Infrastructure as Architecture

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Toward More Sustainable Forms of Urban Infrastructure

The pivotal role of infrastructure in the growth and development of the modern city is well documented and generally appreciated by urbanism's major actors, both private and public. Few would deny that a well-designed and well-maintained infrastructural network is essential if an urban economy is to remain efficient, productive, and, in the age of globalization, competitive. And yet, especially in North America, what is seemingly obvious is challenged by the dominant reality in which the contemporary condition of essential infrastructure belies its fundamental importance. This dichotomy is manifested nowhere more dramatically than with respect to the major roads and bridges of the metropolis, the overall condition of which has evolved, in less than a generation, from exemplary to distressing. Widespread and continuing deterioration is not unique to the older industrial cities of central Canada and the American Northeast and Midwest, but is equally well advanced in Maritime and western Canada and in the relatively new cities of the American Southwest. Deterioration impacts the center and the periphery of municipalities, both large and small, rich and poor. It also affects those experiencing explosive growth as well as those encountering contraction.

A significant portion of this now-deteriorating urban infrastructure was conceived and constructed during one of two periods. In the first of these periods, the 1930s, it was often formed as part of public works programs designed to employ the jobless and to stimulate moribund economies. In the second timeframe, the 1950s and 1960s, it was a feature of the heyday of postwar prosperity. Importantly, the urban infrastructure that we now see crumbling was created under different sets of circumstances in which the various levels of government devised collaborative agreements, programs, and funding formulas which, for the most part, are no longer operative. Especially during the 1950s and 1960s, the various levels of government were less concerned with the renewal of existing infrastructure than with the development of new infrastructure. This era was a time of rapid economic expansion, coupled with low debt (at least as pertained to federal coffers in the United States and Canada), and it was a time during which Keynesian notions of deficit spending held sway.

However, these circumstances have changed. The days of comprehensive infrastructure programs coordinated and administered by such master-builders as New York's Robert Moses are long past. As we struggle to maintain existing and to build new infrastructure, the approach, rather than being comprehensive, has become incremental. The inflationary 1970s, coupled with the recessionary 1980s and early 1990s, altered the basic premise upon which the three levels of government functioned. Beset by mounting debt and shifting ideological winds, both the United States and Canada experienced momentous change, highlighted by reduced transfer payments and the downloading of a wide array of services and responsibilities onto already constrained municipal governments. Generally, these alterations occurred without providing municipal governments the tools by which they could leverage new and sustainable sources of funding.

Consequently, municipal governments, especially those unable to augment revenues by annexing their hinterlands, have found themselves in the unenviable position of having to do more with less. Unfortunately, this scenario is unfolding at precisely the moment when much of this older infrastructure is most in need of revitalization. Although reduced transfer payments and the downloading of responsibilities were initially considered a temporal situation, even in the wealthiest communities budgetary woes have become chronic, and there is no particular reason to believe this situation will change anytime soon. With most funds committed to meet other demands (for example, those arising from public health, police, and transit sectors), with taxpayer resistance to increased taxes, and with severe constraints governing the few areas where they can generate additional revenues, cities have little money left at the end of the day to renew older infrastructure, no matter how vital this infrastructure is to their long-term viability.

Compounding these already dire straits is the nature of city building itself, in particular, the inexorable outward spread of the metropolis at low density, requiring the construction of ever more infrastructure, much of it comprising roads and bridges. Ironically, the power of coalitions of interest, led by the real estate development industry, ensures that, despite budgetary constraints, funding is always available for creating new urban infrastructure, in part because municipal governments see this as a means of leveraging additional tax revenues. A significant percentage of new infrastructure, especially in the United States, has also been developed by the sale of bonds and, increasingly, through privatization, where community builders provide utilities on a community-by-community basis, and where highways are constructed and operated on a user-pay basis. Inevitably, however, this year's new becomes next year's neglected, and the cycle repeats. Over the long term, the practice is unsustainable, yet it continues nonetheless.

