Urban
Studies and Sprawl
(Concepts, Elements & Issues)

Darrin Brunner
Viviana Kaminski

Revised Edition: 2016

ISBN 978-1-280-13354-1

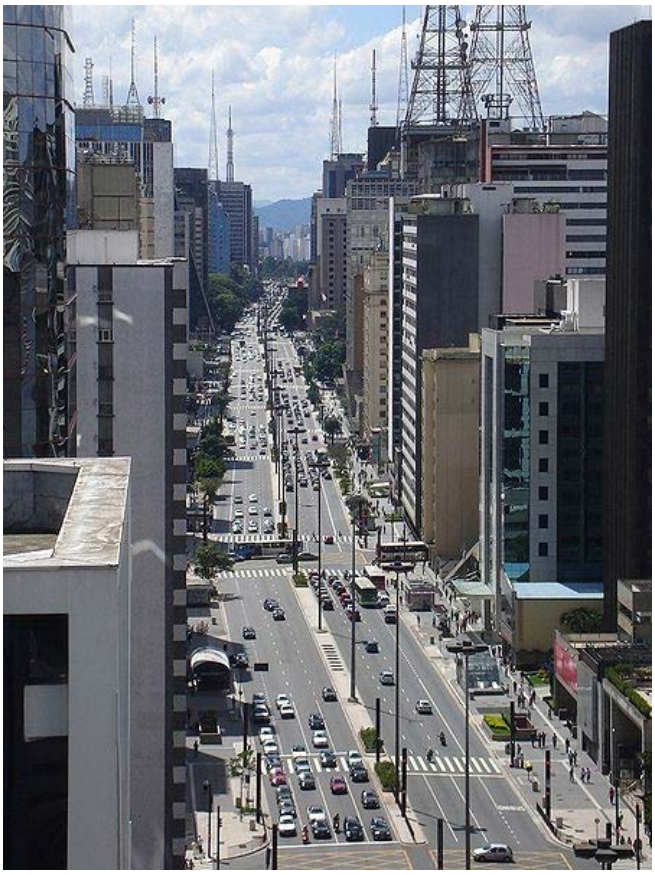
Published by:
Academic Studio
48 West 48 Street, Suite 1116,
New York, NY 10036, United States
Email: info@wtbooks.com

Table of Contents

Chapter- 1

Urban Planning and Urban Design

Urban Planning

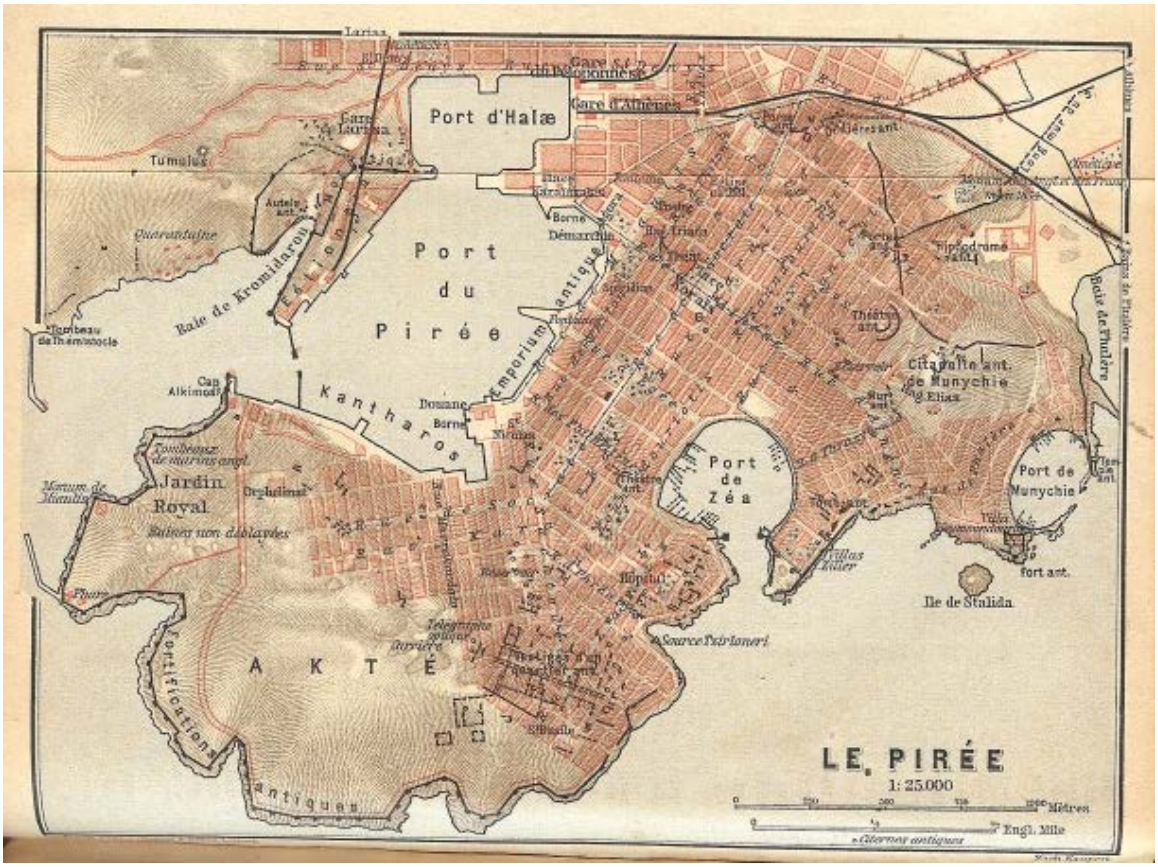


Paulista Avenue, the most traditional and important financial center in São Paulo and Brazil .

Urban, city, and town planning integrates land use planning and transportation planning to improve the built, economic and social environments of communities. Regional planning deals with a still larger environment, at a less detailed level.

Urban planning can include urban renewal, by adapting urban planning methods to existing cities suffering from decay and lack of investment.

History



Map of Piraeus, the port of Athens, showing the grid plan of the city.

In the Neolithic period, agriculture and other techniques facilitated larger populations than the very small communities of the Paleolithic, which probably led to the stronger, more coercive governments emerging at that time. The pre-Classical and Classical periods saw a number of cities laid out according to fixed plans, though many tended to develop organically. Designed cities were characteristic of the Mesopotamian, Harrapan, and Egyptian civilizations of the third millennium BCE.

Distinct characteristics of urban planning from remains of the cities of Harappa, Lothal, and Mohenjo-daro in the Indus Valley Civilization (in modern-day northwestern India and Pakistan) lead archeologists to conclude that they are the earliest examples of deliberately planned and managed cities. The streets of many of these early cities were paved and laid out at right angles in a grid pattern, with a hierarchy of streets from major boulevards to residential alleys. Archaeological evidence suggests that many Harrapan houses were laid out to protect from noise and enhance residential privacy; many also had their own water wells, probably for both sanitary and ritual purposes. These ancient cities

were unique in that they often had drainage systems, seemingly tied to a well-developed ideal of urban sanitation.

The Greek Hippodamus (c. 407 BC) has been dubbed the "Father of City Planning" for his design of Miletus; Alexander commissioned him to lay out his new city of Alexandria, the grandest example of idealized urban planning of the ancient Mediterranean world, where the city's regularity was facilitated by its level site near a mouth of the Nile. The Hippodamian, or grid plan, was the basis for subsequent Greek and Roman cities.

The ancient Romans used a consolidated scheme for city planning, developed for military defense and civil convenience. The basic plan consisted of a central forum with city services, surrounded by a compact, rectilinear grid of streets, and wrapped in a wall for defense. To reduce travel times, two diagonal streets crossed the square grid, passing through the central square. A river usually flowed through the city, providing water, transport, and sewage disposal. Many European towns, such as Turin, preserve the remains of these schemes, which show the very logical way the Romans designed their cities. They would lay out the streets at right angles, in the form of a square grid. All roads were equal in width and length, except for two, which were slightly wider than the others. One of these ran east–west, the other, north–south, and intersected in the middle to form the center of the grid. All roads were made of carefully fitted flag stones and filled in with smaller, hard-packed rocks and pebbles. Bridges were constructed where needed. Each square marked by four roads was called an *insula*, the Roman equivalent of a modern city block.

Each insula was 80 yards (73 m) square, with the land within it divided. As the city developed, each insula would eventually be filled with buildings of various shapes and sizes and crisscrossed with back roads and alleys. Most insulae were given to the first settlers of a Roman city, but each person had to pay to construct his own house.

The city was surrounded by a wall to protect it from invaders and to mark the city limits. Areas outside city limits were left open as farmland. At the end of each main road was a large gateway with watchtowers. A portcullis covered the opening when the city was under siege, and additional watchtowers were constructed along the city walls. An aqueduct was built outside the city walls.

The collapse of Roman civilization saw the end of Roman urban planning, among other arts. Urban development in the Middle Ages, characteristically focused on a fortress, a fortified abbey, or a (sometimes abandoned) Roman nucleus, occurred "like the annular rings of a tree", whether in an extended village or the center of a larger city. Since the new center was often on high, defensible ground, the city plan took on an organic character, following the irregularities of elevation contours like the shapes that result from agricultural terracing.

The ideal centrally-planned urban space: *Sposalizio* by Raphael Sanzio, 1504

The ideal of wide streets and orderly cities was not lost, however. A few medieval cities were admired for their wide thoroughfares and orderly arrangements, but the juridical chaos of medieval cities (where the administration of streets was sometimes passed down through noble families), and the characteristic tenacity of medieval Europeans in legal matters prevented frequent or large-scale urban planning until the Renaissance and the early-modern strengthening of central government administration, as European (and soon after, North American) society transited from city-states to what we would recognize as a more modern concept of a nation-state.

Florence was an early model of the new urban planning, which took on a star-shaped layout adapted from the new star fort, designed to resist cannon fire. This model was

widely imitated, reflecting the enormous cultural power of Florence in this age; "[t]he Renaissance was hypnotized by one city type which for a century and a half— from Filarete to Scamozzi— was impressed upon utopian schemes: this is the star-shaped city". Radial streets extend outward from a defined center of military, communal or spiritual power.

Only in ideal cities did a centrally planned structure stand at the heart, as in Raphael's *Sposalizio* (*Illustration*) of 1504. As built, the unique example of a rationally planned *quattrocento* new city center, that of Vigevano (1493–95), resembles a closed space instead, surrounded by arcading.

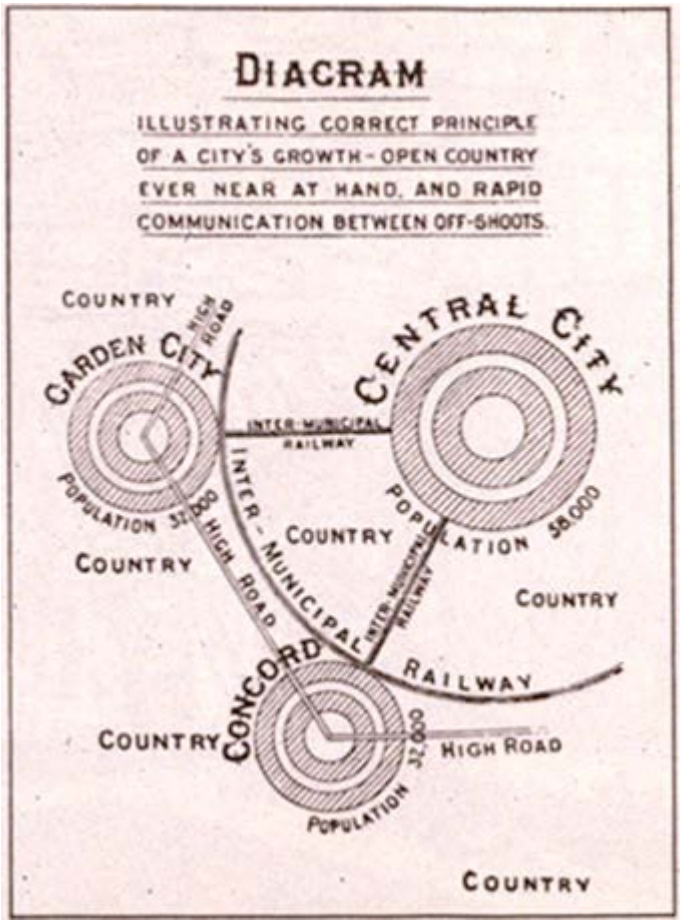
Filarete's ideal city, building on Leone Battista Alberti's *De re aedificatoria*, was named "Sforzinda" in compliment to his patron; its twelve-pointed shape, circumscribable by a "perfect" Pythagorean figure, the circle, took no heed of its undulating terrain in Filarete's manuscript. This process occurred in cities, but ordinarily not in the industrial suburbs characteristic of this era, which remained disorderly and characterized by crowding and organic growth.

Following the 1695 bombardment of Brussels by the French troops of King Louis XIV, in which a large part of the city center was destroyed, Governor Max Emanuel proposed using the reconstruction to completely change the layout and architectural style of the city. His plan was to transform the medieval city into a city of the new baroque style, modeled on Turin, with a logical street layout, with straight avenues offering long, uninterrupted views flanked by buildings of a uniform size. This plan was opposed by residents and municipal authorities, who wanted a rapid reconstruction, did not have the resources for grandiose proposals, and resented what they considered the imposition of a new, foreign, architectural style. In the actual reconstruction, the general layout of the city was conserved, but it was not identical to that before the cataclysm. Despite the necessity of rapid reconstruction and the lack of financial means, authorities did take several measures to improve traffic flow, sanitation, and the aesthetics of the city. Many streets were made as wide as possible to improve traffic flow.

In the 1990s, the University of Kentucky voted the Italian town of Todi as the ideal city and "most livable town in the world", the place where man and nature, history and tradition, come together to create a site of excellence. In Italy, other examples of ideal cities planned according to scientific methods are Urbino, Pienza, Ferrara, San Giovanni Valdarno, and San Lorenzo Nuovo.

Many Central American civilizations also planned their cities, including sewage systems and running water. In Mexico, Tenochtitlan was the capital of the Aztec empire, built on an island in Lake Texcoco in what is now the Federal District in central Mexico. At its height, Tenochtitlan was one of the largest cities in the world, with over 200,000 inhabitants.

Shibam in Yemen features over 500 tower houses, each rising 5 to 11 storeys high, with each floor being an apartment occupied by a single family. The city has some of the tallest mudbrick houses in the world, some over 100 feet (30 meters) high.



Ebenezer Howard's influential 1902 diagram, illustrating urban growth through garden city "off-shoots"

In the developed countries of Western Europe, North America, Japan, and Australasia, planning and architecture can be said to have gone through various paradigms or stages of consensus in the last 200 years. Firstly, there was the industrialised city of the 19th century, where building was largely controlled by businesses and wealthy elites. Around 1900, a movement began for providing citizens, especially factory workers, with healthier environments. The concept of the garden city arose and several model towns were built, such as Letchworth and Welwyn Garden City in Hertfordshire, UK, the world's first garden cities. These were small in size, typically providing for a few thousand residents.

In the 1920s, the ideas of modernism began to surface in urban planning. Based on the ideas of Le Corbusier and using new skyscraper-building techniques, the modernist city stood for the elimination of disorder, congestion, and the small scale, replacing them with preplanned and widely spaced freeways and tower blocks set within gardens. There were plans for large-scale rebuilding of cities in this era, such as the *Plan Voisin* (based on Le

Corbusier's Ville Contemporaine), which proposed clearing and rebuilding most of central Paris. No large-scale plans were implemented until after World War II, however. Throughout the late 1940s and 1950s, housing shortages caused by wartime destruction led many cities to subsidize housing blocks. Planners used the opportunity to implement the modernist ideal of towers surrounded by gardens. The most prominent example of an entire modernist city is Brasilia in Brazil, constructed between 1956 and 1960.

Reaction

By the late 1960s and early 1970s, many planners felt that modernism's clean lines and lack of human scale sapped vitality from the community, blaming them for high crime rates and social problems.

Modernist planning fell into decline in the 1970s when the construction of cheap, uniform tower blocks ended in most countries, such as Britain and France. Since then many have been demolished and replaced by other housing types. Rather than attempting to eliminate all disorder, planning now concentrates on individualism and diversity in society and the economy; this is the post-modernist era.

Minimally planned cities still exist. Houston is a large city (with a metropolitan population of 5.5 million) in a developed country without a comprehensive zoning ordinance. Houston does, however, restrict development densities and mandate parking, even though specific land uses are not regulated. Also, private-sector developers in Houston use subdivision covenants and deed restrictions to effect land-use restrictions resembling zoning laws. Houston voters have rejected comprehensive zoning ordinances three times since 1948. Even without traditional zoning, metropolitan Houston displays large-scale land-use patterns resembling zoned regions comparable in age and population, such as Dallas. This suggests that non-regulatory factors such as urban infrastructure and financing may be as important as zoning laws in shaping urban form.

Sustainable development and sustainability

Sustainable development and sustainability influence today's urban planners. Some planners argue that modern lifestyles use too many natural resources, polluting or destroyyying ecosystems, increasing social inequality, creating urban heat islands, and causing climate change. Many urban planners, therefore, advocate sustainable cities.

However, sustainable development is a recent, controversial concept. Wheeler, in his 1998 article, defines sustainable urban development as "development that improves the long-term social and ecological health of cities and towns." He sketches a 'sustainable' city's features: compact, efficient land use; less automobile use, yet better access; efficient resource use; less pollution and waste; the restoration of natural systems; good housing and living environments; a healthy social ecology; a sustainable economy; community participation and involvement; and preservation of local culture and wisdom.

Because of political and governance structures in most jurisdictions, sustainable planning measures must be widely supported before they can affect institutions and regions. Actual implementation is often a complex compromise.

Collaborative Strategic Goal Oriented Programming (CoSGOP) is a collaborative and communicative way of strategic programming, decision-making, implementation, and monitoring oriented towards defined and specific goals. It is based on sound analysis of available information, emphasizes stakeholder participation, works to create awareness among actors, and is oriented towards managing development processes. It was adopted as a theoretical framework for analyzing redevelopment processes in large urban distressed areas in European cities.

Background of CoSGOP'

CoSGOP is derived from goal-oriented planning (Gesellschaft für Technische Zusammenarbeit - GTZ 1988), which was oriented towards the elaboration and implementation of projects based on a logical framework, which was useful for embedding a specific project in a wider development frame and defining its major elements. This approach had weaknesses: its logical rules were strictly applied and the expert language did not encourage participation. CoSGOP introduced a new approach characterized by communication with and active involvement of stakeholders and those to be affected by the program; strategic planning based on the identification of strengths and weakness, opportunities and threats, as well as on scenario-building and visioning; the definition of goals as the basis for action; and long-term, flexible programming of interventions by stakeholders.

Elements of CoSGOP

CoSGOP is not a planning method but a process model. It provides a framework for communication and joint decision-making, in a structured process characterized by feedback loops. It also facilitates stakeholder learning. The essential elements of CoSGOP are analysis of stakeholders (identifying stakeholders' perceptions of problems, interests, and expectations); analysis of problems and potentials (including objective problems and problems and potentials perceived by stakeholders); development of goals, improvement priorities, and alternatives (requiring intensive communication and active stakeholder participation); specification of an improvement program and its main activities (based on priorities defined with the stakeholders); assessment of possible impacts of the improvement program; definition and detailed specification of key projects and their implementation; continuous monitoring of improvement activities, feedback, and adjustment of the programme (including technical and economic information and perceptions of stakeholders).

The graphical scheme of the Detailed Urbanist Plan for a settlement within the Municipality of Aerodrom within the City of Skopje, Republic of Macedonia.

Application

CoSGOP has been applied in European cross-border policy programming, as well in local and regional development programming. In 2004, the CoSGOP model was applied in the LUDA Project, starting with an analysis of the European experience of urban regeneration projects.

References

Collaborative planning in the United States

Collaborative planning arose in the US in response to the inadequacy of traditional public participation techniques to provide real opportunities for the public to make decisions affecting their communities. Collaborative planning is a method designed to empower stakeholders by elevating them to the level of decision-makers through direct engagement and dialogue between stakeholders and public agencies, to solicit ideas, active involvement, and participation in the community planning process. Active public involvement can help planners achieve better outcomes by making them aware of the public's needs and preferences and by using local knowledge to inform projects. When properly administered, collaboration can result in more meaningful participation and better, more creative outcomes to persistent problems than can traditional participation methods. It enables planners to make decisions that reflect community needs and values, it fosters faith in the wisdom and utility of the resulting project, and the community is given a personal stake in its success.

Experiences in Portland and Seattle have demonstrated that successful collaborative planning depends on a number of interrelated factors: the process must be truly inclusive, with all stakeholders and affected groups invited to the table; the community must have final decision-making authority; full government commitment (of both financial and intellectual resources) must be manifest; participants should be given clear objectives by planning staff, who facilitate the process by providing guidance, consultancy, expert opinions, and research; and facilitators should be trained in conflict resolution and community organization.

Aspects

Aesthetics

Towns and cities have been planned with aesthetics in mind. Here in Bath, England, 18th-century private sector development was designed to appear attractive.

In developed countries, there has been a backlash against excessive human-made clutter in the visual environment, such as signposts, signs, and hoardings. Other issues that generate strong debate among urban designers are tensions between peripheral growth, housing density and new settlements. There are also debates about the mixing tenures and land uses, versus distinguishing geographic zones where different uses dominate. Regardless, all successful urban planning considers urban character, local identity, respects heritage, pedestrians, traffic, utilities and natural hazards.

Planners can help manage the growth of cities, applying tools like zoning and growth management to manage the uses of land. Historically, many of the cities now thought the most beautiful are the result of dense, long lasting systems of prohibitions and guidance about building sizes, uses and features. These allowed substantial freedoms, yet enforce styles, safety, and often materials in practical ways. Many conventional planning techniques are being repackaged using the contemporary term smart growth.

There are some cities that have been planned from conception, and while the results often don't turn out quite as planned, evidence of the initial plan often remains.

Safety

The medieval walled city of Carcassonne in France is built upon high ground to provide maximum protection from attackers.

Historically within the Middle East, Europe and the rest of the Old World, settlements were located on higher ground (for defense) and close to fresh water sources. Cities have often grown onto coastal and flood plains at risk of floods and storm surges. Urban planners must consider these threats. If the dangers can be localised then the affected regions can be made into parkland or green belt, often with the added benefit of open space provision.

Extreme weather, flood, or other emergencies can often be greatly mitigated with secure emergency evacuation routes and emergency operations centres. These are relatively inexpensive and unintrusive, and many consider them a reasonable precaution for any urban space. Many cities will also have planned, built safety features, such as levees, retaining walls, and shelters.

In recent years, practitioners have also been expected to maximize the accessibility of an area to people with different abilities, practicing the notion of "inclusive design," to

anticipate criminal behaviour and consequently to "design-out crime" and to consider "traffic calming" or "pedestrianisation" as ways of making urban life more pleasant.

Some city planners try to control criminality with structures designed from theories such as socio-architecture or environmental determinism. Refer to Foucault and the Encyclopedia of the Prison System for more details. These theories say that an urban environment can influence individuals' obedience to social rules and level of power. The theories often say that psychological pressure develops in more densely developed, unadorned areas. This stress causes some crimes and some use of illegal drugs. The antidote is usually more individual space and better, more beautiful design in place of functionalism.

Oscar Newman's defensible space theory cites the modernist housing projects of the 1960s as an example of environmental determinism, where large blocks of flats are surrounded by shared and disassociated public areas, which are hard for residents to identify with. As those on lower incomes cannot hire others to maintain public space such as security guards or grounds keepers, and because no individual feels personally responsible, there was a general deterioration of public space leading to a sense of alienation and social disorder.

Jane Jacobs is another notable environmental determinist and is associated with the "eyes on the street" concept. By improving 'natural surveillance' of shared land and facilities of nearby residents by literally increasing the number of people who can see it, and increasing the familiarity of residents, as a collective, residents can more easily detect undesirable or criminal behavior. However, this is not a new concept. This was prevalent throughout the middle eastern world during the time of Mohamad. It was not only reflected in the general structure of the outside of the home but also the inside. (refer to various religious texts and archaeological sites)

The "broken-windows" theory argues that small indicators of neglect, such as broken windows and unkempt lawns, promote a feeling that an area is in a state of decay. Anticipating decay, people likewise fail to maintain their own properties. The theory suggests that abandonment causes crime, rather than crime causing abandonment.

Some planning methods might help an elite group to control ordinary citizens. Haussmann's renovation of Paris created a system of wide boulevards which prevented the construction of barricades in the streets and eased the movement of military troops. In Rome, the Fascists in the 1930s created *ex novo* many new suburbs in order to concentrate criminals and poorer classes away from the elegant town.

Other social theories point out that in Britain and most countries since the 18th century, the transformation of societies from rural agriculture to industry caused a difficult adaptation to urban living. These theories emphasize that many planning policies ignore personal tensions, forcing individuals to live in a condition of perpetual extraneity to their cities. Many people therefore lack the comfort of feeling "at home" when at home. Often

these theorists seek a reconsideration of commonly used "standards" that rationalize the outcomes of a free (relatively unregulated) market.

Slums

The rapid urbanization of the last century caused more slums in the major cities of the world, particularly in developing countries. Planning resources and strategies are needed to address the problems of slum development. Many planners are calling for slum improvement, particularly the Commonwealth Association of Planners. When urban planners work on slums, they must cope with racial and cultural differences to ensure that racial steering does not occur.

Slum were often "fixed" by clearance. However, more creative solutions are beginning to emerge such as Nairobi's "Camp of Fire" program, where established slum-dwellers promise to build proper houses, schools, and community centers without government money, in return for land on which they have been illegally squatting on for 30 years. The "Camp of Fire" program is one of many similar projects initiated by Slum Dwellers International, which has programs in Africa, Asia, and South America.

Decay

Urban decay is a process by which a city, or a part of a city, falls into a state of disrepair and neglect. It is characterized by depopulation, economic restructuring, property abandonment, high unemployment, fragmented families, political disenfranchisement, crime, and desolate urban landscapes.

During the 1970s and 1980s, urban decay was often associated with central areas of cities in North America and Europe. During this time, changes in global economies, demographics, transportation, and policies fostered urban decay. Many planners spoke of "white flight" during this time. This pattern was different than the pattern of "outlying slums" and "suburban ghettos" found in many cities outside of North America and Western Europe, where central urban areas actually had higher real estate values.

Starting in the 1990s, many of the central urban areas in North America have been experiencing a reversal of the urban decay, with rising real estate values, smarter development, demolition of obsolete social housing and a wider variety of housing choices.

Reconstruction and renewal

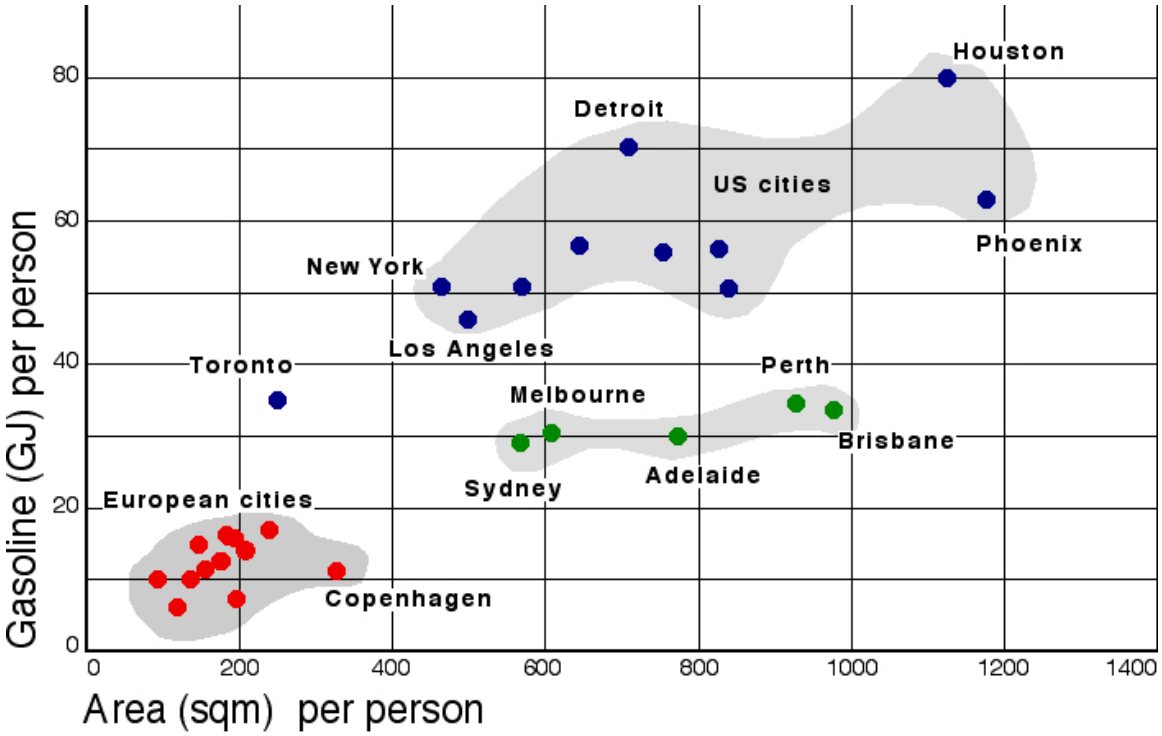
The overall area plan for the reconstruction of Kabul's Old City area, the proposed Kabul - City of Light Development.

Areas devastated by war or invasion challenge urban planners. Resources are scarce. The existing population has needs. Buildings, roads, services and basic infrastructure like power, water and sewerage are often damaged, but with salvageable parts. Historic, religious or social centers also need to be preserved and re-integrated into the new city plan. A prime example of this is the capital city of Kabul, Afghanistan, which, after decades of civil war and occupation, has regions of rubble and desolation. Despite this, the indigenous population continues to live in the area, constructing makeshift homes and shops out of salvaged materials. Any reconstruction plan, such as Hisham Ashkouri's City of Light Development, needs to be sensitive to the needs of this community and its existing culture and businesses.

Urban Reconstruction Development plans must also work with government agencies as well as private interests to develop workable designs.

Transport

Very densely built-up areas require high capacity urban transit, and urban planners must consider these factors in long term plans(Canary Wharf tube station).



Although an important factor, there is a complex relationship between urban densities and car use.

Transport within urbanized areas presents unique problems. The density of an urban environment increases traffic, which can harm businesses and increase pollution unless properly managed. Parking space for private vehicles requires the construction of large parking garages in high density areas. This space could often be more valuable for other development.

Good planning uses transit oriented development, which attempts to place higher densities of jobs or residents near high-volume transportation. For example, some cities permit commerce and multi-story apartment buildings only within one block of train stations and multilane boulevards, and accept single-family dwellings and parks farther away.

Floor area ratio is often used to measure density. This is the floor area of buildings divided by the land area. Ratios below 1.5 are low density. Ratios above five very high density. Most exurbs are below two, while most city centres are well above five. Walk-up apartments with basement garages can easily achieve a density of three. Skyscrapers easily achieve densities of thirty or more.

