5 Avoiding Negative Impacts from Urban Morphology: Case study of the "Neighbourhood Unit"

Chapter summary

A design decision support model must not only account for elements of urban form that help to reduce per-capita GHG emissions, it must also account for elements of urban form that work to increase those emissions. This chapter examines the case study of a very prevalent urban design model, the so-called "neighbourhood unit", and evaluates its impact on urban form as well as emissions.

This chapter is drawn from the peer-reviewed publication "The Neighborhood Unit on Trial" (Mehaffy, Porta and Romice, 2014).

It may well be that within modern urban planning and design, no single practice has had greater influence – and in some quarters, greater controversy – than the use of the "neighbourhood unit" as a standardized increment of urban structure.

The best known example of planning by neighbourhood unit – and one that is still widely influential almost a century later – is that of Clarence Perry, proposed in 1929 for the First Regional Plan of New York, under the auspices of the Russell Sage Foundation (Figure One; Perry, 1929a). His model, like a number of other variations, standardises the components of a neighbourhood, together with their geometric distribution and their relation to perimeter street patterns. To some degree, as we will discuss, Perry's neighbourhood unit also seeks to standardize social populations and their interactions, though this is a distinct and variable element.

As we will discuss, Perry's model is not the only attempt to standardize neighborhoods into units, or to segregate their parts. Standardized and segregated neighbourhood unit planning has roots much deeper in the history of planning – often with accompanying controversy. Nonetheless, it is Perry's model that has been most influential, and the most controversial, on modern planning practices up to the present day.

An indication of the degree of influence (and controversy) of Perry's model even today can be readily be assessed from a sampling of recent communications by prominent urban planners. On the home page of the US-based Form-Based Codes Institute website in August 2011 is a lecture by noted Florida planner Bill Spikowski, in which he argues for the famous 1929 model of Clarence Perry's neighbourhood unit: "I tend to like Perry's view... this stuff is mostly still valid today" (Spikowski, 2007). But in a vociferous 2010 exchange between New Urbanism co-founder Andres Duany and London urban designer Paul Murrain, co-author of the classic design manual *Responsive Environments*, Murrain was sharply critical of his friend Duany's promotion of the Perry model: "I condemn Perry because like you I observe, and I have observed the destruction of integrated urbanism across the developed world to a staggering degree courtesy of the model you promote." (Personal communication copied to the authors and used with permission, October 14, 2010.)

Duany, for his part, has strongly defended his use of the Perry diagram. As he stated to the authors, "I selected Perry's as the chassis for the first generation of New Urbanist diagrams. This was a rational move as it was the most famous diagram in the history of American planning..." At the same time, Duany acknowledged historical problems with Perry's model, but made clear his view that it remained a useful framework: "By close comparison, it served to point out the many subtle differences between old and new urbanist practices." (Personal communication to the authors and used with permission, June 14, 2011.)

This and other recent debates reflect the enduring international legacy of neighbourhood unit planning in general (as we describe below), and Perry's 1929 proposal in particular – as well as its more recently modified versions. The persistence of the debate also reflects the high stakes involved for modern planners, under pressure to respond more effectively to a daunting set of increasingly complex challenges: threats to economic viability, social vitality, public health and well-being, ecological integrity, resource depletion, climate change, and other topics that are increasingly grouped under the heading of "sustainable urbanism." The debate, in this sense, centres on to what extent the neighbourhood unit concept is part of the solution to this set of challenges, or part of the problem – and on whether a modified neighbourhood unit, or indeed some other alternate model, offers the most effective way forward.

This debate is only the most recent in a long history of controversy over neighbourhood unit planning. Indeed, as a number of authors have documented (e.g. Banerjee and Baer, 1984; Silver, 1985; Rofè, 1995; Ben-Joseph, 2005; Lawhon, 2009; Rohe, 2009) the extensive history of neighbourhood unit planning brings with it an equally extensive legacy of debate. Lewis Mumford, a major figure in 20th Century planning in his own right, noted in 1954 that while "during the last two decades the idea of planning by neighborhoods has been widely accepted... a counter-movement has come into existence" that has been "drawing up for battle" (Mumford, 1954). This counter-movement included harsh critics of neighbourhood-unit planning such as Reginald Isaacs, whose prominent 1948 paper "The neighbourhood theory: An analysis of its adequacy" drew a spirited rebuttal from Mumford (Isaacs, 1948; Mumford 1954).

§ 5.1 Neighbourhood unit planning: a pervasive contemporary practice

In even a cursory examination of the history of neighbourhood unit planning, one fact quickly becomes apparent: as Mumford noted, the model has had a profound effect upon the thinking and practice of planners since at least the early twentieth century, and up to the present day. Lawhon, surveying historical US planning literature, cited the extensive record demonstrating that "the neighbourhood unit has widely served as the primary design concept for new residential neighborhoods" (Lawhon, 2009). Nor has that influence faded: Solow, Ham and Donnelly, in a 1969 survey of American planners, reported that "half the [surveyed] group thought the neighbourhood unit concept useful, valid, and ideal for public policy. Nearly 80% used the concept in practice" (Solow, Ham and Donnelly, 1969). Lawhon himself, in a much more recent survey of American planners active in smaller cities and rural areas, found that "fifty seven percent of those familiar with the neighbourhood unit agreed or strongly agreed with the statement that 'the neighbourhood unit is still a valid model to guide residential development design in my community and other communities'" (Lawhon, 2009).

The international literature also documents the pervasive global influence of neighbourhood unit planning, as Murrain's observation to Duany suggests. Mumford, writing at mid-century, also pointed to the then-recent British New Towns as an implementation of what he termed "planning by neighborhoods" (Mumford, 1954, p. 256). Azab, writing from Bahrain in 2006, noted that "the concept has proved to be the backbone for most practices within planning, design and policy making arenas." But as his paper made clear, he shared Murrain's misgivings about its global effects: "Scholars and professionals have widely used – or could we say, 'abused' – the idea without questioning its validity for both practice and/or education" (Azab, 2006). In China the next year – and it would seem, with significant import in view of that country's rapid development – the publication "Chinese Planner's Guide to Western Urban Planning Literature" presented and discussed the neighbourhood unit, and did so uncritically (LeGates and Zhang, 2007).

The neighbourhood unit has also been profoundly influential in countries allied with the former Soviet Union, where the "microrayon" was a closely related form of unitised neighbourhood planning. (Miao, 2003). For example, a similar model, the "danwei," was extensively used in China (Lu, 2006).