Innovative funding solutions have generally focused on the problem of developing new urban infrastructure. Left unresolved for the most part is the problem of renewing older infrastructure. While eventually some of the aging items/objects/systems can be disposed of, abandoned, demolished, or even sold for profit, infrastructure that is deemed essential cannot be so treated. Though it may be permitted to deteriorate, eventually it must be renewed, regardless of the cost. Consequently, there is no question that urban infrastructural renewal is largely dependent on the derivation of innovative and more sustainable funding solutions, and in this regard American cities have long been in the vanguard. A partial solution has been for state governments to grant municipalities greater powers, including expanded powers of taxation. It must be remembered, however, that many jurisdictions have long held such powers, and in many cases much older infrastructure remains in poor condition. Moreover, expanding the powers of taxation is far from a panacea. History has demonstrated that this method of revenue enhancement can be counterproductive, as it may end up driving away the very businesses and residents on which a city's livelihood depends.

While the renewal of a majority of older urban infrastructure awaits innovative funding solutions, the rejuvenation of specific works may be facilitated by other means. What we need is a new approach for the twenty-first century, a new way of taking on the challenges of this post-master-builder age. In order for this new approach to take shape, however, a change in perception is required. Part of the problem is that cities tend to view urban infrastructure as a liability rather than as an asset: roads and bridges are seldom appreciated beyond the utilitarian. More often than not, they are considered a burden and a liability. Unlike land, they are rarely perceived -- and hardly ever capitalized on -- as an asset. But could this scenario be otherwise? Could critical components of urban infrastructure be re-conceptualized from liability to asset? Could this infrastructure be an unseen treasure, contributing not only to its own renewal but to that of the city generally?

As we have seen, one of the more innovative approaches to developing new infrastructure has been the return to practices holding sway before the public sector assumed responsibility: notably, private sector development. The question, therefore, is this: could the private sector be brought in to

renew a city's older infrastructure? Relative to the majority of roads and bridges, the answer would appear negative. The fabric of the city, the way in which most road and bridge infrastructure has been conceived and constructed, would appear to preclude privatization. But what about specific components of a city's infrastructure, such as interchanges and elevated or depressed highways, where land or air-rights might be offered as inducement?

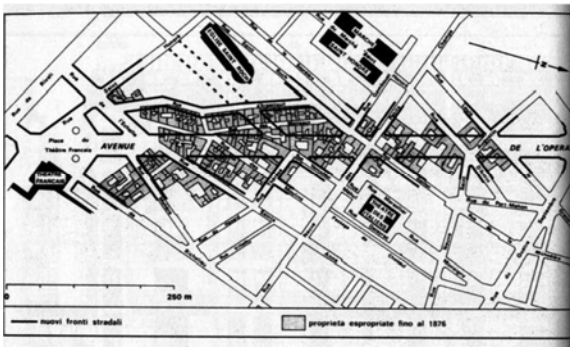

Fig.1 Paris, Avenue de l'Opera; plan and aerial view

If a partial solution to funding new urban infrastructure involved the reestablishment of past approaches, perhaps the key to renewing older infrastructure lies in the past as well.

Haussmann and the example of Paris

Nineteenth century Paris is a good place to start. Most of us are familiar with Georges-Eugène Haussmann's infrastructure modernization program, which unfolded over an eighteen-year period as the centerpiece of Louis-Napoleon's public works campaign and which was designed both to stimulate a recession-bound economy and to defuse the revolutionary tendencies of tens of thousands of unemployed Parisians (Fig. 1). However, few of us realize that Haussmann's program functioned as a kind of a public-private partnership. Haussmann understood that, if infrastructural projects were broadened to include the properties fronting along their lengths, the costs of renewal and development could be borne through the sale of land and offset by increased tax revenues. In this way, the city's prime asset -- its land – could be leveraged by offering it to developers at advantageous prices in exchange for their agreeing to construct residential projects of a type and scale that the Baron deemed appropriate.

