The Environmental Paradox of Cities: Getting Around Dubai

By Douglas Kelbaugh, FAIA
Professor of Architecture and Urban Planning, University of Michigan, USA, worked in Dubai for two years as the Executive Director of Design and Planning at Limitless LLC, a government owned international real estate development company with a portfolio of mixed use, walkable, transit-oriented projects in Asia, Europe and the Middle East.

This editorial on transportation in Dubai is based on the environmental paradox of cities: when humans inhabit dense urban space, they <u>decrease</u> their impact on the <u>global</u> environment more than they <u>increase</u> their impact on the <u>local</u> environment; in other words, their ecological footprints <u>per capita</u> are smaller than in low-density sprawl. This young city of superhighways, superblocks and superhighrises rapidly developed in a disconnected pattern of homogenous enclaves that has undermined physical accessibility by automobile, public transit and foot, as well as the inherent vibrancy and sustainability of compact, complex, connected and complete urbanism.

The environmental paradox of cities means that, while intensifying environmental impact *locally*, the *global* impact of their density on climate change is less than their suburbs' impacts…that is, the same population living in low density patterns of development have a bigger ecological (especially carbon) footprint than if they lived in dense, mixed use, walkable, bikable, transit-oriented urbanism. In wealthy societies, there is a bigger footprint in either case, but in the rich or poor city, it's smaller than in suburbia on a *per capita* basis (which is a more meaningful and equitable sustainability metric on a global basis than the ecological footprint per hectare). Some experts have put a numerical value on this remarkably universal phenomenon: when a city doubles in population, its infrastructure and resource consumption increase by only 75-85% rather than by 100% (similar to the diminishing metabolic and heart rate of animals as they increase in weight). So, today's rapid global urbanization, if it isn't low-density sprawl, is generally a positive trend for the planet. It's especially good news if cities are dense and have a seamless, well connected mix of land use and transportation/transit modes.

Increasing the size, density and mix of uses has related salutary effects, such as promoting walking, biking and transit, which often enhance the public realm and sense of community in today's increasingly diverse cities. And it offers more convenience, with fewer and shorter trips, especially by automobile. Productivity, wages and innovation (as measured in inventions and patents per capita) also rise, as does economic, cultural and social opportunity. Also, a compact city keeps the surrounding countryside more intact, whether it's agrarian or wild. In short, compact cities are good for nature – human nature and Mother Nature. There are some negatives, like increased pollution, noise, congestion, walking speed and communicable disease, as well as crime, overcrowding and mental illness if the urbanism is of low quality.

Dubai

In its lighting fast and audacious development, Dubai, much to its credit, has got half the equation right: it's dense enough to begin to partake of the paradox. Its next challenge is to embrace the other half of the equation - *mixed use* - with lots of worthwhile destinations in walking distance of lots of people, supported by transit and a well connected grid of streets and roads. Its low-rise residential areas are typically single-use and separated by an array of gates, walls, cul-de-sacs, and open land. And the high-rise clusters are also often single-use and difficult to get to.

The chorus line of highrises along Sheik Zayed Road, like fanciful perfume bottles competing with each other for attention, is stunning at night. (Fig. 1) But these trophy towers often ignore their context on the ground, making urban space that can be alienating and scaleless. There are some wonderful exceptions, like the new development ironically called Old Town, with the shimmering, tallest ever Burj Khalifa elegantly punctuating both the sky above and the complex below, which includes a world class fountain and gigantic mall. The Walk at Dubai Marina and the Dubai Financial Center are also delightful on foot, the latter during the day and the former evenings and weekends.

Figure 1   **Stylized highrises rise and shine on Sheik Zayed Road**

Stylized highrises rise and shine on Sheik Zayed Road, Dubai's ultra-wide and ultra-long High Street. There is little if any functional or bulk zoning and the towers – many over 70 stories - neither taper with height nor space themselves for daylight and air.

In this photo, nestling up to the skyscraper wall on the right is a low-rise subdivision of condos and villas on cul-de-sacs.