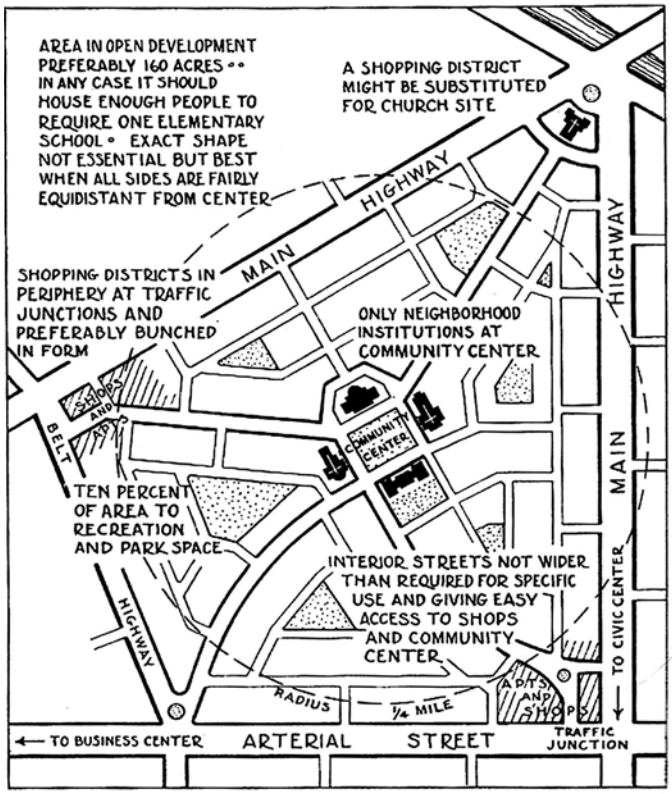

FIGURE 5.1 The Clarence Perry 'Neighborhood Unit' diagram of 1929. Note the size, roughly 1/2 mile or 800m in diameter. Neighborhood institutions at the center were segregated from commercial uses at the edges. The unit's discontinuous streets were largely impermeable to through traffic, which was concentrated at the relatively fast-moving (and therefore relatively pedestrian-unfriendly) arterial edges." Source: New York Regional Plan, Vol. 7 (1929).

Much of this 20th Century influence can indeed be traced – often explicitly by name – to Clarence Perry, the proponent of the landmark 1929 proposal (Figure 5.1), the one that Duany described to Murrain as "the most famous diagram in the history of American planning". Perry did not simply offer his model, but promoted it in a dizzying number of tracts, touted its many benefits as he saw them,

and offered refutations of criticisms (e.g. Perry, 1926, 1929b, 1930). In just one such publication he argued for the traffic mitigation benefits of the neighbourhood unit interior, its social cohesion (and what we would term today "social capital"), its ability to support a local school within walking distance, its usefulness as a model for slum rebuilding, and its profitable mix of amenities offered to buyers, among other benefits (Perry, 1929b).

The scale of Perry's Neighborhood Unit was of particular importance. It spread across an area of ¼ mile radius, that is, roughly ½ mile wide and ½ mile long, surrounded by fast-moving arterials. At the center of this unit were placed civic uses such as schools and parks. At the edge were placed commercial activities such as groceries and other retail. Within the neighbourhood unit, the streets were discontinuous, making it difficult for cars to pass through the center of the neighbourhood; through-traffic was intentionally discouraged.

As his writings make clear, one of Perry's overriding concerns was to accommodate the automobile by creating a separation between fast vehicles and much slower pedestrian-dominated residential areas. As he writes:

"The automobile is working a great change in our city maps. To accommodate the ever growing stream of cars the engineers, in practically all our large cities, are building boulevards, parkways and super-highways. These wide, deep channels are cutting up residential sections into irregularly-shaped islands around which raging streams of traffic will soon flow. Should we not take some steps to formulate the size and the contents of these residential islands? If we permit highway specialization in the interest of the motorist, why should we not insist upon equal municipal care and forethought in the interest of the pedestrian and the resident?" (Perry, 1929b, p. 99)

As we shall see, this advanced concession to the coming "raging streams of traffic" is very much at the core of contemporary controversies. Perry clearly conceives here that the conflict is an inevitable one, and the only alternative is to segregate these two functions by creating functionally demarcated "residential islands." In this sense Perry was promoting a form of segregation by function, a hallmark of early modern planning, and a central feature of use-based or "Euclidean" zoning codes. Drawing from his own words, we can conclude that Perry's intent was to complement traffic engineers' automobile-oriented road planning with a pedestrian-oriented residential precinct.

Lewis Mumford also saw this segregation as inevitable: "Perhaps the first question of importance is what degree of isolation should be accorded the neighbourhood, apart from the inevitable separation made by major traffic arteries." (Mumford, 1954, p. 267). It was thus no surprise that Mumford's partners in the Regional Planning Association of America founded in 1923, Henry Wright and Clarence Stein, developed their influential super-block based layouts for Sunnyside (1924) and Radburn (1929) as a clear anticipation of Perry's diagram under the label of "The Motor Age Suburb". For Mumford, this was clearly a necessary accommodation to the realities of modernity: "Neighborhood unit organization seems the only practical answer to the gigantism and inefficiency of the over-centralized metropolis." (*op.cit.*, p. 266)

This accommodation to automobiles (and to gigantism) was certainly a major theme in the highly influential Radiant City concept of the Swiss architect Le Corbusier. Indeed, according to Samuels et al. (Samuels, Panerai, Castex, & Depaule, 2004) Le Corbusier's thinking has strong parallels to Perry's neighbourhood unit model. For example, Le Corbusier's plan for Chandigarh, conceived since 1951, is entirely based on residential reservations, variously called "sectors," or "neighbourhood units," bounded by urban arterial roads on a 1,200x800 meter grid. The concept was already fully established in the "Ville Verte" (1930) and "La Ville Radieuse" (1935). Other colleagues of Le Corbusier within the *Congrès International d'Architecture Moderne* (CIAM) promoted a similar "superblock" model (Birch, 2011).

Thus it should not come to any surprise then that when the first criticism of orthodox modernist planning started to emerge in the early 1960s, the neighbourhood unit was shortly brought to the center of the battlefield. For example, the highly influential urbanist Jane Jacobs, in her landmark 1961 critique *The Death and Life of Great American Cities*, assaulted the legacy of Le Corbusier and his influences in promoting "the superblock, the project neighbourhood, the unchangeable plan, and grass, grass, grass" (Jacobs, 1961, p. 22). She also assailed the logic of functional segregation and its devastating effect on modern cities, to the point that "today a land-use master plan for a big city is largely a mapper of proposed placement, often in relation to transportation, of many series of decontaminated sortings" (Jacobs, 1961, p. 25).

§ 5.2 Functional and social segregation in Perry's Neighborhood Unit

This functional segregation was not simply a segregation of speeding automobiles from residential neighborhoods. As Mumford argues, the neighbourhood unit is the centrepiece of a wider strategy of zoning by segregated use. "Perry's concept of the neighbourhood unit carried further the earlier notion, first used in Germany, of dividing a city into specialized zones." Perry establishes the neighbourhood unit as one kind of "nuclear" domestic zone: "Treating the domestic quarters of a city as a functional zone, to be differentiated in plan, because of its different needs, from the commercial and industrial zones, he established likewise the need for a nuclear treatment of the domestic zone... All this seems like such elementary common sense that one wonders that anyone should seriously challenge it." (*op.cit.,* pp. 263-264.)

But challenge it they did; as noted previously, Reginald Isaacs' 1948 paper in the Journal of the American Institute of Planners titled "The neighbourhood theory: An analysis of its adequacy" was typically withering (Isaacs, 1948). In this and other cases, Mumford was eager to rise to Perry's defence, making note tersely in this case of "a Mr. Reginald Isaacs," and "one of his attacks on the neighbourhood unit principle" – specifically, the need of a typical family to seek services much farther afield than a neighbourhood unit can provide. Mumford responds that a large number of these services can still be provided within the neighbourhood unit: "the health clinic, the library, the movies, a church, a park, a playground, a variety of shops... there is not one of these activities that could not, with benefit, be relocated in a neighbourhood unit" (*op.cit.,* p. 264).

