximising the benefits to the region through its facilities.

The plan and its implementation grew out of a fortuitous interaction of progress in the regulatory environment, the evolution of a federal flood insurance programme, increasing public support and identification of the necessary funding. It potentially has lessons for similar redevelopments where an urban greyfield floodplain has potentially high value. The city leadership rejected other options such as park and recreation areas with no development or wetland or pastoral floodplain restoration because the site was seen as a potential high-value growth area for the CBD and as an improved front door for the city.

2. Local context

According to the 2010 US census, Cincinnati is an old industrial city of 296 223 people in a metropolitan region with a population of 2 138 038 people. It is about 900 km inland from Washington, DC and is located on a number of scenic bends in the Ohio River (Figure 1). The location includes confluence with three smaller rivers flowing from fertile farmland, two from the north and one from the south (Figure 2). The European early settlers in the late 1700s and the Native Americans before them realised the value of a settlement on a major river that could provide a transportation corridor with the Mississippi River of over 3000 km in length to the world port of New Orleans.

The Ohio River system is supplied by a large, multi-state catchment area of fertile farmland with an average yearly rainfall of over 100 cm. This catchment area has produced flood events of varying levels, especially in the late winter or early spring, creating a tension of attributes as opposed to disadvantages for low-lying riverside locations. According to a draft report from the National Climate Assessment and Development Advisory Committee (NCADAC, 2014), this situation is expected to become more serious because average precipitation is predicted to increase overall in the USA and even more rapidly in the US Midwest. Indications such as these show that climate change and global warming and related floods are not the exclusive concern of coastal regions.