As an architect I could rant about the architectural excesses and superficialities, but, I want to wear my other hat as a urban designer and planner and to focus on getting around the city. Despite the new and impressive Metro system – a momentous step in the right direction – the city is still mired in the superblock/superhighway/supergrid transportation model. Like all such systems, it privileges *mobility* over *accessibility,* i.e., it's designed to move as many vehicles as fast as possible, rather than enabling as many people as possible to get to where they want or need to be. And the vaunted mobility is compromised by frequent traffic jams and pervasive 24/7 construction traffic, although both have slackened since the recession. It goes without saying that the roads and streets are inhospitable to pedestrians and bicyclists.

No left turn – the paradox of intersections

The superblock pattern is a result of vast tracts of land granted to public or private developers by the government to promote growth. With the relentless drive for fast build-out and no comprehensive regional plan, these large parcels have been typically developed as self-contained if not gated communities, creating an archipelago of independent neighborhoods and districts. Most of them act like large lakes that must be driven around. The makes for a less permeable network of public roads, resulting in longer, less direct trips, more traffic, gas consumption and greenhouse gas emissions. There simply aren't enough intersections, especially ones that allow left turns, which is the point of greatest friction and conflict - the Achilles Heel - of any vehicular network.

Traffic roundabouts have reduced the friction inherent in the left turn. However, widening them to three or four lanes has proved very dangerous for drivers, and impossible for pedestrians. The lack of intersections that allowed left turns extended my nightly commute home – 5 km as the crow flies – to 18 km! (Fig. 2) Fortunately, for any car but the many Porsches or Ferraris, this ridiculous route could be cut in half by illegally cutting across several hundred meters of sand. The paradox here is that more intersections increase *accessibility* by shortening routes and travel times, even though turning vehicles slow the speed of traffic. Network connectivity and its sibling proximity, are usually of greater value in driving around cities than high travel speeds on the road. A network is better than a tree; accessibility trumps mobility.

Figure 2   Poor Road Connectivity Increases Travel Distances

Fig. 2 – The lack of places to turn left tripled the distance of my evening commute home. The morning commute was 1/3 as long, because of more opportunities to turn right. With a grid many times coarser than Manhattan, everyone lives, works and shops on large islands surrounded by a ring of asphalt and sea of sand.

And then there's the superhighway supergrid, the American model on hormones. With up to six or even seven lanes in either direction and the world's largest and most baroque interchanges, it can be hair-raising to drive and hair-pulling to navigate. If you miss your exit, you might well miss your meeting. It can take 15 – 30 minutes to recover, and that's only if you have a co-pilot or GPS; and neither map nor electronics can quite keep up with the changing roads and construction detours.

More roads, not more lanes

Let's hope the Roads and Transport Authority's (RTA) plan to carpet the entire Emirate with this supergrid is no longer on the table. (Fig. 3) The hubris and absurdity of this vision is enough to make Los Angeles or Houston blush. And the automatic policy of adding more *lanes* to decongest roads needs to give way to adding more *roads*, especially the missing links in a grid that is too coarse and too incomplete. And those empty 12 lane bypass roads, which feel like a future whose time has passed, should give way to investment in the UAE's proposed national rail system.

Figure 3   **An RTA Plan To Carpet The Entire Emirate With A Supergrid**


An RTA plan to carpet the entire Emirate with a supergrid of superhighways is over-the-top and hopefully over its shelf-life.

A supergrid is not an urban grid: less a Corbusian "machine for living" than a machine for moving machines that move.

There are other smaller discontinuities in the road network, most notably the cul-de-sac, which contribute traffic to the network without providing additional capacity to it. People living on these dead ends may enjoy their quiet privacy, but they are transportation parasites within the larger network. Low traffic on cul-de-sacs means more traffic elsewhere. A city has two basic options: *spread out* its traffic across a close-grained network of many streets to equitably share the traffic burden, or *channel* it on a more hierarchical network of cul-de-sacs, collector, arterials and highways (which typically spares the wealthy neighborhoods). The former strategy favors accessibility and the latter mobility (as long as the major roads are not overloaded with traffic). In fact, the connected grid has greater capacity per lane mile, because the many intersections allow turning left without traffic signals, by slipping between oncoming cars. Whereas the arterial grid requires dedicated left turn lanes and multi-phase traffic signals, with a red light that not only seems longer but actually is longer than the green light. (Fig. 4)