City authorities may try to encourage higher densities to reduce per-capita infrastructure costs. In the UK, recent years have seen a concerted effort to increase the density of residential development in order to better achieve sustainable development. Increasing development density has the advantage of making mass transport systems, district heating and other community facilities (schools, health centres, etc.) more viable. However critics

of this approach dub the densification of development as 'town cramming' and claim that it lowers quality of life and restricts market-led choice.

Problems can often occur at residential densities between about two and five. These densities can cause traffic jams for automobiles, yet are too low to be commercially served by trains or light rail systems. The conventional solution is to use buses, but these and light rail systems may fail where automobiles and excess road network capacity are both available, achieving less than 2% ridership.

The Lewis-Mogridge Position claims that increasing road space is not an effective way of relieving traffic jams as latent or induced demand invariably emerges to restore a socially-tolerable level of congestion.

Suburbanization

Low (auto-oriented) density suburban development near Colorado Springs, Colorado, United States

In some countries, declining satisfaction with the urban environment is held to blame for continuing migration to smaller towns and rural areas (so-called urban exodus). Successful urban planning supported Regional planning can bring benefits to a much larger hinterland or city region and help to reduce both congestion along transport routes and the wastage of energy implied by excessive commuting.

Environmental factors

Environmental protection and conservation are of utmost importance to many planning systems across the world. Not only are the specific effects of development to be mitigated, but attempts are made to minimize the overall effect of development on the local and global environment. This is commonly done through the assessment of Sustainable urban infrastructure and microclimate. In Europe this process is known as a Sustainability Appraisal.

In most advanced urban or village planning models, local context is critical. In many, gardening and other outdoor activities assumes a central role in the daily life of citizens. Environmental planners focus now on smaller and larger systems of resource extraction and consumption, energy production, and waste disposal. A practice known as Arcology seeks to unify the fields of ecology and architecture, using principles of landscape architecture to achieve a harmonious environment for all living things. On a small scale, the eco-village theory has become popular, as it emphasizes a traditional 100-140 person scale for communities.

An urban planner can use a number of quantitative tools to forecast impacts of developpment on the environmental, including roadway air dispersion models to predict air quality impacts of urban highways and roadway noise models to predict noise pollution effects of urban highways. As early as the 1960s, noise pollution was addressed in the design of urban highways as well as noise barriers. The Phase I Environmental Site Assessment can be an important tool to the urban planner by identifying early in the planning process any geographic areas or parcels which have toxic constraints.

Tall buildings in particular can have a substantial effect in channelling winds and shading large areas. The microclimate around the building will typically be assessed as part of the environmental impact assessment for the building.

Light and sound

The **urban canyon effect** is a colloquial, non-scientific term referring to street space bordered by very high buildings. This type of environment may shade the sidewalk level from direct sunlight during most daylight hours. While an oft-decried phenomenon, it is rare except in very dense, hyper-tall urban environments, such as those found in Lower and Midtown Manhattan, Chicago's Loop and Kowloon in Hong Kong.

In urban planning, sound is usually measured as a source of pollution. Another perspective on urban sounds is developed in Soundscape studies emphasising that sound aesthetics involves more than noise abatement and decibel measurements. Hedfors coined 'Sonotope' as a useful concept in urban planning to relate typical sounds to a specific place.

Light pollution has become a problem in urban residential areas, not only as it relates to its effects on the night sky, but as some lighting is so intrusive as to cause conflict in the

residential areas and paradoxically intense improperly installed security lighting may pose a danger to the public, producing excessive glare. The development of the full cutoff fixture, properly installed, has reduced this problem considerably.

Process

Blight may sometimes cause communities to consider redeveloping and urban planning.

Prior to the 1950, Urban Planning was seldom considered a unique profession. Planning focused on top-down processes by which the urban planner created the plans. The planner would know architecture, surveying, or engineering, bringing to the town planning process ideals based on these disciplines. They typically worked for national or local governments.

Changes to the planning process Strategic Urban Planning over past decades have witnessed the metamorphosis of the role of the urban planner in the planning process. More citizens calling for democratic planning & development processes have played a huge role in allowing the public to make important decisions as part of the planning process. Community organizers and social workers are now very involved in planning from the grassroots level. The term advocacy planning was coined by Paul Davidoff in his influential 1965 paper, "Advocacy and Pluralism in Planning" which acknowledged the political nature of planning and urged planners to acknowledge that their actions are not

value-neutral and encouraged minority and under represented voices to be part of planning decisions.

Ozawa and Seltzer (1999)advocate a communicative planning model in education to teach planners to work within the social and political context of the planning process. In their paper "Taking Our Bearings: Mapping a Relationship among Planning Practice, Theory, and Education," the authors demonstrate the importance of educating planners beyond the rational planning model in which planners make supposedly value-neutral recommendations based on science and reason . Through a survey of employers, it was found that the most highly rated skills in entry-level professional hiring are communication-based. The results suggest this view of planning as a communicative discourse as a possible bridge between theory and practice, and indicate that the education of planners needs to incorporate synthesis and communication across the curriculum.

Developers have also played huge roles in development, particularly by planning projects. Many recent developments were results of large and small-scale developers who purchased land, designed the district and constructed the development from scratch. The Melbourne Docklands, for example, was largely an initiative pushed by private developers to redevelop the waterfront into a high-end residential and commercial district.

Recent theories of urban planning, espoused, for example by Salingaros see the city as a adaptive system that grows according to process similar to those of plants. They say that urban planning should thus take its cues from such natural processes.

Urban Design

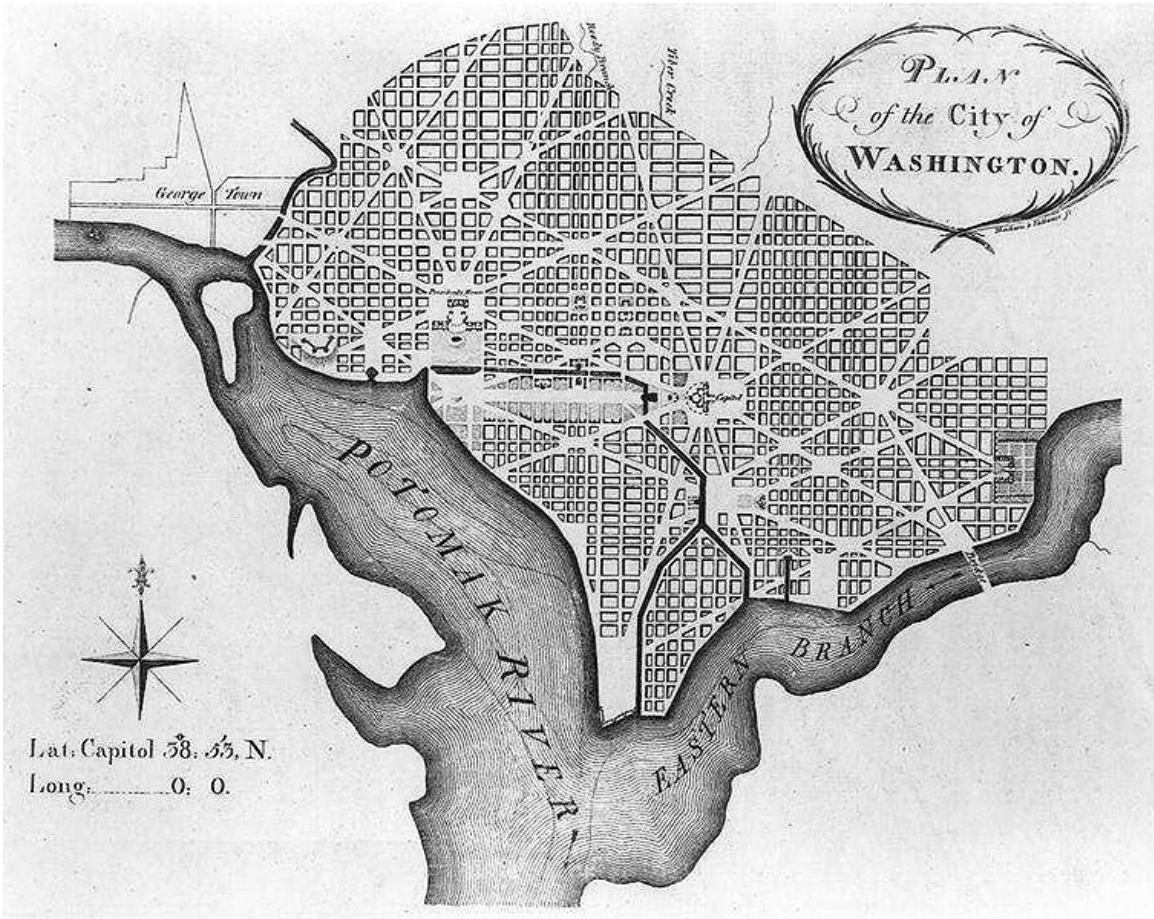
Urban design concerns the arrangement, appearance and functionality of towns and cities, and in particular the shaping and uses of urban public space. It has traditionally been regarded as a disciplinary subset of urban planning, landscape architecture, or architecture and in more recent times has been linked to emergent disciplines such as landscape urbanism. However, with its increasing prominence in the activities of these disciplines, it is better conceptualised as a design practice that operates at the intersection of all three, and requires a good understanding of a range of others besides, such as real estate development, urban economics, political economy and social theory.

Urban design theory deals primarily with the design and management of public space (i.e. the 'public environment', 'public realm' or 'public domain'), and the way public places are experienced and used. Public space includes the totality of spaces used freely on a day-to-day basis by the general public, such as streets, plazas, parks and public infrastructure. Some aspects of privately owned spaces, such as building facades or domestic gardens,

also contribute to public space and are therefore also considered by Urban design theory. Important writers on, and advocates for, urban design theory include Christopher Alexander, Michael E. Arth, Edmund Bacon, Ian Bentley,Peter Calthorpe, Alex Krieger, Gordon Cullen, Andres Duany, Jane Jacobs, Jan Gehl, Kevin Lynch, Roger Montgomery, Aldo Rossi, Colin Rowe, Robert Venturi, William H. Whyte, Bill Hillier, and Elizabeth Plater-Zyberk.

While the two fields are closely related, 'urban design' differs from 'urban planning' in its focus on physical improvement of the public environment, whereas the latter tends, in practice, to focus on the management of private development through established planning methods and programs, and other statutory development controls.

Principles



L'Enfant's plan for Washington DC

Gehl Architects' project for Brighton New Road employing shared space

Public spaces are frequently subject to overlapping management responsibilities of multiple public agencies or authorities and the interests of nearby property owners, as well as the requirements of multiple and sometimes competing users. The design, construction and management of public spaces therefore typically demands consultation and negotiation across a variety of spheres. Urban designers rarely have the degree of artistic liberty or control sometimes offered in design professions such as architecture. It also typically requires interdisciplinary input with balanced representation of multiple fields including engineering, ecology, local history, and transport planning.

The scale and degree of detail considered varies depending on context and needs. It ranges from the layout of entire cities, as with l'Enfant's plan for Washington DC, Griffin and Mahony's plan for Canberra and Doxiadis' plan for Islamabad (although such opportunities are obviously rare), through 'managing the sense of a region' as described by Kevin Lynch, to the design of street furniture.

Urban design may encompass the preparation of design guidelines and regulatory frame--works, or even legislation to control development, advertising, etc. and in this sense overlaps with urban planning. It may encompass the design of particular spaces and structures and in this sense overlaps with architecture, landscape architecture, highway

engineering and industrial design. It may also deal with 'place management' to guide and assist the use and maintenance of urban areas and public spaces.

Much urban design work is undertaken by urban planners, landscape architects and architects but there are professionals who identify themselves specifically as urban designers. Many architecture, landscape and planning programs incorporate urban design theory and design subjects into their curricula and there are an increasing number of university programs offering degrees in urban design, usually at post-graduate level.

Urban design considers:

- *Urban structure* – How a place is put together and how its parts relate to each other
- *Urban typology, density* and sustainability - spatial types and morphologies related to intensity of use, consumption of resources and production and maintenance of viable communities
- *Accessibility* – Providing for ease, safety and choice when moving to and through places
- *Legibility and wayfinding* – Helping people to find their way around and understand how a place works
- *Animation* – Designing places to stimulate public activity
- *Function and fit* – Shaping places to support their varied intended uses
- *Complementary mixed uses* – Locating activities to allow constructive interaction between them
- *Character and meaning* – Recognizing and valuing the differences between one place and another
- *Order and incident* – Balancing consistency and variety in the urban environment in the interests of appreciating both
- *Continuity and change* – Locating people in time and place, including respect for heritage and support for contemporary culture
- *Civil society* – Making places where people are free to encounter each other as civic equals, an important component in building social capital

History

Although contemporary professional use of the term 'urban design' dates from the mid-20th century, urban design as such has been practiced throughout history. Ancient examples of carefully planned and designed cities exist in Asia, India, Africa, Europe and the Americas, and are particularly well-known within Classical Chinese, Roman and Greek cultures. European Medieval cities are often regarded as exemplars of undesigned or 'organic' city development, but there are clear examples of considered urban design in the Middle Ages (see, e.g., David Friedman, *Florentine New Towns: Urban Design in the Late Middle Ages*, MIT 1988).

Throughout history, design of streets and deliberate configuration of public spaces with buildings have reflected contemporaneous social norms or philosophical and religious

beliefs (see, e.g., Erwin Panofsky, *Gothic Architecture and Scholasticism*, Meridian Books, 1957). Yet the link between designed urban space and human mind appears to be bidirectional. Indeed, the reverse impact of urban structure upon human behaviour and upon thought is evidenced by both observational study and historical record. There are clear indications of impact through Renaissance urban design on the thought of Johannes Kepler and Galileo Galilei (see, e.g., Abraham Akkerman, "Urban planning in the founding of Cartesian thought," *Philosophy and Geography* 4(1), 2001). Already René Descartes in his *Discourse on the Method* had attested to the impact Renaissance planned new towns had upon his own thought, and much evidence exists that the Renaissance streetscape was also the perceptual stimulus that had led to the development of coordinate geometry (see, e.g., Claudia Lacour Brodsky, *Lines of Thought: Discourse, Architectonics, and the Origins of Modern Philosophy*, Duke 1996).

The beginnings of modern urban design in Europe are indeed associated with the Renaissance but, especially, with the Age of Enlightenment. Spanish colonial cities were often planned, as were some towns settled by other imperial cultures. These sometimes embodied utopian ambitions as well as aims for functionality and good governance, as with James Oglethorpe's plan for Savannah, Georgia. In the Baroque period the design approaches developed in French formal gardens such as Versailles were extended into urban development and redevelopment. In this period, when modern professional specialisations did not exist, urban design was undertaken by people with skills in areas as diverse as sculpture, architecture, garden design, surveying, astronomy, and military engineering. In the 18th and 19th centuries, urban design was perhaps most closely linked with surveyors and architects. Much of Frederick Law Olmsted's work was concerned with urban design, and so the (then-new) profession of landscape architecture also began to play a significant role in the late 19th century.

Modern urban design can be considered as part of the wider discipline of Urban planning. Indeed, Urban planning began as a movement primarily occupied with matters of urban design. Works such as Ildefons Cerda's *General Theory of Urbanization* (1867), Camillo Sitte's *City Planning According to Artistic Principles* (1889), and Robinson's *The Improvement of Cities and Towns* (1901) and *Modern Civic Art* (1903), all were primarily concerned with urban design, as did the later City Beautiful movement in North America.

'Urban design' was first used as a distinctive term when Harvard University hosted a series of Urban Design Conferences from 1956 . These conferences provided a platform for the launching of Harvard's Urban Design program in 1959-60. The writings of Jane Jacobs, Kevin Lynch, Gordon Cullen and Christopher Alexander became authoritative works for the school of Urban Design.

Gordon Cullen's *The Concise Townscape*, first published in 1961, also had a great influence on many urban designers. Cullen examined the traditional artistic approach to city design of theorists such as Camillo Sitte, Barry Parker and Raymond Unwin. He created the concept of 'serial vision', defining the urban landscape as a series of related spaces.

Jane Jacobs' *The Death and Life of Great American Cities*, published in 1961, was also a catalyst for interest in ideas of urban design. She critiqued the Modernism of CIAM, and asserted that the publicly unowned spaces created by the 'city in the park' notion of Modernists was one of the main reasons for the rising crime rate. She argued instead for an 'eyes on the street' approach to town planning, and the resurrection of main public space precedents, such as streets and squares, in the design of cities.

Kevin Lynch's *The Image of the City* of 1961 was also seminal to the movement, particularly with regards to the concept of legibility, and the reduction of urban design theory to five basic elements - paths, districts, edges, nodes, landmarks. He also made popular the use of mental maps to understanding the city, rather than the two-dimensional physical master plans of the previous 50 years.

Other notable works include Rossi's *Architecture of the City* (1966), Venturi's *Learning from Las Vegas* (1972), Colin Rowe's *Collage City* (1978), and Peter Calthorpe's *The Next American Metropolis* (1993). Rossi introduced the concepts of 'historicism' and 'collective memory' to urban design, and proposed a 'collage metaphor' to understand the collage of new and older forms within the same urban space. Calthorpe, on the other hand, developed a manifesto for sustainable urban living via medium density living, as well as a design manual for building new settlements in accordance with his concept of Transit Oriented Development (TOD). Bill Hillier and Julienne Hanson in "The Social Logic of Space" (1984) introduced the concept of Space Syntax to predict how movement patterns in cities would contribute to urban vitality, anti-social behaviour and economic success. The popularity of these works resulted in terms such as 'historicism', 'sustainability', 'livability', 'high quality of urban components', etc. become everyday language in the field of urban planning.

Equality issues

Until the 1970s, urban designers had taken little account of the needs of people with disabilities. At that time, disabled people began to form movements demanding recognition of their potential contribution if social obstacles were removed. Disabled people challenged the 'medical model' of disability which saw physical and mental problems as an individual 'tragedy' and people with disabilities as 'brave' for enduring them. They proposed instead a 'social model' which said that barriers to disabled people result from the design of the built environment and attitudes of able-bodied people. 'Access Groups' were established composed of people with disabilities who audited their local areas, checked planning applications and made representations for improvements. The new profession of 'access officer' was established around that time to produce guidelines based on the recommendations of access groups and to oversee adaptations to existing buildings as well as to check on the accessibility of new proposals. Many local authorities now employ access officers who are regulated by the Access Association. A new chapter of the Building Regulations (Part M) was introduced in 1992. Although it was beneficial to have legislation on this issue the requirements were fairly minimal but continue to be

improved with ongoing amendments. The Disability Discrimination Act 1995 continues to raise awareness and enforce action on disability issues in the urban environment.

Chapter- 2

Form-based Code

A **form-based code** (FBC) is a means of regulating development to achieve a specific urban form. Form-based codes create a predictable public realm by controlling physical form primarily, with a lesser focus on land use, through city or county regulations.

Form-based codes are a new response to the modern challenges of urban sprawl, deterioration of historic neighborhoods, and neglect of pedestrian safety in new development. Tradition has declined as a guide to development patterns, and the widespread adoption by cities of single-use zoning regulations has discouraged compact, walkable urbanism. Form-based codes are a tool to address these deficiencies, and to provide local governments the regulatory means to achieve development objectives with greater certainty.

Scope

Form-based codes address the relationship between building facades and the public realm, the form and mass of buildings in relation to one another, and the scale and types of streets and blocks. The regulations and standards in form-based codes, presented in both diagrams and words, are keyed to a regulating plan that designates the appropriate form and scale (and therefore, character) of development rather than only distinctions in land-use types. This is in contrast to conventional zoning's focus on the micromanagement and segregation of land uses, and the control of development intensity through abstract and uncoordinated parameters (e.g., floor area ratios, dwelling units per acre, setbacks, parking ratios) to the neglect of an integrated built form. Not to be confused with design guidelines or general statements of policy, form-based codes are regulatory, not advisory.

Form-based codes are drafted to achieve a community vision based on time-tested forms of urbanism. Ultimately, a form-based code is a tool; the quality of development outcomes is dependent on the quality and objectives of the community plan that a code implements.

History

Form-based codes are part of a long history of shaping the built landscape for public benefit. Such efforts go back to the urban designs of Hippodamus of ancient Greece, the planning of cities in ancient China, and Roman town planning. The Laws of the Indies, promulgated by the Spanish Crown starting in the 16th century, established some basic urban form requirements for colonial towns in the Americas. William Penn when planning Philadelphia in the 17th century did not shy from precise urban form requirements when he said, "Let every house be in a line, or upon a line, as much as may be."

During the 18th century, Baroque urban design commonly brought buildings to the fronts of their lots with common facade treatments. Baron Haussmann, appointed by Napoleon III to oversee the redevelopment of Paris in the 19th century, stipulated precise ratios of building heights to street widths; disposition and sizes of windows and doors on building facades; consistent planting of street trees; and standardization of material colors to bring unity and harmony to the public environment.

Emergence of modern form-based codes

Regulating urban form is a challenge in modern democracies. Design guidelines adopted by municipalities, without legal enforceability, often invite capricious observance, thus failing to produce the comprehensive changes required to produce satisfying public places. When public planning exercises fail to produce predictable results, citizens often rebel against any development. In addition, from early in the twentieth century to the present, attempts at regulating the built landscape have usually been done for reasons that neglect community form, that are more concerned with the uses of property and impacts of scale than the form that development takes. And a planning profession that in recent decades has focused on policy, neglecting design, encouraged an abstract intellectual response to problems that are largely physical in nature.

The development of modern form-based codes was started by architects, urban designers, and physical planners frustrated by the ineffectiveness of past criticisms of sprawl development and the failure of critics to propose realistic alternatives. These professionals, used to thinking physically about community problems, began the search for systematic physical solutions in the 1970s. Architect Christopher Alexander published *A Pattern Language* in 1977, a compendium of physical rules for designing humane buildings and places. Ian McHarg developed systematic mapping tools to encourage deliberate development patterns sensitive to local environmental conditions. Traditional Neighborhood Development ordinances were drafted beginning in the early 1990s as sets of development regulations to promote traditional neighborhood forms in new development projects. TND ordinances were typically adopted as an optional regulatory procedure that developers could request in place of conventional zoning . But their design regulations were not mapped to parcels or streets in advance, so lacked predictability of outcomes; TND ordinances proved to be an instructive effort, but showed few results.

Meanwhile, the accelerating scale of worldwide urban growth and the rapid expansion of the extent of cities heightened the need for regulatory tools better equipped to deal with such growth. The first serious attempt at creating a modern form-based code was done in 1982 to guide the development of the Florida resort town of Seaside by the husband and wife design team of Andres Duany and Elizabeth Plater-Zyberk. Realizing that designing an entire town would be an overwhelming task and would in the end lack the visual serendipity that only comes from myriad creative minds at work, they created a design code that established basic physical standards mapped to parcels, and then invited developers and architects to put their own distinctive stamp on their projects—but operating within those standards. The Seaside Code proved very successful; the resulting development of the town of Seaside is widely recognized as one of the most important and appealing planning efforts of the post-World War II era.

Duany/Plater-Zyberk's codes and the work of subsequent form-based code practitioners are not top-down mandates from imperial designers as in the baroque era or the wishful thinking of design guidelines that lack enforceability, but are instead legal regulations adopted by units of local government. As regulations they possess police power; violators of the regulations can be cited, and their invocation or retraction must go through a legislative process. As such, the community plays a more forceful role in shaping its physical future.

Form-based codes produce more consistent and predictable patterns of development in relationship to the public realm than typically achieved through conventional zoning regulations.

Recent developments

Although the Seaside code was commissioned by a private developer, most current codes are commissioned by counties and municipalities. Since Seaside, the scale of form-based

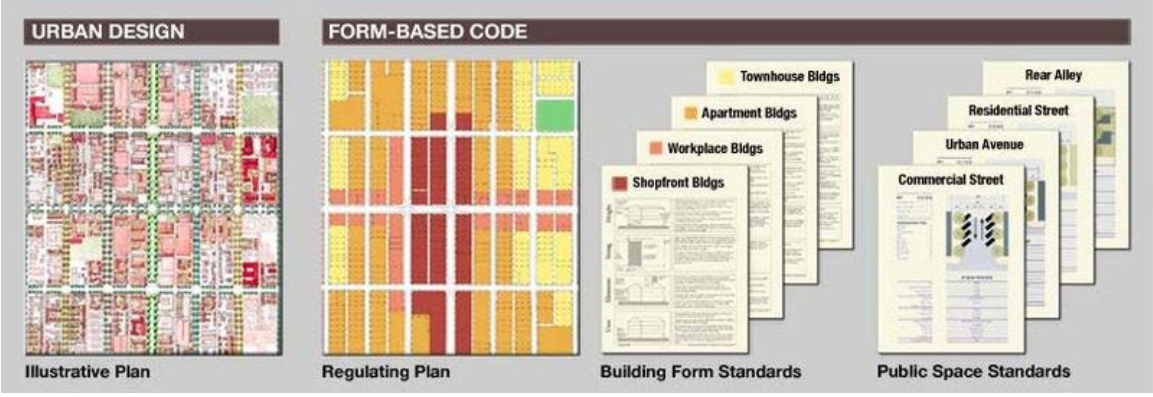
coding projects has grown. Form-based coding can be applied at many scales, from a two-block main street to a county-wide region. An early form-based code was adopted for downtown West Palm Beach in 1995. A significant code for a major urban arterial, the Columbia Pike in Arlington County, Virginia, was adopted in 2003 (Ferrell Madden Associates). A regional FBC was adopted in 2006 by St. Lucie County, Florida (Spikowski Associates, Dover-Kohl Partners). Duany/Plater-Zyberk has drafted a model FBC that is also a transect-based code that can be calibrated for local needs—the SMARTCODE. Its first attempted customization was done for Vicksburg, Mississippi in 2001 (Mouzon & Greene). The lessons learned there led to the first California adoption of a citywide form-based code for the City of Sonoma in March 2003 (Crawford Multari & Clark Associates, Moule & Polyzoides), followed in 2004 by the first SmartCode adopted in the U.S., for central Petaluma, California (Fisher and Hall Urban Design, Crawford Multari & Clark Associates). SmartCodes are now being calibrated for Miami, Florida and Hurricane Katrina ravaged communities in Mississippi and Louisiana, along with cities as diverse as Taos, NM, Michigan City, IN, Jamestown, RI, Lawrence, KS, New Castle, DE, and Bran, Romania. Planetary climate change that must be mitigated by changes in the human environment will no doubt be an inducement to form-based and transect-based coding in the future.

Because of the growing number of consultants advertising themselves as capable of writing FBCs but with little or no training, in 2004 the non-profit Form-Based Codes Institute was organized to establish standards and teach best practices. In addition, SmartCode workshops are regularly scheduled by PlaceMakers.com, SmartCodePro.com, and SmartCodeLocal.com.

Components of form-based codes

Form-based codes commonly include the following elements:

- *Regulating Plan.* A plan or map of the regulated area designating the locations where different building form standards apply, based on clear community intentions regarding the physical character of the area being coded.
- *Public Space Standards.* Specifications for the elements within the public realm (e.g., sidewalks, travel lanes, on-street parking, street trees, street furniture, etc.).
- *Building Form Standards*. Regulations controlling the configuration, features, and functions of buildings that define and shape the public realm.
- *Administration.* A clearly defined application and project review process.
- *Definitions.* A glossary to ensure the precise use of technical terms.



At a minimum, a form-based code, written to enable or preserve a specific urban form, consists of building form and public space standards keyed to a regulating plan. An urban design is the intention or goal, the form-based code is the regulatory tool to achieve it.

Form-based codes also sometimes include:

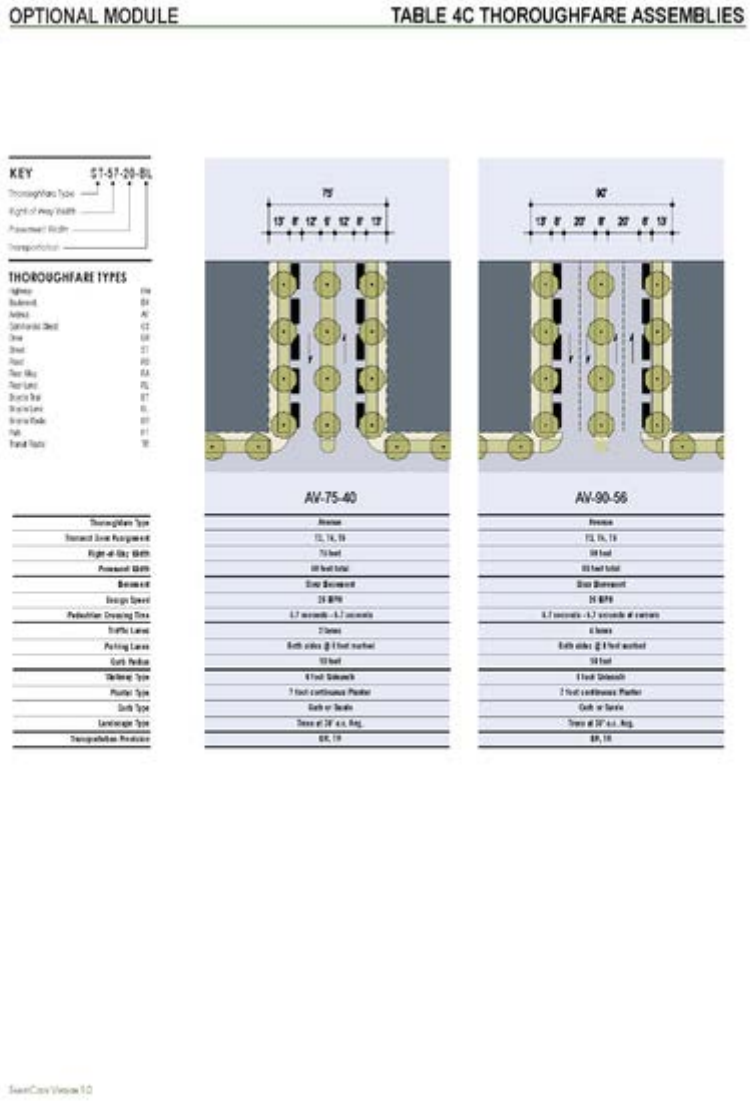
- *Architectural Standards.* Regulations controlling external architectural materials and quality.
- *Landscaping Standards.* Regulations controlling landscape design and plant materials on private property as they impact public spaces (e.g. regulations about parking lot screening and shading, maintaining sight lines, insuring unobstructed pedestrian movements, etc.).
- *Signage Standards.* Regulations controlling allowable signage sizes, materials, illumination, and placement.
- *Environmental Resource Standards.* Regulations controlling issues such as storm water drainage and infiltration, development on slopes, tree protection, solar access, etc.
- *Annotation.* Text and illustrations explaining the intentions of specific code provisions.