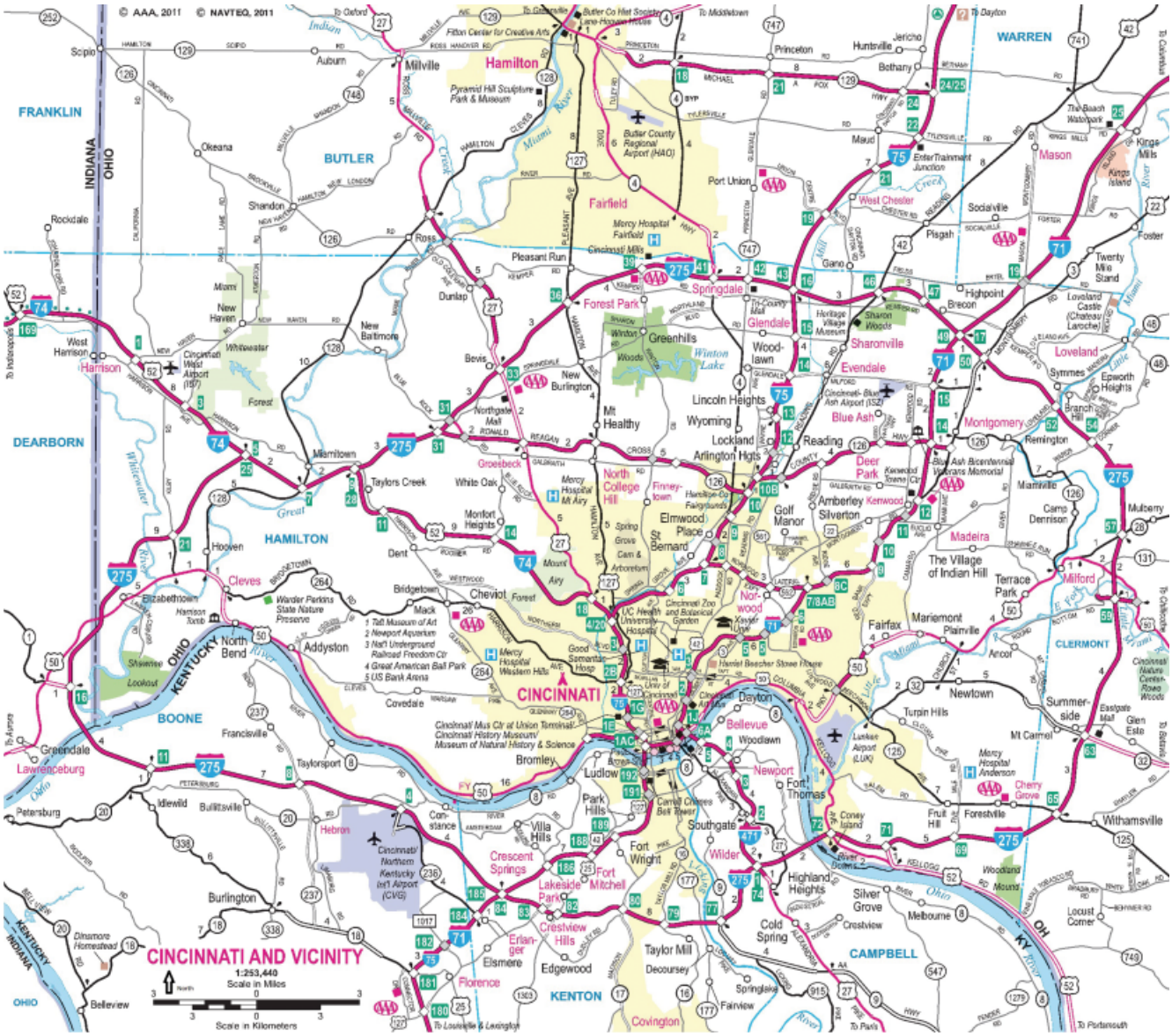

Figure 1. Map showing the location of Cincinnati on the Ohio River (used with permission of the American Automobile Association (AAA, 2014))

The site chosen for the city by its early developers comprised two river terraces surrounded by hillsides. The city founders chose the first terrace, located at about the 100-year flood level (1% probability of a flood event in a given year), to lay out their city. Owing to flooding of the first terrace, the site has continually posed challenges to engineers and planners trying to capture the value of its proximity to the river. Fortunately, the second terrace offered a safe haven above the 500-year flood level (0·2% probability of a flood event in any given year). That higher elevation became the eventual home of the CBD. Unfortunately, that move abandoned the riverfront to poorly maintained low-value uses or railroad sidings.

3. The regulatory environment and guidelines

Multiple factors from the regulatory environment simultaneously addressed flooding in Europe and USA to set the stage for the CRF plan. People worldwide experience floods. In fact, according to the official website of the US National Flood Insurance Program (NFIP), floods are the most common natural disaster in the USA. The first paragraph of the website's home page states 'From 2003 to 2012, total flood insurance claims averaged nearly $4 billion per year. In high-risk areas, there is at least a 1 in 4 chance of flooding during a 30-year mortgage' (NFIP, 2014a). The federal government established the NFIP under the Federal

Figure 2. Central and eastern riverfronts of Cincinnati to the right and northern Kentucky on the left (north to the right of the figure) (June 2012) (from the Banks Project construction project file, used with the permission of the contractor, Messer Construction)

Emergency Management Agency (FEMA) as a benefit to local governments following the programme's requirements covering construction in such high-risk flood areas. This benefit effectively became a proscriptive requirement for constructing in a floodplain because flood insurance required by mortgage lenders from the private market was prohibitively expensive. FEMA has also made considerable training materials available on its website such as *Approaches to Sustainable and Resilient Construction in Floodprone Areas* (Ingargiola, 2014).

Clearly, mitigating these losses and the attendant human misery must be a high priority. Traditional flood defences, levees or flood walls, are extremely expensive to construct, inflexible, costly to maintain and, when they fail, leave the area defenceless. To illustrate that situation, the NFIP website has a 'levee simulator' under the community resources tab for people to understand the various ways that levees can fail and the implications of such failure (NFIP, 2014b).

The European Commission on the Environment (ECE) gives similar information on its website and, in like fashion, notes that 'Floods are the most common and most costly natural disaster in Europe, which has severe floods with devastating effects every year, and such flood events are likely to become more frequent with climate change.' The ECE calls for better environmental options and greater stakeholder involvement. In fact guidance documents on the website recognise that, from the environmental and true cost standpoint, comprehensive non-structural methods to mitigate flood events and their effects have become the most positive solution to the problem (ECE, 2011). The ECE also launched a discussion on preparedness and response. Beyond that, *Integrated Flood Risk Analysis and Management Methodologies*, set up by the European Commission Sixth Framework Programme and hosted in the UK at HR Wallingford, has brought together the collective wisdom of 17 European institutions on everything from mitigating flood damage by enhanced natural systems to evacuation best practices (Floodsite, 2014).

In the UK, the planning portal of the Department for Communities and Local Government (DCLG) has made great strides in providing guidance regarding development in flood-prone areas since its first reference (DCLG, 2003). That early document on flood preparedness focused on improving the flood resistance of existing structures – a significant challenge given many historical settlements along water courses. Newer guidance (DCLG, 2007) accepts that some development will occur in areas of flood risk. Through extensive laboratory research into the performance of various building materials and techniques, the DCLG offered guidance on both construction and post-flood event recovery. Critically, it recognised site drainage as an issue and introduced the concept of sustainable drainage systems (SUDS).

In March 2012, DCLG launched its comprehensive planning practice guidance website and approached the topic of minimising risk from flooding in the total planning context. This site includes a section entitled *Flood Risks and Coastal Change, Planning and Flood Risk* (DCLG, 2014), which contains guidance on the implications of building in areas of high flood risk and the methodology for preferred site selection that attempts to discourage such undertakings. It does acknowledge their inevitability in certain situations and emphasises drainage and SUDS as primary concerns for all developments regardless of location.