Figure 4   **Grid Versus Hierarchical Road Network**
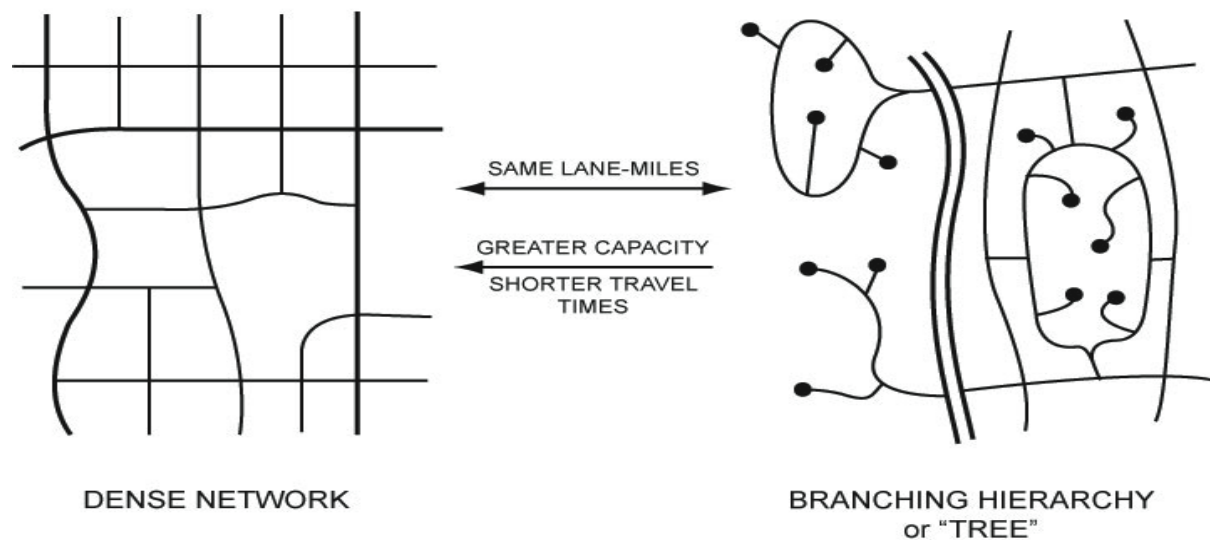
A dense network of roads/streets (on left) has greater capacity than the tree-like hierarchy of the superhighway and superblock arterials with collectors and cul-de-sacs (on right). Travel distances and times are shorter with a network while moving more vehicles on an equivalent amount of roadway (which also means less pavement to install and maintain, plus less run-off, land use and heat gain for the same capacity and travel times).

In Dubai, the preferred traffic calming device is the speed bump. They are more than a constant pest – they shorten the life of your vehicle's suspension system and the length of your cervical spine, and can be a literal pain in the neck. (There were several dozen speed bumps on my daily commute.) Sometimes they are placed sensibly on neighborhood streets, to warn the driver of an upcoming pedestrian crosswalk or intersection. But too often they are used on arterials and even highways, to simply slow down drivers, who are all assumed to be speeders if unchecked. This assumption may be true for many of us, but there are less tyrannical ways to put the brakes on fast drivers. Research has shown that driving speed is determined more by street and lane width than by posted speed limits. Narrower roads not only slow traffic, they cut the consumption of land, asphalt and energy, as well as reduce stormwater run-off, road maintenance, and the flooding and erosion that often follows rainstorms. Why build wide roads that are engineered for high speed, and then impede that speed with jarring bumps? It's like putting one foot on the gas pedal and the other on the brake pedal at the same time.

Transit – Public and Private

The RTA has made significant progress in public transit, now operating the first line of the world's largest automated Metro, as well as a growing fleet of handsome standard and double-decker buses. (Fig. 5) There are even gleaming (if under-insulated) air conditioned bus shelters, which are welcome for the half of the year that is intensely hot and humid. The seldom-discussed transportation backstory, however, is *private* transit. I mean the many private vans, mini-buses, and buses that ferry workers to and from their workplaces (mainly construction sites) and their often remote, segregated and very crowded living quarters (8 men to a room!). These vehicles total about 200,000! They are everywhere, mostly vans, but over 10,000 light and heavy buses – 10 times the number of public buses. It's rarely mentioned, but it's this private transit that is doing the lion's share of moving workers around the city. This system results in much lower vehicle miles traveled (VMT) and tailpipe emissions (although some of these buses are old and polluting) than if the workers were commuting in private cars, or even in public buses, which are not usually as packed as the company buses. The poorly-paid, over-worked army of construction laborers are the unsung transportation, as well as construction heroes of Dubai.