In fact this is one of the chief criticisms of contemporary critics like Paul Murrain, who question whether such an internalized concentration of shops, clinics, libraries and other amenities could be viable for such a small population (Murrain, 2011). Influential studies today point to the link between the amount and type of facilities on the one hand, and the urban scale at which they should be provided on the other. The distribution is scalar, not compartmentalized, and there is a link between higher services and public infrastructure, which implies an open and integrated relationship between neighborhoods (Urban Task Force, 1999). Indeed, it seems highly improbable that the service needs of contemporary lifestyles will be exactly congruent with the services offered by such a uninitialized, standardized, neighbourhood structure.

Mumford also rejected accusations that neighbourhood units would serve the purpose of "segregation by race or caste or income," which he argued "have nothing whatever to do with the neighbourhood principle" (*op.cit.,* p. 256). Unfortunately, one of the people who apparently disagreed with him on this point was none other than Clarence Perry:

> "[The neighbourhood unit scheme] illustrates a method of producing homogeneity. When the real estate plan is dangled before the public, automatically it draws together a group of people of similar living standards and similar economic ability to realize them. McKenzie has pointed out that the segregation of a city population "along racial, economic, social and vocational lines" is a normal process and one which is constantly at work. Already cooperation in housing schemes is being taken up by various occupational groups. There are also signs of racial and religious ventures in the same direction. The use of a neighbourhood formula in suburban building and slum rebuilding schemes is going to promote this grouping process." (Perry, 1929b, p. 99)

Whether we favour this tendency or not, Perry concluded, it is a fundamental social phenomenon and one we need to accommodate, much as we accommodate the inevitability of "raging streams of traffic" that will be "cutting up residential sections." Hence for him the neighbourhood unit is once more the logical response to an inevitable demand.

A somewhat different social goal for neighbourhood unit planning came later from New Urbanist planners, who explicitly sought a "sense of community" from the bounded physical layout of the neighbourhood. Such a bounded layout might also help to supply the missing identity and "sense of place" within modern suburbia. But as noted in an influential critique by Talen (1999), the question remained whether such a sense of community would also engender a sense of exclusion and social segregation, alone or in combination with other factors.

§ 5.3 The roots of neighbourhood unit planning

While in the history of planning the neighbourhood unit is most closely associated with Clarence Perry's 1929 diagram, there is abundant evidence that Perry's contribution only formalized, albeit in a profoundly influential way, the ideas of a much older tradition of thought and debate.

Mumford, in his 1954 paper on the neighbourhood unit *(op. cit.)*, testified to this common lineage, and described an even deeper foundation in the European and American social reform movements that were associated with Garden City planning: the "community center" movement, the "Social Unit" movement and others. Mumford concluded that "though Perry no more discovered the neighbourhood unit than Le Corbusier discovered modern architecture, the work of each of them has had a dramatic value in crystallizing many diffuse efforts" (Mumford, 1954).

Architectural historians Donald Leslie Johnson (2002) and Eran Ben-Joseph (2005) have traced Perry's neighbourhood unit concept to Chicago planners associated with the City Beautiful movement, to the Garden City movement, and to the rise of city planning as a professional discipline around the turn of the century. They noted the contemporary influence of Daniel Burnham's 1909 Chicago Plan (completed with planner Edward H. Bennett), a seminal document of City Beautiful planning. As Jane Jacobs noted, Burnham's plan also segregated elements of the city into their own units – in his case, civic elements – "the whole being treated as a complete unit, in a separate and well-defined way" (Jacobs, 1961, p. 24).

These ideas were certainly not unchallenged in their day. Johnson documented heated contemporary controversy over Burnham's lavish new civic district from several camps. Social reformers of the day, including Jacob Riis, George B. Ford, and Benjamin C. Marsh, were bitterly critical of what Marsh termed the plan's "gigantic cost" for "civic vanity" and "external adornment." Designers were no less critical: architect Cass Gilbert dismissed the superficiality of the plan and noted "if it is to be city beautiful it will be one naturally." Prominent landscape architect Jens Jensen slammed the plan as "a show city" and "a city of places" (quoted in Johnson, 2002, p.229, 230).

Around the same time, and on the other side of the Atlantic, Ebenezer Howard's Garden City proposal was certainly no less influential in the history of neighbourhood unit planning – and no less the subject of intense debate (Birch, 2002). Howard's proposal featured a series of residential "wards" which were strikingly similar to Perry's units. Raymond Unwin, the planner who implemented Howard's ideas in Garden City realizations such as Letchworth (1903) and Welwyn (1920) – and who was later to travel to the USA and interact with Perry – introduced in the plans of these two cities Perry-like enlarged urban blocks (the direct precedents of modernist super-blocks), dead-end service streets or cul de sacs, and inward-turning, back-on-street cottage building types.

Silver (1985) anchored neighbourhood-based planning in an even older tradition of social reform, noting that "interest in the neighbourhood idea and in enhancing its potential through planning has been an enduring feature of American thought for at least the past 100 years" – i.e. since at least 1885 (Silver, 1985). As Lewis Mumford pointed out in his 1954 defense, the neighbourhood unit in particular was at no point a wholly new invention; there are clear parallels to European *quartier* planning. "Paris, for all its formal Cartesian unity, is a city of neighborhoods... the sense of belonging to a particular *arrondisement* or *quartier* is just as strong in the shopkeeper, the bistro customer, or the petty craftsman as the sense of being a Parisian." Likewise, he said, Venice "is a city of neighborhoods, established as parishes in relation to a dominant church or square; and by its very constitution it reminds us that the medieval city was composed on the neighbourhood principle..." (Mumford, 1954, pp.256-257)

Why, then, Mumford asked, is it necessary to introduce a new concept into planning practice? Why did spontaneous neighbourhood grouping, "so well defined before the seventeenth century," as he put it, tend to disappear in more recent plans? Mumford gave two reasons: "the segregation of income groups under capitalism," and "the increase of wheeled vehicles and the domination of the avenue in planning." As new arterials cut through "urban tissue that had once been organically related to neighbourhood life," as he puts it, "the city as a whole became more united, perhaps; but at the cost of destroying, or seriously undermining, neighbourhood life" (*op.cit.*,p.258-259).

Mumford highlighted a critical distinction between earlier *quartier* planning and the neighbourhood unit: the latter would find an accommodation to the new vehicular traffic by creating a more isolated, functionally segregated neighbourhood island. This island would be connected to other islands through the arterial traffic of vehicles – but not through the old pedestrian connections. This was a fateful transition, fundamentally altering the connective fabric between neighborhoods, and heavily favouring one dominant mode of travel – the automobile.

§ 5.4 Contemporary criticisms of neighbourhood unit planning

It was clear, then, that one key goal of the neighbourhood unit for both Perry and Mumford was the protection of residential neighborhoods from the disruptive vehicular traffic of modernity. As Perry argued, if we must accept the inevitability that modern arterials will cut apart a series of irregularly shaped residential islands, then we must "take some steps to formulate the size and the contents of these residential islands" (Perry, 1929b, p. 99). In his case, these islands were to be roughly ½ mile (800 mts) square. But we now know that the geometry of this spacing is highly dependent on the scale of pedestrian mobility, and getting the scale wrong is likely to have significant consequences

(e.g. Mehaffy et al., 2010). In fact, the geometric basis for this argument has been called into question by a number of critics since then.