Individual institutions have also issued guidance focused on incident management. For example, the London Emergency Services Liaison Panel (LESLP) produced a substantial manual detailing flood pre-event and post-event incident response (LESLP, 2012). Flooding is now truly viewed as a serious problem requiring comprehensive, environmentally friendly and national solutions that need to move from research to practice.

4. Linking flood resilience, amenity value and riverfront development

Cincinnati's CRF had obvious value, but it was largely untapped because of the lack of a policy to approach flooding. By way of definition, the June 2012 issue of *Municipal Engineer* contained a rigorous policy investigation on the theme of resistance and resilience in infrastructure (Rogers *et al.*, 2012). In addition to their thorough investigation of various approaches, Rogers *et al.* noted that although guidance and regulations assist in delivering resilience in aspects of infrastructure, little attention has been given to interconnected systems of the whole picture.

The case study presented in this paper attempts to remedy that situation by investigating a specific large-scale project to see how the resilience side of that equation has been implemented by integrating it into a master plan and, in turn, how it made a dramatic difference to the development of the CRF and turned it from a regional liability to a point of regional pride.

Although development in floodplains poses significant challenges and can result in catastrophic situations, redeveloped riverfronts have been documented to show clear economic and social benefits from their waterfront locations. The CRF held potentially great value, not just as a recreational and entertainment amenity, but also as a valuable extension to the CBD.

Researchers have developed tools to judge the amenity value of a body of water. Examples include *The Amenity Value of English Nature: A Hedonic Price Approach* by Gibbons *et al.* (2011) as part of the UK national ecosystem assessment and 'River amenity evaluation: a review and commentary' (Leatherberry, 1979) in the *Journal of the American Water Resources Association*.

A recent report by the Urban Land Institute, a well-respected, independent and global non-profit member organisation, evaluated the changing value and the population of waterfront land (Brandes and Leblanc, 2013). Although this study focused on coastal regions, the issues of responsible development that mitigate the risk in flood-prone areas transcend geographical location. The report concluded that planning and designing for flood resilience and prevention rather than resistant flood protection should be the key to enable responsible use of the amenity value of waterfront locations.

5. Planning the riverfront and the effect of the regulatory environment and public aspirations

Fortunately, the current master plan for Cincinnati's CRF developed at a time when floodplain management became a national issue. Beyond the proscriptive requirements in the NFIP, in 2000 the concept of resilience, or the ability of individual buildings or infrastructure to return quickly to or never leave service, had been codified in the USA into the International Residential Code (ICC, 2012), following the American Society of Civil Engineers (ASCE) *Flood Resilient Design and Construction* as a standard reference (ASCE, 2005). This reference focuses on lifting all habitable space and electrical and mechanical systems above the 100-year floodplain with a structure that can withstand the hydraulic pressures of a flood, with any fixtures in the lower level being submersible. This document even included guidance in constructing waterproofed floodable parking structures – a critical part of the project under study in this paper. FEMA has, in turn, linked use of this guidance document to compliance with its flood regulations and to the requirements for buildings constructed after 1986 to obtain federal flood insurance, making clear the rules for development in a floodplain (FEMA, 2005).

Cincinnati has made multiple attempts to plan and develop its CRF. A review of the history of planning up to the 1990s and of the growing importance of the regulatory environment should help understand the importance of the 1997 plan. The original plan of the town of Cincinnati by Israel Ludlow, dated 1802 (Figure 3), laid out a grid of streets from the river's edge on the first river terrace (Ludlow, 1802). A common public landing was included at the foot of Broadway. The town was developed in that manner but, as noted earlier, was periodically inundated. However, in the dry months of August and September, the river level dropped and navigation was difficult or impossible. To counter this twin problem, the US Army Corps of Engineers (USACE) established the Ohio River navigation system of locks and dams and buoys, authorised by Congress in 1878 but not completed until 1929. Historical flood events and river levels are documented by the USACE (USACE, 2009). With its mission for riverbank protection and improved access, the USACE has been a critical part of the permitting and funding system for any development that could affect water quality, floodways or floodplains.