Building Form Standards

Building attributes that can be regulated in a Building Form Standard, in this case for a hypothetical street in a neighborhood center

The types of buildings that make for a lively main street are different from the types of buildings that make for a quiet residential street. Building Form Standards are sets of enforceable design regulations for controlling building types and how they impact the public realm. These Standards are mapped to streets on a Regulating Plan. Building Form Standards can control such things as: the alignment of buildings to the street; how close buildings are to sidewalks; the visibility and accessibility of building entrances; minimum and maximum buildings heights; minimum or maximum lot frontage coverage; minimum and maximum amounts of window coverage on facades; physical elements required on buildings (e.g. stoops, porches, types of permitted balconies); and the general usage of floors (e.g. office, residential, or retail). These regulations are less concerned with architectural styles and designs than in how buildings shape public spaces. If a local government also wishes to regulate the quality of architecture--for example to preserve the historic appearance of a neighborhood--then Architectural Standards should be drafted in addition to Building Form Standards.

Public Space Standards



An example of a Public Space Standard for public streets from the SmartCode 9.0

Public Space Standards control the physical form of squares, parks, the public right-of-way of streets, and other public spaces. Public spaces are typically under the control of public works, parks, and highway departments. Streets, being the most common public spaces in a community, are the most frequently regulated. Public Space Standards for streets are typically described with dimensioned cross-sections and/or plan views showing travel lane widths, sidewalk widths, street tree and street lamp placement, locations of transit lanes, and the placement of architecture. Plan view diagrams may also be included showing spacing of street trees and lamps, and the radii of the curves of street corners.

Identifying Form-Based Codes

How does one determine if a development regulation is a form-based code and a well-crafted one? Form-based codes generally receive affirmative answers to all of the following questions:

- Is the code's focus primarily on regulating urban form and less on land use?
- Is the code regulatory rather than advisory?
- Does the code emphasize standards and parameters for form with predictable physical outcomes (build-to lines, frontage type requirements, etc.) rather than relying on numerical parameters (floor-area ratios, density, etc.) whose outcomes are impossible to predict?
- Does the code require private buildings to shape public space through the use of building form standards with specific requirements for building placement?
- Does the code promote and/or conserve an interconnected street network and pedestrian-scaled blocks?
- Are regulations and standards keyed to specific locations on a regulating plan?
- Are the diagrams in the code unambiguous, clearly labeled, and accurate in their presentation of spatial configurations?

Implementation

How are form-based codes incorporated into a local government's development regulations? There are three basic ways:

Mandatory codes. This is the most common adoption approach. It has the most regulatory "teeth"—compliance is required. But it is the most ambitious of the approaches, making the new code a seamless part of, or a complete replacement for, the existing zoning ordinance. The form-based code can be adopted as a new zoning district or as an overlay district.

Unique to California and a few other states with appropriate enabling legislation, form-based codes can be contained within a planning document called a "specific plan," which can completely override the zoning ordinance for a given geographic area. Since it stands apart from the zoning ordinance, it can be more creative in its format, giving the coder greater freedom in designing for user-friendliness through page layout, diagrams, and illustrations. Also, the urban design plan and the implementing regulations are bundled together, greatly improving user comprehension. But since the specific plan is not securely integrated within the existing zoning ordinance, it may be more politically vulnerable to retraction.

Example adopted codes:
Winter Springs Town Center District Code, Winter Springs, Florida
Farmers Branch Station Area Form-Based Code, Farmers Branch, Texas
Central Petaluma Specific Plan and SmartCode, Petaluma, California

Optional (parallel) codes. An optional or parallel form-based code serves as an alternative to, but doesn't replace, a present zoning ordinance. Compliance is voluntary. The developer has the choice of complying with the form-based code or the zoning ordinance, but it must be one or the other. This approach makes sense when compliance with the zoning ordinance is so difficult and time consuming that most development is stymied. Thus a developer has the option of following a form-based code that will streamline and simplify his development process. But, for a local government to maintain two different sets of development regulations for one area is added work which can be significant if the area is extensive. Also depending on the area being regulated, if some developers are choosing the form-based code and others nearby are not, the possibilities for integrated place-making can be compromised.

Example codes:
Columbia Pike Form-Based Code, Arlington County, Virginia
Pike Road SmartCode, Pike Road, Alabama
Pass Christian SmartCode, Pass Christian, Mississippi

Floating-zone codes. Floating zones are most often written to facilitate master-planned suburban communities and are called PUDs (planned unit developments). However, floating-zone codes are now being written as form-based codes to facilitate urban development. A floating-zone form-based code does not contain a regulating plan but includes instructions and standards for developers to follow when they prepare a regulating plan for their property (e.g. maximum block dimensions, street types, building types, open space accessibility, sidewalk widths.) This distinguishes floating-zone codes from the other two approaches–developers rather than the local government create the regulating plans and the urban designs that they facilitate, but the local government sets the standards. Floating-zone codes allow local governments to establish urban form standards for development without incurring the expense of developing urban design and regulating plans. Developers are given the freedom, within clear parameters, to prepare regulating plans for their property that are likely to meet government approval. A developer submits his or her regulating plan for approval through the rezoning process. Upon rezoning, the floating zone replaces the prior zoning for that property and the regulating plan becomes binding.

Example codes:
Miami/Dade County TND District, Dade County, Florida
Towns, Villages, Countryside Land Development Regulations, St. Lucie County, Florida
Flowood SmartCode, Flowood, Mississippi
Montgomery SmartCode, Montgomery, Alabama (not to be confused with the mandatory SmartCode for downtown)

Initially a local government may wish to adopt a form-based code for its entire jurisdiction following one approach, but find this too ambitious with short-term resource and political limitations requiring a more focused effort. Instead it may wish to follow one approach for a smaller area, and then phase in other areas using the same or different approaches as needed. Or a floating-zone code could be adopted for large areas awaiting

the public resources coming later that would allow the local government to draft its own regulating plans. Whatever approach is followed—or combination of approaches—simplicity and consistency helps at the permit desk where the code is implemented.

Chapter- 3

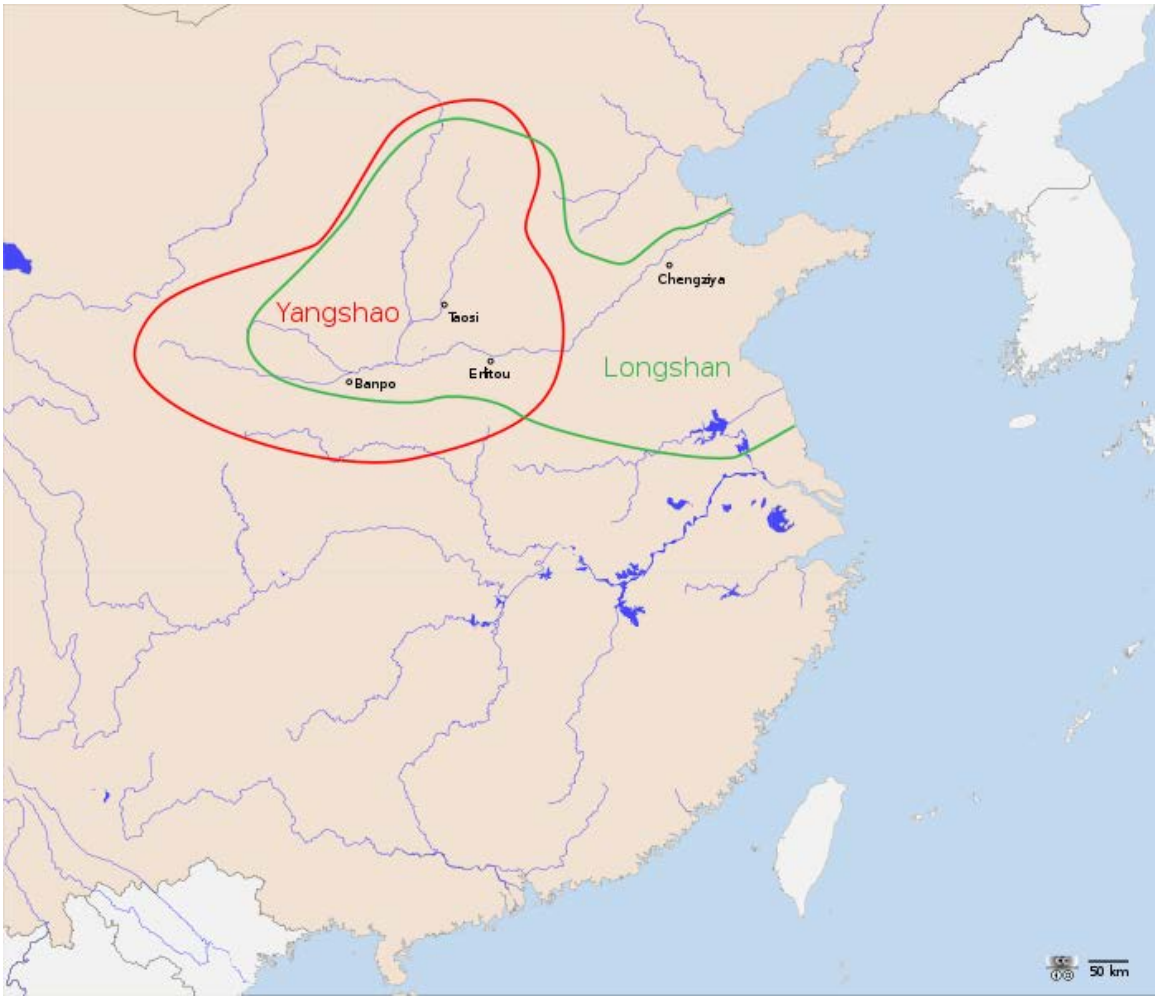
Ancient Chinese Urban Planning

Ancient Chinese urban planning is the application of traditional Chinese architecture principals to urban design. These traditions can be summarized as: *fengshui* geomancy and astronomy, the field-well system, *gaitian* cosmology, *Qi* as a medium of energy connecting man, earth, and heaven, political power shared between military aristocracy and educated advisers, the holy place *bo*, three tiered economic system under absolute state control, proto-writing, and the walled yet portable capital city as a diagram of political power.

Early development

Ultimately, urban planning originated during the urbanization of the Yellow River valley in the Neolithic Age. The urbanization process in China, as elsewhere in the world, is related to the process of centralizing power in a political state. Although several cultures formed competing states, the direct ancestor of the Chinese state was Longshan culture. Therefore, the earliest Chinese urban planning was a synthesis of Longshan traditional cosmology, geomancy, astrology, and numerology. This synthesis generated a diagram of the cosmos, which placed man, state, nature, and, heaven in harmony. The city was planned in the context of this cosmic diagram to maintain harmony and balance, principals important in Chinese law.

Neolithic Age urbanization



Yangshao and Longshan Culture

Urbanization begins at Banpo (4,800-3,750 BC) on the zhongyuan plain of the Yellow River. Historically, Banpo grew from a typical Yangshao village in both size and organization until the construction of the Great Hall c 4,000 BCE. Like Eridu in Mesopotamia, Banpo in East Asia was the first instance of specialized architecture, something other than a house. Physically, Banpo was composed of 200 round pit houses and the Great Hall across 5 ha and surrounded by a ditch. These pit houses were sited for solar gain by aligning the door to the *Yingshi* asterism just after the winter solstice. Already, at this early stage the principal of south facing entry was firmly established.

Like all Neolithic people, life at Banpo was synchronized to the agricultural year, which was timed by the movement of the Big Dipper as a celestial clock. The *Book of Odes* describes this annual cycle. Beginning in spring, The adolescents swam through the flood waters at the triangular confluence of two rivers. They emerged shivering, and in this state they were infused with the souls of ancestors buried in the earth who had reemerged at the springs of the Yellow River. In this energized state they procreated in a location

deemed to possess magical earth energy. These locations were unsuitable for agriculture, usually a hill, and therefore were uncleared primeval forests. Consecrated procreation was essential to maintaining the cycle of life. When the flood waters receded, the triangle was divided into fields between the families. In autumn there was a large festival at the completion of the harvest. In winter, the men left their homes and retired to the Great Hall, where they were led by an the village elders in drinking and singing to repel the cold.

The needs, and beliefs, of Banpo society created the prototype Chinese urban typology. The springtime sacred procreation sites became, in time, the Holy Place called *bo* . Moreover, the connection between ancestors, earth, and fertility developed into a theory of *Qi* energy and *Fengshui* geomancy. The *Book of Burial* elaborates this theory. Man is considered concentrated Qi, when his bones are returned to the earth they become re-energized by Qi. The living descendants are affected by the Qi generated from the bones of their ancestors, "...as a lute string will pick of the vibration of another lute string near it." In this theory, the world was an active matrix of Qi into which graves, houses, and cities must be carefully inserted by fengshui principals to maintain harmony. The shape of this world was described by a parallel cosmology of a round heaven revolving around a square earth. This *gaitian* cosmology originated from neolithic astronomy. This cosmic diagram is depicted on jade *bi* and *cong* used to talk to sky and earth spirits, respectively. In particular, Yangshao pottery decorated with Big Dipper inscribed on a nine-in-one square (earth) surrounded by a circle (heaven) already depicts a cosmic diagram of earth divided into nine parts. This nine-in-square, in time, became basis of the well-field system, which was the basic geometric and legal module of urban-regional planning. Likewise, the Great Hall became the prototype of later palaces and imperial cities.

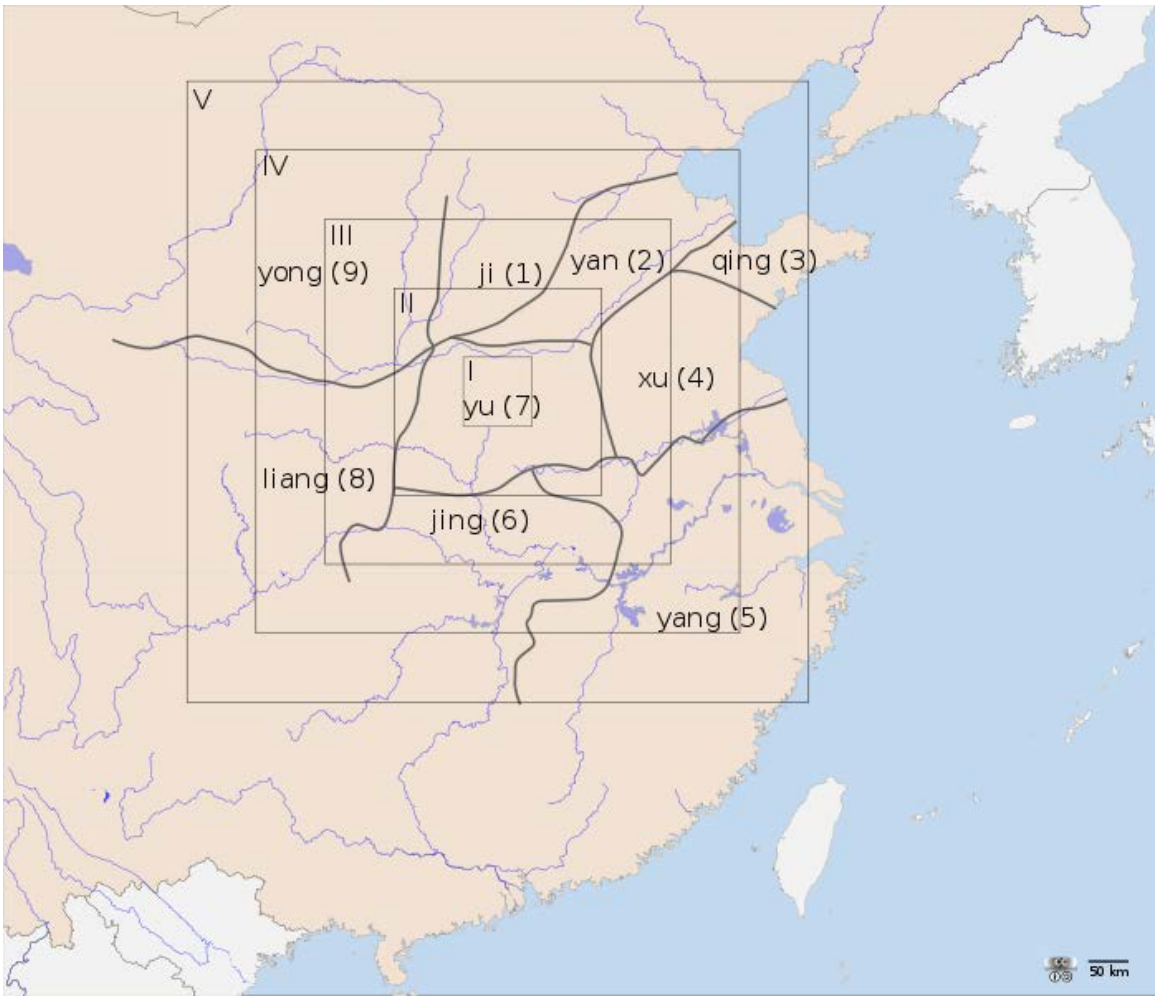
Longshan Culture (3000-2000 BC)arrived from the east one thousand years after Banpo in the same area. This arrival is mythologized by the story of the Yellow Emperor. A man of vigorus energy who dispensed law, standardized measures, invented writing, and conquered. The Longshan tribes formed a superstratum over Yangshao culture. As they fused ideologically and socially, all the elements of a new state and civilization appeared. Culturally, protowriting in the form of the Longshan Script, was used on oracle bones. Politically, a Longshan warlord ruled with the help of an Yangshao adviser. Both the use of oracle bones, and the rule of a king with adviser had continuity into the Shang Dynasty. The first capital was Chengziya in 2500 BCE followed by Taosi in 2300 BCE and finally by Erlitou in 2000 BC. Longshan Culture developed directly into the Xia and Shang Dynasties.

The hierarchical and militaristic aspects of Longshan culture are evident in their cities. Their shape is a walled square filled with square houses. The transition from round to square homes is always accompanied by centralizing power in history. The square shaped city, itself a product of centralized power, historically arises a from a military encamp-pment. It is the city as a diagram of political power. The new order made its mark on the Urban-Regional context. Three levels of settlement emerged in the early Longshan state, village called Jū (0-1 ha), city Yi (1-5 ha), and capital called Dū (<5 ha). These three tiers of settlements are the physical realization of central place theory. The original Yangshao

Jū villages formed a matrix of production that channeled goods upward to larger Longshan Yi and ultimately to the Dū. Political power was therefore defined as the amount of the highly productive matrix of agriculture and village under control. The greater the area, the more wealth passed upwards to the capital. Other cites were economically unnecessary as there was neither long distance trade nor markets. Currently, the division of urban and rural areas is still poorly defined in China.

The final Longshan capital, Erlitou is the physical manifestation of massive social change in China c 2000 BC. Erlitou began in the Neolithic as a Yangshao bo. Later additions of alters and temples. It was a sacred city, even when absorbed by the Longshan tribes, and thus was never walled. Erlitou was the site of transition into the Bronze Age. The legendary Xia Dynasty may have been the ruling class of Erlitou.

Bronze Age urbanization



Xia Dynasty 9 Zhou & Shang Dynasty 5 Domains

Erlitou is sited at the confluence of the Lou and Yi rivers, a sacred place known as the Waste of Xia. Geographically, the Waste of Xia marked the center of the nine-in-one

square earth. During the transitional Erlitou Culture, diverse Neolithic traditions were woven into one coherent harmonious philosophical and political system. In this system earth was the mirror of heaven ruled by the Jade Emperor. Residing in Polaris, he sent the heavenly breath of Qi down to earth through meridians. The Qi concentrated in mountains and rivers, by informed site planning, a building and even a city could fit into this energized matrix. Politically, Qi flowed from heaven through earth into and the through the divine emperor through his city out of the gates into his realm. The emperor kept heaven and earth in harmonious balance through his absolute power. An adviser class interpreted the omens of heaven to inform his actions. Geographically, the state was square shaped and centered on the ruler. As described in the *Book of Documents*, China is a square of 45,000 *li* with five nested squares spaced at 500 *li* to create five zones. Beginning at the center, Royal Domain (500 x 500 *li*), Noble Domain, Domain of Peace-Securing, Domain of Restraint, and Wild Domain. Outside the fifth zone, the barbarian tribes lived. The Xia and Early Shang place was a miniature diagram of this cosmos. It had a traditional Longshan square shape oriented strictly north-south since Qi flows that direction (Polaris in the north). This square was further subdivided into nine parts based on the now ancient nine-in-one square, which had become a prosperity symbol. A rectalinear walled settlement for servants and craftsmen formed around this palace.

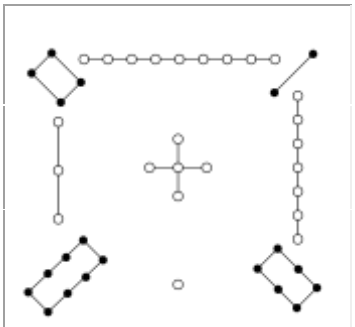
The nine-in-one square was transformed into the Holy Field symbol, sometime during the Shang Dynasty. In a myth the founder of the Xia Dynasty, Yu the Great, received the Holy Field symbol from a magical turtle sent by heaven. Its importance cannot be underestimated as it is the geometric basis of ancient Chinese architecture, urban planning, and geography. By the time of the Xia Dynasty, the nine-in-one square territory of earth was divided into nine states.

Although an important stage in urbanization, Erlitou was not a true city. It was a palace complex surrounded by an over-sized Neolithic village. During the Bronze Age, expensive bronze artifacts belonged exclusively to the aristocracy, the peasants still lived at a neolithic level of development. There was a succession of these palatial *du* capitals during the Xia and into the Early Shang Dynasties. Each successive capital had a higher level of development until the Late Shang capital Yin. Yin was the first true city and represented the culmination of Longshan Culture. The design of the palace at Yin was copied by the Zhou Dynasty to create the palace at Zhouyuan, which consolidated all the addition and experimentation of Yin over centuries. Although a copy, Zhouyuan was innovative for its high level of planning. This feature of Zhou urbanism would later be implemented at a national scale. Politically, the Zhou tribe, a vassal of the Shang dynasty, moved through a series of three capitals, Fan, Bo, and Shen, before settling at their ancestral capital, Zhouyuan on the Weishui River.

Classical Standard

When the Zhou took control of China from the Shang, they upset the natural and harmonious order of the universe, there was a serious legal question over their divine right to rule. The sudden death of their leader shortly afterward seemed to confirm that they had violated the will of heaven. The acting regent, the Duke of Zhou, acted quickly to restore the balance by resettling the Shang aristocracy, scholars, and craftsmen in the Holy Waste of Xia. He designed a new holy city, Chengzhou, according to strict cosmological principals to house them. Finally, he moved the 9 ding to be stored there. It was believed by these actions harmony would be restored and heaven would grant the Zhou the right to rule China. This work although based on centuries of design precedent was a radial synthsis and the first truly planned city in China. With Chengzhou, the Duke of Zhou established the classical standard of urban planning. Most new cities were modeled after its design. Ultimately, its forms were codified in the *Rites of Zhou*.

The Holy Field Symbol



4	9	2
3	5	7
8	1	6

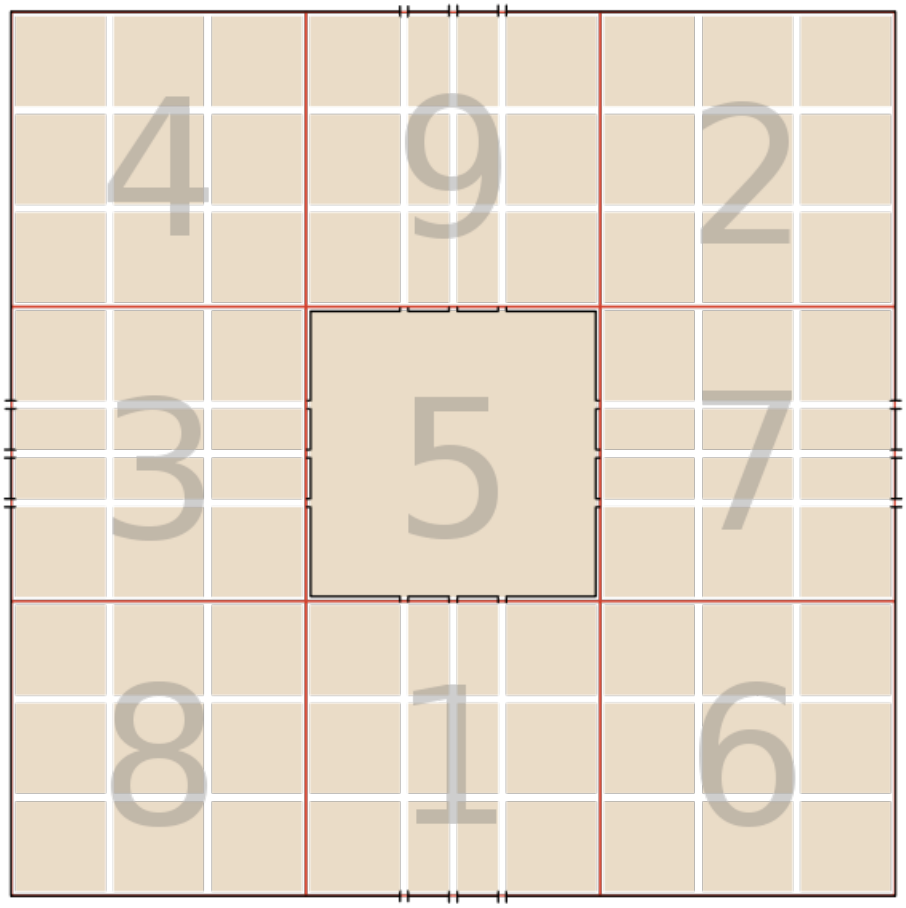
original diagram | modern notation

Concepts

The cities were planned by based on an enlarged Holy Field. The Holy Field symbol is essentially numerology applied to the nine-in-one square. Each square is numbered 1-9 to form a magic square of M = 15. Symbolic meaning based on homophony of the integer names had existed since the Xia Dynasty; however, this symbolism became fully expanded to Numerology during the Zhou Dynasty. The Holy Field was used to conceptualize many systems such as astronomy, geography, and politics. The Center is the subject of the system, the inner eight squares represents the means through which the subject acts, he twelve outer edges are amplifications of their qualities. The four squares of even integers at the corners are *yin* and the five axial squares of odd integers are *yang*. This was considered the correct balance of yin and yang to keep a harmonious flow of Qi.

The ideal city was therefore a diagram of this multipurpose cosmological symbol drawn upon the landscape. The *Rites of Zhou* codified how the Holy Field would be transformed into a city. Moreover, it dictated planning from a residential to regional scale.

The construction (ying) of the capital city by the artisans each side is 9 *li* (~3 km) in length with three gates; 9 longitudinal and 9 latitudinal lines divide the interior of the city with north to south road 9 times the carriage gauge in width (9 gui); the ancestral temple is on the left (of the palace city in the middle) and Sheji altars for the god of land and the god of grains on the right side; the palace faces the imperial court and backed against the market and the court and market are both one hundred *mu* (1 fú).



Plan of Chengzhou (supergrid in red)

A temple of ancestors was placed in square 7, a temple of agriculture in square 3, and an audience hall in square 1. The market was not considered of high importance and placed in square 9 to the north of the palace.The palace was located in square 5 of the Holy Field. The palace itself was a copy of the one at Zhouyuan. Square 5 was enclosed by fortifications to form the Inner City. The edge of the Holy Field was enclosed in a second ring of fortifications and referred to as the Outer City. The fortifications were specified as

20 m wide and 15 m high. The wall of the Outer City was pierced by 12 gates aligned with 3 major North-South avenues and 3 major East-West avenues. Parallel with these avenues, were 6 minor avenues for a total of 9 avenues running North-South and 9 avenues running East-West. These 18 avenues were specified as the width of nine chariots (Chinese: 24 *bu*; SI: 30 m), and divided the city into wards (Chinese: Pinyin: fāng) of 1x1 *li*. Conceptually each ward was an individual village, thus the capital was 81 villages within a wall. Inside each ward individual land was parceled out in modules of 8 *mu* (66.5x66.5 m, 4,553.47 m^2). The 8 *mu* standard plat could accommodate one aristocratic residence or be subdivided into as many as six smaller residential plats. The flexibility of this simple system allowed great diversity within each ward, but great homogeny at the city scale.

The Zhou classical standard extended the concept of modular planning used in the Capital to the regional planning scale. The city was part of a modular regional system of urban economics. It mirrored the hierarchy of the state in a smaller scale. Each module, whether urban or rural, in the hierarchy therefore had the same population base and political power. The economic rank of a city determined its size, as measured in li which was considered to be the length of a village as set by the Yellow Emperor. The value of the li at the time of Chengzhou was 358.2 m. At the smallest scale even the plats were built out into standardized Chinese houses as proscribed in the *Rites of Zhou*.

Zhou Urban Hierarchy:

- Capital city 9x9 *li* 81 wards of 1 *li*
- Primary city 5x5 *li* 25 wards of 1 *li*
- Secondary city 4x4 *li* 16 wards of 1 li
- Tertiary city 3x3 *li* 9 wards of 1 *li*

The first city planned and built according to the Zhou classical standard, Chengzhou (1036 BCE), illustrates the ideal city. First a suitable site was determined with correct Qi resources, a hill in the north (Mt. Mang) and river in the south (Luo river). Next, the center was determined by a compass, and a furrow was plowed to mark the edge of the wall. Then the a central place was built in square 5, finally the land was parceled out. Chengzhou, although the official capital in name and a holy city was never the political capital of the Western Zhou dynasty. Rather, a smaller version of Chengzhou called Wangcheng was built nearby in 1021 BCE. Because of their proximity both cities are erroneously called Luoyang in history.

Iron Age urbanization

As China moved into the Iron Age the total control of the Zhou over their empire dissolved into multiple states each one; however, modeled the precedent of Chengzhou to build their capitals. These period called the Eastern Zhou Dynasty, was a time of great urbanization in China. Chengzhou itself finally became the political capital of the Eastern Zhou in 510 BCE (its fortification tripled in width). The cites lost the strict rank to size hierarchy imposed by imperial authority and grew according to their economic and

military functions. This period although politically chaotic was a great period of urbanization, and experimentation of architecture and urban planning.

Along with the growth of cites there was a parallel growth of urban society; independent merchants, artisans, scholars, and the like all emerged a new social class at this time. In addition to the growth in the Yellow River Valley, the Yangtze River Valley began to urbanize under the cultural model of the Zhou Dynasty. The cities of states such as Wu, Yue, Chu, and Shu had regional variations on the Zhou classical standard. By the time of the Qin Dynasty conquest there was a great diversity of wealthy cites across China excluding the Lingnan region.

The city marketplace with tower was a new feature of this era that marked the beginning of an integrated economic function of cites. The architecture of the warring states featured high walls, large gates, and towers. The development of the tower as a symbol of power and social order especially defined this era. The tower usually projected outward at the top to create an image of strength and intimidation. The new marketplace was always overlooked by a tower.