One of the most incisive structural criticisms came from Jane Jacobs, in her 1961 argument against what she termed "the curse of border vacuums." These vacuums, she argued, are created by the abrupt edges of large single uses, including the residential "superblocks" of Perry and others. The challenge for urban designers, as she saw it (and drawing on an earlier argument from Kevin Lynch) was to convert these edges into "seams" which would serve to connect the two sides, creating greater cross-movement of diverse populations, and "normal city cross-use of their territory by people from outside it" (Jacobs, 1961, pp. 257-269; p. 394).

Clearly this was not at all what Clarence Perry had in mind for his homogeneous "protected residential cell" (Perry, 1929b, p. 99). But Jacobs argued that this pervasive model of inward-turning neighborhoods was devastating to cities, and to their economies:

> "Unfortunately orthodox planning theory is deeply committed to the ideal of supposedly cozy, inward-turned city neighborhoods...[This is] the point of departure for nearly all neighbourhood renewal plans, for all project building, for much modern zoning... This ideal of the city neighbourhood as an island, turned inward on itself, is an important factor in our lives nowadays [but] it is a silly and harmful ideal... Whatever city neighborhoods may be, or may not be, and whatever usefulness they may have, or be coaxed into having, their qualities cannot work at cross-purposes to thoroughgoing city mobility and fluidity of use, without economically weakening the city of which they are a part." (Jacobs, 1961, p. 114-115)

Yet this was precisely the model that planners used to develop post-war US cities like Phoenix (as shown in Figure 5.2). The model of the neighbourhood unit was married with the "functional classification system" – a hierarchy of fast-moving arterial street grids feeding into more fragmented collectors within the neighbourhood unit, feeding in turn into highly fragmented local streets – all centring upon a half-mile square neighbourhood unit.

A more recent strain of criticism has come from network theory, especially as it has been applied to street networks. For example, Hillier et al (2010) provided an analysis of connectivity patterns that reinforced Jacobs' criticism of "border vacuums" around neighbourhood units that are too large and disconnected. Porta et al (2011) have cited evidence from recent research in complex networks that demonstrate that large, isolated residential islands disrupt universal dynamics in the relationship between space and service/retail location in cities. Their evidence shows that community services and shops reinforce each other in urban systems (of all kinds and ages) most effectively, when they are spatially associated with main streets and thoroughfares, which allow them to exploit the so-called "movement economy" (Hillier et al, 1993). Uses that are not so located tend in the long term to struggle, or fail altogether.

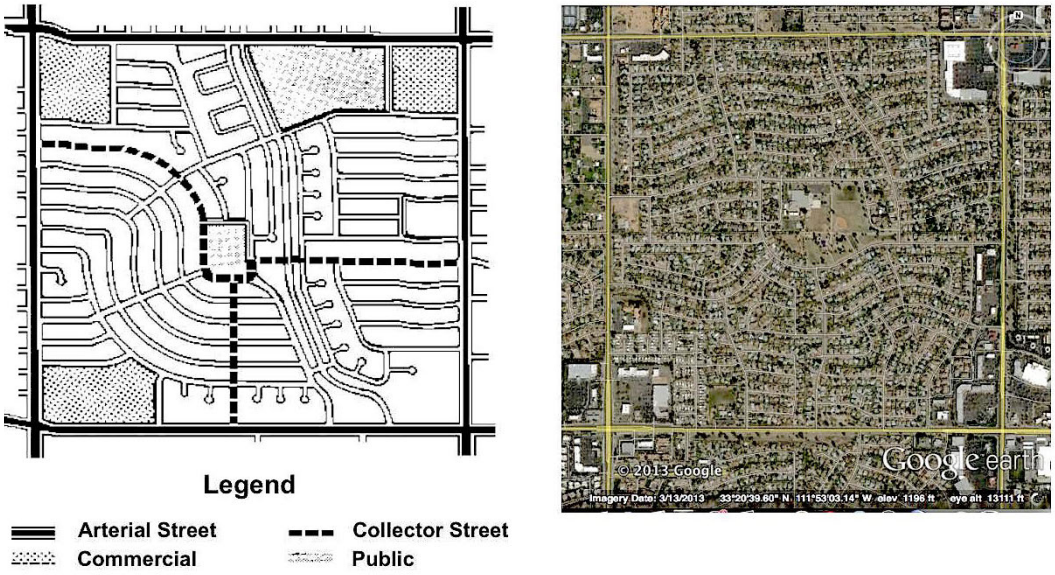

FIGURE 5.2 The Neighborhood Unit integrated with the US Functional Classification System (left) which became the model for development in cities like Phoenix (right). Areas of minimum ½ mile in width interrupted through traffic, which was concentrated in perimeter arterials. Central uses were limited to neighbourhood institutions, like parks and schools. The perimeter arterials fed largely discontinuous collectors, which led into highly discontinuous local streets. Sources: fhwa.gov, Google Earth.

Recent transportation advocates (e.g. Hall 2011) have also argued that the old arterial models, rooted in the outmoded engineering logic of the tree-like "functional classification system," are no longer viable. The latest models, by contrast, follow the diffusion logic of networks, and the elastic, adaptive dynamics of agent-based systems. Vehicle drivers are not like molecules of water in a pipe, but can choose their mode and route. The more engineers provide wide, fast arterials for automobile-dependent transportation, the more they "induce demand" and generate ever more congestion. Meanwhile, wide and fast arterials sever the pedestrian connectivity between neighborhoods, by creating disruptions along their borders.

Reform-minded transportation engineers today are therefore focused less on "mobility" as an absolute goal, and more on balancing *mobility* with *access*. They do so by creating a *diffusion network*, and by reducing the need for trips, and offering alternate transportation choices. Jacobs, Macdonald and Rofé (2002) argued that fast single-mode arterials have a viable alternative in the form of multi-modal, multiway boulevards. Hall (2011), a New Urbanist traffic engineer, served as a co-author on the Institute of Transportation Engineers' recommended practice guide, Walkable Urban Thoroughfares (ITE, 2010). He noted that the new approach no longer requires isolated neighbourhood units -- what he termed "pedestrian petting zoos." The answer to Perry's "raging streams of traffic" is thus not to turn our backs on them, but to engage them, and convert them into a more context-sensitive, pedestrian-friendly "diffusion network" of much calmer, narrower, streets and boulevards. At the same time, residents need to be offered multiple travel modes, a complement of ordinary daily destinations that are well-distributed and, where car travel is still desired, a more integrated and adapted form of automobility (Hall, 2011).

A key problem for Perry, according to some prominent transportation critics, is in creating viable public transit service. One such critic is Shelley Poticha, former senior urban advisor for the Obama administration, and previously executive director of the Congress for the New Urbanism (CNU). At a 2008 CNU conference session, she gave a very public critique of the fragmentation of transport in an updated version of Perry's model proposed by New Urbanist practitioner Doug Farr (Poticha, 2008).

Farr removed the segregation of civic from commercial uses, but otherwise left the features of Perry's scheme intact (see Figure 5.3).