Figure 5   Multiple Modes

Cars, taxis, vans, buses, trucks and Metro stream and sometimes scream by the world's tallest building, which stands higher than the Empire State and Chrysler Buildings stacked one atop the other

It's no secret that the traffic fatality rate, especially for pedestrians, is among the highest in the world. It's often blamed on poor drivers who hail from many different countries and cultures. But surely, the excessive width of the local roads and number of highspeed roadways contribute. Other fallout of Dubai's automobile-dependent lifestyles is the lack of physical exercise and the fast-food culture of roadside eateries. Both factors contribute to the native Emeratis' rate of obesity and diabetes, probably the highest in the world. But Dubai's worst stigma is the planet's highest per capita ecological footprint, pumped up by the high vehicle usage (as well as by a "construction economy," which continues despite the economic downturn, albeit at much slower pace).

Infill the missing fabric and links

Dubai, having built an extensive infrastructure and many high density areas, is now in a position to get the second half of the urban paradox right. It can *infill* existing development, and build more mixed use, walkable urbanism on the open urban land that has been leapfrogged, as well as add the missing links in the transportation network. Just as important as connecting the dots, the existing *single use* dots need to be transformed into more complete and complex districts and neighborhoods. New and retrofit development is best located near Metro stations, with the highest densities within a quarter mile radius. To be fair, this type of infill is exactly what many U.S. cities also need to do, if they are to overcome the equally unsustainable imprint of single use zoning and the leapfrog development of endless suburbs.

If these places are well designed, interesting, humane environments, people will live, work, shop and recreate there not only because of proximity, but because they *want* to be there. They will enjoy being footloose pedestrians on pleasant days and evenings, just as they now flock to The Walk in Dubai Marina or mob the dancing fountain at Dubai Mall. Walking is the healthiest, greenest, safest, cheapest, friendliest and most enjoyable way to move around a city. With a rich mix of uses and a pedestrian scale, walking will flourish, even in less than perfect weather. And transit, which always starts and ends with a walking leg, enables the pedestrian to get around the whole city.

A city without mixed use is simply dense, highrise sprawl*,* which is typically the worst of both worlds: it offers neither the stimulating life of cities nor the quiet privacy and greenery of suburbs. If suburban sprawl is boring to Gen Xers and Yers, dense sprawl is not only boring but noisy and crowded. Monocultures, like over-specialized species and ecosystems, are inherently less sustainable. In social, economic and environmental terms, they are less resilient, less able to adapt and co-evolve with changing conditions. Nor are they as culturally vibrant, architecturally rich, or spatially interesting.

The government-owned company in Dubai for which I worked while on leave from the University had an international portfolio of projects that embodied these principles. Alas, like most developers in the global recession, it had no choice but to radically downsize itself and cancel most of its projects before it could help reshape the prevailing development model. On the other hand, this hiatus in the economy's breathless pace of growth – whether for several years or a decade – is precisely what's needed in Dubai and other overheated, overleveraged economies and in cultures of excess, including my home country. Except for the unequal distribution of economic pain across society, the interlude provides this small Emirate the opportunity to take stock of its breakneck trajectory from a creekside pearling village to a world metropolis in half a century. To its credit, this remarkable explosion of an instant city in an empty desert was fueled as much by raw gumption and vision as by the petrodollars flowing through it. Like many countries the world over – including and in some cases *especially* in the industrialized West – now is the time for Dubai to harness that energy and bravura to a new vision, one that is not short-sighted or naively futuristic but more measured and mature. It can become more sustainable, strategic and, in more ways than one, streetwise. It is poised to embrace a more complex urbanism, with its paradoxical environmental dividends. Its survival – like that of every metropolis – depends on it.

www.vtpi.org/Kelbaugh_Dubai.pdf