By the time the 1883 flood washed over the area, most residents had already abandoned the floodplain; by 1900, only railroads and low-value development remained. Cincinnati's first planning document that was more than a grid of streets, *The Park System for the City of Cincinnati* (CPC, 1907) laid out a series of hilltop parks, green corridors and interconnecting parkways for the entire city, but contained no plan for a riverfront park or parkway or

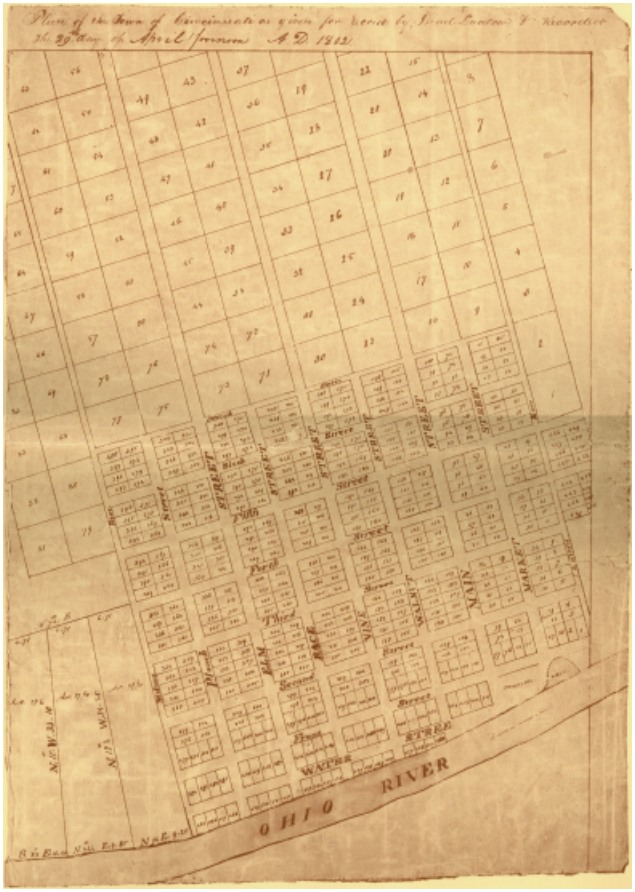

Figure 3. Plan of the street layout of Cincinnati dated 1802 (from the collection of Archives and Rare Books Library, University of Cincinnati and used with permission)

flood control. The follow-up document in 1925, *The Official Plan of the City of Cincinnati* (CCPC, 1925), perhaps the first American comprehensive city master plan, provided some insight into why the riverfront was ignored. It wrote off the riverfront as a place for anything other than rail and undetermined industry and proposed that there should be no civic investment in the area. The *Report on the Plan of Main Thoroughfares for Hamilton County Ohio* in 1936 brought the first hint of the freeway to be constructed in later years along Second and Third Street as a means to distribute traffic from the eastern suburbs (RPC, 1936). The 1939 *Riverfront Rehabilitation Plan* (CCPC, 1939a) in turn showed the roadway in configuration similar to the eventual Fort Washington Way freeway at the edge of the second terrace and a total clearance of the CRF in favour of a football stadium. Importantly, in its approval of the plan, the commission reported in its annual report that the city needed to preserve its access to the river and not to construct a flood wall or levee (Figure 4) (CCPC, 1939b).

The 1948 *Metropolitan Master Plan* (CCPC, 1948) and the 1949 *Motorways, Cincinatti Metropolitan Master Plan Study* (CCPC, 1949) portrayed the final alignment for the freeway, although it was not constructed for 10 years (Figure 5). The 1948 plan was a radical departure from earlier plans for the riverfront and portrayed the idea of a large public investment, with a new flood-proof government centre built on stilts or flood walls next to a new baseball field. This plan was accompanied by a series of maps analysing the required flood protection. Importantly, it did not include a levee along the river but did show a flood-protected freeway on the Second Street alignment, effectively walling off the riverfront from the CBD. The freeway, a multi-purpose stadium and an arena were constructed and in place by 1975.

A park, another part of the plan, was constructed on the eastern riverfront upstream from the CRF, in the hope of sparking residential construction to the east of the proposed government centre. Even with massive investments in that first riverfront park, only one apartment building was constructed, One Lytle Place, and even then not until 1980. The building, a 20-floor example of concrete brutalist architecture, resulted in considerable protests during construction because of its height, bulk and general appearance. It used a bridge over the freeway to connect it to higher ground at Third Street and included a flood-proof lower two levels, resulting in a very unattractive street frontage. Nevertheless, with the high demand for rental flats in the central city core, especially with a river view, it has experienced low vacancy and has become an icon of sorts. Along with an arena, it has remained in place from the earlier plan, now with an above grade parking structure between them instead of another tower as originally planned (Figure 6).