Effectively, Haussmann was able to modernize much of the medieval city's infrastructure of roads, bridges, and sewers by comprehensively integrating infrastructural renewal and real estate development, from financing to design, all the while stimulating a dramatic rise in property values. The financing method was complex, and largely dependent on deficit spending. Implicit was the legal right to expropriate land and to sell it at market value. Haussmann argued, correctly as it turned out, that a rapidly expanding population, combined with land sales and new commercial and industrial investment, would deliver revenues sufficient to retire long-term debts contracted by the public works initiative. Conservative bankers, including the Rothchilds, demurred from participating in the venture, but entrepreneurial financiers, notably the Pereire brothers' *Crédit Mobilier*, welcomed the opportunity and ultimately derived considerable fortunes by acquiring property along the newly created boulevards and then selling that property at a substantial profit.[1]

Haussmann's deficit spending may no longer be considered a viable strategy, in part owing to the burdensome weight of government debt. But his idea of comprehensively integrated public-private initiatives that exchange land for real estate development remains attractive. In fact, this model is at the base of a wide array of initiatives currently underway across North America. These are initiatives that have learned much from the largely unfortunate experience of postwar urban renewal. However, a majority of these programs, some of which have proven enormously successful, notably *Habiter Montréal*, are geared to urban regeneration generally and to housing development specifically rather than toward the renewal of an aging infrastructure of roads and bridges. Consequently, in just one of a seemingly endless litany of examples, the economic revitalization of a significant part of South Dallas, an historically low cost, low wage, African-American community, remains stymied. This lack of action has been caused in large measure by a public sector unable to allocate the funds needed to renew the district's severely deteriorated network of roads, bridges, and sewers, conditions which act to discourage investment (despite the presence of various city and state incentives),

and which prevent the district from playing its rightful role in the city's evolution.

Le Corbusier and the example of Algiers

Taking a cue from Haussmann, Swiss architect Le Corbusier conceived a scheme for the renewal and development of colonial Algiers during the 1930s. An accomplished synthesist, Le Corbusier took the notion of integrating infrastructure and real estate to its logical conclusion by merging the two into a single, comprehensive, mixed-use structure, the so-called inhabited viaduct or "living bridge." Considered to be among the most influential schemes in the history of modern town planning, Le Corbusier's Obus Plan (revised repeatedly for over a decade and progressively refined and reduced in scale) began without a client when he was invited to participate in a conference on the future of Algiers. The initial scheme is best known: it featured an enormous, sinuously curving, kilometers-long viaduct accommodating a major highway and housing, offices, shops, and restaurants.

It seldom is appreciated that Le Corbusier's concept was itself inspired by a project in the heart of historic Algiers, the Boulevard de l'Impératrice (Fig. 2) (subsequently renamed the Boulevard Che Guevara). The Boulevard had been conceived as a multi-level inhabited viaduct near the waterfront, running some 1700 meters in length and eighteen meters in width, and containing at its deepest point four levels of housing, offices, shops, and restaurants. Significantly, its construction began in the 1860s, at the pinnacle of Haussmann's influence. It is equally seldom appreciated that Le Corbusier's living bridge concept actually bore fruit, notably in the guise of the Immeuble Burdeau, designed by Algerian-based architects and constructed during the first half of the 1950s.[2]

On the other side of the Atlantic a few years hence, in 1965, to the infuriation of local residents (including the West Village's Jane Jacobs), New York's Robert Moses, all-powerful commissioner of parks and parkway development, resuscitated the dormant but long-planned Lower Manhattan Expressway project. The project had been designed to connect the Williamsburg and Manhattan Bridges on the city's east side with the west

Fig.2 Infrastructure as architecture, Immeuble Burdeau, Algiers

side highway and Holland Tunnel. Moses not only lost the ensuing battle to build the Lower Manhattan Expressway, but his failure to realize the project produced national as well as international repercussions. Ultimately, it marked the beginning of the end of the master-builder approach to urban infrastructure, especially as pertained to projects that tore asunder existing neighborhoods, be they directed by powerful and charismatic figures like Haussmann and Moses, or by faceless bureaucrats.

Intriguingly, Moses' proposal failed to learn from Le Corbusier's Obus Plan, or, for that matter, from the Boulevard de l'Impératrice and Immeuble Burdeau. Unlike these, and contrary to his own proposition for the Mid-Manhattan Elevated Expressway, Moses envisaged a mono-functional, elevated highway alone. He sought neither to integrate infrastructure and real estate within the viaduct nor along the right-of-way. At best, Moses proposed that the base of the structure could accommodate parking. Anticipating the widespread demolition of older buildings, for the most part housing lower-income residents and modest businesses, Moses assumed that the clearances would appreciate property values, leading to a general rise in prosperity. This process, he believed, would render the area newly attractive to real estate development. However, Moses failed to appreciate the growing power of his opponents and their desire to ensure that infrastructural projects such as roads and bridges would provide direct and tangible benefits to the communities through which

they ran.[3] It is interesting to speculate about what might have occurred had Moses proposed an integrated infrastructural project, perhaps even an inhabited viaduct, one that accommodated local needs and desires. The outcome may well have been different.