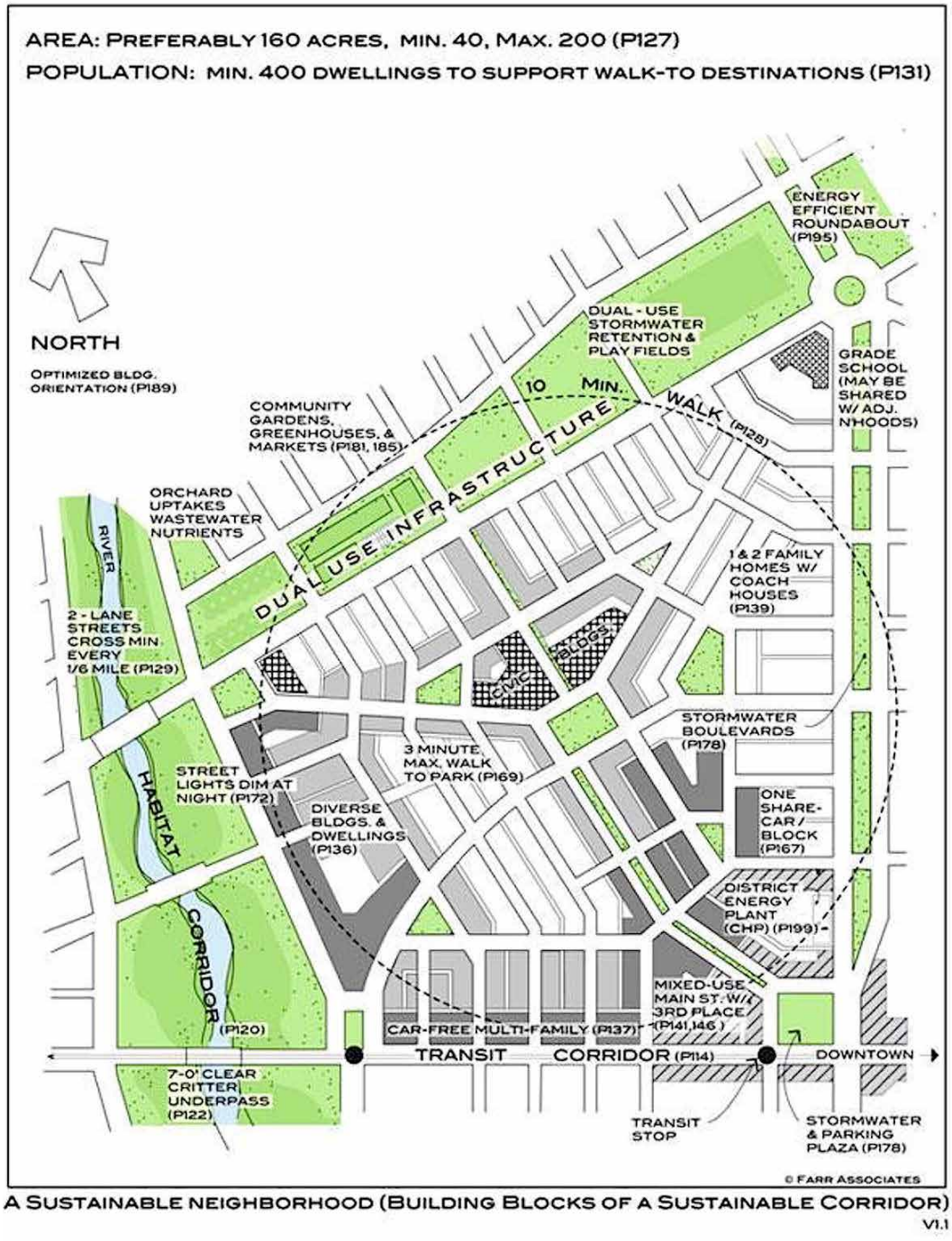

FIGURE 5.3 An updated version of the Clarence Perry Unit, shown in Doug Farr's 2008 book *Sustainable Urbanism*. The segregation of civic from commercial uses has been removed – but the relatively impermeable ½ mile square unit bounded by more concentrated, comparatively fast-moving arterials, remains. So do the connectivity issues across these arterials – and also between the units, and across the larger city. Source: Farr and Associates (2008).

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The criticism by Poticha and others is as follows: By not centring neighborhoods on arterials, the Perry model and its variants create a fragmented transit service area that cannot be serviced cost-effectively. According to such critics, this failure has a significant impact on the viability of a public transit system, and on the resulting ability to reduce carbon emissions from urban transportation.

Australian urban designer Chip Kaufman, in an email to Andres Duany and others, described such a problem in "a surreal tropical siting of a Perry-inspired English new town." Before presenting his solution, Kaufman showed the existing condition "to show Perry's influence even this far from the UK. Who could support such an influence?" The trouble, he says, is that the unitary neighborhoods do not allow transit at their centres, which would be far more efficient; instead, the transit must effectively zig-zag around their edges, which is highly inefficient. (Personal communication, copied to the authors and used with permission, October 14, 2010).

Ultimately, criticism of Perry's diagram, and indeed of the neighbourhood *as a design unit,* has come from the discipline of urban morphology. For example, Mehaffy et al. (2010) have raised the argument that in its initial conception the neighbourhood unit fostered a fundamental flaw in *the scale* of the city, which informed the construction of the modern city and contributed to many of its key failures. The neighbourhood unit size has always been tailored around the size of a pedestrian catchment area, i.e. the typical 5 minutes walk or ¼ mile (approx. 400 meters), by fixing this distance as *the radius* of the circle inscribed in the unit's boundaries. As a consequence, major urban arterials placed at the borders of these units are set ½ mile (800 meters) apart. By contrast, cities in history have been built, to a remarkably consistent degree, at roughly *half* that scale - that is, they have a remarkably consistent network of through streets that are spaced at about ¼ mile or 400 meters apart. The scale of this urban network, as we argued, has impacts on a number of critical factors influencing urban life and dynamics, such as vehicular diffusion, connectivity, navigability, accessibility to shops and services, pedestrian mobility, and a more integrated vehicular mobility. The historical act of *doubling* this measure (and thus quadrupling the areas involved) now can be seen as having a major deleterious effect on the structure of walkable cities, and advancing excessive automobile dependence. In short, this "alteration in scale" has been devastating to the multi-modal integrity of cities.

There is one other criticism of neighbourhood-based planning that is well worth mentioning: the notion that a neighbourhood is even properly regarded as an artefact to be created by planners, as a formulaic unit or otherwise. Baird et al (2010), in a more specific version of Jacobs' "fluidity of use" argument, propose that it was exactly the continuity of the urban fabric that enacted the self-organizing, continuously changing, adapting formation of neighborhoods in historical cities -- at least until the advent of "professional" theories of urban design in the 20th century. The neighbourhood, they argue, is essentially a social construct, made of ever-changing and layered systems of personal and collective links within and across cultural boundaries.

Research in environment behavior studies on what contributes to residential preferences, place attachment, and place identity, has also established that neighborhoods are psychological concepts, and that often there is no correspondence between this conceptualization and the pre-established physical boundaries of a neighbourhood (Gifford, 2002).

Research has also uncovered an important link between neighbourhood satisfaction and broader concepts such as personal satisfaction with the city as a whole, psychological well-being, and satisfaction with quality of life in general. Important non-spatial determinants of perceived quality include participation in organizations outside the neighbourhood, as well as other physical, cultural, personal and societal factors (Gifford, 2002).