Imperial Era

The imperial era of urban planning was marked by the theory of a national master plan which extended imperial authority uniformly across China by creating a hierarchy economic and political of cites. The origin of this master plan was Han Dynasty idealized memory of Zhou Dynasty rule as a golden age, that never existed. In this national master plan the empire of China was divided into provinces based on the earlier Nine Regions of Zhou, thus maintaing the concept of China as a square Holy Field. Each province was divided prefectures and each prefecture into counties. In the center of each county was a walled city. The county edge was one day march from the walled city. In this way imperial authority was omnipresent. The network of imperial administrative cites was overlaid on an existed network of unwalled villages and townships. One county therefore ruled over several townships and many more villages. This system of taxation and law imposed on a very productive matrix of agricultural villages is a continuation of the social system created by the Longshan and Yangshao cultures. The apex of this national master plan was a new creation, the imperial capital. The imperial capital was designed as microcosm of the national master plan.

Formation

Historically, the cites of the six states were combined into one unified regional system under the Qin Dynasty unification of China. Also under the Qin Dynasty Chengzhou lost its status as a holy city and was renamed Luoyang in 236 BCE. The Qin Dynasty destroyed most of the Eastern Zhou urbanization to concentrated its collected wealth at the capital Xianyang. Colonization of the Lingnan, and Ordos regions began at this time, using the a modified from the Zhou classical standard of urban design. The Qin created a national system of military garrisons on a three-tier administrative hierarchy as a practical measure to control the population according to strict legalist principles. Ironically

because legalism was so repressive the Qin lost power in a revolt and were replaced by the Han Dynasty, who continued the Qin system of imperial administration under a more a balanced confucian doctrine.

At its inception the Han Dynasty was immediately faced with the task of rebuilding the urban infrastructure which had been destroyed by Qin Dynasty purges and the war of succession after its downfall. The Han rebuilt China according to a national master plan from the Zhou Dynasty which had never been realized. To this end Han Dynasty scholars collected the scraps of knowledge that survived the Qin Dynasty purge to write the *Book of Diverse Crafts*, which was the basis of urban planning until the modern era. Thus, the rebuilt cities, new cites, and colonial cities were uniform to this imperial standard, and Chinese urban society flourished once again.

The County

During the Han Dynasty official administration extended only to the county level. The county was the primary unit of government control which harnessed the productive power of the villages in its area of control to concentrate wealth. The county was thus a city-state in function with two parts; a walled settlement 1×1*li* at the geographical center of territory. The city had no name of its own, it was named by adding the suffix -*cheng* to the county's name. The territory of the county was divided into districts called townships which were subdivided into villages. Villages generally had a population of 100. Currently the village level is the lowest level of administration in China. These local units, counties, were collected in groups of 8-10 called prefectures, and the prefectures were gathered in groups of 12-16 to form provinces. Economically, the county was a market for productive countryside, which consisted not only of agriculture, but also townships and villages of people to work the land and produce goods by cottage industry. The county extended military control over a segment of this productive matrix and was the entry point for goods to channel upward to the Imperial City. There were approximately 1500 counties in China proper. This economic structure was later modified by commercial towns in the Middle Ages.

A country was controlled by a magistrate in a walled complex in the walled county center. He was responsible for tax collection, justice, postal service, police, granaries, salt stores, social welfare, education, and religious ceremony. The magistrate's complex (yamen) was sited at the center of this the city at the point where the main east-west street crossed the main north-south street. The main entrance was in the south and axially aligned along the main north south street connecting to the south gate of the walls. Two arches on the east west street marked the entry forming a small plaza. The south side of the plaza was a dragon wall and the north was the main gate of the compound. This gate lead to a courtyard passing through this courtyard to another gate, called the gate of righteousness, lead to the main courtyard of the complex. The north side of this courtyard was the central hall where the magistrate worked the two side halls contained the six offices. behind the central hall was another courtyard and hall where the magistrate met with higher ranking officials. The three courtyard compound formed the center of the

complex to the east west of it were other halls, offices, granaries, stables, libraries, official residences, and prisons.

Imperial city

The imperial capital was meant to exist outside of any one region, even the one it was physically located in. To achieve this it used a text based plan, a cult of heaven, forced migration, and symbolization of the city as the Emperor. The evolution of the imperial capital occurred in three stages, first the super-regional capital on Xianyang, followed by the semi-regional and semi-textual capital of Changan, and finally fully realized in the fully textual capital of Luoyang. The capital city, Changan, was built to exceed in every way Xinayang. Luoyang would became the model of all future imperial cities.

Later developments

After the fall of the Han Dynasty China entered a period of Decline which Ended with the Tang Dynasty. A new urban paradigm was created at this time

Neoclassical Standard

The Yuan Dynasty revived the old classical standard of the Zhou Dynasty. This standard was used until World War Two at which time modern Chinese urban planning began.

Chapter- 4

Height Restriction Laws

Height restriction laws are laws that restrict the maximum height of structures. Height restriction laws are always applied for the surroundings of airports, because too tall structures of any kind are always a danger for flight safety. Height restriction laws are not always kept strictly. Sometimes there are exceptions made for important infrastructure equipment, as radio towers or for structures older than the airport. These structures have to be marked with red and white paint, have flight safety lamps on top, or both. Often red and white paint and flight safety lamps have to be installed on high structures (taller than 100 metres) far away from airports.

Beside this, there are further types of height restriction laws, depending on architectural reasons.

One of the most important types of restriction involves limiting the height of new buildings so as not to block views of an older work decreed to be important landmark by a government. For example, In the Tsarist Russian capital of Saint Peterburg, buildings could not be taller than the Winter Palace, and in Washington, D.C., no building can be more than 20 feet (6m) taller than the width of the street on which it sits due to the Heights of Buildings Act of 1910.

Asia

Hong Kong, People's Republic of China

To protect the ridge line along Hong Kong Island and in Kowloon, height restrictions are imposed according to the location of the buildings or structures.

Indonesia

In Bali, Indonesia, a building cannot be higher than a palm tree, which is about 20 meters. The only building that is higher than a palm tree is the Bali Beach hotel because the hotel was built before the height restriction was announced.

Singapore

The Civil Aviation Authority of Singapore permits buildings to be constructed only up to a maximum height of 280 metres due to aviation reasons.

Canada

Canada has no national height restrictions, but many individual cities do have height restriction bylaws and building is restricted by the national aviation authority (Transport Canada) near airports. Some examples:

- Edmonton: the federal aviation authority, Transport Canada, mandates that all buildings be less than 150 metres (490 ft) because of the nearby Edmonton City Centre Airport.
- Montreal: until the late 1920s, all buildings were limited to 10 stories. Currently buildings are limited to a height less than the elevation of Mount Royal, the city's central hill, or 223 metres (732 ft) above mean sea level. This effectively limits the maximum height to around 200 metres (660 ft) in the downtown.
- Ottawa-Gatineau: buildings in downtown Ottawa are limited to 45.5 metres (149 ft) so that the Peace Tower, part of the parliament buildings, can dominate the skyline. However, many exceptions have been made and several building in the region are taller than this.
- Vancouver: maintains "view corridors" that protect views of the North Shore Mountains. It also has a density bank that allows developers to exceed maximum building height restrictions in exchange for preserving heritage buildings.
- Whitehorse: No buildings should be taller than four storeys due to the nearby fault line. The Whitehorse Chamber of Commerce said that maintaining the height restriction of four storyes would discourage businesses from coming to the city. On 2007, the city rejected the proposal to increase the height limit to eight storeys. In order to exceed height limit, the developer would have to apply for an amendment to the city's official community plan.

Most of Canada's tallest buildings are located in three cities: Toronto, Montreal and Calgary.

Europe

In Europe, there is no official general law restricting the height of structures. However, only the following structures exceeding the 1200 ft (365.76 m) level were ever built in Europe outside the territory of former Soviet Union:

Structure	Year of built	Country	Town	Pinnacle height (m)	Pinnacle height (ft)	Remarks
Gerbrandy Tower	1961	Netherlands	Lopik	366.8 m	1203 ft	Original height: 382.5 m (1255 ft). 1987: height reduction to 375 m (1230 ft). Further height reduction to 366.8 m (1203 ft) on August 2, 2007
Torreta de Guardamar	1962	Spain	Guardamar del Segura	370 m	1214 ft	radio mast insulated against ground used by US-military for VLF-transmission
Longwave radio mast Hellissandur	1963	Iceland	Hellissandur	412 m	1352 ft	radio mast insulated against ground, originally used for LORAN-C, now for longwave broadcasting
Emley Moor TV Mast	1964	United Kingdom	Emley Moor	385 m	1263 ft	collapsed in 1969
Belmont TV Mast	1965	United Kingdom	Donington on Bain	388 m	1273 ft	
Berlin TV Tower	1969	Germany	Berlin	368 m	1207 ft	Original height: 362 m (1188 ft), height was later increased to 365 m (1198 ft) and in 1997 to 368 m (1207 ft)
Warszawa Radio Mast	1974	Poland	Gabin	646.4 m	2121 ft	Collapsed in 1991

Except for Warszawa Radio Mast and Berlin TV Tower, whose height was until 1997 below the 1200 ft level, all these structures were built before 1965. As the number of architectural structures rapidly increase, when you go down to the 1200 ft level, 1200 ft seems to be an unofficial maximum height for structures in Europe outside the former Soviet Union.

In the area of former Soviet Union, there seems to exist no official or unofficial height restriction limit as the 540 metres tall Ostankino Tower in Moscow, the 419.7 metres tall chimney of GRES-2 in Eibastusz and the 385 metres tall TV Tower in Kiev show.

The lists of tallest structures in Denmark, Sweden and Finland suggest, that in these countries the height of structures is restricted to 1100 ft (335.28 m).

Beside this, there are height restriction laws in many towns with a lot of old buildings and monuments, because structures far taller than those surrounding it have a known tendency not to mix well with historically or architecturally significant surroundings.

In Athens buildings are not allowed to surpass 12 floors such as not to block the view towards the parthenon. There are several exceptcions though such as the Athens Tower, the Atrina center and the OTE central building who exceed that level. This is due to them being either build far away from the center or the fact that they were constructed in periods of political instability. The city's tallest structure is the Athens Tower reaching 103m and counting 25 floors.

Further height restriction laws exist also in order not to disturb the air exchange in cities, which can be handicapped by large tall buildings.

United States

In the United States, the maximum height of structures of any kind is restricted to 2,000 feet (609.6 m). However, there are exceptions possible, if a taller would be in public benefit (like the KXTV/KOVR Tower) or, of course, if the structure is older than the restriction law, which was made in 1965, as in case of the KVLY/KTHI TV Mast. There are also some locales where no building may be higher than a designated building. An example is in Madison, Wisconsin, where no building located within one mile of the Wisconsin State Capitol may be higher than it.

Chapter- 5

Land Use Forecasting

Land use forecasting undertakes to project the distribution and intensity of trip generating activities in the urban area. In practice, land use models are demand driven, using as inputs the aggregate information on growth produced by an aggregate economic forecasting activity. Land use estimates are inputs to the transportation planning process.

The discussion of land use forecasting to follow begins with a review of the Chicago Area Transportation Study (CATS) effort. CATS researchers did interesting work, but did not produce a transferable forecasting model, and researchers elsewhere worked to develop models. After reviewing the CATS work, the discussion will turn to the first model to be widely known and emulated: the Lowry model developed by Ira S. Lowry when he was working for the Pittsburgh Regional Economic Study. Second and third generation Lowry models are now available and widely used, as well as interesting features incorporated in models that are not widely used.

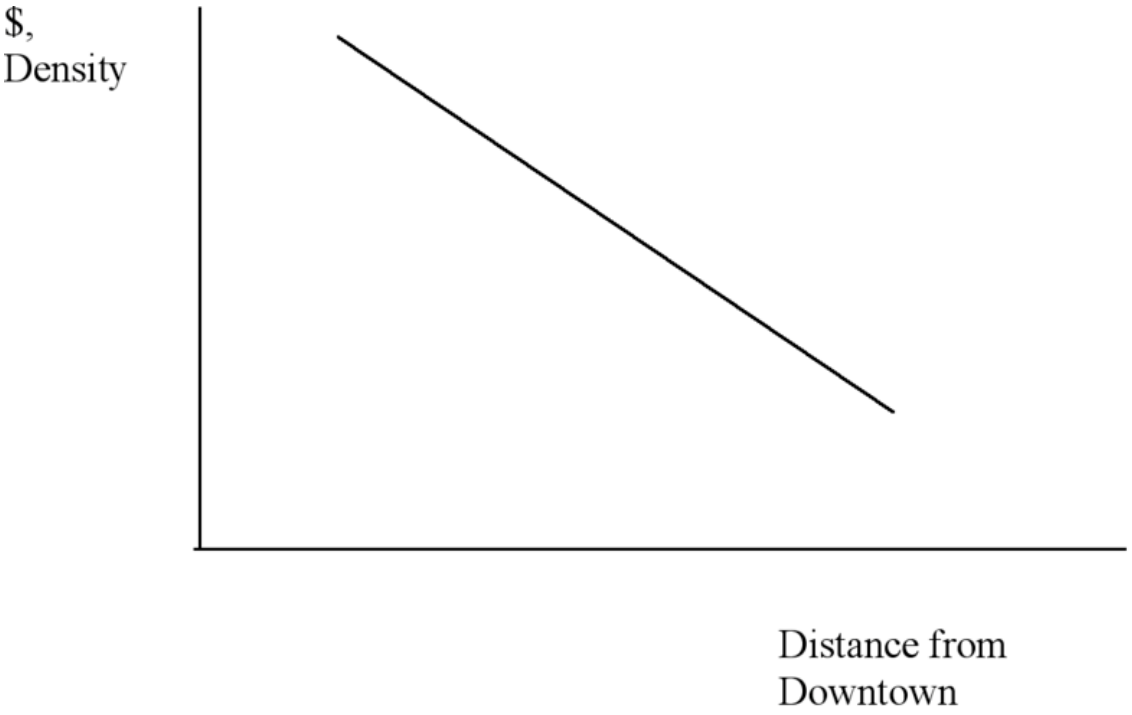
Today, the transportation planning activities attached to metropolitan planning organizations are the loci for the care and feeding of regional land use models. In the US, interest in and use of models is growing rapidly, after an extended period of limited use. Interest is also substantial in Europe and elsewhere.

Even though the majority of metropolitan planning agencies in the US do not use formal land use models, we need to understand the subject: the concepts and analytic tools shape how land use-transportation matters are thought about and handled; there is a good bit of interest in the research community where there have been important developments; and a new generation of land use models such as UrbanSim has developed since the 1990's that depart from these aggregate models, and incorporate innovations in discrete choice modeling, microsimulation, dynamics, and geographic information systems.

Land Use Analysis at the Chicago Area Transportation Study

In brief, the CATS analysis of the 1950s was “by mind and hand” distribute growth. The product was maps developed with a rule-based process. The rules by which land use was allocated were based on state-of-the art knowledge and concepts, and it hard to fault CATS on those grounds. The CATS took advantage of Colin Clark’s extensive work on the distribution of population densities around city centers. Theories of city form were available, sector and concentric circle concepts, in particular. Urban ecology notions were

important at the University of Chicago and University of Michigan. Sociologists and demographers at the University of Chicago had begun its series of neighborhood surveys with an ecological flavor. Douglas Carroll, the CATS director, had studied with Amos Hawley, an urban ecologist at Michigan.



Colin Clark studied the population densities of many cities, and he found traces similar to those in the figure. Historic data show how the density line has changed over the years. To project the future, one uses changes in the parameters as a function of time to project the shape of density in the future, say in 20 years. The city spreads glacier-like. The area under the curve is given by population forecasts.

The CATS did extensive land use and activity surveys, taking advantage of the City work done by the Chicago Planning Commission. Hock's work forecasting activities said what the land uses-activities were that would be accommodated under the density curve. Existing land use data were arrayed in cross section. Land uses were allocated in a manner consistent with the existing pattern.

The study area was divided into transportation analysis zones: small zones where there was a lot of activity, larger zones elsewhere. The original CATS scheme reflected its Illinois State connections. Zones extended well away from the city. The zones were defined to take advantage of Census data at the block and minor civil division levels. They also strived for homogeneous land use and urban ecology attributes.

The first land use forecasts at CATS arrayed developments using "by hand" techniques, as stated. We do not fault the "by hand" technique – the then state of computers and data systems forced it. It was a rule based land use allocation. Growth was the forcing function, as were inputs from the economic study. Growth said that the population density envelope would have to shift. The land uses implied by the mix of activities were allocated from "Where is the land available?" and "What's the use now?" Considerations. Certain types of activities allocate easily: steel mills, warehouses, etc.

Conceptually, the allocation rules seem important. There is lot of spatial autocorrelation in urban land uses; it's driven by historical path dependence: this sort of thing got started here and seeds more of the same. This autocorrelation was lost somewhat in the step from "by hand" to analytic models.

The CATS procedure was not viewed with favor by the emerging Urban Transportation Planning professional peer group, and in the late 1950s there was interest in the development of analytic forecasting procedures. At about the same time, similar interests emerged to meet urban redevelopment and sewer planning needs, and interest in analytic urban analysis emerged in political science, economics, and geography.

Lowry Model

Hard on the heels of the CATS work, several agencies and investigators began to explore analytic forecasting techniques, and between 1956 and the early 1960s a number of modeling techniques evolved. Irwin (1965) provides a review of the status of emerging models. One of the models, the Lowry model, was widely adopted.

Supported at first by local organizations and later by a Ford Foundation grant to the RAND Corporation, Ira S. Lowry undertook a three-year study in the Pittsburgh metropolitan area. (Work at RAND will be discussed later.) The environment was data rich, and there were good professional relationships available in the emerging emphasis on location and regional economies in the Economics Department at the University of Pittsburgh under the leadership of Edgar M. Hoover. The structure of the Lowry model is shown on the flow chart.

The flow chart gives the logic of the Lowry model. It is demand driven. First, the model responds to an increase in basic employment. It then responds to the consequent impacts on service activities. As Lowry treated his model and as the flow chart indicates, the model is solved by iteration. But the structure of the model is such that iteration is not necessary.

Although the language giving justification for the model specification is an economic language and Lowry is an economist, the model is not an economic model. Prices, markets, and the like do not enter.

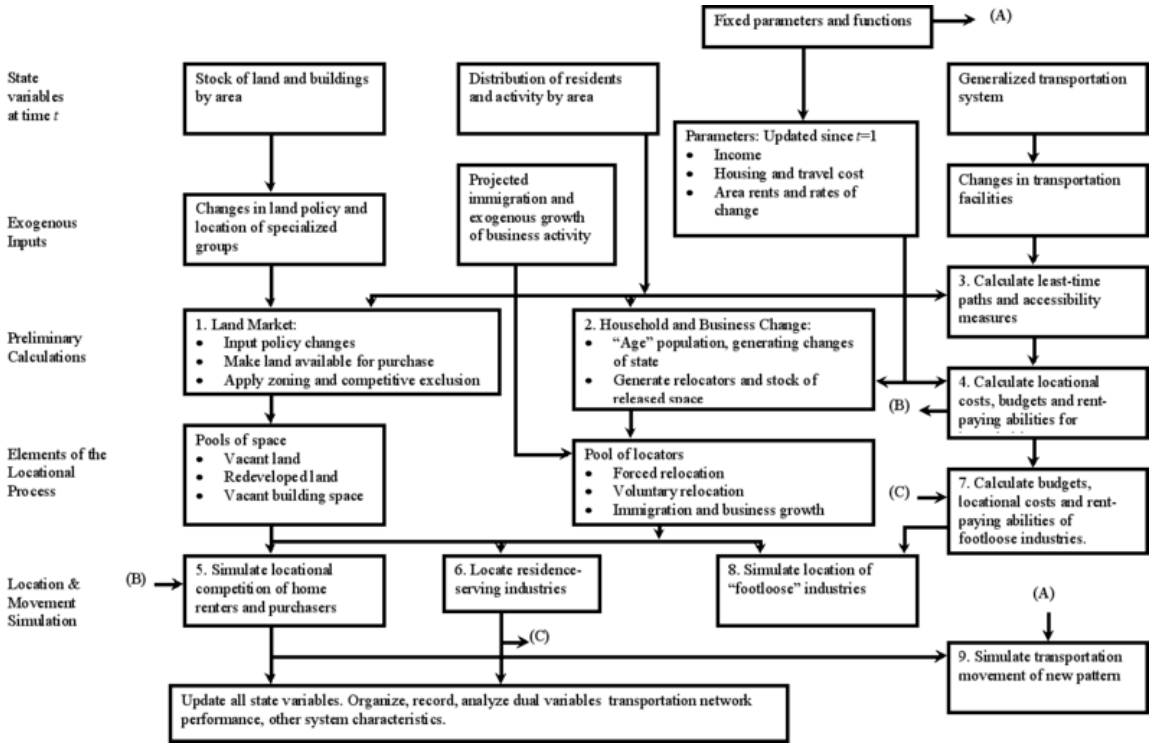
A review of Lowry's publication will suggest reasons why his approach has been widely adopted. The publication was the first full elaboration of a model, data analysis and handling problems, and computations. Lowry's writing is excellent. He is candid and discusses his reasoning in a clear fashion. One can imagine an analyst elsewhere reading Lowry and thinking, "Yes, I can do that."

The diffusion of innovations of the model is interesting. Lowry was not involved in consulting, and his word of mouth contacts with transportation professionals were quite limited. His interest was and is in housing economics. Lowry did little or no "selling." We learn that people will pay attention to good writing and an idea whose time has come.

The model makes extensive use of gravity or interaction decaying with distance functions. Use of "gravity model" ideas was common at the time Lowry developed his model; indeed, the idea of the gravity model was at least 100 years old at the time. It was under much refinement at the time of Lowry's work; persons such as Alan Voorhees, Mort Schneider, John Hamburg, Roger Creighon, and Walter Hansen made important contributions.

The Lowry Model provided a point of departure for work in a number of places. Goldner (1971) traces its impact and modifications made. Steven Putnam at the University of Pennsylvania used it to develop PLUM (Projective Land Use Model) and I (incremental)PLUM. We estimate that Lowry derivatives are used in most MPO studies, but most of today's workers do not recognize the Lowry heritage, the derivatives are one or two steps away from the mother logic.

Penn-Jersey Model



The P-J (Penn-Jersey, greater Philadelphia area) analysis had little impact on planning practice. It will now be discussed, even so, because it illustrates what planners might have done, given available knowledge building blocks. It is an introduction to some of the work by researchers who are not practicing planners.

The P-J study scoped widely for concepts and techniques. It scoped well beyond the CATS and Lowry efforts, especially taking advantage of things that had come along in the late 1950s. It was well funded and viewed by the State and the Bureau of Public Roads as a research and a practical planning effort. Its Director's background was in public administration, and leading personnel were associated with the urban planning department at the University of Pennsylvania. The P-J study was planning and policy oriented.

The P-J study drew on several factors "in the air". First, there was a lot of excitement about economic activity analysis and the applied math that it used, at first, linear programming. T. J. Koopmans, the developer of activity analysis, had worked in transportation. There was pull for transportation (and communications) applications, and the tools and interested professionals were available.

There was work on flows on networks, through nodes, and activity location. Orden (1956) had suggested the use of conservation equations when networks involved intermediate modes; flows from raw material sources through manufacturing plants to market were treated by Beckmann and Marschak (1955) and Goldman (1958) had treated commodity flows and the management of empty vehicles.

Maximal flow and synthesis problems were also treated (Boldreff 1955, Gomory and Hu 1962, Ford and Fulkerson 1956, Kalaba and Juncosa 1956, Pollack 1964). Balinski (1960) considered the problem of fixed cost. Finally, Cooper (1963) considered the problem of optimal location of nodes. The problem of investment in link capacity was treated by Garrison and Marble (1958) and the issue of the relationship between the length of the planning time-unit and investment decisions was raised by Quandt (1960) and Pearman (1974).

A second set of building blocks was evolving in location economics, regional science, and geography. Edgar Dunn (1954) undertook an extension of the classic von Thünen analysis of the location of rural land uses. Also, there had been a good bit of work in Europe on the interrelations of economic activity and transportation, especially during the railroad deployment era, by German and Scandinavian economists. That work was synthesized and augmented in the 1930's by August Lösch, and his The Location of Economic Activities was translated into English during the late 1940s. Edgar Hoover's work with the same title was also published in the late 1940s. Dunn's analysis was mainly graphical; static equilibrium was claimed by counting equations and unknowns. There was no empirical work (unlike Garrison 1958). For its time, Dunn's was a rather elegant work.

William Alonso's (1964) work soon followed. It was modeled closely on Dunn's and also was a University of Pennsylvania product. Although Alonso's book was not published until 1964, its content was fairly widely known earlier, having been the subject of papers at professional meetings and Committee on Urban Economics (CUE) seminars. Alonso's work became much more widely known than Dunn's, perhaps because it focused on "new" urban problems. It introduced the notion of bid rent and treated the question of the amount of land consumed as a function of land rent.

Wingo (1961) was also available. It was different in style and thrust from Alonso and Dunn's books and touched more on policy and planning issues. Dunn's important, but little noted, book undertook analysis of location rent, the rent referred to by Marshall as situation rent. Its key equation was:

$$R = Y\,(P - c) - Ytd$$

where: R = rent per unit of land, P = market price per unit of product, c = cost of production per unit of product, d = distance to market, and t = unit transportation cost.

In addition, there were also demand and supply schedules.

This formulation by Dunn is very useful, for it indicates how land rent ties to transportation cost. Alonso's urban analysis starting point was similar to Dunn's, though he gave more attention to market clearing by actors bidding for space.

The question of exactly how rents tied to transportation was sharpened by those who took advantage of the duality properties of linear programming. First, there was a spatial price

equilibrium perspective, as in Henderson (1957, 1958) Next, Stevens (1961) merged rent and transportation concepts in a simple, interesting paper. In addition, Stevens showed some optimality characteristics and discussed decentralized decision-making. This simple paper is worth studying for its own sake and because the model in the P-J study took the analysis into the urban area, a considerable step.

Stevens 1961 paper used the linear programming version of the transportation, assignment, translocation of masses problem of Koopmans, Hitchcock, and Kantorovich. His analysis provided an explicit link between transportation and location rent. It was quite transparent, and it can be extended simply. In response to the initiation of the P-J study, Herbert and Stevens (1960) developed the core model of the P-J Study. Note that this paper was published before the 1961 paper. Even so, the 1961 paper came first in Stevens' thinking.

The Herbert-Stevens model was housing centered, and the overall study had the view that the purpose of transportation investments and related policy choices was to make Philadelphia a good place to live. Similar to the 1961 Stevens paper, the model assumed that individual choices would lead to overall optimization.

The P-J region was divided into *u* small areas recognizing *n* household groups and *m* residential bundles. Each residential bundle was defined on the house of apartment, the amenity level in the neighborhood (parks, schools, etc), and the trip set associated with the site. There is an objective function:

$$\max Z = \sum_{k=1}^{u} \sum_{i=1}^{n} \sum_{h=1}^{m} x_{ih}^{k} \left(b_{ih} - c_{ih}^{k} \right) \quad x_{ih}^{k} \geq 0$$

wherein x_{ihk} is the number of households in group *i* selecting residential bundle *h* in area *k*. The items in brackets are bih (the budget allocated by *i* to bundle *h*) and c_{ihk}, the purchase cost of *h* in area *k*. In short, the sum of the differences between what households are willing to pay and what they have to pay is maximized; a surplus is maximized. The equation says nothing about who gets the surplus: it is divided between households and those who supply housing in some unknown way. There is a constraint equation for each area limiting the land use for housing to the land supply available.

$$\sum_{i=1}^{n} \sum_{h=1}^{m} s_{ih} x_{ih}^{k} \leq L^{k}$$

where: s_{ih} = land used for bundle *h* L_k = land supply in area *k*

And there is a constraint equation for each household group assuring that all folks can find housing.

$$\sum_{k=1}^{u} \sum_{h=1}^{m} x_{ih}^{k} = N_i$$

where: N_i = number of households in group i

A policy variable is explicit, the land available in areas. Land can be made available by changing zoning and land redevelopment. Another policy variable is explicit when we write the dual of the maximization problem, namely:

$$\min Z' = \sum_{k=1}^{u} r^k L^k + \sum_{i=1}^{n} v_i \left(-N_i\right)$$

Subject to:

$$s_{ih} r^k - v_i \geq b_{ih} - c_{ih}^k$$

$$r^k \geq 0$$

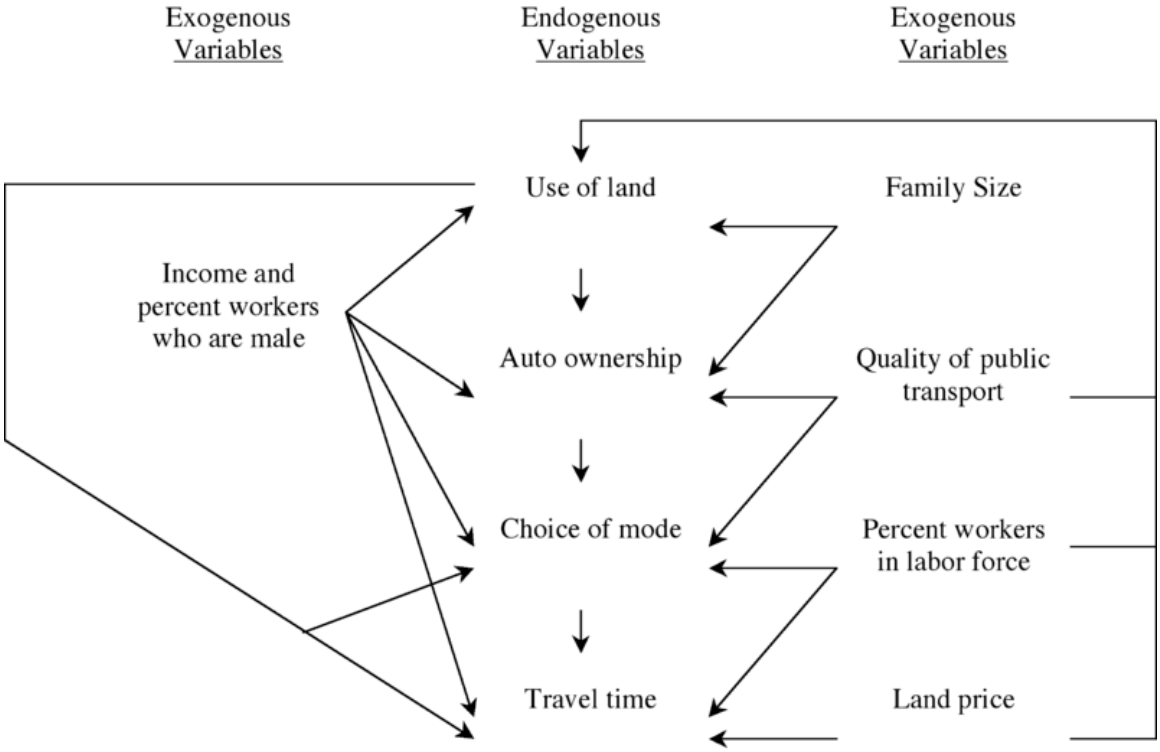
The variables are r^k (rent in area k) and v_i an unrestricted subsidy variable specific to each household group. Common sense says that a policy will be better for some than others, and that is reasoning behind the subsidy variable. The subsidy variable is also a policy variable because society may choose to subsidize housing budgets for some groups. The constraint equations may force such policy actions.