Infrastructure versus Architecture

Infrastructure has long figured prominently in North American real estate development. For instance, the first streetcar companies were founded, owned, and operated by subdivision developers in order to facilitate the sale of real estate. Urban highway development, its design and precise routing, historically has been closely tied to real estate interests, as has been well documented in the case of US-59 in the Sharpstown district of Houston, Texas. It has long been understood that infrastructure is essential for the sale of real estate, or to put it differently, that infrastructure facilitates urban development. In light of this long and intimate relationship, is it not possible to reverse the proposition, to propose urban development as a means of facilitating infrastructure renewal?

This question leads us to the supposition that, in today's environment, innovative approaches are required not only to finance infrastructural renewal, but to design, construct, and maintain it as well. In today's environment, it is necessary to reconsider the mono-functional nature of much urban infrastructure. In other words, we need to reexamine the idea that roads and bridges exist to serve but one purpose, the efficient movement of vehicles. The continuing budgetary crisis -- the new reality -- presents an opportunity to rethink the relationship between infrastructure and the city, infrastructure and program, infrastructure and architecture. Just as contemporary urban planning understands the benefits that accrue from mixed-use developments, and the many downsides to segregated zoning, urban infrastructure must be so reconceived. No longer should a bridge be just a bridge. Rather, it should be conceived as an essential component of an integrated urban development, one that is not only integrated financially, but also conceptually. An integrationist approach to urban infrastructural renewal would encourage --

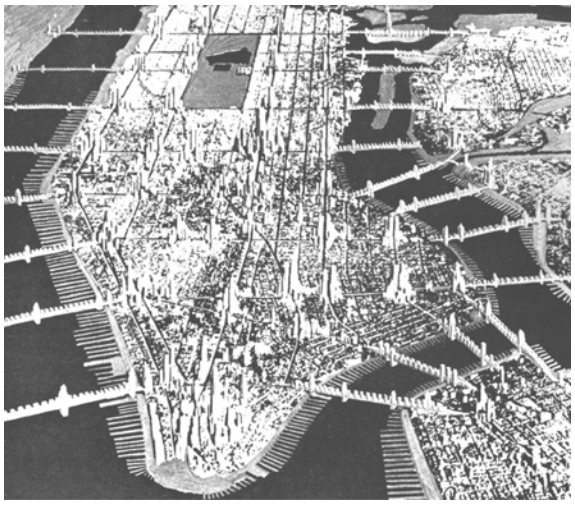

Fig. 3 Raymond Hood, Hugh Ferris, "Residential Bridge" proposal

indeed, would necessitate -- greater coordination between public and private sectors in the development of the city. It would also require greater interdisciplinary cooperation, especially as concerns planning, engineering, and architecture.

History has provided numerous models of integrated infrastructure, from medieval London and its famous Bridge, to Renaissance Florence and the Ponte Vecchio, to nineteenth and twentieth century Algiers, to the "residential bridge" proposals for New York City by Raymond Hood and Hugh Ferris (Fig. 3). An integrated approach to infrastructure design and development provides the basis for the complex, extensive, and internationally renowned "underground city" in Montréal. The question is: can this approach be applied to existing, critical infrastructural components that are badly deteriorated and in need of renewal, but for which funding has not been forthcoming? The answer requires that a case be tested.