Lastly, as Hall, Porta and others have noted, it is doubtful whether "walkability" is a meaningful concept when confined to isolated residential pockets, "cut apart" from one another by "raging streams of traffic" (in the words of Clarence Perry). More likely, it seems that such pockets will be little more than what Rick Hall dubbed "pedestrian petting zoos" – providing very poor access to essential services and destinations.

Therefore, the design of urban space can contribute to neighborhoods, most importantly, by assuring continuity of accessibility across a larger urban field. Within this field, neighborhoods can emerge under the "attraction" of central services, but still more or less spontaneously. That continuity is in fact essential to enable the purely social dynamics of neighborhoods to occur, and it can't be severed without fundamentally undermining the social cohesion of urban communities, their identity and place attachment – and ultimately, the identity and vitality of the city as a whole.

§ 5.5 Empirical evidence for the poor performance of the neighbourhood unit

As we have seen clearly from the discussion of the Perry proposal, the neighbourhood unit in 20th Century practice proceeded from the assumed inevitability of large-scale, automobile-dominant transportation systems as requirements for modern mobility (Perry, 1929a, 1929b; Mumford, 1954). But this assumption is increasingly open to question in an age of resource depletion and environmental damage, and as policy has turned markedly toward greater diversity in transportation modes and destinations. In that light, a more rigorous re-assessment of the impacts of the neighbourhood unit, viewed as a ubiquitous element of modern urban morphology, seems overdue.

Though empirical research on neighbourhood units per se is still relatively immature, and direct causal links are weak, the circumstantial evidence already available suggests significant impacts. Research on areas planned according to neighbourhood unit theory – including very large suburban areas across the USA, Australia and other countries – shows lower rates of walking, higher rates of obesity, lower rates of social interaction, and higher rates of social isolation and exclusion, relative to older areas with more continuous urban fabric (see e.g. Power, 2001; Frumkin, 2002; Dannenberg et al, 2003; Berke et al., 2007; Diez Roux and Mair, 2009). There are surely other factors involved as well, but we suggest that there is enough evidence to shift the burden of proof onto the defenders of the neighbourhood unit.

Calculations of ecological footprints also show a heavy current imbalance between consumption of productive land in developed and developing countries, with North America, Canada and Northern Europe featuring the greatest values, and a dangerously speedy trajectory towards the overall depletion of productive land. This depletion is closely tied to the growth of automobile-based suburban development, within which neighbourhood unit planning has played a historically prominent role (Frey and Yaneske, 2007). Though causal evidence is incomplete, once again it seems the burden of proof must be on the proponents of continued neighbourhood unit planning, to justify its continued use as an ecologically responsible practice.

Research is also indicating a significant increase in greenhouse gas emissions per person in suburban areas that have extensively used neighbourhood unit planning, such as Phoenix and other US cities (Brown, Southworth and Sarzynski, 2008). Hankey and Marshall (2010) presented evidence that 15–20% of projected cumulative emissions in the USA could be reduced through feasible changes

in urban form, including more continuous walkable fabric. This benefit was from transportation efficiency alone; when adding other factors such as infrastructure and associated building type, the feasible reduction amount could well be significantly more.

Though this circumstantial evidence needs confirmation with more direct causal evidence, it seems sufficient to conclude at this point that with regard to greenhouse gas emissions and related challenges of resource consumption, neighbourhood-unit planning is, at best, problematic. The disruption of continuous walkable urban fabric may well perpetuate over-reliance on the automobile, and reduce the capacity for more inherently efficient, self-organizing urban patterns. This would be entirely consistent with Jane Jacobs' critique, and with the new insights of network science – but it does merit further evaluation and confirmation.

§ 5.6 Evidence from empirical examples for the feasibility of continuous walkable urbanism

Paul Murrain and other critics of modern neighbourhood unit planning argue that the mobility demands of modern cities *can* be met, even as they maintain a continuous fabric of diverse walkability. As evidence, they point to a large number of empirical examples of successful modern cities that do a reasonably good job of the latter.

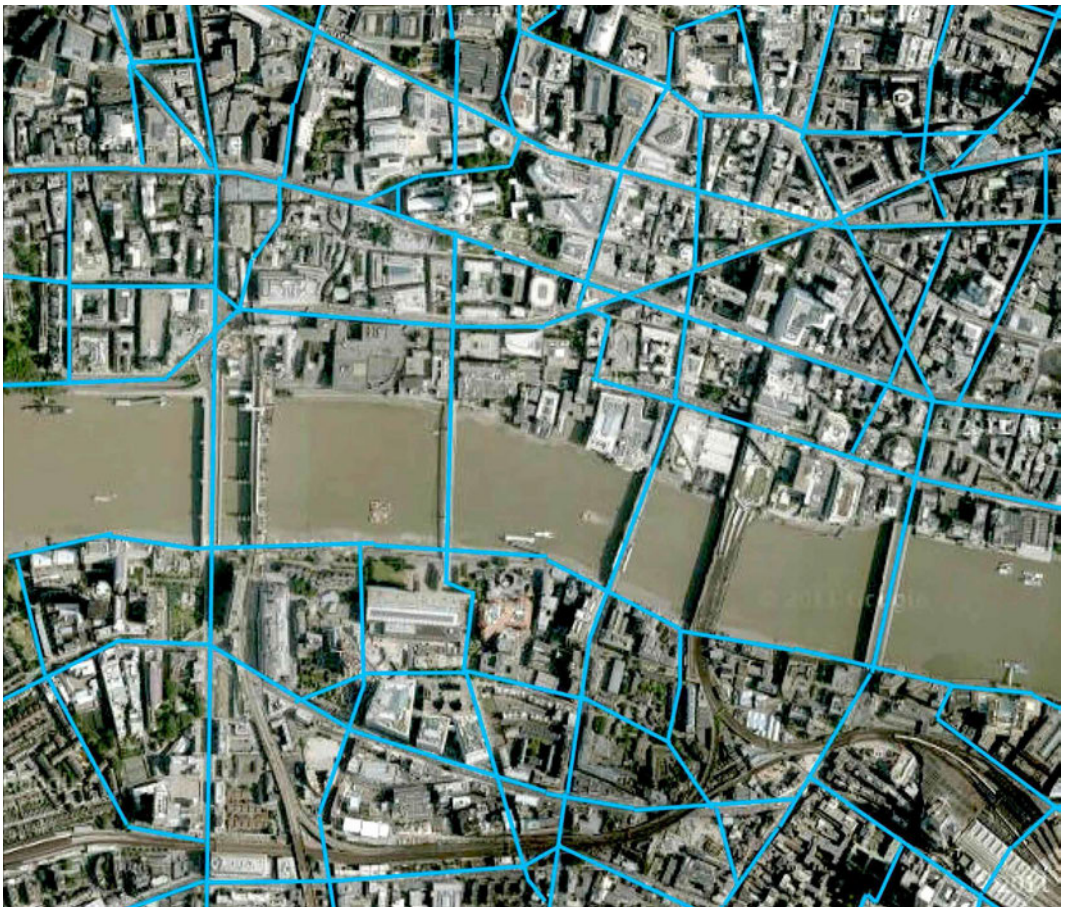

FIGURE 5.4 An aerial of central London showing a portion of its pedestrian-permeable network, at no more than 1/4 mile (400m) nodal spacing for the multi-modal through street network. Source: Google Earth, drawing by S Porta (2012).