It is apparent that the Herbert-Stevens scheme is a very interesting one. Its also apparent that it is housing centered, and the tie to transportation planning is weak. That question is answered when we examine the overall scheme for study, the flow chart of a single iteration of the model. How the scheme works requires little study. The chart doesn't say much about transportation. Changes in the transportation system are displayed on the chart as if they are a policy matter.

The word "simulate" appears in boxes five, eight, and nine. The P-J modelers would say, "We are making choices about transportation improvements by examining the ways improvements work their way through urban development. The measure of merit is the economic surplus created in housing."

Academics paid attention to the P-J study. The Committee on Urban Economics was active at the time. The committee was funded by the Ford Foundation to assist in the development of the nascent urban economics field. It often met in Philadelphia for review of the P-J work. Stevens and Herbert were less involved as the study went along. Harris gave intellectual leadership, and he published a fair amount about the study (1961, 1962). However, the P-J influence on planning practice was nil. The study didn't put transportation up front. There were unsolvable data problems. Much was promised but never delivered. The Lowry model was already available.

Kain Model



About 1960, the Ford Foundation made a grant to the RAND Corporation to support work on urban transportation problems. (Lowry's work was supported in part by that grant) The work was housed in the logistics division of RAND, where the economists at RAND were housed. The head of that division was then Charles Zwick, who had worked on transportation topics previously.

The RAND work ranged from new technology and the cost of tunneling to urban planning models and analyses with policy implications. Some of the researchers at RAND were regular employees. Most, however, were imported for short periods of time. The work was published in several formats: first in the RAND P series and RM series and then in professional publications or in book form. Often, a single piece of work is available in differing forms at different places in the literature.

In spite of the diversity of topics and styles of work, one theme runs through the RAND work – the search for economic policy guides. We see that theme in Kain (1962), which is discussed by de Neufville and Stafford, and the figure is adapted from their book.

Kain's model dealt with direct and indirect affects. Suppose income increases. The increase has a direct effect on travel time and indirect affects through the use of land, auto ownership, and chopice of mode. Work supported at RAND also resulted in Meyer, Kain and Wohl (1964). These parts of the work at RAND had considerable influence on subsequent analysis (but not so much on practice as on policy). John Meyer became President of the National Bureau of Economic Research and worked to refocus its lines of

work. Urban analysis Kain-style formed the core of a several-year effort and yielded book length publications (see, e.g., G. Ingram, et al., The NBER Urban Simulation Model, Columbia Univ. Press, 1972). After serving in the Air Force, Kain moved to Harvard, first to redirect the Urban Planning Department. After a time, he relocated at the Kennedy School, and he, along with José A. Gómez-Ibáñez, John Meyer, and C. Ingram, lead much work in an economic-policy analysis style. Martin Wohl moved on from RAND, eventually, to Carnegie-Mellon University, where he continued his style of work (e.g. Wohl 1984).

Policy Oriented Gaming

The notion that the impact of policy on urban development might be simulated was the theme for a conference at Cornell in the early 1960s; collegiums were formed, several streams of work emerged. Several persons developed rather simple (from today's view) simulation games. Land use development was the outcome of gravitational type forces and the issue faced was that of conflicts between developers and planners when planners intervened in growth. CLUG and METROPOLIS are two rather well known products from this stream of work (they were the SimCity of their day); there must be twenty or thirty other similar planner vs. developer in the political context games. There seems to have been little serious attempt to analyze use of these games for policy formulation and decision-making, except for work at the firm Environmetrics.

Peter House, one of the Cornell Conference veterans, established Environmetrics early in the 1960s. It, too, started with relatively simple gaming ideas. Over about a ten-year period, the comprehensiveness of gaming devices was gradually improved and, unlike the other gaming approaches, transportation played a role in their formulation. Environmetrics' work moved into the Environmental Protection Agency and was continued for a time at the EPA Washington Environmental Studies Center.

A model known as River Basin was generalized to GEM (General Environmental Assessment Model) and then birthed SEAS (Strategic Environmental Assessment Model) and SOS (Son of SEAS). There was quite a bit of development as the models were generalized, too much to be discussed here.

The most interesting thing to be noted is change in the way the use of the models evolved. Use shifted from a "playing games" stance to an "evaluate the impact of federal policy" stance. The model (both equations and data) is viewed as a generalized city or cities. It responds to the question: What would be the impact of proposed policies on cities?

An example of generalized question answering is LaBelle and Moses (1983) La Belle and Moses implement the UTP process on typical cities to assess the impact of several policies. There is no mystery why this approach was used. House had moved from the EPA to the DOE, and the study was prepared for his office.

University of North Carolina

A group at Chapel Hill, mainly under the leadership of Stuart Chapin, began its work with simple analysis devices somewhat similar to those used in games. Results include Chapin (1965), Chapin and H. C. Hightower (1966) and Chapin and Weiss (1968). That group subsequently focused on (1) the ways in which individuals make tradeoffs in selecting residential property, (2) the roles of developers and developer decisions in the urban development process, and (3) information about choices obtained from survey research. Lansing and Muller (1964 and 1967) at the Survey Research Center worked in cooperation with the Chapel Hill Group in developing some of this latter information.

The first work was on simple, probabilistic growth models. It quickly moved from this style to game-like interviews to investigate preferences for housing. Persons interviewed would be given "money" and a set of housing attributes – sidewalks, garage, numbers of rooms, lot size, etc. How do they spend their money? This is an early version of the game The Sims. The work also began to examine developer behavior, as mentioned.

Reviews and Surveys

In addition to reviews at CUE meetings and sessions at professional meetings, there have been a number of organized efforts to review progress in land use modeling. An early effort was the May 1965 issue of the Journal of the American Institute of Planners edited by B. Harris. The next major effort was a Highway Research Board Conference in June, 1967 (HRB 1968) and this was most constructive. This reference contains a review paper by Lowry, comments by Chapin, Alonso, and others. Of special interest is Appendix A, which listed several ways that analysis devices had been adapted for use. Robinson (1972) gives the flavor of urban redevelopment oriented modeling. And there have been critical reviews (e.g. Brewer 1973, Lee 1974). Pack (1978) addresses agency practice; it reviews four models and a number of case studies of applications.. The discussion above has been limited to models that most affected practice (Lowry) and theory (P-J, etc.) there are a dozen more that are noted in reviews. Several of those deal with retail and industry location. There are several that were oriented to urban redevelopment projects where transportation was not at issue.

Discussion

Lowry-derived land use analysis tools reside in the MPOs. The MPOs also have a considerable data capability including census tapes and programs, land use information of varied quality, and survey experiences and survey-based data. Although large model work continues, fine detail analysis dominates agency and consultant work in the US. One reason is the requirement for environmental impact statements. Energy, noise, and air pollution have been of concern, and techniques special to the analysis of these topics have been developed. Recently, interest has increased in the uses of developer fees and/or other developer transportation related actions. Perceived shortages for funds for highways and transit are one motive for extracting resources or actions from developers. There's also the long-standing ethic that those who occasion costs should pay. Finally, there is a

small amount of theoretical or academic work. Small is the operative word. There are few researchers and the literature is limited.

The discussion to follow will first emphasize the latter, theory-oriented work. It will then turn to a renewed interest in planning models in the international arena. Modern behavioral, academic, or theory-based analysis of transportation and land use date from about 1965. By modern we mean analysis that derives aggregate results from micro behavior. First models were Herbert-Stevens in character. Similar to the P-J model, they:

- Treated land as the constraining resource and land use choices given land rent variations as the critical behavior.
- Imagined roles for policy makers.
- Emphasized residential land uses and ignored interdependencies in land uses.
- Used closed system, comparative statics ways of thinking.
- And gave no special attention to transportation.

There have been three major developments subsequently:

1. . Consideration of transportation activities and labor and capital inputs in addition to land inputs,
2. . Efforts to use dynamic, open system ways of thinking, and
3. . Inquiry into how micro choice behavior yields macro results.

The Herbert-Stevens model was not a behavioral model in the sense that it did not try to map from micro to macro behavior. It did assume rational, maximizing behavior by locators. But that was attached to macro behavior and policy by assumed some centralized authority that provided subsidies. Wheaton (1974) and Anderson (1982) modified the Herbert-Stevens approach in different, but fairly simple, ways to deal with the artificiality of the Herbert-Stevens formulation.

An alternative to the P-J, Herbert-Stevens tradition was seeded when Edwin S. Mills, who is known as the father of modern urban economics, took on the problem of scoping more widely. Beginning with Mills (1972), Mills has developed a line of work yielding more publications and follow on work by others, especially his students.

Using a Manhattan geometry, Mills incorporated a transportation component in his analysis. Homogeneous zones defined by the transportation system were analyzed as positioned x integer steps away from the central zone via the Manhattan geometry. Mills treated congestion by assigning integer measures to levels of service, and he considered the costs of increasing capacity. To organize flows, Mills assumed a single export facility in the central node. He allowed capital-land rent trade offs yielding the tallest buildings in the central zones.

Stating this in a rather long but not difficult to understand linear programming format, Mills' system minimizes land, capital, labor, and congestion costs, subject to a series of constraints on the quantities affecting the system. One set of these is the exogenously

gives vector of export levels. Mills (1974a,b) permitted exports from non-central zones, and other modifications shifted the ways congestion is measured and allowed for more than one mode of transport.

With respect to activities, Mills introduced an input-output type coefficient for activities; aqrs, denotes land input q per unit of output r using production technique s. T.J. Kim (1979) has followed the Mills tradition through the addition of articulating sectors. The work briefly reviewed above adheres to a closed form, comparative statics manner of thinking. This note now will turn to dynamics.

The literature gives rather varied statements on what consideration of dynamics means. Most often, there is the comment that time is considered in an explicit fashion, and analysis becomes dynamic when results are run out over time. In that sense, the P-J model was a dynamic model. Sometimes, dynamics are operationalized by allowing things that were assumed static to change with time. Capital gets attention. Most of the models of the type discussed previously assume that capital is malleable, and one considers dynamics if capital is taken as durable yet subject to ageing – e.g., a building once built stays there but gets older and less effective. On the people side, intra-urban migration is considered. Sometimes too, there is an information context. Models assume perfect information and foresight. Let's relax that assumption.

Anas (1978) is an example of a paper that is "dynamic" because it considers durable capital and limited information about the future. Residents were mobile; some housing stock was durable (outlying), but central city housing stock was subject to obsolescence and abandonment.

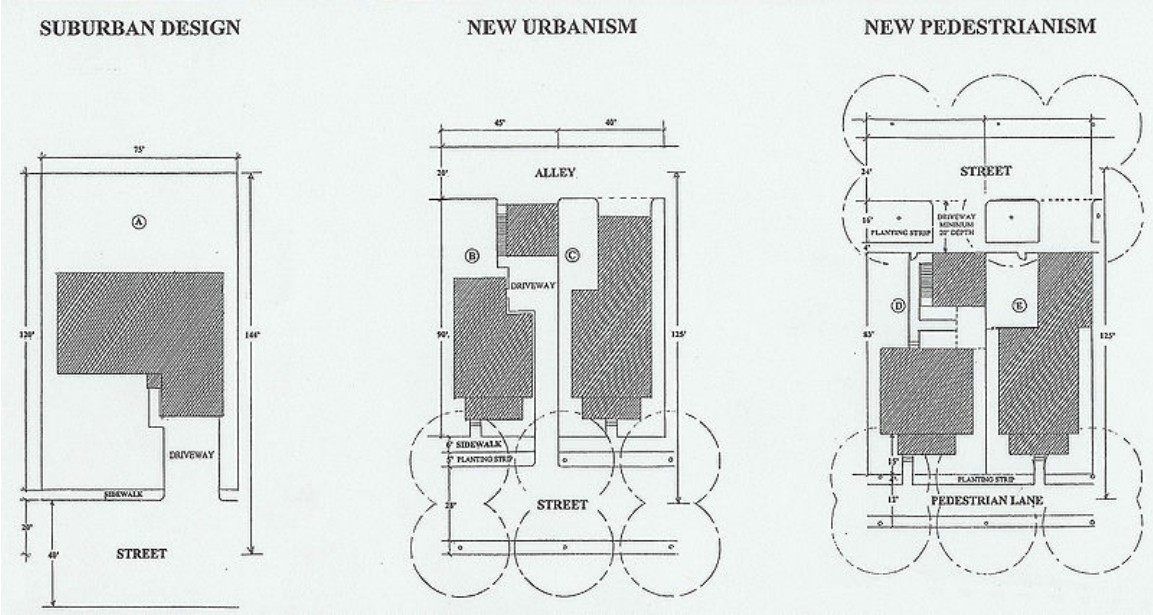
Persons working in other traditions tend to emphasize feedbacks and stability (or the lack of stability) when they think "dynamics," and there is some literature reflecting those modes of thought. The best known is Forester (1968), which set off an enormous amount of critique and some follow on thoughtful extensions (e.g., Chen (ed), 1972)

Robert Crosby in the University Research Office of the US DOT was very much interested in the applications of dynamics to urban analysis, and when the DOT program was active some work was sponsored (Kahn (ed) 1981). The funding for that work ended, and we doubt if any new work was seeded.

The analyses discussed use land rent ideas. The direct relation between transportation and land rent is assumed, e.g., as per Stevens. There is some work that takes a less simple view of land rent. An interesting example is Thrall (1987). Thrall introduces a consumption theory of land rent that includes income effects; utility is broadly considered. Thrall manages both to simplify analytic treatment making the theory readily accessible and develop insights about policy and transportation.

Chapter- 6

New Pedestrianism



Suburban design compared to New Urbanism and New Pedestrianism.

Principles of New Pedestrianism at a street in the renewed city center of Radovish, Republic of Macedonia. Pedestrians are dominant, but there is also place for cars (parked on the left).

New Pedestrianism (NP) is a more idealistic variation of New Urbanism in urban planning theory, founded in 1999 by Michael E. Arth, an American artist, urban/home/ landscape designer, futurist, and author. NP addresses the problems associated with New Urbanism and is an attempt to solve various social, health, energy, economic, aesthetic, and environmental problems, with special focus on reducing the role of the automobile. A neighborhood or new town utilizing NP is called a Pedestrian Village. Pedestrian Villages can range from being nearly car-free to having automobile access behind nearly every house and business, but pedestrian lanes are always in front.

To a large extent New Urbanism is a revival of traditional street patterns and urban design. New Pedestrianism also respects traditional town design, but seeks to further reduce the negative impact of the automobile, the use of which has increased dramatically since WWII. By eliminating the front street and replacing it with a tree-lined pedestrian lane, emphasis is placed on low-impact alternative travel such as walking and cycling. Pedestrian lanes are usually 12 to 15 feet (5 m) wide, with one smooth side for rolling conveyances such as bicycles, Segways, and skates and the other, narrower, textured side for pedestrians and wheelchairs. Eliminating the automobile street from the front allows for intimate scale plazas, fountains, pocket parks, as well as an unspoiled connection to natural features such as lakes, streams, and forests that may border or be included in a Pedestrian Village. A vast public realm is created that is free from the sight, smell, and sound of automobiles, yet automobiles are still served on a separate network.

New Pedestrianism has been proposed for Kisima Kaya, a new town in Kenya, for Tiger Bay Village, FL as a solution to the homeless problem, and for new towns and neighborhoods that can be built anywhere whether as rehabilitation of existing neighborhoods, infill, edge-of-town neighborhoods, or new towns.

The automobile

To a large extent, NP is a reaction to the way in which the automobile has impacted the environment and reshaped the cities. Arth writes: "Our quality of life is dependent on achieving a spectrum of physical and psychological needs in a clean, safe, and beautiful environment that can only be accomplished with highly integrated urban design and planning. As long as vehicles, roads, parking lots, garages, and automobile-related businesses cover a significant portion of the landscape and determine the design of nearly everything else, most American cities will continue to be dysfunctional and degraded slumscapes, choked with traffic."

North American cities can suffer chronic traffic congestion despite the width of the highways. Shown here is Highway 401 in Ontario, Canada.

Over six million motor vehicle related accidents result in almost three million injuries, and over 42,000 deaths each year in the United States alone. Worldwide, approximately half a million deaths occur each year from motor vehicle accidents.

Over-reliance on the automobile, coupled with the lack of a pedestrian-friendly environment, has contributed to two-thirds of adult Americans being overweight or obese. Americans spend about $33 billion a year trying to lose weight. Degradation of the urban and rural landscape caused by sprawl also has wide-ranging negative effects on the environment and contributes to high maintenance costs to the infrastructure.

Most Americans spend as much of their income on transportation as on housing, with residents of more automobile-dependent cities spending as much as three times as much of their Gross Regional Product (GRP). People in Houston, Atlanta, Dallas-Ft.Worth spend about 23% of their GRP on transportation compared to 9% in Honolulu, New York City, and Baltimore, and 7% in Toronto. These statistics are from the late 90's before the huge runup in oil prices, and do not include some of the hidden costs of oil consumption.

Energy

Oil production peaked in the U.S. in 1970 and today only 35% of oil consumed is produced domestically. The U.S. has grown increasingly dependent on obtaining oil that lies in the states which are hostile to American interests. This is assumed by Arth and many others to have led to increased U.S. militarism in oil rich countries and a growing trade deficit. NP seeks to reduce oil consumption by designing neighborhoods and towns that require far less automobile travel. Most daily trips and recreation in a Pedestrian Village would be within pleasant walking or bicycling distance. New Pedestrianism asserts that it is necessary only to connect village centers to create a highly efficient public transportation system.

New Pedestrianism, in its ideal form, reduces the need for oil and other limited energy sources by reducing consumption and utilizing renewable energy. It is anticipated, especially as the cost of photovoltaic cells drops, that individual homes would be equipped with solar panels and solar water heaters, and that solar parks would harvest energy for the whole community. Reducing energy needs and moving away from oil dependency would presumably address health, social, economic, and environmental problems.

New Pedestrianism for the homeless

In January 2007, Arth proposed that a Pedestrian Village be built for the adult homeless in Volusia County, Florida, as a prototype for a national solution that would cost less than what he calls the "current Band-Aid approach to the problem." Tiger Bay Village would be nearly car-free and provide six kinds of housing, ranging from multi-bed barracks in buildings that look like traditional two story homes, to Katrina Cottages. It would have a lake, swimming lagoon, pool, hiking trails, parks, community gardens and orchards. The residents would help build and maintain the village, and it would also serve as a permanent home for those with mental disabilities who are unable to reintegrate into outside society. All the needs of both temporary and permanent residents would be available on site, and the village would be located on a major bus route. Amenities would also include a labor service that would provide pre-screened workers to the public. The village was

designed under a master plan, but the purpose and design of the buildings could be reassessed as it was built in stages over the years. The proposal fueled a national debate about what to do about the homeless while also garnering derision from some quarters by being called either a "resort for the homeless" or a "gulag reservation." Arth has been careful to explain that this is not a solution for low income housing, which should be integrated into the community.

Michael E. Arth launched a website to organize support for building pedestrian villages for the homeless in early 2009, which also provides a great deal of information about the concept.

Aesthetics

New Pedestrianism replaces front streets with tree-lined pedestrian lanes that form a linear park system that directly connects all homes and businesses to each other, as well as to parks, greenbelts, plazas, courtyards, water features, schools, recreation, and other amenities. This presumably raises the value of all property because the public and private properties are no longer devalued by the appearance and danger of excessive automobile dependency. A separate, tree-lined, street grid for cars also exists, but it is always relegated to the rear, and the pedestrian/bike grid as the primary transportation network ensures that unsightly, noisome traffic is vastly reduced on the rear streets. In Pedestrian Villages, density increases because buildings can be built close to quiet, car-free lanes without the need for huge setbacks that are typical in suburban sprawl. This, in turn, places more emphasis on building design, peaceful and intimate public spaces, and aesthetics that is scaled for pedestrians.

History

Like New Urbanism, New Pedestrianism has its roots in compact, mixed-use neighborhoods common in the United States (and elsewhere) during and prior to the first quarter of the 20th century. New Pedestrianism borrows and then expands upon earlier experiments in urban design that focused on separating pedestrians from vehicular traffic.

A walk street in Venice, California, built around 1905.

In a few beachside communities in Southern California, including Venice, California, "walk streets" were constructed around 1905 in a few blocks near the beach. Houses faced pedestrian lanes that ranged between 3 and 10 feet wide. Narrow alleys in the rear handled cars and parking. The canals in Venice, California, built during the same period, also had both sidewalks and canals in front of the houses.

Urban planners Ebenezer Howard and Sir Patrick Geddes were an earlier influence on the design of Radburn, New Jersey, built at the dawn of the automobile age in 1929. Radburn had pedestrian lanes in front and vehicular access at the rear on cul-de-sacs that protruded into large multi-use blocks. A study done in 1970 by John Lansing of the University of Michigan showed that 47% of its residents did their grocery shopping on foot, compared to 8% for a conventional subdivision nearby. He also determined that, overall, Radburn residents drove far less than in any other areas he studied. The Radburn plan has been copied in various forms in Sweden, England, Japan, New Zealand, and Australia.

The San Antonio River Walk, also known as "Paseo del Rio," was initiated in 1929. In this case, the San Antonio River underwent flood control measures and was turned into a peaceful canal lined on both sides with lively pedestrian promenades, plazas, sidewalk cafes, restaurants, clubs, shops, hotels, and other attractions that are completely separate from any vehicles. The promenades pass underneath the roads since Paseo del Rio is one level below the street and vehicular access to buildings is one story above the river.

Village Homes in Davis, California was founded in 1975 by Michael and Judy Corbett. The 70-acre (280,000 m^2) subdivision has 225 homes and 20 apartments. Solar design and solar panels are utilized for heating. The homes have walkways passing through an

extensive greenbelt system on one side of the houses with automobile access on the other side.

Some streets in the New Urbanist development of Rosemary Beach, Florida also have boardwalks in front of some of the homes.

In 2005 New Pedestrianism was offered by Arth as part of the solution to the rebuilding of New Orleans.

Films and books about New Pedestrianism

New Urban Cowboy: Toward a New Pedestrianism, produced in 2008, is a feature length documentary that tells the story of Arth's struggle to retrofit a crack slum into a Pedestrian Village while also explaining the philosophy of New Pedestrianism.

Democracy and the Common Wealth: Breaking the Stranglehold of the Special Interests, gives a comprehensive assessment of society and how New Pedestrianism fits into the overall scheme of things. There are also many illustrations and photographs, and a section called "Anatomy of a Pedestrian Village."

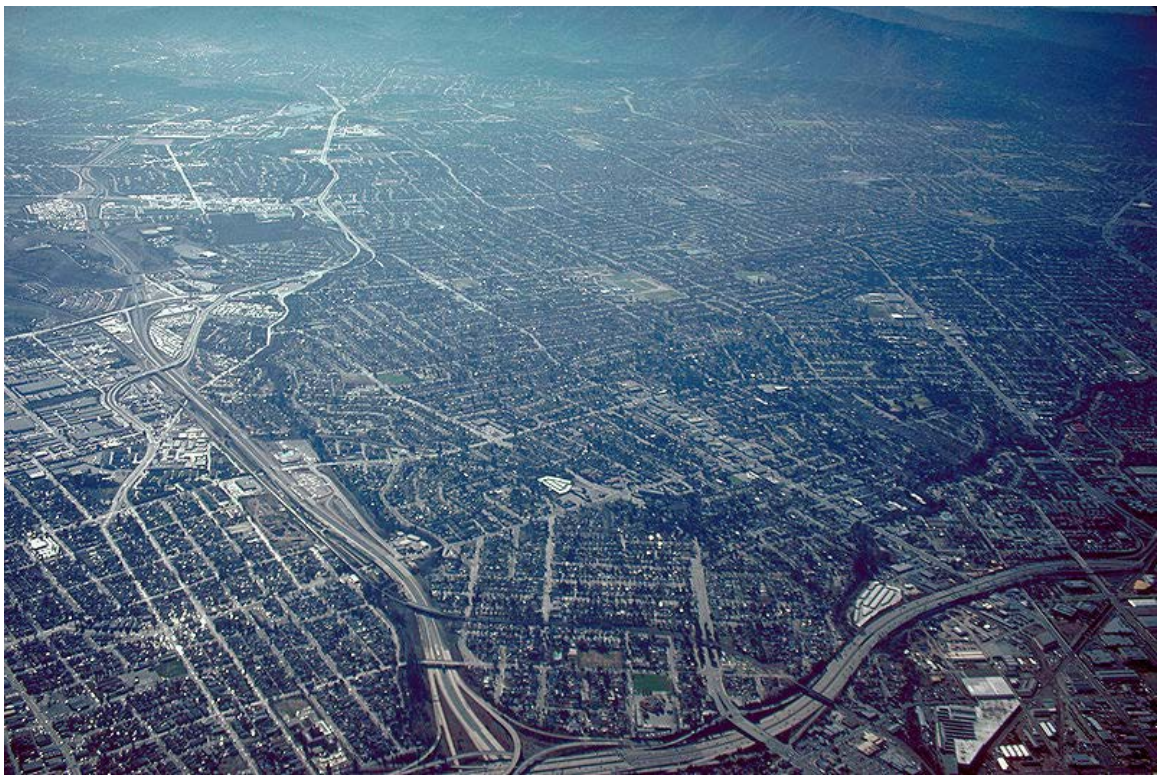
Examples

These are examples of New Pedestrianism-style Pedestrian Villages that represent the various types:

- Venice, California - Walking streets with and without canals, and a car-free promenade, circa 1910.
- San Antonio River Walk, Texas - Car-free promenade, 1920s.
- Louvain-la-Neuve, Belgium - Pedestrian Village with parking hidden below, 1969.
- Garden Village in Austin, Texas, USA - Proposed infill Pedestrian Village to replace former site of Mueller airport.
- Downtown DeLand, Florida, USA - (Historic Garden District)- Infill retrofit of existing neighborhood, 2001-2007.
- Kisima Kaya, Kenya - New town proposed near Nairobi, Kenya, in 2006.
- Tiger Bay Village, Florida, USA - Proposed, nearly-car-free Pedestrian Village as a solution to homelessness, 2007.

Chapter- 7

Introduction to Urban Sprawl



Urban sprawl spatial pattern in San Jose, California

Urban sprawl, also known as **suburban sprawl**, is a multifaceted concept, which includes the spreading outwards of a city and its suburbs to its outskirts to low-density and auto-dependent development on rural land, high segregation of uses (e.g. stores and residential), and various design features that encourage car dependency. As a result, many urban planners, government officials, and social scientists contend that sprawl has a number of disadvantages, including:

- High car dependence
- Inadequate facilities, e.g.: cultural, emergency, health, and so forth
- Low public support for sprawl
- High per-person infrastructure costs

- Inefficient street layouts
- Inflated costs for public transportation
- Lost time and productivity for commuting
- High levels of racial and socioeconomic segregation
- Low diversity of housing and business types
- High rates of obesity due to less walking and biking
- Less space for conservation and parks
- High per-capita use of energy, land, and water
- Perceived low aesthetic value

Notwithstanding these disadvantages, some government officials and private business employers contend that sprawl has certain advantages, such as more single family residences on larger lots, lower land prices, and higher profits for businesses due to the lack of laws limiting urban sprawl.

Discussions and debates about sprawl are often obfuscated by the ambiguity associated with the phrase. "The aim of creating sustainable and compact cities is inhibited by urban sprawl as development is uncontrolled." (K.H Sebonego) For example, some comm.-entators measure sprawl only with the average number of residential units per acre in a given area. But others associate it with decentralization (spread of population without a well-defined center), discontinuity (leapfrog development, as defined below), segregation of uses, etc.

Urban economists have entered the debate relatively recently. They tend to examine urban sprawl as the aggregate extent of urban land use or as the average urban land use density. It has been shown that urban sprawl can increase the aggregate urban land use and lower the average land use density while at the same time lowering average commuting travel times and increasing discretionary mobility.

The term urban sprawl generally has negative connotations due to the health, environmental and cultural issues associated with the phrase. Residents of sprawling neighborhoods tend to emit more pollution per person and suffer more traffic fatalities. Sprawl is controversial, with supporters claiming that consumers prefer lower density neighborhoods and that sprawl does not necessarily increase traffic.

Urban sprawl of Boston

Characteristics

In Utah, which has been one of the top ten fastest growing U.S. states since at least 1990, Jordan Landing has become a byword for suburban sprawl. In response to the rapid population growth of the southern Salt Lake County area, a ten-lane freeway, the Mountain View Corridor, a light rail line, UTA TRAX, and a double-decker commuter train, FrontRunner, are being built to facilitate efficient transportation.

Sprawl is characterized by several land use patterns which usually occur in unison:

Single-use zoning

This refers to a situation where commercial, residential, institutional and industrial areas are separated from one another. Consequently, large tracts of land are devoted to a single use and are segregated from one another by open space, infrastructure, or other barriers. As a result, the places where people live, work, shop, and recreate are far from one another, usually to the extent that walking, transit use and bicycling are impractical, so all these activities generally require an automobile.

Low-density zoning

Sprawl consumes much more land per-capita than traditional urban developments because zoning laws generally require that new developments are of low density. The exact definition of "low density" is arguable, but a common example is that of single family homes on large lots, with four or fewer units per net acre. Buildings usually have fewer stories and are spaced farther apart, separated by lawns, landscaping, roads or parking lots. Lot sizes are larger, and because more automobiles are used much more land is designated for parking. The impact of low density development in many communities is that developed or "urbanized" land is increasing at a faster rate than the population.

Overall density is often lowered by "leap-frog development". This term refers to the relationship, or lack thereof, between subdivisions. Such developments are typically separated by large green belts, i.e. tracts of undeveloped land, resulting in an average density far lower even than the low density described in the previous paragraph. This is a 20th and 21st century phenomenon generated by the current custom of requiring a developer to provide subdivision infrastructure as a condition of development (DeGrove and Turner, 1991). Usually, the developer is required to set aside a certain percentage of the developed land for public use, including roads, parks and schools. In the past, when a local government built all the streets in a given location, the town could expand without interruption and with a coherent circulation system, because it had condemnation power. Private developers generally do not have such power (although they can sometimes find local governments willing to help), and often choose to develop on the tracts that happen to be for sale at the time they want to build, rather than pay extra or wait for a more appropriate location.

Car-dependent communities

Areas of urban sprawl are also characterized as highly dependent on automobiles for transportation, a condition known as automobile dependency. Most activities, such as shopping and commuting to work, require the use of a car as a result of both the area's isolation from the city and the isolation the area's residential zones have from its industrial and commercial zones. Walking and other methods of transit are not practical; therefore, many of these areas have few or no sidewalks. In many suburban communities, stores and activities that are in close proximity "as the crow flies" require automobiles, because the different areas are separated by fences, walls, and drainage ditches. Some critics argue that excessive parking requirements exacerbate car dependency.