6. Funding implementation of the plan

By the 1990s, change was a common theme. Along with the increased clarity of floodplain regulations and improved Ohio River water quality (Orsanco, 2014), the public's frustration with the unattractive, unproductive riverfront reached a peak when the city's two professional sports teams – the Cincinnati Bengals football team and the Cincinnati Reds baseball team – added to the tempo, both announcing they wanted their own new facilities on the riverfront instead of the 1970 joint-use stadium that they then occupied. At the same time, Fort Washington Way came under study by the Ohio Department of Transportation as part of the renewal of facilities on interstate highway I-71, which used Fort Washington Way to cross the riverfront. Not only did the freeway need, at a minimum, repaving and replacement of its bridges, but it also sported the highest accident rate of any one

Figure 4. Proposed rehabilitation plan for the CRF (CCPC, 1939a)

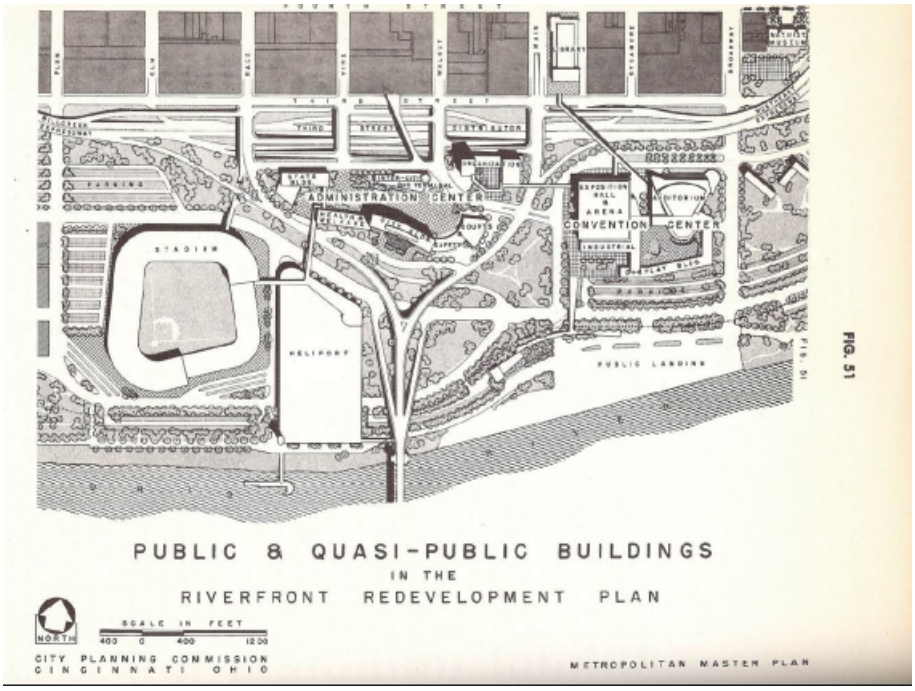

Figure 5. CRF plan for redevelopment from the 1948 metropolitan master plan (CCPC, 1948)

Figure 6. Arena, the East Garage and One Lytle Place apartments with the east interchange of Fort Washington Way (north to the right of the figure) (June 2012) (from the Banks Project construction project file, used with the permission of the contractor, Messer Construction)

mile in Ohio's freeway system and cut the city off from the riverfront (Figure 7). All of these issues produced the civic energy, the vision and the promise of funds to implement a change.

This desire for change culminated in 1996 when, through a petition referendum, the citizens of Hamilton County (the county that contains Cincinnati) placed on the ballot a half penny per dollar increase in the local sales tax (a tax on goods sold in Hamilton County collected at the point of purchase). The underlying principle of the referendum was that revenue would be devoted to retiring construction bonds dedicated to building two stadia, to redeveloping the surface parking lots and derelict rail and warehouse facilities that dominated the CRF and (some hoped) to replace the old arena. Buoyed by the public enthusiasm, the City of Cincinnati and Hamilton County joined forces to hire urban design consultants to devise a plan to site the stadia and produce a viable redevelopment. They were further charged to develop a transportation plan in association with the Ohio Department of Transportation and the Metropolitan Planning Organization, OKI, and their consultant.

7. Details of the flood-resilient plan

The consultants in conjunction with staff from the government client organisations documented the new flood-resilient vision for CRF redevelopment in two documents – the stadium siting and riverfront redevelopment urban design study (UDA, 1997) and the environmental document for the freeway reconfiguration (PB, 1997). Those documents were ultimately merged in the final urban design master plan for the CRF (UDA, 2000) (Figure 8). Fortunately, an existing city street, Third Street, formed the most southern extent of the second river terrace forming the CBD. It was located just to the north of the freeway, 3 m above even the 500-year flood level (0·2% probability of the river reaching that

Figure 7. Fort Washington Way prior to realignment (1990) (north to the right) (from the public collection of the City of Cincinnati)

level in a given year) and above any recorded flood. This made it the logical westbound leg of the collector–distributor and a new Second Street formed the eastbound leg, constructed at the same elevation to the south of the freeway now depressed into a trench. Anchoring the streets on the elevation of Third Street enabled development podiums and the new riverfront street grid to be constructed well above the highest recorded flood. To maintain the floodplain storage capacity and to comply with building code requirements, the plan used a floodable transit centre and parking structures built up from the elevation of the first terrace to support the flood-resilient streets and development podium at the Second Street elevation (Figure 9).