Critics like Andres Duany argue that modern cities require a balance of mobility with access, and therefore, except within the neighbourhood unit itself, vehicular mobility must supersede pedestrian mobility. But many modern cities (as we discuss below) do maintain a surprising degree of large-scale pedestrian mobility, while simultaneously providing vehicular mobility and vehicular access. Again, the question is one of balancing the scales of integration, especially between pedestrian and vehicular modes.

Murrain, for his part, has brought to Duany's attention the example of London, which maintains continuous walkable fabric in one of the most modern and economically successful cities in the world. Instead of being cut up into isolated residential islands, London manages to submerge the more damaging uses – again, freeways, railroads, subway lines – and maintain a remarkably small-scale, fine-grained urbanism in many areas. As Murrain notes, he is able to walk from his home in Southwark to many parts of the city – and does so frequently -- without encountering any significant pedestrian barriers. (Figure 5.4.)

Another intriguing example – and a darling of many New Urbanist planners on both sides of the Perry debate – is Portland, Oregon. By accident of history, and by virtue of later visionary planners inspired by Jacobs, Portland's central core (not to be confused with its suburbs) has managed to achieve many of Jacobs' key "generators of diversity:" mixed use, small blocks, a mix of old and new buildings, and (at least by US standards) concentration of population and activities (Figure 5.5.) It does so while maintaining a relatively successful modern economy that presents no evidence of a deficit of mobility.

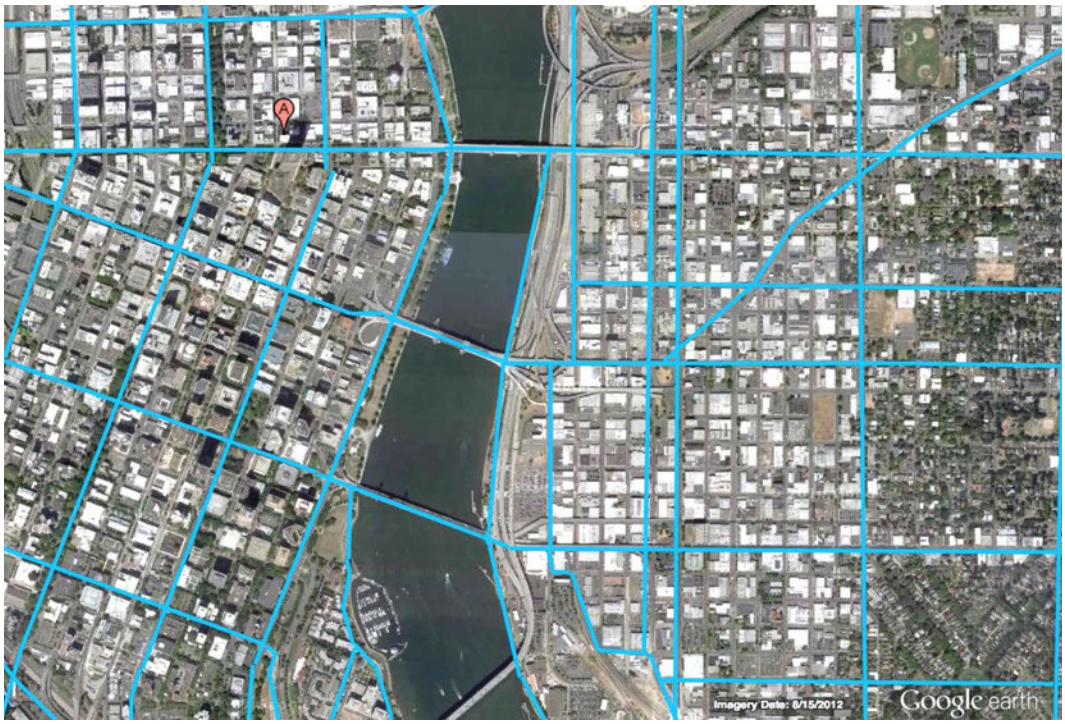

FIGURE 5.5 An aerial photograph of Portland, Oregon showing its pedestrian-permeable network of relatively low-speed arterials at a maximum 1/4 mile (400M) spacing, which continues at grade across the river as well as much of the central freeway system. The interstitial areas within the grid, which are interrupted with traffic-calming features designed to discourage cut-through traffic, are roughly half the size of a Perry Neighborhood unit. This more diffuse, permeable, multi-modal network aids in what Jacobs called "thoroughgoing city mobility and fluidity of use. Source: Google Earth, drawing by S. Porta (2012)

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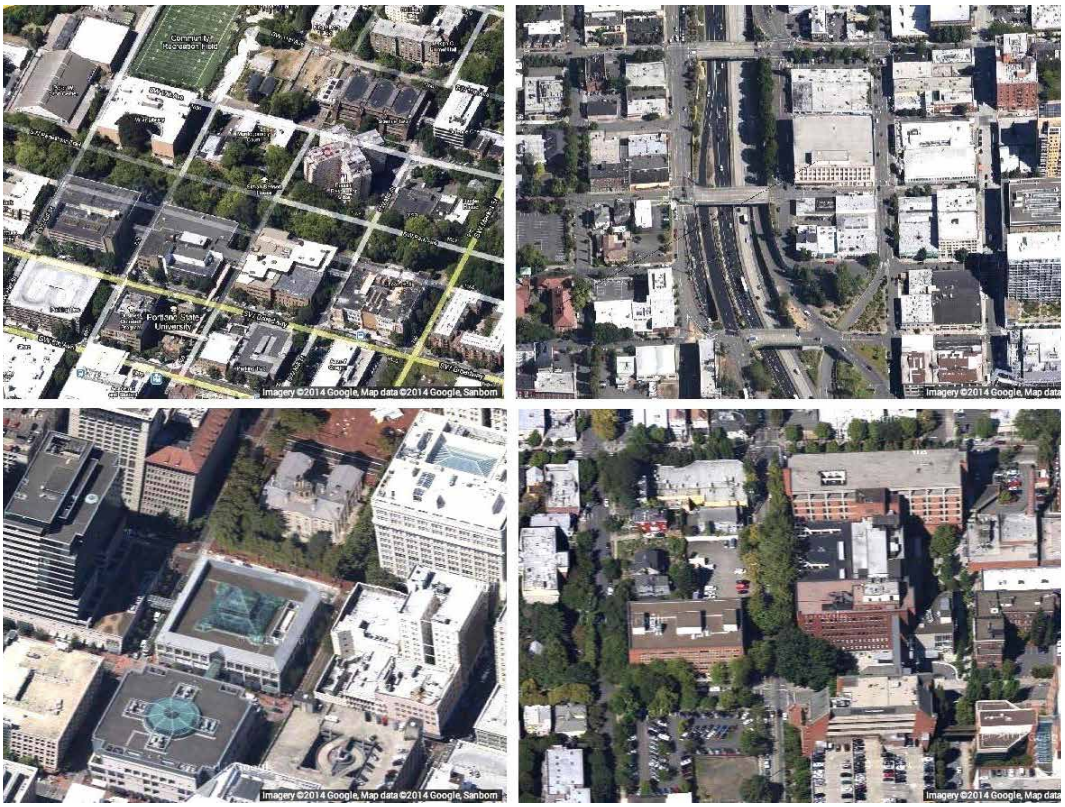

FIGURE 5.6 More viws of Portland's grid of pedestrian-friendly thoroughfares, and its permeability at no more than ¼ mile, across the river, a park, and local freeways, as well as other areas that are usually assumed to be impermeable. The neighbourhood unit's typically fast ½ mile arterial grid surrounding a superblock-like impermeable cluster of local streets is missing. Indeed, typical "campus" uses are seamlessly integrated into a fluid grid. Upper left: a university district, home of Portland State University's 25,000 students. Lower left: Pioneer Place, a shopping mall spread over three blocks. Upper right: a typical flex industrial zone, with pedestrian-friendly thoroughfares passing at grade above a freeway. Lower right: Good Samaritan hospital district. Source: Google Maps.