Job Sprawl and Spatial Mismatch

Job Sprawl is another land use symptom of urban sprawl and car-dependent comm.-unities. It is defined as low-density, geographically spread-out patterns of employment, where the majority of jobs in a given metropolitan area are located outside of the main city's Central Business District (CBD), and increasingly in the suburban periphery. It is often the result of urban disinvestment, the geographic freedom of employment location allowed by predominantly car-dependent commuting patterns of many American suburbs,

and many companies' desire to locate in low-density areas that are often more affordable and offer potential for expansion. Spatial mismatch is related to job sprawl and economic Environmental Justice. Spatial Mismatch is defined as the situation where poor urban, predominantly minority citizens are left without easy access to entry-level jobs, as a result of increasing job sprawl and limited transportation options to facilitate a reverse commute to the suburbs.

Job sprawl has been documented and measured in various ways. It has been shown to be a growing trend in America's metropolitan areas.{cn} The Brookings Institution has published multiple articles on the topic. In 2005, author Michael Stoll defined job sprawl simply as jobs located more than 5-mile (8.0 km) radius from the CBD, and measured the concept based on year 2000 U.S. Census data. Other ways of measuring the concept with more detailed rings around the CBD include a 2001 article by Edward Glaeser and Elizabeth Kneebone's 2009 article, which show that sprawling urban peripheries are gaining employment while areas closer to the CBD are losing jobs. These two authors used three geographic rings limited to a 35-mile (56 km) radius around the CBD: 3 miles (4.8 km) or less, 3 to 10 miles (16 km), and 10 to 35 miles (56 km). Kneebone's study showed the following nationwide breakdown for the largest metropolitan areas in 2006: 21.3% of jobs located in the inner ring, 33.6% of jobs in the 3-10 mile ring, and 45.1% in the 10-35 mile ring. This compares to the year 1998 - 23.3%, 34.2%, and 42.5% in those respective rings. The study shows CBD employment share shrinking, and job growth focused in the suburban and exurban outer metropolitan rings.

In terms of measurement, spatial mismatch can be thought of as the percentage of people who would have to move in order to be distributed in the same way as jobs. Stoll's research shows that a substantially higher percentage of African Americans (53.5%) experience spatial mismatch than European Americans (35.6%). On average, more than half of African American citizens would need to move to accomplish similar distribution to jobs. Latinos (45.8%) experience spatial mismatch as well, though to a lesser extent than African Americans.

Automobile Dependency

Traffic in Los Angeles

Automobile dependency is a term coined by Professors Peter Newman and Jeff Kenworthy to capture the predicament of most cities in the United States, Canada, Australia and New Zealand, and to a lesser extent, large cities in Europe.

Automobile dependency implies that cities where automobiles are the predominant transport not only deny their residents freedom of choice about the way they live and move around the city, but that the culture of automobile use has produced a kind of addiction to them. The analogy is made with addictions to harmful substances and activities because of the well-known law of diminishing returns in relation to increasing use or participation - the more that is used, the less of the desired effect is gained until a point is reached where the substance or activity has to be maintained to remain 'normal' - a state of dependency.

When it comes to automobile use, there is a spiralling effect where traffic congestion produces the 'demand' for more and bigger roads and removal of 'impediments' to traffic flow, such as pedestrians, signalised crossings, traffic lights, cyclists, and various forms of street-based public transit such as streetcars (trams). These measures make automobile use more pleasurable and advantageous at the expense of other modes of transport, so greater traffic volumes are induced. Additionally, the urban design of cities adjusts to the needs of automobiles in terms of movement and space. Buildings are replaced by parking lots. Open air shopping streets are replaced by enclosed malls. Walk-in banks and fast-

food stores are replaced by drive-in versions of themselves that are inconveniently located for pedestrians. Town centres with a mixture of commercial, retail and entertainment functions are replaced by single-function business parks, 'category-killer' retail boxes and 'multiplex' entertainment complexes, each surrounded by large tracts of parking.

These kinds of environments require automobiles to access them, thus inducing even more traffic onto the increased roadspace. This results in congestion, and the cycle above continues. Roads get ever bigger, consuming ever greater tracts of land previously used for housing, manufacturing and other socially useful purposes. Public transit becomes less and less viable and socially stigmatised, eventually becoming a minority form of transportation. People's choices and freedoms to live functional lives without the use of the car are greatly reduced. Such cities are automobile dependent.

Automobile dependency is seen primarily as an issue of environmental sustainability due to the consumption of non-renewable resources and production of greenhouse gases responsible for global warming. It is also an issue of social and cultural sustainability. Like gated communities, the private automobile produces physical separation between people and reduces the opportunities for unstructured social encounter that is a significant aspect of social capital formation and maintenance in urban environments.

There are a number of planning and design approaches to redressing automobile dependency, known variously as New Urbanism, Transit-oriented development, and Smart growth. Most of these approaches focus on the physical urban design, urban density and landuse zoning of cities. Dr. Paul Mees, a transport planning academic formerly at the University of Melbourne argues that investment in good public transit, centralised management by the public sector and appropriate policy priorities are more significant than issues of urban form and density.

There are of course many who argue against a number of the details within any of the complex arguments related to this topic, particularly relationships between urban density and transit viability, or the nature of viable alternatives to automobiles that provide the same degree of flexibility and speed. There is also research into the future of automobility itself in terms of shared usage, size reduction, roadspace management and more sustainable fuel sources.

Automobile dependency, Urban Sprawl and Smart Growth

Whether the smart growth does or can reduce problems of automobile dependency associated with urban sprawl have been fiercely contested issues over several decades. The influential study in 1989 by Peter Newman and Jeff Kenworthy compared 32 cities across North America, Australia, Europe and Asia. The study has been criticised for its methodology but the main finding that denser cities, particularly in Asia, have lower car use than sprawling cities, particularly in North America, has been largely accepted - although the relationship is clearer at the extremes across continents than it is within countries where conditions are more similar.

Within cities studies from across many countries (mainly in the developed world) have shown that denser urban areas with greater mixture of land use and better public transport tend to have lower car use than less dense suburban and ex-urban residential areas. This usually holds true even after controlling for socio-economic factors such as differences in household composition and income. This does not necessarily imply that suburban sprawl causes high car use, however. One confounding factor, which has been the subject of many studies, is residential self-selection: people who prefer to drive tend to move towards low density suburbs, whereas people who prefer to walk, cycle or use transit tend to move towards higher density urban areas, better served by public transport. Some studies have found that, when self-selection is controlled for, the built environment has no significant effect on travel behaviour. More recent studies using more sophisticated methodologies have generally refuted these findings: density, land use and public transport accessibility can influence travel behaviour, although social and economic factors, particularly household income, usually exert a stronger influence.

The Paradox of Intensification

Reviewing the evidence on urban intensification, smart growth and their effects on automobile use Melia et al (2011) found support for the arguments of both supporters and opponents of smart growth. Planning policies which increase population densities in urban areas do tend to reduce car use, but the effect is a weak one, so doubling the population density of a particular area will not halve the frequency or distance of car use.

These findings led them to propose the paradox of intensification, which states:

Ceteris paribus, urban intensification which increases population density will reduce per capita car use, with benefits to the global environment, but will also increase concentrations of motor traffic, worsening the local environment in those locations where it occurs.

At the city-wide level it may be possible, through a range of positive measures to counteract the increases in traffic and congestion which would otherwise result from increasing population densities: Freiburg im Breisgau in Germany is one example of a city which has been more successful in reducing automobile dependency and constraining increased in traffic despite substantial increases in population density.

This study also reviewed evidence on the local effects of building at higher densities. At the level of the neighbourhood or individual development positive measures (e.g. improvements to public transport) will usually be insufficient to counteract the traffic effect of increasing population density. This leaves policy-makers with four choices: intensify and accept the local consequences, sprawl and accept the wider consequences, a compromise with some element of both, or intensify accompanied by more radical measures such as parking restrictions, closing roads to traffic and carfree zones. Where possible, this is the authors' preferred option.

Developments characteristic of sprawl

Housing subdivisions

Sprawl outside of Toronto

Housing subdivisions are large tracts of land consisting entirely of newly-built residences. Prominent New Urbanist architectural firm Duany Plater-Zyberk & Company claim that housing subdivisions "are sometimes called villages, towns, and neighborhoods by their developers, which is misleading since those terms denote places which are not exclusively residential." They are also referred to as developments.

Strip malls

Shopping centers are locations consisting of retail space. In the U.S. and Canada, these vary from strip malls which refer to collections of buildings sharing a common parking lot, usually built on a high-capacity roadway with commercial functions (i.e., a "strip"). Similar developments in the UK are called Retail Parks. Strip malls/retail parks contain a wide variety of retail and non-retail functions that also cater to daily use (e.g. video rental, takeout food, laundry services, hairdresser). Strip malls consisting mostly of big box stores or category killers are sometimes called "power centers" (U.S.). These developments tend to be low-density; the buildings are single-story and there is ample space

for parking and access for delivery vehicles. This character is reflected in the spacious landscaping of the parking lots and walkways and clear signage of the retail establishments. Some strip malls are undergoing a transformation into Lifestyle centers; entailing investments in common areas and facilities (plazas, cafes) and shifting tenancy from daily goods to recreational shopping. European countries such as France, Belgium and Germany have implemented size restrictions for superstores found in strip malls in an effort to limit sprawl (Davies 1995).

Shopping malls

Another prominent form of retail development in areas characterized by "sprawl" is the shopping mall. Unlike the strip mall, this is usually composed of a single building surrounded by a parking lot which contains multiple shops, usually "anchored" by one or more department stores (Gruen and Smith 1960). The function and size is also distinct from the strip mall. The focus is almost exclusively on recreational shopping rather than daily goods. Shopping malls also tend to serve a wider (regional) public and require higher-order infrastructure such as highway access and can have floorspaces in excess of a million square feet (ca. 100,000 m²). Shopping malls are often detrimental to downtown shopping centers of nearby cities since the shopping malls acts as a surrogate for the city center (Crawford 1992). Some downtowns have responded to this challenge by building shopping centers of their own (Frieden and Sagelyn 1989; consider also Toronto Eaton Centre (1977), Ottawa's Rideau Centre, Boston's Shops at Prudential Center, and Providence's Providence Place).

In the 1970s, the Ontario government created the Ontario Downtown Renewal Programme, which helped finance the building of several downtown malls across Ontario (such as the aforementioned Eaton Centre). The program was created to reverse the tide of small business leaving downtowns for larger sites surrounding the city.

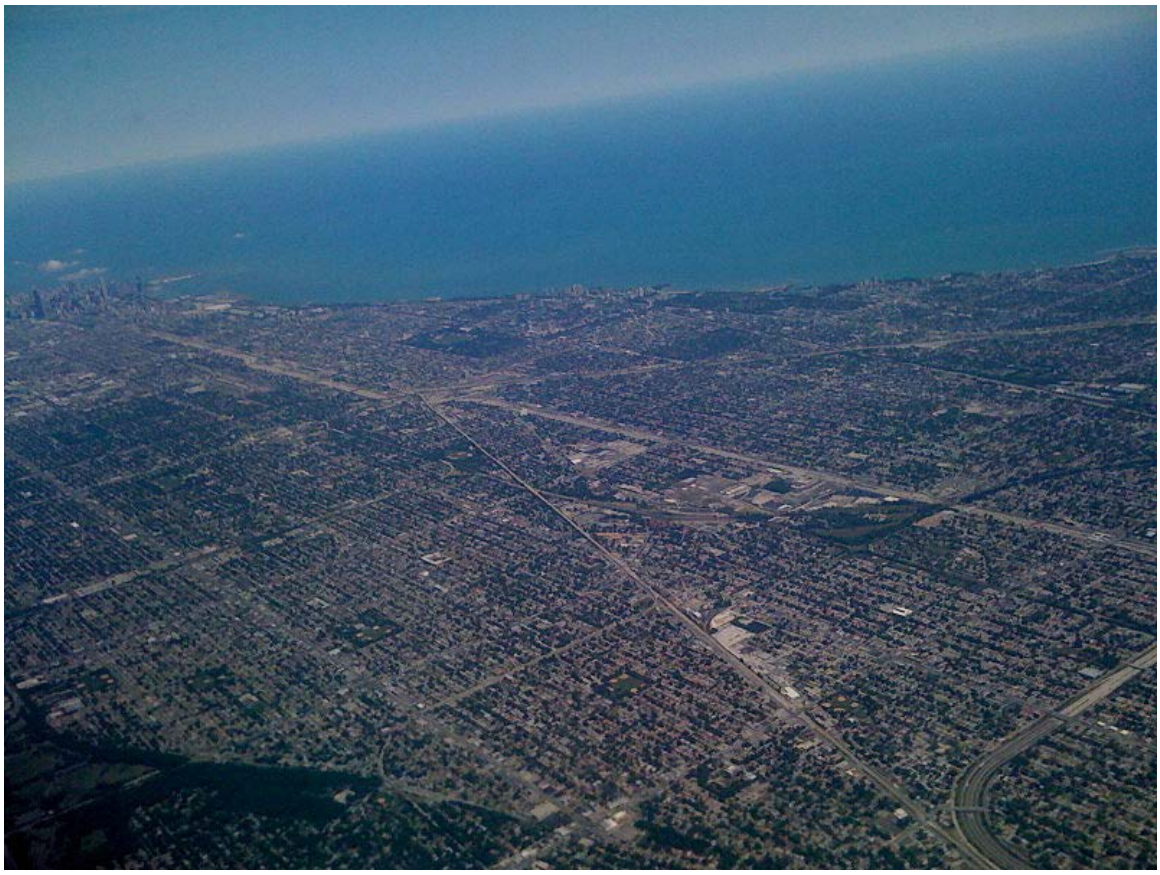
Fast food chains

Fast food chains are common in suburban areas. They are often built early in areas with low property values where the population is expected to boom and where large traffic is predicted, and set a precedent for future development. Eric Schlosser, in his book *Fast Food Nation*, argues that fast food chains accelerate suburban sprawl and help set its tone with their expansive parking lots, flashy signs, and plastic architecture (65). Duany Plater Zyberk & Company believe that this reinforces a destructive pattern of growth in an endless quest to move away from the sprawl that only results in creating more of it (Duany Plater-Zyberk 26).

Examples

According to the National Resources Inventory (NRI), about 8,900 square kilometers (2.2 million acres) of land in the United States was developed between 1992 and 2002. Presently, the NRI classifies approximately 100,000 more square kilometers (40,000 square miles) (an area approximately the size of Kentucky) as developed than the Census

Bureau classifies as urban. The difference in the NRI classification is that it includes rural development, which by definition cannot be considered to be "urban" sprawl. Currently, according to the 2000 Census, approximately 2.6 percent of the U.S. land area is urban. Approximately 0.8 percent of the nation's land is in the 37 urbanized areas with more than 1,000,000 population. In 2002, these 37 urbanized areas supported around 40% of the total American population.



The Chicago metro area, nicknamed "Chicagoland"

Nonetheless, some urban areas have expanded geographically even while losing population. But it was not just urbanized areas in the U.S. that lost population and sprawled substantially. According to data in "Cities and Automobile Dependence" by Kenworthy and Laube (1999), urbanized area population losses occurred while there was an expansion of sprawl between 1970 and 1990 in Brussels, Belgium; Copenhagen, Denmark; Frankfurt, Hamburg, and Munich, Germany; and Zurich, Switzerland, albeit without the wholesale dismantling of public transit systems that occurred in the United States.

The urban sprawl of Melbourne

At the same time, the urban cores of these and nearly all other major cities in the United States, Western Europe, and Japan that did not annex new territory experienced the related phenomena of falling household size and, particularly in the U.S., "white flight", sustaining population losses. This trend has slowed somewhat in recent years, as more people have regained an interest in urban living.

The term *Los Angelization* is also sometimes used for urban sprawl, though this may be misleading. Los Angeles was one of the world's first low density urbanized areas, as a result of wide automobile ownership. However, Los Angeles has become more dense over the past half-century, principally due to small lot zoning and a high demand for housing due to population growth. Los Angeles increased its density to 2,729/km² (7,068 per square mile) in 2000. Land consumption per resident in 2000 was 0.11-acre (450 m^2), which made Los Angeles the most densely populated urbanized area in the United States. It should be pointed out, however, that average density is not the only measure of sprawl; some urbanists argue that the city's car-dependent, decentralized form is itself a type of "sprawl" development.

Urban sprawl is not limited to developed countries, and may be more prevalent in developing countries. For example, there is considerable land consumed by urban sprawl

in Mexico City, in Beijing, in Antananarivo (the capital of Madagascar), in Johannesburg, and in eastern parts of South Africa.

Smart growth and the Compact City

The term 'smart growth' has been particularly used in North America. The terms 'compact city' or 'urban intensification' are often used to describe similar concepts, in Europe and particularly the UK where it has influenced Government policy and planning practice in recent years.

The first urban growth boundary in the U.S. was in Fayette County, Kentucky in 1958. Fifteen years later, the state of Oregon enacted a law in 1973 limiting the area urban areas could occupy, through urban growth boundaries. As a result, Portland, the state's largest urban area, has become a leader in smart growth policies that seek to make urban areas more compact (they are called urban consolidation policies). After the creation of this boundary, the population density of the urbanized area increased somewhat (from 1,135 in 1970 to 1,290 per km² in 2000) USA Urbanized Areas 1950-1990 USA Urbanized Areas 2000. While the growth boundary has not been tight enough to vastly increase density, the consensus is that the growth boundaries have protected great amounts of wild areas and farmland around the metro area.

Many parts of the San Francisco Bay Area have also adopted urban growth boundaries; 25 of its cities and 5 of its counties have urban growth boundaries. Many of these were adopted with the support and advocacy of Greenbelt Alliance, a non-profit land conservation and urban planning organization.

In other areas, the design principles of District Regionalism and New Urbanism have been employed to combat urban sprawl.

Chapter- 8

Traffic Congestion

Traffic congestion on Marginal Pinheiros, near downtown São Paulo. According to *Time* magazine, São Paulo has the world's worst traffic jams. Drivers are informed through variable message signs the prevailing queue length.

Common traffic in Ho Chi Minh City, Vietnam

Congestion on a city road in Moscow

Congestion in Kharkov

A traffic jam in the Himalayas (Garhwal hills, India)

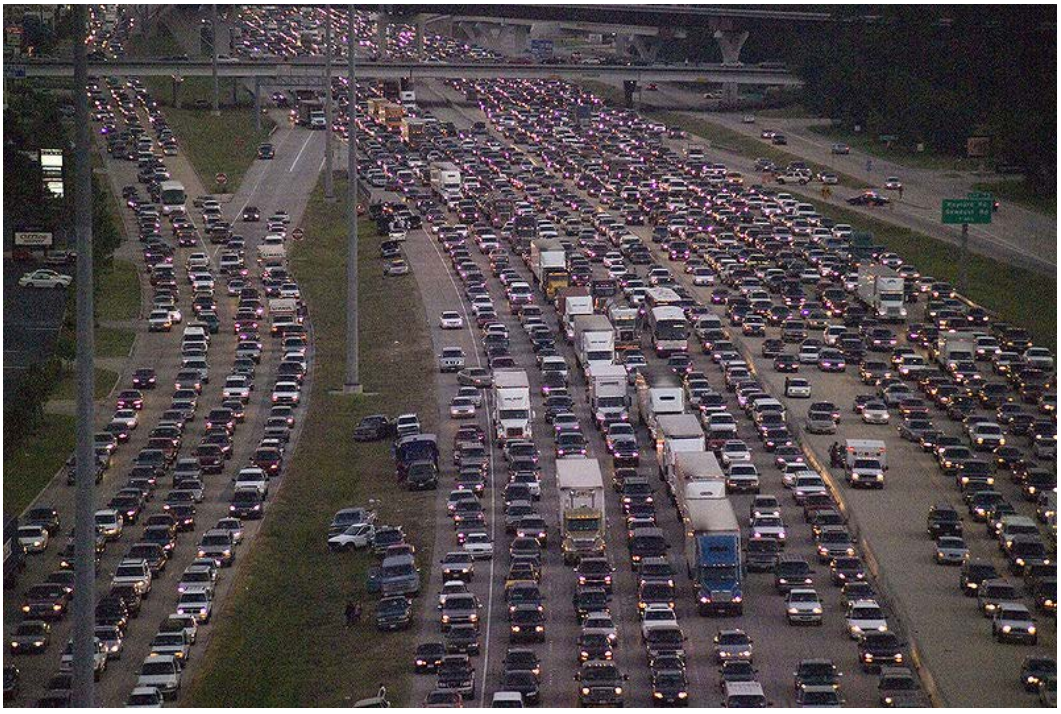
Bangkok is notorious for its traffic congestion

Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queueing. The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, congestion is incurred. As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a **traffic jam**.

Causes

Congestion on a street in Taipei consisting primarily of motorcycles

Congestion caused by a road accident, Algarve, Portugal



Congestion caused by evacuees fleeing Hurricane Rita. Traffic in all lanes of the highway is traveling in the same direction.

Traffic congestion in Al Bayda city, Libya in 2010

Traffic congestion occurs when a volume of traffic or modal split generates demand for space greater than the available road capacity, this is point is commonly termed saturation. There are a number of specific circumstances which cause or aggravate congestion; most of them reduce the capacity of a road at a given point or over a certain length, or increase the number of vehicles required for a given volume of people or goods. About half of U.S. traffic congestion is recurring, and is attributed to sheer weight of traffic; most of the rest is attributed to traffic incidents, road works and weather events.

Traffic research still cannot fully predict under which conditions a "traffic jam" (as opposed to heavy, but smoothly flowing traffic) may suddenly occur. It has been found that individual incidents (such as accidents or even a single car braking heavily in a previously smooth flow) may cause ripple effects (a cascading failure) which then spread out and create a sustained traffic jam when, otherwise, normal flow might have continued for some time longer.

Mathematical theories

Some traffic engineers have attempted to apply the rules of fluid dynamics to traffic flow, likening it to the flow of a fluid in a pipe. Congestion simulations and real-time observations have shown that in heavy but free flowing traffic, jams can arise spon-

taneously, triggered by minor events ("butterfly effects"), such as an abrupt steering maneuver by a single motorist. Traffic scientists liken such a situation to the sudden freezing of supercooled fluid. However, unlike a fluid, traffic flow is often affected by signals or other events at junctions that periodically affect the smooth flow of traffic. Alternative mathematical theories exist, such as Boris Kerner's three phase traffic theory.

Because of the poor correlation of theoretical models to actual observed traffic flows, transportation planners and highway engineers attempt to forecast traffic flow using empirical models. Their working traffic models typically use a combination of macro-, micro- and mesoscopic features, and may add matrix entropy effects, by "platooning" groups of vehicles and by randomising the flow patterns within individual segments of the network. These models are then typically calibrated by measuring actual traffic flows on the links in the network, and the baseline flows are adjusted accordingly.

It is now claimed that equations can predict these in detail:

> Phantom jams can form when there is a heavy volume of cars on the road. In that high density of traffic, small disturbances (a driver hitting the brake too hard, or getting too close to another car) can quickly become amplified into a full-blown, self-sustaining traffic jam...
> A team of MIT mathematicians has developed a model that describes how and under what conditions such jams form, which could help road designers minimize the odds of their formation. The researchers reported their findings May 26 in the online edition of Physical Review E.
> Key to the new study is the realization that the mathematics of such jams, which the researchers call 'jamitons,' are strikingly similar to the equations that describe detonation waves produced by explosions, says Aslan Kasimov, lecturer in MIT's Department of Mathematics. That discovery enabled the team to solve traffic jam equations that were first theorized in the 1950s.

Economic theories

India's economic surge has resulted in a massive increase in the number of private vehicles on its roads, overwhelming the transport infrastructure. Shown here is a traffic jam in Delhi.

As in India, China's economic surge has resulted in a massive increase in the number of private vehicles on its roads overwhelming the transport infrastructure. Shown here is a traffic jam in Beijing.

Congested roads can be seen as an example of the tragedy of the commons. Because roads in most places are free at the point of usage, there is little financial incentive for drivers not to over-use them, up to the point where traffic collapses into a jam, when demand becomes limited by opportunity cost. Privatization of highways and road pricing have both been proposed as measures that may reduce congestion through economic incentives and disincentives. Congestion can also happen due to non-recurring highway incidents, such as a crash or roadworks, which may reduce the road's capacity below normal levels.

Economist Anthony Downs, in his books *Stuck in Traffic* (1992) and *Still Stuck in Traffic* (2004), argues that rush hour traffic congestion is inevitable because of the benefits of having a relatively standard work day. In a capitalist economy, goods can be allocated either by pricing (ability to pay) or by queueing (first-come first-serve); congestion is an example of the latter. Instead of the traditional solution of making the "pipe" large enough to accommodate the total demand for peak-hour vehicle travel (a supply-side solution), either by widening roadways or increasing "flow pressure" via automated highway systems, Downs advocates greater use of road pricing to reduce congestion (a demand-side solution, effectively rationing demand), in turn plowing the revenues

generated therefrom into public transportation projects. Road pricing itself is controversial, more information is available in the dedicated article.

Classification

Qualitative classification of traffic is often done in the form of a six letter A-F level of service (LOS) scale defined in the Highway Capacity Manual, a US document used (or used as a basis for national guidelines) worldwide. These levels are used by transportation engineers as a shorthand and to describe traffic levels to the lay public. While this system generally uses delay as the basis for its measurements, the particular measurements and statistical methods vary depending on the facility being described. For instance, while the percent time spent following a slower-moving vehicle figures into the LOS for a rural two-lane road, the LOS at an urban intersection incorporates such measurements as the number of drivers forced to wait through more than one signal cycle.

Negative impacts

Traffic congestion detector in Germany

Traffic congestion has a number of negative effects:

- Wasting time of motorists and passengers ("opportunity cost"). As a non-productive activity for most people, congestion reduces regional economic health.
- Delays, which may result in late arrival for employment, meetings, and education, resulting in lost business, disciplinary action or other personal losses.
- Inability to forecast travel time accurately, leading to drivers allocating more time to travel "just in case", and less time on productive activities.
- Wasted fuel increasing air pollution and carbon dioxide emissions owing to increased idling, acceleration and braking. Increased fuel use may also in theory cause a rise in fuel costs.
- Wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements.
- Stressed and frustrated motorists, encouraging road rage and reduced health of motorists
- Emergencies: blocked traffic may interfere with the passage of emergency vehicles traveling to their destinations where they are urgently needed.
- Spillover effect from congested main arteries to secondary roads and side streets as alternative routes are attempted ('rat running'), which may affect neighborhood amenity and real estate prices.

Countermeasures

It has been suggested by some commentators that the level of congestion that society tolerates is a rational (though not necessarily conscious) choice between the costs of improving the transportation system (in infrastructure or management) and the benefits of quicker travel. Others link it largely to subjective lifestyle choices, differentiating between car-owning and car-free households.

Road infrastructure

- Junction improvements
    - Grade separation, using bridges (or, less often, tunnels) freeing movements from having to stop for other crossing movements
    - Ramp signalling, 'drip-feeding' merging traffic via traffic signals onto a congested motorway-type roadway
    - Reducing junctions
        - Local-express lanes, providing through lanes that bypass junction on-ramp and off-ramp zones
        - Limited-access road, roads that limit the type and amounts of driveways along their lengths
- Reversible lanes, where certain sections of highway operate in the opposite direction on different times of the day/ days of the week, to match asymmetric demand. This may be controlled by Variable-message signs or by movable physical separation

- Separate lanes for specific user groups (usually with the goal of higher people throughput with fewer vehicles)
    - Bus lanes as part of a busway system
    - HOV lanes, for vehicles with at least three (sometimes at least two) riders, intended to encourage carpooling
        - Slugging, impromptu carpooling at HOV access points, on a hitchhiking or payment basis
        - Market-based carpooling with pre-negotiated financial incentives for the driver

Urban planning and design

City planning and urban design practices can have a huge impact on levels of future traffic congestion, though they are of limited relevance for short-term change.

- Grid plans including Fused Grid road network geometry, rather than tree-like network topology which branches into cul-de-sacs (which reduce local traffic, but increase total distances driven and discourage walking by reducing connectivity). This avoids concentration of traffic on a small number of arterial roads and allows more trips to be made without a car.
- Zoning laws that encourage mixed-use development, which reduces distances between residential, commercial, retail, and recreational destinations (and encourage cycling and walking)
- Carfree cities, car-light cities, and eco-cities designed to eliminate the need to travel by car for most inhabitants.
- Transit-oriented development are residential and commercial areas designed to maximize access to public transport.

Supply and demand

Widening works underway on the M25 motorway to increase the number of lanes

Congestion can be reduced by either increasing road capacity (supply), or by reducing traffic (demand). Capacity can be increased in a number of ways, but needs to take account of latent demand otherwise it may be used more strongly than anticipated. Critics of the approach of adding capacity have compared it to "fighting obesity by letting out your belt" (inducing demand that did not exist before). Reducing road capacity has in turn been attacked as removing free choice as well as increasing travel costs and times.

Increased supply can include:

- Adding more capacity at bottlenecks (such as by adding more lanes at the expense of hard shoulders or safety zones, or by removing local obstacles like bridge supports and widening tunnels)
- Adding more capacity over the whole of a route (generally by adding more lanes)
- Creating new routes
- Traffic management improvements

Reduction of demand can include:

- Parking restrictions, making motor vehicle use less attractive by increasing the monetary and non-monetary costs of parking, introducing greater competition for

limited city or road space. Most transport planning experts agree that free parking distorts the market in favour of car travel, exacerbating congestion.

- Park and ride facilities allowing parking at a distance and allowing continuation by public transport or ride sharing. Park-and-ride car parks are commonly found at metro stations, freeway entrances in suburban areas, and at the edge of smaller cities.
- Reduction of road capacity to force traffic onto other travel modes. Methods include traffic calming and the shared space concept.
- Road pricing, charging money for access onto a road/specific area at certain times, congestion levels or for certain road users
    - "Cap and trade", in which only licensed cars are allowed on the roads. A limited quota of car licences are issued each year and traded in a free market fashion. This guarantees that the number of cars does not exceed road capacity while avoiding the negative effects of shortages normally associated with quotas. However since demand for cars tends to be inelastic, the result are exorbitant purchase prices for the licenses, pricing out the lower levels of society, as seen Singapore's Certificate of Entitlement scheme.
    - Congestion pricing, where a certain area, such as the inner part of a congested city, is surrounded with a cordon into which entry with a car requires payment. The cordon may be a physical boundary (i.e., surrounded by toll stations) or it may be virtual, with enforcement being via spot checks or cameras on the entry routes. Major examples are Singapore's electronic road pricing, the London congestion charge system, Stockholm congestion tax and the use of HOT lanes predominately in North America.
- Road space rationing, where regulatory restrictions prevent certain types of vehicles from driving under certain circumstances or in certain areas.
    - Number plate restrictions based on days of the week, as practiced in several large cities in the world, such as Athens, Mexico City and São Paulo. In effect, such cities are banning a different part of the automobile fleet from roads each day of the week. Mainly introduced to combat smog, these measures also reduce congestion. A weakness of this method is that richer drivers can purchase a second or third car to circumvent the ban.
    - Permits, where only certain types of vehicles (such as residents) are permitted to enter a certain area, and other types (such as through-traffic) are banned. For example, Bertrand Delanoë, the mayor of Paris, has proposed to impose a complete ban on motor vehicles in the city's inner districts, with exemptions only for residents, businesses, and the disabled.
- Policy approaches, which usually attempt to provide either strategic alternatives or which encourage greater usage of existing alternatives through promotion, subsidies or restrictions.
    - Incentives to use public transport, increasing modal shares. This can be achieved through infrastructure investment, subsidies, transport integration, pricing strategies that decrease the marginal cost/fixed cost ratios, improved timetabling and greater priority for buses to reduce journey time e.g. [Bus Lanes], [BTR].