These structures were constructed to be free to drain during and after a flood event. The manager of the parking facilities produced a manual to address procedures after receiving warning of an impending flood event. Tied to the regional incident management notification system and originating from the USACE, the facility manager will receive at least 48 h notice to warn owners to remove any vehicles that remain. Flood waters typically contain high concentrations of silt and driftwood, and the manual also contains instructions on how to clean the parking structures and put them back into operation: the basic principle is to keep the debris wet and moving out of the structured parking to the streets where it can be removed with the rest of the debris. The parking structure's drainage system contains special traps to keep the system clear and prevent backflow.

To facilitate development, the project team created air lots in the property master plan that mirrored the ground lots below. This legal construct established the streets and development podiums that were to be constructed atop the parking structures, providing a number of advantages that helped make the mixed-use development project possible (Figure 10). Plotting air lots above the 500-year flood level greatly simplified the process for obtaining financing, a building permit and a floodplain permit. The developer needed only an elevation certificate based on a topographic survey of the podium and the streets that had been constructed well out of the reach of even the 500-year flood, thus avoiding the lengthy reviews for constructing in a flood hazard zone. The creation of air lots enabled the development's financing to be undertaken in a similar way to that of a conventional building site. Air lots and rights of way – literally property in the air at a given elevation supported on the parking structures – created a comprehensive 3D approach to property ownership and development and flood management (Figure 11).

The creation of air lots separated the developer's property interests from the public property on which the garages were constructed. This separation created physical attributes to allow development to the highest and best use for the air lots. The developer's mixed-use construction upon the higher valued air lots allowed these elevated investments to be tracked independently from their parking structure foundation. Separation allowed the elevated portion to be assessed independently for tax purposes, allowed for independent collateral in conventional financing and finally permitted investment recapture with eventual sale of the developed air lot property. The end uses and associated value of the air lots have been consistent with conventional ground lots.

The buildings were therefore safer, easier to build, less expensive to insure and finance and, with the street grid at the same elevation as the building floor plate, remained accessible even in a flood event. Although flooding would not go unnoticed, all the inhabited space would continue to function normally although parking would be lost for the duration of the event – typically for 5–7 d once every 30 years. Climate change may alter that frequency of flooding, but so far it appears to be a minimal inconvenience.

8. Immediate benefits

Both the city and the county have firmly supported the urban design concept that the development should be seen as a new neighbourhood extension of the CBD (RAC, 1999). The first phase of the development has been a success, with 100% occupancy rates in its 300 residential flats and 92% occupancy in