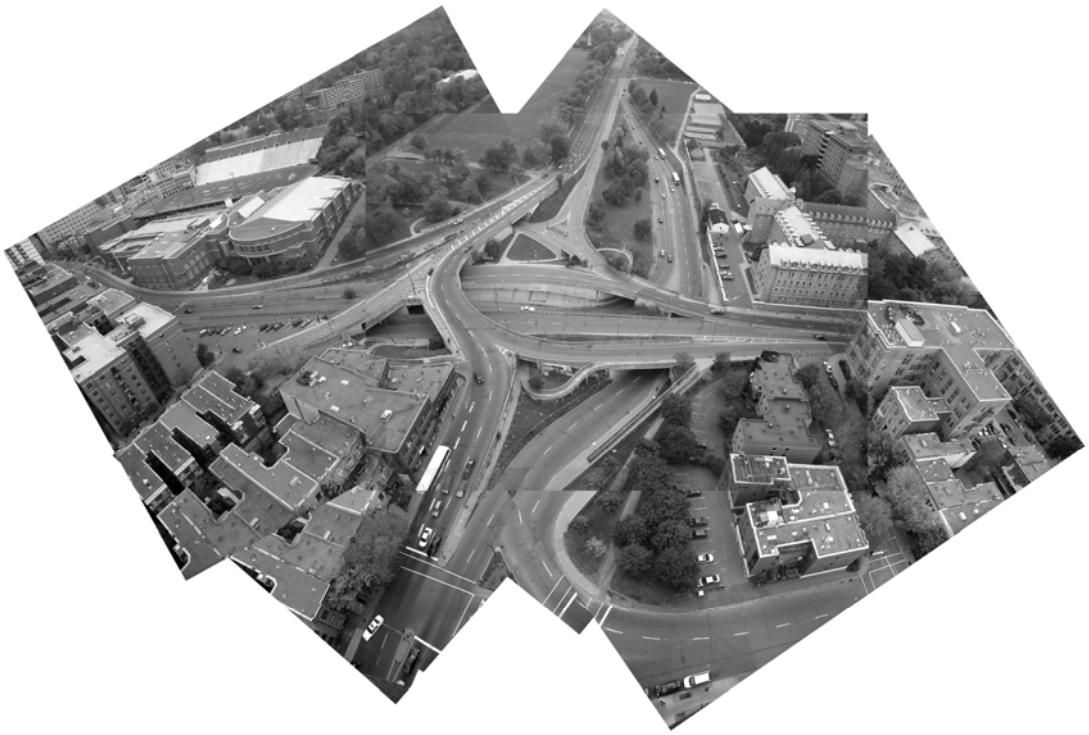

Fig. 4 Aerial view of Montreal's Pine-Parc Interchange

Infrastructure as Architecture: the case of Montréal's Pine-Parc Interchange

For the purposes of choosing the test case, it was determined that the infrastructural component should comprise a bridge structure with a significant land component located within or adjacent to an existing, well-established neighborhood. Most major cities in the United States and Canada contain one or more bridge structures in the form of multi-level interchanges that were constructed as part of comprehensive highway development and urban renewal schemes that were never fully completed due to funding cuts, shifting priorities, or concerted public opposition. In eastern Canada alone, such large-scale "interchange" sites can be found in Halifax (to the east and north of the Scotia Square shopping complex), in Québec City (on the north side of the historic walled city), and in Montréal, at the threshold where the center city meets Frederick Law Olmsted's historic Parc Mont Royal (Fig. 4). This latter site has been selected as the test case.

Known locally as Pine-Parc, the interchange occurs at the junction of two major routes: Avenue des Pins, which transits the city east to west at the base of Mont Royal, and Avenue du Parc, bisecting the city north to south while connecting the downtown core across the mountain with the inner suburbs. The complex, multi-level interchange, constructed during the 1960s, was conceived in two ways. First, it was seen as a means of alleviating a serious problem of traffic congestion, exacerbated by the presence of the mountain. Second, the interchange was considered an essential component of an urban renewal scheme which would require the leveling of much of the Milton-Parc district near McGill University, a community of students, activists, and lower income families residing in modest, turn-of-the-century walkup flats. The district had recently experienced significant socio-economic decline, not least because of the absentee landlords' failure to adequately maintain the housing stock, a situation that, in turn, was encouraged by the presence of speculative developers who were working in consort with city officials to declare the area a slum so that it could be demolished and reconstructed at much higher density.

While the interchange project went ahead, necessitating the expropriation of a part of the residential district and encroaching significantly on the park itself, the real estate endeavor it was meant to serve was realized only partially. Sustained community opposition ensured that plans for Cité Concordia, as it was to be called, were dramatically revised and scaled back, and the project never proceeded beyond the first phase. This initial stage had comprised several high-rise apartment buildings, each proffering spectacular views of the mountain and the downtown, a high-rise office tower and hotel, an underground shopping concourse, and a mammoth, multi-level underground parking garage. Rebranded La Cité and subsequently Place du Parc, the project (partially funded by the Ford Foundation) came on stream just as the Québec economy entered recession. It thus proved a financial disaster. Of its various programmatic elements, the hotel and shopping concourse turned out to be the least viable.