- Cycling promotion through legislation, cycle facilities, subsidies, and awareness campaigns. The Netherlands has been pursuing cycle friendly policies for decades, and around a quarter of their commuting is done by bicycle.
- Telecommuting encouraged through legislation and subsidies.
- Online shopping promotion, potentially with automated delivery booths helping to solve the last mile problem and reduce shopping trips made by car.

Traffic management

Use of so-called Intelligent transportation system, which guide traffic:

- Traffic reporting, via radio, GPS or possibly mobile phones, to advise road users
- Variable message signs installed along the roadway, to advise road users
- Navigation systems, possibly linked up to automatic traffic reporting
- Traffic counters permanently installed, to provide real-time traffic counts
- Convergence indexing road traffic monitoring, to provide information on the use of highway on-ramps
- Automated highway systems, a future idea which could reduce the safe interval between cars (required for braking in emergencies) and increase highway capacity by as much as 100% while increasing travel speeds
- Parking guidance and information systems providing dynamic advice to motorists about free parking
- Active Traffic Management system opens up UK motorway hard shoulder as an extra traffic lane, it uses CCTV and VMS to control and monitor the traffic's use of the extra lane

Other associated

- School opening times arranged to avoid rush hour traffic (in some countries, private car school pickup and drop-off traffic are substantial percentages of peak hour traffic).
- Considerate driving behaviour promotion and enforcement. Driving practices such as tailgating and frequent lane changes can reduce a road's capacity and exacerbate jams. In some countries signs are placed on highways to raise awareness, while others have introduced legislation against inconsiderate driving.
- Visual barriers to prevent drivers from slowing down out of curiosity (often called "rubbernecking" in the United States). This often includes accidents, with traffic slowing down even on roadsides physically separated from the crash location. This also tends to occur at construction sites, which is why some countries have introduced rules that motorway construction has to occur behind visual barrier
- Speed limit reductions, as practiced on the M25 motorway in London. With lower speeds allowing cars to drive closer together, this increases the capacity of a road. Note that this measure is only effective if the interval between cars is reduced, not the distance itself. Low intervals are generally only safe at low speeds.

- Lane splitting/filtering, where space-efficient vehicles, usually motorcycles, scooters, and ultra-narrow cars ride or drive in the space between cars, buses, and trucks. This is however illegal in many countries as it is perceived as a safety risk.

By country

Australia

Traffic during peak hours in major Australian cities, such as Melbourne, Sydney, Brisbane and Perth, is usually very congested and can cause considerable delay for motorists. Australians rely mainly on radio and television to obtain current traffic information. GPS, webcams, and online resources are increasingly being used to monitor and relay traffic conditions to motorists. Measures put in place by the federal and state government to combat traffic congestion include construction of new road infrastructure and increased investment in public transport. In Brisbane, ongoing road works projects on many major roads have caused ongoing congestion throughout the city and increased commutes considerably.

Brazil

Typical traffic jam in São Paulo downtown, despite road space rationing by plate number. *Rua da Consolação*, São Paulo, Brazil.

In Brazil the recent records of traffic jams over the major big cities are recognized by public authorities as one of the main challenges for São Paulo, Rio de Janeiro, Belo

Horizonte, Brasilia, Curitiba and Porto Alegre, where due to the country's economic bonanza, the automobile fleets have almost doubled in several of these cities from 2000 to 2008.

According to *Time* magazine, São Paulo has the world's worst daily traffic jams. On June 10, 2009, the historical record was set with more than 182 miles (293 km) of accumulated queues out of 522 mi (835 km) being monitored. Despite implementation since 1997 of road space rationing by the last digit of the plate number during rush hours every weekday, traffic in this 20 million city still experiences severe congestion. According to experts, this is due to the accelerated rate of motorization occurring since 2003, in São Paulo the fleet is growing at a rate of 7.5% per year, with almost 1,000 new cars bought in the city every day, and the limited capacity of public transport. The subway has only 38 miles (61 km) of lines, though 22 further miles are under construction or planned by 2010. Every day, many citizens spend between three up to four hours behind the wheel. In order to mitigate the aggravating congestion problem, since June 30, 2008 the road space rationing program was expanded to include and restrict trucks and light commercial vehicles.

Canada

Highway 401 in Ontario, which passes through Toronto, suffers chronic traffic congestion despite its width, as its average speed varies between 31km/h and 52km/h in 2008.

According to the Toronto Board of Trade, in 2010, Toronto is ranked as the most congested city of 19 surveyed cities, with an average commute time of 80 minutes.

China

The August 2010 China National Highway 110 traffic jam in Hebei province, China, is considered the world's worst traffic jam ever, as traffic congestion stretched more than 100 kilometres (62 mi) from August 14 to the 26, including at least 11 days of total gridlock. The event was caused by a combination of road works and thousands of coal trucks from Inner Mongolia's coalfields that travel daily to Beijing. The New York Times has called this event the "Great Chinese Gridlock of 2010."

Colombia

In Bogotá the excessive traffic jams cause high levels of stress in people, and are the main cause of air pollution. The problem has been mitigated partially since 2000 through the implementation of the TransMilenio, a bus rapid transit system that has been improving mobility throughout the city. The city also restricts use of vehicles several days each week depending on the last digits of license plates. However, this system, called 'Pico y placa' tends to promote the purchase of second cars by the wealthy.

Hong Kong

Hong Kong aborted a congestion pricing system in the 1980s due to public pressure and has since relied on a vehicle high purchase tax to discourage overall car purchasing but has developed no localised congestion management techniques, However the Transport Department in Hong Kong has set up websites with maps showing congestion for the Cross Harbor Tunnel, it has also set up signs on both sides of the harbor telling drivers which is the quickest way to get to the other side of Victoria Harbor.

Iran

Because of low price of gas and gasoil in Iran and inadequate public transportation traffic congestion is a common problem in different cities like Mash'had, Isfahan, Shiraz and especially Tehran (capital city of Iran). Recently developing Metro and BRT systems in Tehran and strategies for limiting gas uses has been applied to reduce car using, but unfortunately the problem is still crucial.

Netherlands

The road network in the Netherlands is usually congested in the morning and afternoon rush hour on working days. However, the rush hour periods seem to have become longer and longer and one may occasionally run into congestion any time of the day or night. Commuter traffic to and from major cities such as Amsterdam, Rotterdam, The Hague, Utrecht, Eindhoven, Zwolle, Enschede and Groningen may cause congestion. Congestion is difficult to resolve because the Netherlands is a relatively densely populated country

where there is little room for expansion. Proposals for a "pay per distance travelled" is thought to discourage car driving but has not been implemented yet due to car owner resistance.

New Zealand

New Zealand has followed strongly car-oriented transport policies since after World War II (especially in the Auckland area, where about one third of the country's population lives), and currently has one of the highest car-ownership rates per capita in the world, after the United States. Because of the negative results, congestion in the big centres is a major problem. Current measures include both the construction of new road infrastructure as well as increased investment in public transport, which had strongly declined in all cities of the country except Wellington.

United Kingdom

In the United Kingdom the inevitability of congestion in some urban road networks has been officially recognised since the Department for Transport set down policies based on the report *Traffic in Towns* in 1963:

Even when everything that it is possibly to do by way of building new roads and expanding public transport has been done, there would still be, in the absence of deliberate limitation, more cars trying to move into, or within our cities than could possibly be accommodated..

The Department for Transport sees growing congestion as one of the most serious transport problems facing the UK. On 1 December 2006, Rod Eddington published a UK government-sponsored report into the future of Britain's transport infrastructure. The Eddington Transport Study set out the case for action to improve road and rail networks, as a "crucial enabler of sustained productivity and competitiveness". Eddington has estimated that congestion may cost the economy of England £22 bn a year in lost time by 2025. He warned that roads were in serious danger of becoming so congested that the economy would suffer. At the launch of the report Eddington told journalists and transport industry representatives introducing road pricing to encourage drivers to drive less was an "economic no-brainer". There was, he said "no attractive alternative". It would allegedly cut congestion by half by 2025, and bring benefits to the British economy totalling £28 bn a year.

On Fridays in California, Interstate 5 is often congested as Los Angeles residents travel north for the weekend.

United States

The Texas Transportation Institute estimated that, in 2000, the 75 largest metropolitan areas experienced 3.6 billion vehicle-hours of delay, resulting in 5.7 billion U.S. gallons (21.6 billion liters) in wasted fuel and $67.5 billion in lost productivity, or about 0.7% of the nation's GDP. It also estimated that the annual cost of congestion for each driver was approximately $1,000 in very large cities and $200 in small cities. Traffic congestion is increasing in major cities and delays are becoming more frequent in smaller cities and rural areas.

By late 2010 the five cities in the United States with the worst rush hour traffic congestion were New York City, Washington, D.C., San Francisco, Seattle and Los Angeles.

Chapter- 9

Smart Growth

Smart growth is an urban planning and transportation theory that concentrates growth in compact walkable urban centers to avoid sprawl and advocates compact, transit-oriented, walkable, bicycle-friendly land use, including neighborhood schools, complete streets, and mixed-use development with a range of housing choices. The term 'smart growth' is particularly used in North America. In Europe and particularly the UK, the terms 'Compact City' or 'urban intensification' have often been used to describe similar concepts, which have influenced Government planning policies in the UK, the Netherlands and several other European countries.

Smart growth values long-range, regional considerations of sustainability over a short-term focus. Its goals are to achieve a unique sense of community and place; expand the range of transportation, employment, and housing choices; equitably distribute the costs and benefits of development; preserve and enhance natural and cultural resources; and promote public health.

History

Transportation and community planners began to promote the idea of compact cities and communities in the early 1970s. The cost and difficulty of acquiring land (particularly in historic and/or areas designated as conservancies) to build and widen highways caused some politicians to reconsider basing transportation planning on motor vehicles.

Architect Peter Calthorpe promoted and popularized the idea of urban villages that relied on public transportation, bicycling, and walking instead of automobile use. Architect Andrés Duany promoted changing design codes to promote a sense of community, and to discourage driving. Colin Buchanan and Stephen Plowden helped to lead the debate in the United Kingdom.

Government subsidies for infrastructure have disguised the true cost of sprawl. Examples include subsidies for highway building, fossil fuels, and electricity.

Electrical subsidies

With electricity, there is a cost associated with extending and maintaining the service delivery system, as with water and sewage, but there also is a loss in the commodity

being delivered. The farther from the generator, the more power is lost in distribution. According to the Department of Energy's (DOE) Energy Information Administration (EIA), 9 percent of energy is lost in transmission. Current average cost pricing, where customers pay the same price per unit of power regardless of the true cost of their service, subsidizes sprawl development. With electricity deregulation, some states now charge customers/developers fees for extending distribution to new locations rather than rolling such costs into utility rates.

New Jersey, for example, has implemented a plan that divides the state into five planning areas, some of which are designated for growth, while others are protected. The state is developing a series of incentives to coax local governments into changing zoning laws that will be compatible with the state plan. The New Jersey Board of Public Utilities recently proposed a revised rule that presents a tiered approach to utility financing. In areas not designated for growth, utilities and their ratepayers are forbidden to cover the costs of extending utility lines to new developments—and developers will be required to pay the full cost of public utility infrastructure. In designated growth areas that have local smart plans endorsed by the State Planning Commission, developers will be refunded the cost of extending utility lines to new developments at two times the rate of the revenue received by developers in smart growth areas that do not have approved plans.

Rationale for smart growth

Smart growth is an alternative to urban sprawl, traffic congestion, disconnected neighborhoods, and urban decay. Its principles challenge old assumptions in urban planning, such as the value of detached houses and automobile use.

Climate protection

Seattle Mayor Greg Nickels launched an initiative in 2005 to advance the goals of the Kyoto Protocol, through leadership and action by at least 141 American cities. As of October 2006, 319 mayors (representing more than 51.4 million Americans) had accepted the challenge.

Under the US Mayors' Climate Protection Agreement, cities must commit to three actions to meet the Kyoto Protocol in their own communities—one of which is adopting certain Smart growth principles.

"Cities for Climate Protection", under ICLEI, has 150 U.S. cities and towns participating, and 600 municipalities worldwide. Like the U.S. Mayors' Climate Protection Agreement, communities use a five-step methodology to reduce global warming and air pollution emissions.

Environmental protection

Environmentalists promote Smart Growth by advocating urban-growth boundaries, or Green belts, as they have been termed in England since the 1930s.

Public health

Transit-oriented development can improve the quality of life and encourage a healthier, pedestrian-based lifestyle with less pollution. The United States Environmental Protection Agency suggests Smart growth to reduce air pollution.

Elements

Growth is "smart growth", to the extent that it includes the elements listed below.

Compact neighborhoods

Compact, livable urban neighborhoods attract more people and business. Creating such neighborhoods is a critical element of reducing urban sprawl and protecting the climate. Such a tactic includes adopting redevelopment strategies and zoning policies that channel housing and job growth into urban centers and neighborhood business districts, to create compact, walkable, and bike- and transit-friendly hubs. This sometimes requires local governmental bodies to implement code changes that allow increased height and density downtown and regulations that not only eliminate minimum parking requirements for new development but establish a maximum number of allowed spaces. Other topics fall under this concept:

- mixed-use development
- inclusion of affordable housing
- restrictions or limitations on suburban design forms (e.g., detached houses on individual lots, strip malls and surface parking lots)
- inclusion of parks and recreation areas

Transit-oriented development

Transit-oriented development (TOD) is a residential or commercial area designed to maximize access to public transport, and mixed-use/compact neighborhoods tend to use transit at all times of the day. Many cities striving to implement better TOD strategies seek to secure funding to create new public transportation infrastructure and improve existing services. Other measures might include regional cooperation to increase efficiency and expand services, and moving buses and trains more frequently through high-use areas. Other topics fall under this concept:

- Transportation Demand Management measures
- road pricing system (tolling)
- commercial parking taxes

Pedestrian- and bicycle-friendly design

Biking and walking instead of driving can reduce emissions, save money on fuel and maintenance, and foster a healthier population. Pedestrian- and bicycle-friendly improve-

ments include bike lanes on main streets, an urban bike-trail system, bike parking, pedestrian crossings, and associated master plans. The most pedestrian- and bike-friendly variant of smart growth and New Urbanism is New Pedestrianism because motor vehicles are on a separate grid.

Others

- preserving open space and critical habitat, reusing land, and protecting water supplies and air quality
- transparent, predictable, fair and cost-effective rules for development
- historic preservation
- Setting aside large areas where development is prohibited, nature is able to run its course, providing fresh air and clean water.
- Expansion around already existing areas allows public services to be located where people are living without taking away from the core city neighborhoods in large urban areas.
- Developing around preexisting areas decreases the socioeconomic segregation allowing society to function more equitably, generating a tax base for housing, educational and employment programs.

Policy Tools

Zoning Ordinances

The most widely used tool for achieving smart growth is the local zoning law. Through zoning, new development can be restricted to specific areas, and additional density incentives can be offered for brownfield and greyfield land. Zoning can also reduce the minimum amount of parking required to be built with new development, and can be used to require set-asides for parks and other community amenities.

Environmental Impact Assessments

One popular approach to assist in smart growth in democratic countries is for law-makers to require prospective developers to prepare environmental impact assessments of their plans as a condition for state and/or local governments to give them permission to build their buildings. These reports often indicate how significant impacts generated by the development will be mitigated - the cost of which is usually paid by the developer. These assessments are frequently controversial. Conservationists, neighborhood advocacy groups and NIMBYs are often skeptical about such impact reports, even when they are prepared by independent agencies and subsequently approved by the decision makers rather than the promoters. Conversely, developers will sometimes strongly resist being required to implement the mitigation measures required by the local government as they may be quite costly.

In communities practicing these smart growth policies, developers comply with local codes and requirements. Consequently, developer compliance builds communal trust because it demonstrates a genuine interest in the environmental quality of the community.

Communities Implementing smart growth

The United States Environmental Protection Agency has recognized these cities for implementing smart growth principles:

- Arlington, Virginia, United States -- view documentary, "Arlington's Smart Growth Journey"
- Minneapolis & Saint Paul, Minnesota, United States
- Davidson, North Carolina, United States
- Denver, Colorado, United States

The Smart Growth Network has recognized these cities for implementing smart growth principles.

- The Kentlands; Gaithersburg, Maryland, United States (for live-work units)
- East Liberty; Pittsburgh, Pennsylvania, United States (establishing downtown retail)
- Moore Square Museums Magnet Middle School; Raleigh, North Carolina, United States (for being located downtown)
- Garfield Park; Chicago, Illinois, United States (retaining transit options)
- New Jersey Pineland; Southern New Jersey, United States (for transfer of development rights away from undeveloped land)

Smart Growth, Urban Sprawl and Automobile dependency

Whether smart growth (or the 'Compact City') does or can reduce problems of automobile dependency associated with urban sprawl have been fiercely contested issues over several decades. An influential study in 1989 by Peter Newman and Jeff Kenworthy compared 32 cities across North America, Australia, Europe and Asia. The study has been criticised for its methodology but the main finding that denser cities, particularly in Asia, have lower car use than sprawling cities, particularly in North America, has been largely accepted - although the relationship is clearer at the extremes across continents than it is within countries where conditions are more similar.

Within cities studies from across many countries (mainly in the developed world) have shown that denser urban areas with greater mixture of land use and better public transport tend to have lower car use than less dense suburban and ex-urban residential areas. This usually holds true even after controlling for socio-economic factors such as differences in household composition and income. This does not necessarily imply that suburban sprawl causes high car use, however. One confounding factor, which has been the subject of many studies, is residential self-selection: people who prefer to drive tend to move towards low density suburbs, whereas people who prefer to walk, cycle or use transit tend to

move towards higher density urban areas, better served by public transport. Some studies have found that, when self-selection is controlled for, the built environment has no significant effect on travel behaviour. More recent studies using more sophisticated methodologies have generally refuted these findings: density, land use and public transport accessibility can influence travel behaviour, although social and economic factors, particularly household income, usually exert a stronger influence.

The Paradox of Intensification

Reviewing the evidence on urban intensification, smart growth and their effects on travel behaviour Melia *et al.* (2011) found support for the arguments of both supporters and opponents of smart growth. Planning policies which increase population densities in urban areas do tend to reduce car use, but the effect is a weak one, so doubling the population density of a particular area will not halve the frequency or distance of car use.

For example, Portland, Oregon a U.S. city which has pursued smart growth policies, substantially increased its population density between 1990 and 2000 when other US cities of a similar size were reducing in density. As predicted by the paradox, traffic volumes and congestion both increased more rapidly than in the other cities, despite a substantial increase in transit use.

These findings led them to propose the paradox of intensification, which states:

At the city-wide level it may be possible, through a range of positive measures to counteract the increases in traffic and congestion which would otherwise result from increasing population densities: Freiburg im Breisgau in Germany is one example of a city which has been more successful in this respect.

This study also reviewed evidence on the local effects of building at higher densities. At the level of the neighbourhood or individual development positive measures (e.g. improve-ments to public transport) will usually be insufficient to counteract the traffic effect of increasing population density. This leaves policy-makers with four choices: intensify and accept the local consequences, sprawl and accept the wider consequences, a compromise with some element of both, or intensify accompanied by more radical measures such as parking restrictions, closing roads to traffic and carfree zones. Where possible, this is the authors' preferred option.

Criticism

Wendell Cox is a vocal opponent of smart growth policies. He argued before the United States Senate Committee on Environment and Public Works that, "smart growth strategies tend to intensify the very problems they are purported to solve." Cox and Joshua Utt analyzed smart growth and sprawl, and argued that:

Our analysis indicates that the Current Urban Planning Assumptions are of virtually no value in predicting local government expenditures per capita. The lowest local govern-

ment expenditures per capita are not in the higher density, slower growing, and older municipalities. On the contrary, the actual data indicate that the lowest expenditures per capita tend to be in medium- and lower-density municipalities (though not the lowest density); medium- and faster-growing municipalities; and newer municipalities. This is after 50 years of unprecedented urban decentralization, which seems to be more than enough time to have developed the purported urban sprawl-related higher local government expenditures. It seems unlikely that the higher expenditures that did not develop due to sprawl in the last 50 years will evolve in the next 20--despite predictions to the contrary in The Costs of Sprawl--2000 research. It seems much more likely that the differences in municipal expenditures per capita are the result of political, rather than economic factors, especially the influence of special interests.

The phrase "smart growth" implies that other growth and development theories are not "smart". There is debate about whether transit-proximate development constitutes smart growth when it is not transit-oriented. The National Motorists Association does not object to smart growth as a whole, but strongly objects to traffic calming, which is intended to reduce automobile accidents and fatalities, but may also reduce automobile usage and increase alternate forms of public transportation.

In 2002 the National Center for Public Policy Research, a self-described conservative think tank, published an economic study entitled "Smart Growth and Its Effects on Housing Markets: The New Segregation" which termed smart growth "restricted growth" and suggested that smart growth policies disfavor minorities and the poor by driving up housing prices.

Some libertarian groups, such as the Cato Institute, criticize smart growth on the grounds that it leads to greatly increased land values, and people with average incomes can no longer afford to buy detached houses.

A number of ecological economists claim that industrial civilization has already "overshot" the carrying capacity of the Earth, and "smart growth" is mostly an illusion. Instead, a steady state economy would be needed to bring human societies back into a necessary balance with the ability of the ecosystem to sustain humans (and other species).

A study released in November 2009 characterized the smart-growth policies in the U.S. state of Maryland as a failure, concluding that "[t]here is no evidence after ten years that [smart-growth laws] have had any effect on development patterns." Factors include a lack of incentives for builders to redevelop older neighborhoods and limits on the ability of state planners to force local jurisdictions to approve high-density developments in "smart-growth" areas. Buyers demand low-density development and because voters tend to oppose high density developments near them.

Chapter- 10

Compact City

The Compact City is an an urban planning and urban design concept, which promotes relatively high residential density with mixed land uses. It is based on an efficient public transport system and has an urban layout which – according to its advocates – encourages walking and cycling, low energy consumption and reduced pollution. A large resident population provides opportunities for social interaction as well as a feeling of safety in numbers and 'eyes on the street'. It is also arguably a more sustainable urban settlement type than urban sprawl because it is less dependent on the car, requiring less (and cheaper per capita) infrastructure provision (Williams, 2000 cited in Dempsey 2010).

Origins

The term *Compact City* was first coined in 1973 by George Dantzig and Thomas L. Saaty, two mathematicians whose utopian vision was largely driven by a desire to see more efficient use of resources. The concept, as it has influenced urban planning, is often attributed to Jane Jacobs and her book *The Death and Life of Great American Cities* (1961), a critique of modernist planning policies claimed by Jacobs to be destroying many existing inner-city communities.

Among other criticisms of the conventional planning and transport planning of the time, Jacobs' work attacked the tendency, inherited from the Garden City Movement, towards reducing the density of dwellings in urban areas. Four conditions were necessary to enable the diversity essential for urban renewal: mixed uses, small walkable blocks, mingling of building ages and types, and "a sufficiently dense concentration of people". The 'sufficient' density would vary according to local circumstances but, in general, a hundred dwellings per acre (247 per hectare – high by American standards, but quite common in European and Asian cities) could be considered a minimum.

The Compact City and 'Smart Growth'

Although the term was coined by American writers, it has been used more in recent years by European and particularly British planners and academics. In North America the term smart growth has become more common. The two concepts are very similar, although 'smart growth' carries more strongly normative connotations. In Australia, Lehmann has extensively written about the Compact City and Green Urbanism. His book *The Prin-*

ciples of Green Urbanism (Earthscan, 2010; ISBN 978-1-84407-817-2) presents a series of international case studies in great detail and outlines 15 core principles for the design of compact, sustainable cities.

Influence on policy in the UK

The Compact City had a particularly strong influence on planning policy in the UK during the Labour Governments of 1997–2010. The first Labour Government in 1998 set up the Urban Taskforce under Lord Richard Rogers, which produced the report Towards an Urban Renaissance. Influenced by this report, the UK Government issued PPG 3 Planning Policy Guidance on Housing which introduced a 60% brownfield target, a minimum net residential density guideline of 30 dwellings per hectare, a sequential hierarchy beginning with urban brownfield land, maximum parking guidelines replacing the previous minima, and a policy of intensification around public transport nodes. Over the succeeding years, these targets were substantially exceeded, with the brownfield proportion reaching 80% by 2009, and average densities 43 dwellings per hectare.

The Compact City, urban sprawl and automobile dependency

Whether the Compact City (or 'smart growth') does or can reduce problems of automobile dependency associated with urban sprawl has been fiercely contested over several decades. An influential study in 1989 by Peter Newman and Jeff Kenworthy compared 32 cities across North America, Australia, Europe and Asia. The study's methodology has been criticised but the main finding that denser cities, particularly in Asia, have lower car use than sprawling cities, particularly in North America, has been largely accepted – although the relationship is clearer at the extremes across continents than it is within countries where conditions are more similar.

Within cities, studies from across many countries (mainly in the developed world) have shown that denser urban areas with greater mixture of land use and better public transport tend to have lower car use than less dense suburban and exurban residential areas. This usually holds true even after controlling for socio-economic factors such as differences in household composition and income. This does not necessarily imply that suburban sprawl causes high car use, however. One confounding factor, which has been the subject of many studies, is residential self-selection: people who prefer to drive tend to move towards low density suburbs, whereas people who prefer to walk, cycle or use transit tend to move towards higher density urban areas, better served by public transport. Some studies have found that, when self-selection is controlled for, the built environment has no significant effect on travel behaviour. More recent studies using more sophisticated methodologies have generally refuted these findings: density, land use and public transport accessibility can influence travel behaviour, although social and economic factors, particularly household income, usually exert a stronger influence.

The paradox of intensification

Reviewing the evidence on urban intensification, smart growth and their effects on travel behaviour, Melia et al (2011) found support for the arguments of both supporters and opponents of the compact city. Planning policies which increase population densities in urban areas do tend to reduce car use, but the effect is a weak one, so doubling the population density of a particular area will not halve the frequency or distance of car use.

For example, Portland, Oregon, a U.S. city which has pursued smart growth policies, substantially increased its population density between 1990 and 2000 when other US cities of a similar size were reducing in density. As predicted by the paradox, traffic volumes and congestion both increased more rapidly than in the other cities, despite a substantial increase in transit use.

These findings led them to propose the paradox of intensification, which states:

> “Ceteris paribus, urban intensification which increases population density will reduce per capita car use, with benefits to the global environment, but will also increase concentrations of motor traffic, worsening the local environment in those locations where it occurs.”

At the city-wide level it may be possible, through a range of positive measures, to counteract the increases in traffic and congestion which would otherwise result from increasing population densities: Freiburg im Breisgau in Germany is one example of a city which has been more successful in this respect.

This study also reviewed evidence on the local effects of building at higher densities. At the level of the neighbourhood or individual development, positive measures (e.g. improvements to public transport) will usually be insufficient to counteract the traffic effect of increasing population density. This leaves policy-makers with four choices: intensify and accept the local consequences, sprawl and accept the wider consequences, a compromise with some element of both, or intensify accompanied by more radical measures such as parking restrictions, closing roads to traffic and carfree zones. Where possible, this is the authors' preferred option.

Urban Design

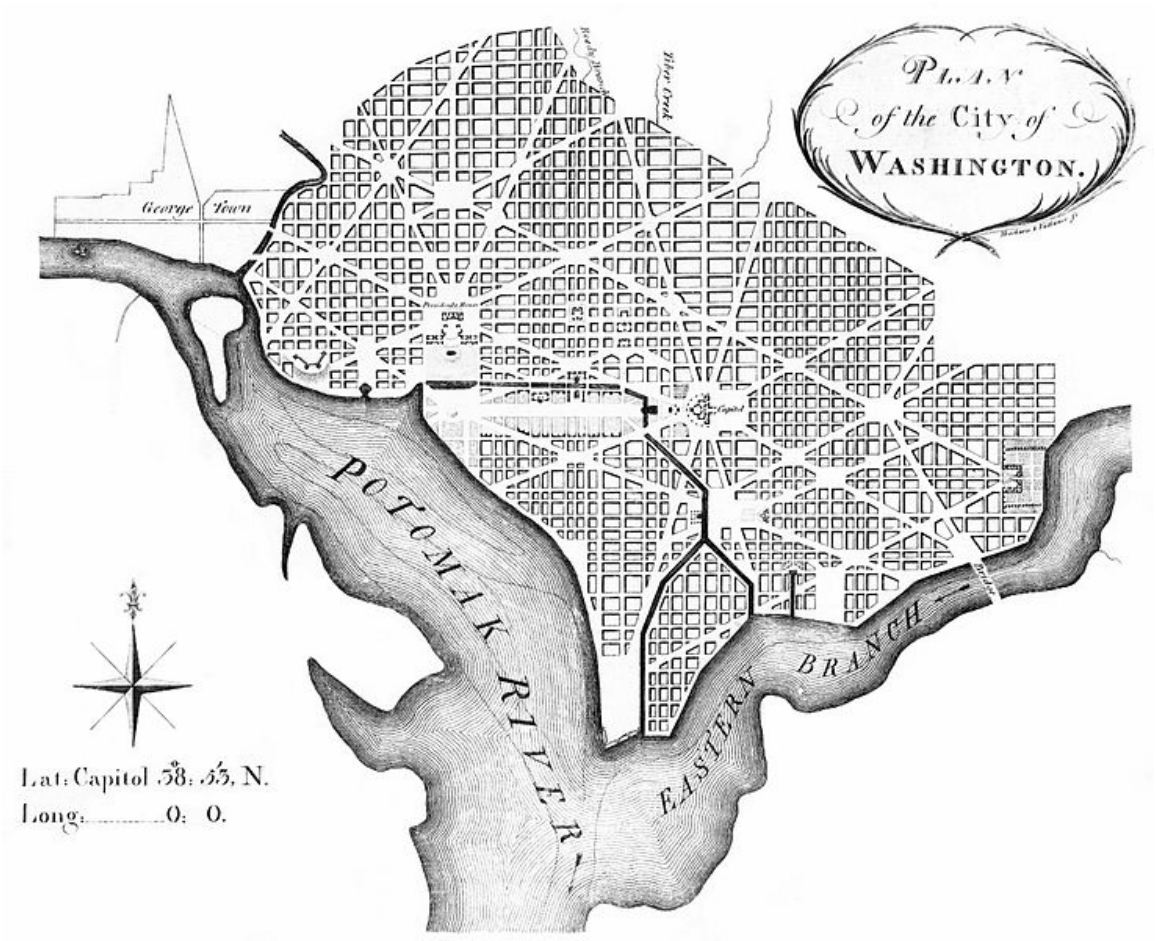
Urban design concerns the arrangement, appearance and functionality of towns and cities, and in particular the shaping and uses of urban public space. It has traditionally been regarded as a disciplinary subset of urban planning, landscape architecture, or architecture and in more recent times has been linked to emergent disciplines such as landscape urbanism. However, with its increasing prominence in the activities of these disciplines,

it is better conceptualised as a design practice that operates at the intersection of all three, and requires a good understanding of a range of others besides, such as real estate development, urban economics, political economy and social theory.