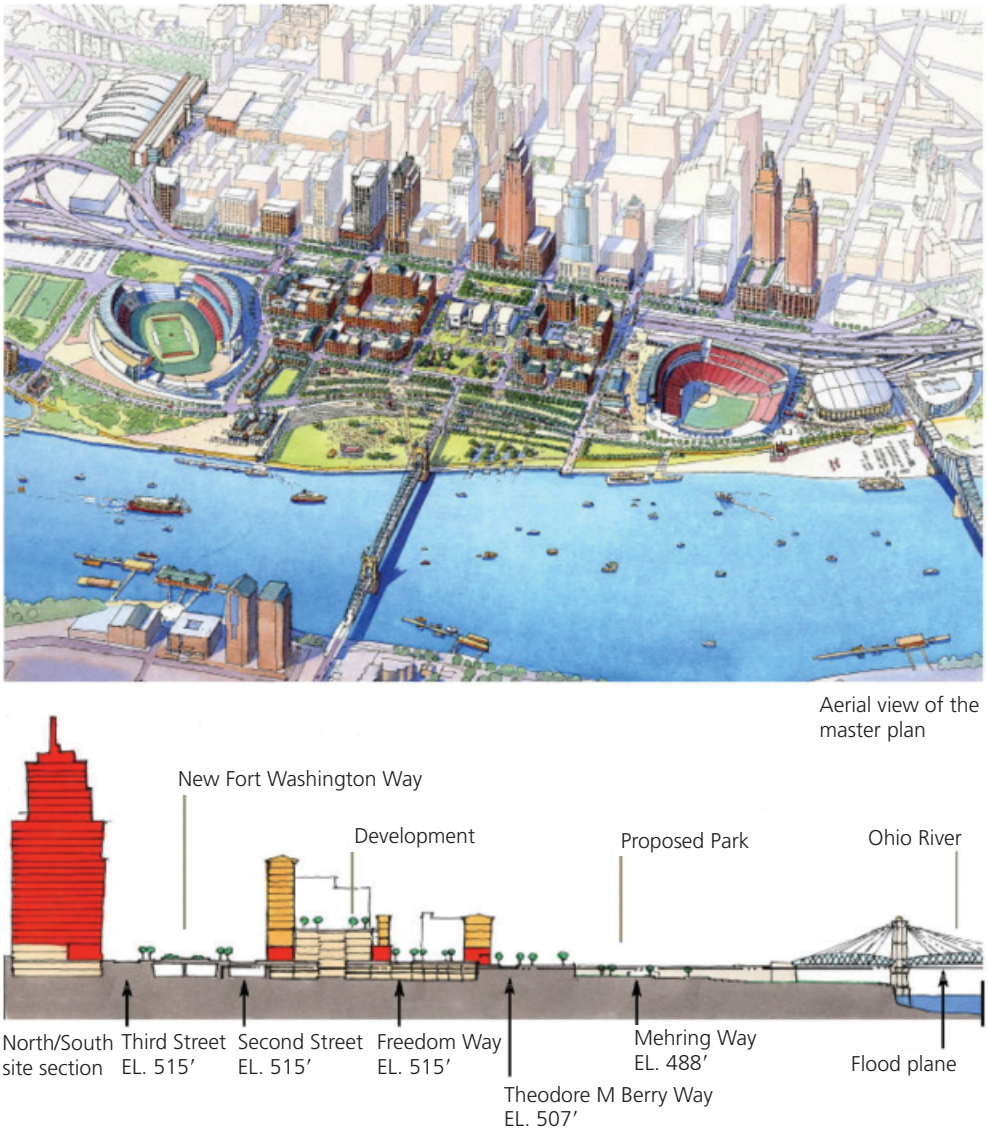

Figure 8. The Banks Project master plan from the 2000 approved urban design master plan (City Planning Commission records)

the 7500 m^2 of ground-floor commercial space. To date, the occupancy of the flats and shops combined with the large numbers of visitors to the stadia, park and commercial space point to success in creating a viable physical environment.

Taking advantage of this success and the flexibility of the air lots, the developer sold the first two mixed-use buildings at a substantial profit (Figure 12). Following that, in August 2014, General Electric, who already constructs jets engines in Cincinnati, decided to locate one of its five worldwide operation centres in the second phase of the project, sharing a city block with a building by the developer holding an additional 300 flats and commercial space (Figure 13).

9. Cost of the benefits

Even with successful businesses, popular flats and the sports teams, the expense of the capital improvements on the riverfront has continued to be controversial. When the current buildings under construction are completed, the developer will have invested approximately US$270 000 000. The public sector investments are shown in Table 1.

The University of Cincinnati carried out an economic benefits study that projected the benefits of the completed project and the planned project over time (ECUC, 2012). The study noted the value of even the low-wage jobs created in the restaurants in phase 1 and also offered the optimistic assessment that taxes from

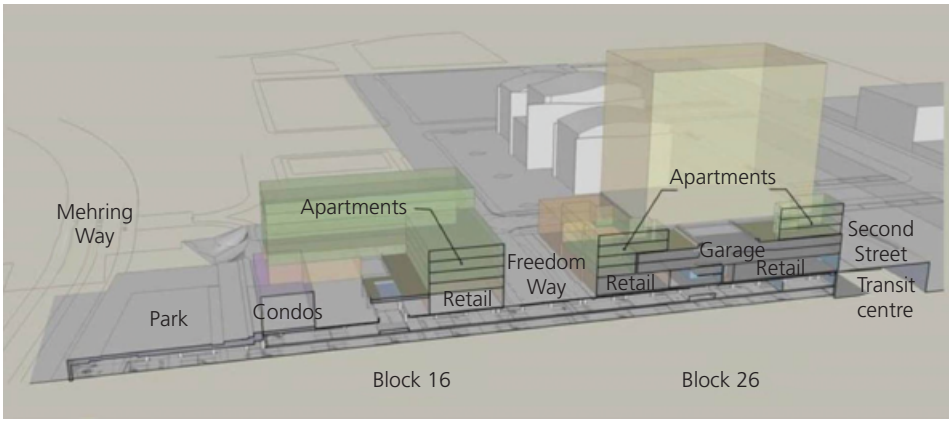

Figure 9. Section through the proposed development project showing the multi-layer strategy with floodable transit facility and parking structure supporting the mixed-use development and street grid and part of the amenity park space (2007 Carter Dawson development proposal, City Planning Commission records)

Figure 10. Parking structure and street grid under construction, demonstrating creation of the floodable parking structures supporting the raised street grid and podium, viewed from the northeast (July 2009)

Figure 11. Completed first phase of the mixed-use development viewed from southwest with the ballpark on the right, the buildings on Third Street in the background and the phase 1 park in the foreground (November 2011)

high-skill and high-salary jobs (e.g. General Electric) will help the city and county recover their investment.