More than being financially challenged, the project, combined with the interchange, proved a poor neighbor. Where once Mont Royal was readily accessible from the Milton-Parc neighborhood, it now was hidden behind a bulky and insolvent real estate project and cut off by a labyrinthine highway interchange, one that was to prove deadly to many a pedestrian. Since that time, each succeeding administration has promised to remedy the situation, and dozens of proposals have been advanced. Most have focused on eliminating the interchange entirely, but these have not proven viable. Alternatively, some have proposed that the city reconstruct the interchange in order to lessen its impact, while rendering the park more accessible. Several attractive designs have been advanced, but all fail to resolve the basic dilemma: the city has no money. If one accepts the city's position that it is without funds, then it would appear that the only way forward is to engage the private sector and create a public-private partnership charged with redeveloping the interchange while at the same time striking a balance between the interests of the public and those of the private sector.

As depicted, the proposed scheme demolishes the interchange entirely and replaces it with an integrated, mixed-use structure, featuring housing, retail, office, and parking in a configuration that owes much to Le Corbusier's living bridge idea (Fig. 5). The multi-level interchange is rationalized into two grade-separated corridors, the upper consisting of Avenue du Parc and the lower of Avenue des Pins. Beneath and running parallel to des Pins is an expanded shopping center (this component of the current development eventually became viable) designed to connect the Place du Parc complex and the Milton-Parc neighborhood through the project to a major new civic space, here named Place Olmsted. The concept would increase the mountain's acreage while eliminating the public's need to traverse traffic-laden arteries. In effect, the proposal appropriates Montreal's highly successful, three-dimensional, interior city concept, whereby major retail, commercial, and residential facilities are interconnected by a comprehensive, all-weather, underground pedestrian network. Above and also running parallel to Avenue des Pins is an air-rights residential slab that acts as a symbolic gateway from the park to the city center and vice-versa. Proffering magnificent views of the mountain and the downtown, this residential structure provides partial recovery of infrastructural costs. To the east and the south, located on land freed up from the reconfigured intersection, rises a slender office tower, sufficiently narrow and strategically sited so as not to block views from the existing office block.

Would the real estate industry countenance such a proposition? Would the neighborhood's residents support such a development? There are precedents, but what is certain is that projects of this nature are dependent on a broad, inclusive, and consultative process. Most certainly, the age of Haussmann is long gone. But does the closing of that era mean it no longer is possible to build comprehensively? And while the age of Moses is over, does that mean it no longer is possible to "think big"? Integrated approaches to infrastructural renewal may well be the wave of the future. So too, perhaps, may be innovative variations on Le Corbusier's living bridge.