Urban design theory deals primarily with the design and management of public space (i.e. the 'public environment', 'public realm' or 'public domain'), and the way public places are experienced and used. Public space includes the totality of spaces used freely on a day-to-day basis by the general public, such as streets, plazas, parks and public infrastructure. Some aspects of privately owned spaces, such as building facades or domestic gardens, also contribute to public space and are therefore also considered by Urban design theory. Important writers on, and advocates for, urban design theory include Christopher Alexander, Michael E. Arth, Edmund Bacon, Ian Bentley,Peter Calthorpe, Alex Krieger, Gordon Cullen, Andres Duany, Jane Jacobs, Jan Gehl, Kevin Lynch, Roger Montgomery, Aldo Rossi, Colin Rowe, Robert Venturi, William H. Whyte, Bill Hillier, and Elizabeth Plater-Zyberk.

While the two fields are closely related, 'urban design' differs from 'urban planning' in its focus on physical improvement of the public environment, whereas the latter tends, in practice, to focus on the management of private development through established planning methods and programs, and other statutory development controls.

Principles



L'Enfant's plan for Washington DC

Gehl Architects' project for Brighton New Road employing shared space

Public spaces are frequently subject to overlapping management responsibilities of multiple public agencies or authorities and the interests of nearby property owners, as well as the requirements of multiple and sometimes competing users. The design, construction and management of public spaces therefore typically demands consultation and negotiation across a variety of spheres. Urban designers rarely have the degree of artistic liberty or control sometimes offered in design professions such as architecture. It also typically requires interdisciplinary input with balanced representation of multiple fields including engineering, ecology, local history, and transport planning.

The scale and degree of detail considered varies depending on context and needs. It ranges from the layout of entire cities, as with l'Enfant's plan for Washington DC, Griffin and Mahony's plan for Canberra and Doxiadis' plan for Islamabad (although such opportunities are obviously rare), through 'managing the sense of a region' as described by Kevin Lynch, to the design of street furniture.

Urban design may encompass the preparation of design guidelines and regulatory frameworks, or even legislation to control development, advertising, etc. and in this sense overlaps with urban planning. It may encompass the design of particular spaces and structures and in this sense overlaps with architecture, landscape architecture, highway

engineering and industrial design. It may also deal with 'place management' to guide and assist the use and maintenance of urban areas and public spaces.

Much urban design work is undertaken by urban planners, landscape architects and architects but there are professionals who identify themselves specifically as urban designers. Many architecture, landscape and planning programs incorporate urban design theory and design subjects into their curricula and there are an increasing number of university programs offering degrees in urban design, usually at post-graduate level.

Urban design considers:

- *Urban structure* – How a place is put together and how its parts relate to each other
- *Urban typology, density* and sustainability - spatial types and morphologies related to intensity of use, consumption of resources and production and maintenance of viable communities
- *Accessibility* – Providing for ease, safety and choice when moving to and through places
- *Legibility and wayfinding* – Helping people to find their way around and understand how a place works
- *Animation* – Designing places to stimulate public activity
- *Function and fit* – Shaping places to support their varied intended uses
- *Complementary mixed uses* – Locating activities to allow constructive interaction between them
- *Character and meaning* – Recognizing and valuing the differences between one place and another
- *Order and incident* – Balancing consistency and variety in the urban environment in the interests of appreciating both
- *Continuity and change* – Locating people in time and place, including respect for heritage and support for contemporary culture
- *Civil society* – Making places where people are free to encounter each other as civic equals, an important component in building social capital

History

Although contemporary professional use of the term 'urban design' dates from the mid-20th century, urban design as such has been practiced throughout history. Ancient examples of carefully planned and designed cities exist in Asia, India, Africa, Europe and the Americas, and are particularly well-known within Classical Chinese, Roman and Greek cultures. European Medieval cities are often regarded as exemplars of undesigned or 'organic' city development, but there are clear examples of considered urban design in the Middle Ages.

Throughout history, design of streets and deliberate configuration of public spaces with buildings have reflected contemporaneous social norms or philosophical and religious beliefs. Yet the link between designed urban space and human mind appears to be

bidirectional. Indeed, the reverse impact of urban structure upon human behaviour and upon thought is evidenced by both observational study and historical record. There are clear indications of impact through Renaissance urban design on the thought of Johannes Kepler and Galileo Galilei. Already René Descartes in his *Discourse on the Method* had attested to the impact Renaissance planned new towns had upon his own thought, and much evidence exists that the Renaissance streetscape was also the perceptual stimulus that had led to the development of coordinate geometry.

The beginnings of modern urban design in Europe are indeed associated with the Renaissance but, especially, with the Age of Enlightenment. Spanish colonial cities were often planned, as were some towns settled by other imperial cultures. These sometimes embodied utopian ambitions as well as aims for functionality and good governance, as with James Oglethorpe's plan for Savannah, Georgia. In the Baroque period the design approaches developed in French formal gardens such as Versailles were extended into urban development and redevelopment. In this period, when modern professional specialisations did not exist, urban design was undertaken by people with skills in areas as diverse as sculpture, architecture, garden design, surveying, astronomy, and military engineering. In the 18th and 19th centuries, urban design was perhaps most closely linked with surveyors and architects. Much of Frederick Law Olmsted's work was concerned with urban design, and so the (then-new) profession of landscape architecture also began to play a significant role in the late 19th century.

Modern urban design can be considered as part of the wider discipline of Urban planning. Indeed, Urban planning began as a movement primarily occupied with matters of urban design. Works such as Ildefons Cerda's *General Theory of Urbanization* (1867), Camillo Sitte's *City Planning According to Artistic Principles* (1889), and Robinson's *The Improvement of Cities and Towns* (1901) and *Modern Civic Art* (1903), all were primarily concerned with urban design, as did the later City Beautiful movement in North America.

'Urban design' was first used as a distinctive term when Harvard University hosted a series of Urban Design Conferences from 1956. These conferences provided a platform for the launching of Harvard's Urban Design program in 1959-60. The writings of Jane Jacobs, Kevin Lynch, Gordon Cullen and Christopher Alexander became authoritative works for the school of Urban Design.

Gordon Cullen's *The Concise Townscape*, first published in 1961, also had a great influence on many urban designers. Cullen examined the traditional artistic approach to city design of theorists such as Camillo Sitte, Barry Parker and Raymond Unwin. He created the concept of 'serial vision', defining the urban landscape as a series of related spaces.

Jane Jacobs' *The Death and Life of Great American Cities*, published in 1961, was also a catalyst for interest in ideas of urban design. She critiqued the Modernism of CIAM, and asserted that the publicly unowned spaces created by the 'city in the park' notion of Modernists was one of the main reasons for the rising crime rate. She argued instead for

an 'eyes on the street' approach to town planning, and the resurrection of main public space precedents, such as streets and squares, in the design of cities.

Kevin Lynch's *The Image of the City* of 1961 was also seminal to the movement, particularly with regards to the concept of legibility, and the reduction of urban design theory to five basic elements - paths, districts, edges, nodes, landmarks. He also made popular the use of mental maps to understanding the city, rather than the two-dimensional physical master plans of the previous 50 years.

Other notable works include Rossi's *Architecture of the City* (1966), Venturi's *Learning from Las Vegas* (1972), Colin Rowe's *Collage City* (1978), and Peter Calthorpe's *The Next American Metropolis* (1993). Rossi introduced the concepts of 'historicism' and 'collective memory' to urban design, and proposed a 'collage metaphor' to understand the collage of new and older forms within the same urban space. Calthorpe, on the other hand, developed a manifesto for sustainable urban living via medium density living, as well as a design manual for building new settlements in accordance with his concept of Transit Oriented Development (TOD). Bill Hillier and Julienne Hanson in "The Social Logic of Space" (1984) introduced the concept of Space Syntax to predict how movement patterns in cities would contribute to urban vitality, anti-social behaviour and economic success. The popularity of these works resulted in terms such as 'historicism', 'sustainability', 'livability', 'high quality of urban components', etc. become everyday language in the field of urban planning.

Equality issues

Until the 1970s, urban designers had taken little account of the needs of people with disabilities. At that time, disabled people began to form movements demanding recognition of their potential contribution if social obstacles were removed. Disabled people challenged the 'medical model' of disability which saw physical and mental problems as an individual 'tragedy' and people with disabilities as 'brave' for enduring them. They proposed instead a 'social model' which said that barriers to disabled people result from the design of the built environment and attitudes of able-bodied people. 'Access Groups' were established composed of people with disabilities who audited their local areas, checked planning applications and made representations for improvements. The new profession of 'access officer' was established around that time to produce guidelines based on the recommendations of access groups and to oversee adaptations to existing buildings as well as to check on the accessibility of new proposals. Many local authorities now employ access officers who are regulated by the Access Association. A new chapter of the Building Regulations (Part M) was introduced in 1992. Although it was beneficial to have legislation on this issue the requirements were fairly minimal but continue to be improved with ongoing amendments. The Disability Discrimination Act 1995 continues to raise awareness and enforce action on disability issues in the urban environment.

Chapter- 11

Transit, Bicycling and Pedestrian Oriented Developments

Transit-oriented development is sometimes distinguished by some planning officials from "transit-proximate development" because it contains specific features that are designed to encourage public transport use and differentiate the development from urban sprawl. Examples of these features include mixed-use development that will use transit at all times of day, excellent pedestrian facilities such as high quality pedestrian crossings, narrow streets, and tapering of buildings as they become more distant from the public transport node. Another key feature of transit-oriented development that differentiates it from "transit-proximate development" is reduced amounts of parking for personal vehicles.

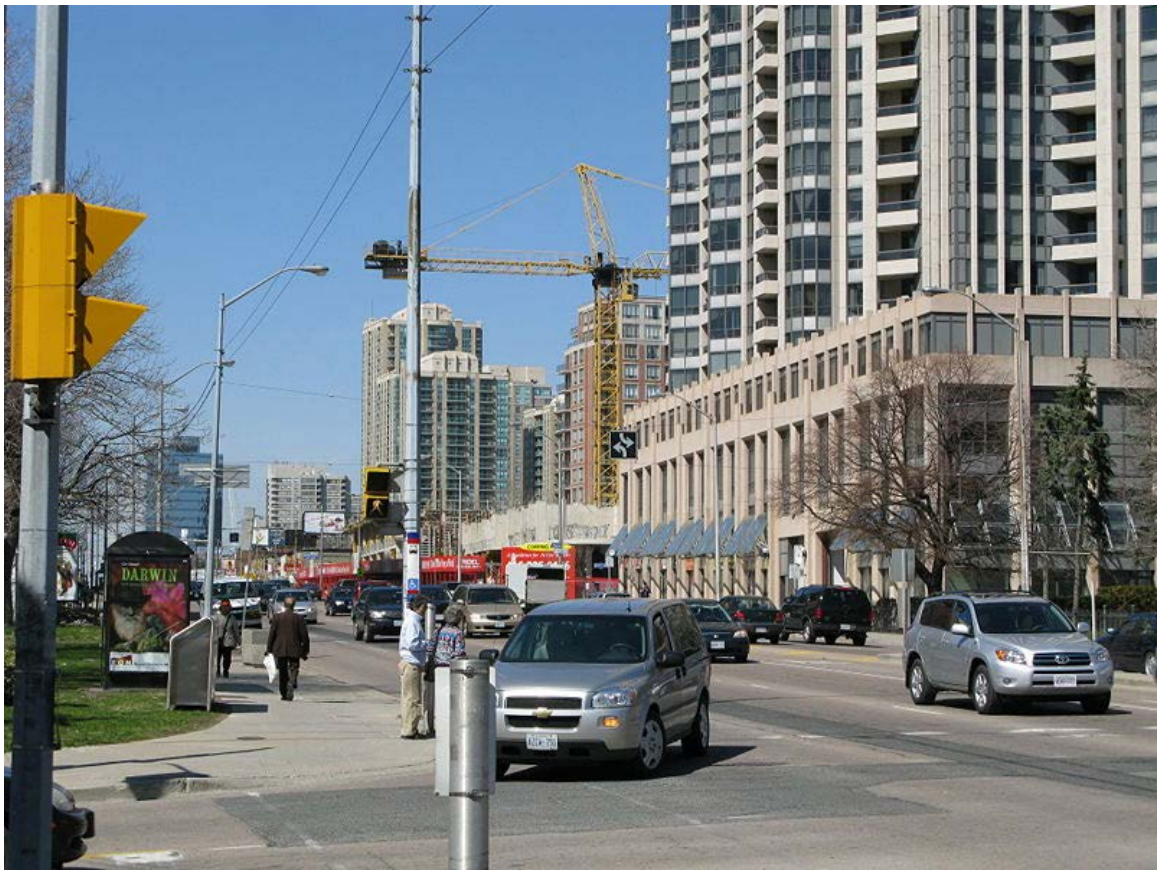
TOD in cities

Many cities in the USA and Canada are developing TOD policy. Denver, Montreal, San Francisco, and Vancouver among many other cities have developed, and continue to write policies and strategic plans which aim to reduce automobile dependency and increase the use of public transit.

Curitiba

November 15 Street, a major street in Curitiba, made pedestrian-exclusive in 1972

One of the earliest, and most successful examples of TOD is Curitiba, in Brazil. Curitiba was organized into transport corridors very early in its history. Over the years, it has integrated its zoning and transportation to place high density development next to high capacity transportation. Since the failure of its first, rather grandiose, city plan due to lack of funding, Curitiba has focused on working with economical forms of infrastructure, so it has arranged unique adaptations, such as bus routes (inexpensive infrastructure) with routing systems, limited access and speeds similar to subway systems. The source of innovation in Curitiba has been a unique form of participatory city planning that emphasizes public education, discussion and agreement.



Vicinity of Finch subway station, Toronto

Vancouver

Greater Vancouver has had a strong history of creating new development around its SkyTrain lines and also created the concept of regional town centres around the major stations and transit corridors. Of note is the Metrotown area of the suburb of Burnaby, BC near the Metrotown SkyTrain Station. The areas around stations have spurred the development of billions of dollars of high-density real estate, with multiple highrises near the many stations.

Toronto

Toronto has a longstanding policy of encouraging new construction along the route of its primary Yonge Street subway line. Most notable are the development of the Yonge and Eglinton area in the 1960s and 1970s; and the present development of the 2 km of the Yonge Street corridor north of Sheppard Avenue, which began in the late 1980s. In the period since 1997 alone the latter stretch has seen the appearance of a major new shopping centre and the building and occupation of over twenty thousand new units of condominium housing. Since the opening of the Sheppard subway line in 2002, there is a condominium construction boom along the route on Sheppard Avenue East between Yonge Street and Don Mills Road.

Calgary

Bridgeland, Calgary

Calgary is home to a very successful TOD community called The Bridges, located in the community of Bridgeland. The Bridges is home to a diverse range of condos, shops, services, and parks. Some other TODs currently being constructed are London and Westbrook, both high rise condo and retail communities in suburban areas of the City. The City continues to create TOD policy for other Calgary communities. Calgary City Council has allocated funding for the creation of six Station Area Plans around the city, to guide increasing development pressure around some of the light rail transit stations. On June 9, 2008, Calgary City Council approved the first station area plan in Calgary's history.

Edmonton

Most of the suburban high rises were not along major rail lines like other cities until recently, when there has been incentive to do so. Century Park is a growing condo community in southern Edmonton at the south end of Edmonton's LRT. It will include low to high rise condos, recreational services, shops, restaurants, and a fitness centre. Edmonton has also had a transit-proximate development for some time in the north-eastern suburbs at Clareview which includes a large park and ride, and low rise apartments among big box stores and associated power center parking. Edmonton is also looking into some new TODs in various parts of the city. In the northeast, there is plans to redevelop underutilized land at two sites around existing LRT, Fort Road and Stadium Station. In the west, there is plans to have some medium density condos in the Glenora neighbourhood along a future LRT route as well as a TOD in the southeast in the Strathearn neighbourhood along the same future LRT on existing low rise apartments.

Hong Kong

In the mid-20th century, no railway was built until an area was well developed. However, in recent decades, Hong Kong has started to have some TOD developments, where a railway is built simultaneously with residential development above or nearby. Examples include:

- LOHAS Park
- Olympian City
- Tung Chung

Melbourne

Melbourne, Australia, the fastest growing settlement in Australia, is expected to reach a population of 5 million by 2030 with the overwhelming majority of its residents relying on private automobiles. Since the turn of the century, sporadic efforts have been made by various levels of government to implement transit-oriented development principles. However, a lack of commitment to funding public transport infrastructure, resulting to overcrowding and amending zoning laws has dramatically slowed progress towards sustainable development for the city.

Guatemala City

In an attempt to control rapid growth of Guatemala City, the municipal government (Municipalidad de Guatemala) headed by long time Mayor Álvaro Arzú, has implemented a plan to control its growth based on transects along its important arterial roads and exhibitting Transit-oriented development (TOD) characteristics. This plan denominated POT (Plan de Ordenamiento Territorial) aims to allow taller building structures of mixed uses to be built next to large arterial roads and gradually decline in height and density as you move away from such. This is simultaneously being implemented along with a Bus Rapid Transit {BRT} system called Transmetro.

San Francisco Bay Area

The San Francisco Bay Area includes nine counties and 101 cities, including San Jose, San Francisco, Oakland and Fremont. Local and regional governments encourage transit-oriented development to decrease traffic congestion, protect natural areas, promote public health and increase housing options. The region has designated Priority Development Areas and Priority Conservation Areas. Current population forecasts for the region predict that it will grow by 2 million people by 2035 due to both the natural birth rate and job creation, and estimate that 50% of this growth can be accommodated in Priority Development Areas through transit-oriented development.

Equity and TOD

One criticism of TOD is that it has the potential to spur gentrification in low-income areas. In some cases, TOD can raise the housing costs of formerly affordable neighborhoods, pushing low- and moderate-income residents farther away from jobs and transit. When this happens, TOD projects can disrupt low-income neighborhoods. When executed with equity in mind, however, TOD has the potential to benefit low- and moderate-income (LMI) communities: it can link workers to employment centers, create construction and maintenance jobs, and has the potential to encourage investment in areas that have suffered neglect and economic depression. TOD also reduces transportation costs, which can have a greater impact on LMI households since they spend a larger share of their income on transportation relative to higher-income households. This frees up household income that can be used on food, education, or other necessary expenses. Low-income people are also less likely to own personal vehicles and therefore more likely to depend exclusively on public transportation to get to and from work, making reliable access to transit a necessity for their economic success.

Bicycling-oriented development (BOD)

Bicycles are the preferred means of travel in many countries. Also, bicycles are permitted in public transit. Businesses in areas of some towns where bicycle use is high are thriving. Bicycles and transit are contributing in two important ways toward the success of businesses:

- First is that on average the people living the closest to these business districts have more money to spend locally because they don't spend as much on their cars.
- Second, because these people rely more on bicycling, walking and transit than on driving, they tend to focus more of their commerce on locally-owned neighborhood businesses that are convenient for them to reach.

Pedestrian-oriented development

Walkability is a measure of how friendly an area is to walking. Walkability has many health, environmental, and economic benefits. However, evaluating walkability is cha-

llenging because it requires the consideration of many subjective factors. Factors influencing walkability include the presence or absence and quality of footpaths, sidewalks or other pedestrian right-of-ways, traffic and road conditions, land use patterns, building accessibility, and safety, among others. Walkability is an important concept in sustainable urban design.

Chapter- 12

Criticism and Response to Urban Sprawl

Rural neighborhoods in Morrisville, North Carolina are rapidly developing

affluent, urbanized neighborhoods and subdivisions. The two images above are on opposite sides of the same street.

Criticism

Arguments opposing urban sprawl run the gamut from the more concrete effects such as health and environmental issues to more abstract consequences involving neighborhood vitality.

Health and environmental impact

Urban sprawl is associated with a number of negative environmental and public health outcomes, with the primary result being increased dependence on automobiles.

However, this is mitigated significantly with nearby development of shopping and recreation areas. Also, many people prefer to live close to their place of business which is increasingly centered less around urban areas.

Increased pollution and reliance on fossil fuel

In the years following World War II, when vehicle ownership was becoming widespread, public health officials recommended the health benefits of suburbs due to soot and

industrial fumes in the city center. However, air in modern suburbs is not necessarily cleaner than air in urban neighborhoods. In fact, the most polluted air is on crowded highways, where people in suburbs tend to spend more time. On average, suburban residents generate more per capita pollution and carbon emissions than their urban counterparts because of their increased driving.

Increase in traffic and traffic-related fatalities

A heavy reliance on automobiles increases traffic throughout the city as well as automobile crashes, pedestrian injuries, and air pollution. Motor vehicle crashes are the leading cause of death for Americans between the ages of five and twenty-four and is the leading accident-related cause for all age groups. Residents of more sprawling areas are at greater risk of dying in a car crash.

Increased obesity

The American Journal of Public Health and the American Journal of Health Promotion, have both stated that there is a significant connection between sprawl, obesity, and hypertension. Many urbanists argue that this is due to less walking in sprawl-type developments. Living in a car centered culture forces inhabitants to drive everywhere, thus walking far less than their urban (and generally healthier) counterparts.

Decrease in social capital

Urban sprawl may be partly responsible for the decline in social capital in the United States. Compact neighborhoods can foster casual social interactions among neighbors, while sprawl creates barriers. Sprawl tends to replace public spaces with private spaces such as fenced-in backyards.

Decrease in land and water quantity and quality

Due to the larger area consumed by sprawling suburbs compared to urban neighborhoods, more farmland and wildlife habitats are displaced per resident. As forest cover is cleared and covered with impervious surfaces (concrete and asphalt) in the suburbs, rainfall is less effectively absorbed into the ground water aquifers. This threatens both the quality and quantity of water supplies. Sprawl increases water pollution as rain water picks up gasoline, motor oil, heavy metals, and other pollutants in runoff from parking lots and roads. Sprawl fragments the land which increases the risk of invasive species spreading into the remaining forest.

Increased infrastructure costs

Living in larger, more spread out spaces generally makes public services more expensive. Since car usage becomes endemic and public transport often becomes significantly more expensive, city planners are forced to build large highway and parking infrastructure, which in turn decreases taxable land and revenue, and decreases the desirability of the

area adjacent to such structures. Providing services such as water, sewers, and electricity is also more expensive per household in less dense areas.

Increased personal transportation costs

Residents of low-density areas spend a higher proportion of their income on transportation than residents of high density areas. The RAC estimates that the average cost of operating a car in the UK is £5,000 a year, most of which stems from financing costs and depreciation. In comparison, a yearly underground ticket for a suburban commuter in London (where the average wage is higher than the national average) costs £1,000-1,500, which, because of subsidies do not cover financing for the rail or depreciation of the infrastructure. In the Euro-15, rail transit requires $69 billion euros in subsidies while road transportation nets $107 billion euros in additional taxes.

Neighborhood quality

Critics of sprawl maintain that quality of life is eroded by lifestyles promoted by sprawl promotes. Duany and Plater-Zyberk believe that in traditional neighborhoods the nearness of the workplace to retail and restaurant space that provides cafes and convenience stores with daytime customers is an essential component to the successful balance of urban life. Furthermore, they state that the closeness of the workplace to homes also gives people the option of walking or riding a bicycle to work or school and that without this kind of interaction between the different components of life the urban pattern quickly falls apart. (Duany Plater-Zyberk 6, 28). James Howard Kunstler has argued that poor aesthetics in suburban environments make them "places not worth caring about", and that they lack a sense of history and identity.

White flight

Some blame suburbs for what they see as a homogeneity of society and culture, leading to sprawling suburban developments of people with similar race, background and socioeconomic status. They claim that segregated and stratified development was institutionalized in the early 1950s and 1960s with the financial industries' then-legal process of redlining neighborhoods to prevent certain people from entering and residing in affluent districts. Sprawl may have a negative impact on public schools as finances have been pulled out of city cores and diverted to wealthier suburbs. They argue that the residential and social segregation of whites from blacks in the United States creates a socialization process that limits whites' chances for developing meaningful relationships with blacks and other minorities, and that the segregation experienced by whites from blacks fosters segregated lifestyles and can lead to positive views about themselves and negative views about blacks.

Groups that oppose sprawl

The American Institute of Architects and the American Planning Association recommend against sprawl and instead endorses smart, mixed-use development, including buildings

in close proximity to one another that cut down on automobile use, save energy, and promote walkable, healthy, well-designed neighborhoods. The Sierra Club, the San Francisco Bay Area's Greenbelt Alliance, and other environmental organizations oppose sprawl and support investment in existing communities. NumbersUSA, a national organization advocating immigration reduction, also opposes urban sprawl, and its executive director, Roy Beck, specializes in the study of this issue.

Response

American public policy analyst Randal O'Toole of the Cato Institute, a libertarian think tank, has argued that sprawl, thanks to the automobile, gave rise to affordable suburban neighborhoods for middle class and lower class individuals, including non-whites. He notes that efforts to combat sprawl often result in subsidizing development in wealthier and whiter neighborhoods while condemning and demolishing poorer minority neighborhoods. Benefits of increased mobility that created sprawl also decreased rural land use by increasing productivity thus allowing more than 240 million acres (970,000 km^2) of pastures in the United States to be reforested. This accounts for nearly 3 times as much land as is currently occupied by urban centers in the United States.

Consumer preference for sprawl

Peter Gordon, a professor of planning and economics at the University of Southern California's School of Urban Planning and Development, argues that many households in the United States, Canada, and Australia, especially middle and upper class families, have shown a preference for the suburban lifestyle. Reasons cited include a preference towards lower-density development (for lower ambient noise and increased privacy), better schools, less crime, and a generally slower lifestyle than the urban one. Those in favor of the current pro low-density land use policies also argue that this sort of living situation is an issue of personal choice and economic means. One suburban Detroit politician defends low-density development as the preferred lifestyle choice of his constituents, calling it "...the American Dream unfolding before your eyes."

Urban Sprawl and automobile dependency

Whether urban sprawl does increase problems of automobile dependency and whether conversely, policies of smart growth can reduce them have been fiercely contested issues over several decades. An influential study in 1989 by Peter Newman and Jeff Kenworthy compared 32 cities across North America, Australia, Europe and Asia. The study has been criticised for its methodology but the main finding that denser cities, particularly in Asia, have lower car use than sprawling cities, particularly in North America, has been largely accepted although the relationship is clearer at the extremes across continents than it is within countries where conditions are more similar.

Within cities, studies from across many countries (mainly in the developed world) have shown that denser urban areas with greater mixture of land use and better public transport tend to have lower car use than less dense suburban and ex-urban residential areas. This

usually holds true even after controlling for socio-economic factors such as differences in household composition and income. This does not necessarily imply that suburban sprawl causes high car use, however. One confounding factor, which has been the subject of many studies, is residential self-selection: people who prefer to drive tend to move towards low density suburbs, whereas people who prefer to walk, cycle or use transit tend to move towards higher density urban areas, better served by public transport. Some studies have found that, when self-selection is controlled for, the built environment has no significant effect on travel behaviour. More recent studies using more sophisticated methodologies have generally refuted these findings: density, land use and public transport accessibility can influence travel behaviour, although social and economic factors, particularly household income, usually exert a stronger influence.

The Paradox of Intensification

Reviewing the evidence on urban intensification, smart growth and their effects on travel behaviour Melia et al. (2011) found support for the arguments of both supporters and opponents of smart growth measures to counteract urban sprawl. Planning policies which increase population densities in urban areas do tend to reduce car use, but the effect is a weak one, so doubling the population density of a particular area will not halve the frequency or distance of car use.

These findings led them to propose the paradox of intensification, which states:

Debate over traffic and commute times

Those not opposed to low density development argue that traffic intensities tend to be less, traffic speeds faster and, as a result, ambient air pollution is lower. Kansas City, Missouri is often cited as an example of ideal low-density development, with congestion below the mean and home prices below comparable Midwestern cities. Wendell Cox and Randal O'Toole are the leading figures supporting lower density development.

Longitudinal (time-lapse) studies of commute times in major metropolitan areas in the United States have shown that commute times decreased for the period 1969 to 1995 even though the geographic size of the city increased.

Risk of increased housing prices

There is also some concern that Portland-style anti-sprawl policies will increase housing prices. Some research suggests Oregon has had the largest housing affordability loss in the nation, but other research shows that Portland's price increases are comparable to other Western cities.

In Australia, it is claimed by some that housing affordability has hit "crisis levels" due to "urban consolidation" policies implemented by state governments. In Sydney, the ratio of the price of a house relative to income is 9:1. The issue was being debated between the major political parties in the lead up to the Australian federal election.

Freedom

There are some sociologists such as Durkheim who suggest there is a link between population density and the number of rules that must be imposed. The theory goes that as people are moved closer together geographically their actions are more likely to noticeably impact others around them. This potential impact requires the creation of additional social or legal rules to prevent conflict. A simple example would be as houses become closer together the acceptable maximum volume of music decreases, as it becomes intrusive to other residents.

Crowding and increased aggression

Numerous studies link increased population density with increased aggression. Some people believe that increased population density encourages crime and anti-social behavior. It is argued that human beings, while social animals, need significant amounts of social space or they become agitated and aggressive. However, the relationship between higher densities and increased social pathology has been largely discredited

Sprawl does not cause obesity

University of Toronto economics professor Matthew Turner argues that there is no evidence that sprawl affects obesity; instead that previous findings of a positive relationship most likely reflect a failure to control properly for the fact the individuals who are more likely to be obese choose to live in more sprawling neighborhoods.

James Robins, a professor of epidemiology in the Harvard School of Public Health, has read news reports of the sprawl research, concluding "This seems so far from what people would take as strong scientific evidence or a direct causal link."

The Role of the Active Transportation Network

One solution to the dilemma posed by the ubiquitous expansion of suburban sprawl is the potential for the development of the active transportation network. Cities such as Seattle where the 42 mi (62 km) Burke-Gilman multi-use trail has been in use for over 30 years have seen a significant number of commuters utilize the network for long distance travel both with human-powered and increasingly with electric-assist mobility aids (e-bikes). The dual benefits of exercise and mobility may contribute to a mitigation of the negative effects of sprawl in areas where the active transportation network is adequately developed. The opportunity to load bicycles onto public transit allows such a network to function even during inclement weather and provides a new hope for those metropolitan areas where available rights-of-way and greenbelt lands still exist for the development of the active transportation network.