Portland has also managed, to a remarkable degree, to maintain a continuous walkable urban fabric, even across the kinds of barriers that Jacobs warned against: rivers, freeways, large parks, schools, industrial areas, even shopping malls and hospitals (Figure 5.6). As it has done this, it has also accomplished the remarkable feat of providing vehicular mobility *and* access.

By continuing the walkable small-block grid through these uses – and often allowing them to span the grid with bridges and tunnels spaced at approx. ¼ mile – the city demonstrates that large-use specialist functions ***can*** be integrated within small-grained urban areas, thereby avoiding what Jacobs called "border vacuums." The most challenging uses, freeways, are submerged in key neighborhoods, while the street grid continues overhead (Figure 5.6, upper right). The same challenges are met in the case of rivers, and other large disruptions. Other large uses (hospitals, universities, shopping malls, industrial districts) also function well within a modern economy, while simultaneously integrating a permeable pedestrian network.

This tactic was also implemented in Barcelona after the Olympics, therefore achieving a higher level of integration between local neighborhoods that were previously severed on both sides (Figure 5.7).

Portland's urban form has allowed it to support an unusually high modal share of walking, biking and transit relative to automobile trips – one of the highest for walking and biking combined in the US, according to the US Census Bureau's 2010 survey. The city has also achieved an impressive

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reduction in greenhouse gas emissions, according to the Climate Action Plan report of the City of Portland and Multnomah County (2009, p. 12). That report indicates that the per capita emissions in 2008 were 19% below 1990 levels. Whether this impressive achievement has been the result (at least partially) of the fluidity of pedestrian and bicycle mobility across neighborhoods remains to be fully demonstrated. However, the arguments presented herein outline a powerful case in the affirmative, in our view.

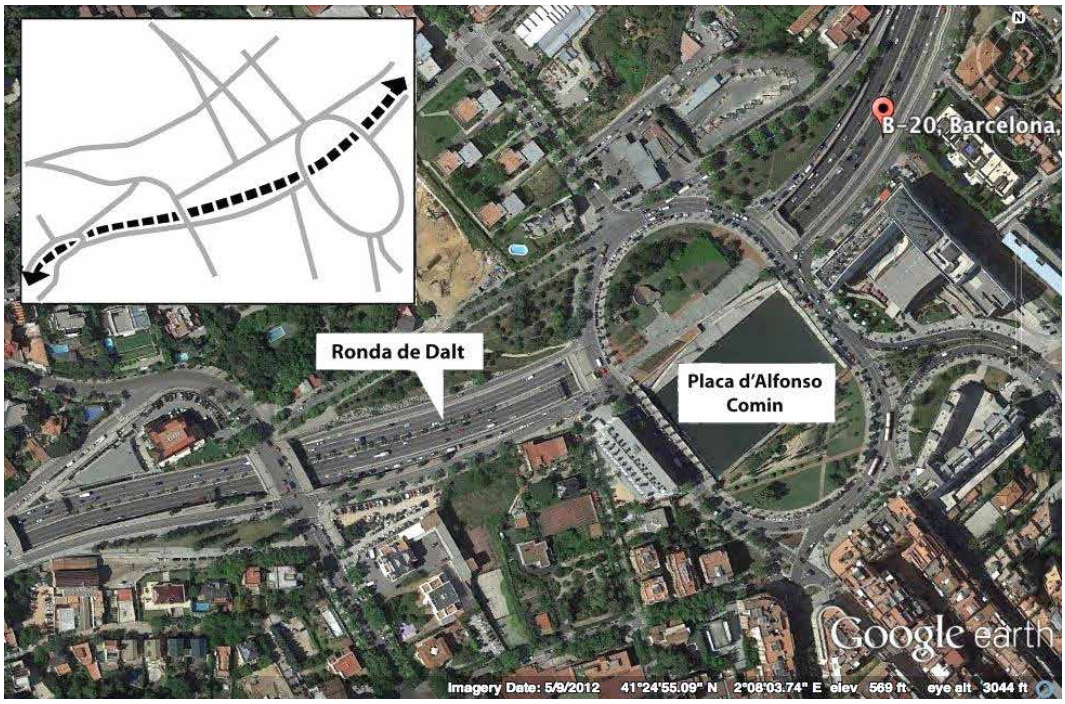

FIGURE 5.7 Barcelona's pedestrian network was integrated across a freeway as part of the 1992 Olympics. Source: Google Earth.

§ 5.7 Conclusion

As we have seen, vigorous and even impassioned debate over use of neighbourhood unit planning continues today among prominent planners. New questions have arisen about the effect of standardized neighbourhood unit planning on viable public transportation, cross-neighbourhood walkability, social diversity, movement economics and other critical parameters. Critics now claim - with the preponderance of evidence on their side, as we have seen - that it is time to discard the neighbourhood unit as a best-practice model. We have examined here an alternate model that has empirically demonstrated advantages.

In drawing conclusions, it must be noted that there is a distinction to be made between the transportation functions of a neighbourhood, and the social interactions and groupings that occur there. However, these two factors are clearly inter-dependent, and to the extent that the physical geometry of a neighbourhood constrains the social interaction there, the result seems likely to be a

predictable set of negative social effects. (As we noted, Clarence Perry accepted social segregation, and he was evidently not concerned that neighbourhood units might reinforce or increase this trend.)

On the other hand, a physical structure that is conducive to what Jacobs called "city mobility and fluidity of use" in turn would seem to have positive impacts on economic vitality, equity, and other social and environmental factors. The empirical evidence, while incomplete, tends to support this claim. Thus, the question of planning by neighbourhood unit appears to be one with profound implications for the long-term vitality of a neighbourhood, and its ability to self-organize into an economically and socially productive system.

We have also noted the incomplete but already strong circumstantial evidence that neighbourhood unit planning contributes significantly to environmental externalities and related impacts. As we noted, among other factors, there are new and disturbing questions about the increased rates of greenhouse gas emissions per capita associated with (and possibly caused in part by) neighbourhood-based planning.

Our conclusion is that an approach to neighbourhood structure "beyond the neighbourhood unit" – one that provides an appropriately scaled framework on which a more continuous, more spontaneous urban pattern may be formed -- is possible, and moreover necessary. The evidence does suggest that a much more optimum balance can indeed be achieved, seamlessly combining an essentially continuous walkable city fabric with the mobility functions afforded by modern transportation systems like arterials and railways.

As we have argued, the critical issue is one of scale: specifically, the scale of pedestrian mobility must be matched to the scale of vehicular mobility, within an integrated framework for fluid movement and growth (Mehaffy et al., 2010). Although more research is surely needed, examples from Portland and elsewhere do tend to show that such a goal can be reached. The preponderance of evidence also already strongly suggests that the neighbourhood unit, as a standardized repetitive element at a specified scale, fails this essential test.

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