Unfortunately, the county's sales tax has failed to produce sufficient revenue to cover the interest and principal payments to bond holders and other stipulations of the bond covenants, including maintenance and upgrades to the stadia. Whole-life costs were certainly not considered. This shortfall has forced the county to use other revenue to cover that obligation and cut services. The city, in a similar situation, financed the freeway reconfiguration with a complicated scheme bringing together funds from the federal government with state and local dollars, including internal notes and bonds. The worldwide economic collapse in 2008 reduced local income tax receipts and the performance of the city's investment portfolio. As a result, the mutual enthusiasm of the city and the county has been cyclical from 1997 to the present depending on the results of their annual budget cycles. To finance their share of the second phase, the public parties used, as their primary financial tools, the deferred land payment they received from the developer's sale of the first phase of the development and deferred property rates on the new building, called tax increment financing.

10. Conclusions

Through a plan drawn up in 1997 and under implementation in stages since that time, Cincinnati has been constructing a development that emphasises resilience rather than resistance in the face of flooding from the Ohio River. Cincinnati's strategy of flood resilience evolved in response not only to actions at the federal level aimed at reducing risk to life and property from

Figure 12. Completed first phase of the development viewed from the northeast with the John A. Roebling Suspension Bridge (1866) over the Ohio River and northern Kentucky in the background (June 2012)

Figure 13. Proposed General Electric global operations centre (2014) (Cincinnati Planning Commission files)

floods, but also – and just as importantly – from a desire to connect the city with the river and resolve local frustration with the condition of the central riverfront (CRF) in the 1990s. It had seemed impossible to redevelop that floodplain, the historic heart of the city below Third Street, into anything other than unprotected, low-value land uses or transportation or sports facilities protected with massive floodwalls and kept dry during flood events by energy-hungry pumps.

In summary, the conclusions from this case study are based on five project metrics.

- The development has been an economic success. Even through the global economic uncertainty of the past 5 years, the first phase has been a financial success with 300 apartments fully rented and 92% of the 7500 m^2 of commercial space leased. This success has come after considerable investment in underlying infrastructure by the public parties, the city and the county, with some additional financing from federal and state sources (ECUC, 2012). The city's park department has financed part of their operation costs from payments from the Moerlein Lager House, built atop the parking structure along with a large lawn forming a partial green roof.
- The project has won national awards. The most prestigious, the American Planning Association 2013 National Award of Excellence for Plan Implementation, included the two professional sports stadiums that bookend the project (APA, 2013; CCCC, 2013).
- The new riverfront park has provided a protected and landscaped riparian zone and has been a major public success. It enhanced the development and won follow-up funding from the USACE for riverbank protection and public access and large private donations for further park development (Figure 14).
- The Cincinnati Bengals football team and the Cincinnati Reds baseball team regularly fill their facilities during their seasons. Although they don't always win, they have brought significant focus and patrons to the riverfront.
- Constructing a resilient project in a floodplain poses challenges, but it also offers environmental opportunities beyond the amenity value of the riverfront location. This project has been able to take advantage of the porous alluvium to provide a ready supply of water for an open-loop geothermal system for all the energy needs at Moerlein Lager House and a future hotel. The US Green Building Council awarded LEED Silver to the first phase of the development.

		Cost: US$
1996–2006	Fort Washington Way	328 000 000
	Paul Brown stadium	455 000 000
	Parking, infrastructure and site improvements	152 600 000
	Great American ballpark	280 000 000
2008–2013	Parking and infrastructure	128 000 000
Total to 2013		1 343 600 000

Table 1. Public sector costs to 2013 for redevelopment of the Cincinnati CRF

Figure 14. Walnut St Park stairway and cascade fountain with Ohio River, John A. Roebling Suspension Bridge and northern Kentucky in background (June 2013)

11. Lessons learned

Other cities contemplating such a strategy should carefully consider the upfront costs of the infrastructure necessary for such an approach, its probable lengthy and disruptive implementation, and the impact on the operations budget once the facilities are brought into use. Long-term operational costs of the park have been budgeted from a fee from the development, but the success of any development can turn. In the USA, a close working relationship with the USACE is necessary for any work in the floodplain of a navigable body of water. Owing to the usual lengthy time frames involved, this is not an undertaking for the faint of heart. Any entity proposing an undertaking similar to that in Cincinnati needs to consider all costs and all benefits and to be prepared to take on challenges over the long term.

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