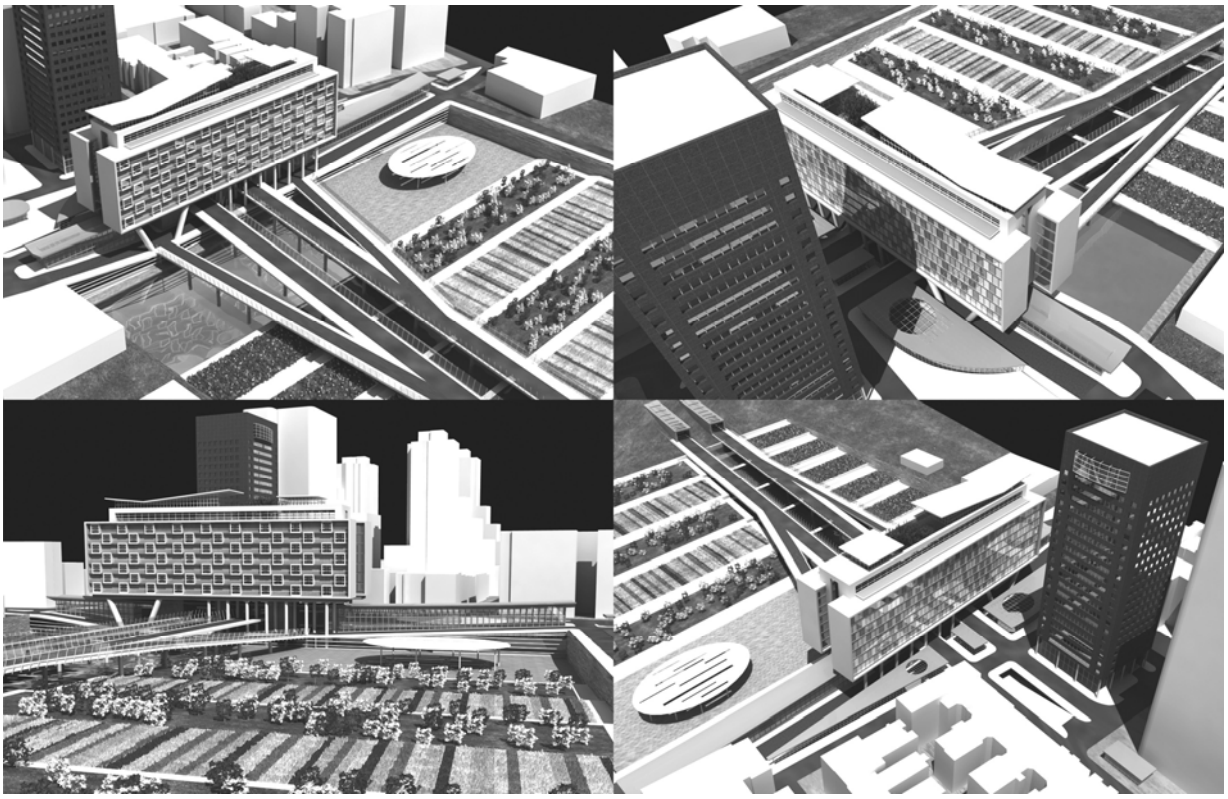

Fig. 5 Proposal for Pine-Parc reconstruction

Postscript

One should never underestimate the role of politics in the making of the city. Having been made, once again, a campaign pledge in the most recent municipal election, to the surprise of many the municipal administration actually followed through on its promise, and the redevelopment of Pine-Parc has begun. Perhaps not surprisingly, the City of Montreal took the easiest path of those available, simply demolishing the interchange in its entirety, replacing it with a traditional, grade-level intersection, with the flow of traffic and pedestrians regulated by traffic lights. The concept owes much to Haussmann, in that adjacent property owned by the city, as well as a small area of land freed up as a result of the interchange's demolition and reconfiguration, is to be marketed to the private sector for the development of a modest, low-rise, four-to-six floor residential block. The specificities of its location, its vilification by local residents, and the peculiarities of civic politics, combined in such a way as to ensure that the Pine-Parc interchange would be destroyed. The resulting project is truly unfortunate. It misses by a wide mark the opportunity to seize upon infrastructure as an asset, and to create an integrated development that uses its site intensively while acting as a symbolic gateway to the heart of the downtown. If its previous incarnation presented significant shortcomings for pedestrians and for the ability of neighborhood residents to safely access Mont Royal, and it did, at least it manifested a quintessentially modernist ambition, exhibiting a certain robustness and even splendor. In its current rendition it not only lacks that ambition, it lacks any ambition, in effect demonstrating a loss of faith in Montreal as a modern, three-dimensional city. Most importantly, Pine-Parc cannot be an exemplar for a more sustainable approach to infrastructural renewal. Consequently, Montreal's vast inventory of roads and bridges, at least that which lacks a political champion, will almost certainly continue deteriorating, to the detriment of the city's image and economy.

References

[1] See for instance Saalman, Howard, *Haussmann: Paris Transformed*, George Braziller, New York, 1971; and Sutcliffe, Anthony, *The Autumn of Central Paris: The Defeat of Town Planning 1850-1970*, McGill-Queen's University Press, Montreal, 1971.

[2] See for instance Lamprakos, Michele, "Le Corbusier and Algiers: The Plan Obus as Colonial Urbanism," in Nezar Al Sayyad, (Ed), *Forms of Dominance: On the Architecture and Urbanism of the Colonial Enterprise*, Avebury, Aldershot, 1992.

[3] See for instance Caro, Robert A., *Power Broker: Robert Moses and the Fall of New York*, Vintage, New York, 1975.