Do You Want Utilities With That? Avoiding the Unintended Economic Consequences of Poorly Planned Growth on the Provision of Water and Sewer Service

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This practice guide considers the economic costs of poorly planned growth on the provision of linear utilities (including electricity, natural gas, telephone, cable and drainage), but focuses on water and sewer service because they are most likely to be key to project approval.

Written for utility managers and regulators, municipal officials, and planning commissioners—and the consumers and voters whom they serve–this Practice Guide aims to improve awareness, facilitate communication and promote better resolution of the challenges they face together as they try to manage growth.

Introduction

The term "sprawl" means different things to different people, but is usually heard in quality-of-life terms: low-density development; uses requiring automotive transportation between homes and jobs, schools and services, and the resulting traffic congestion; the growth of big-box chain stores and demise of locally-owned neighborhood shops; and residential subdivisions of socioeconomic homogeneity.

As suburban and exurban developments move beyond existing municipal water and sewer service-areas, consideration of the related public health (obesity due to dependence on automobiles), fire-fighting and economic concerns have grown, and deserve more attention.

Homebuyers often fail to grasp the consequences of buying a house that must have water delivered to a basement cistern, depends on a backyard septic system and lies miles from the nearest fire hydrant—until they have made the largest purchase of their lives, moved in and spent a few years there.

The rate of growth in sprawl through 2025 is expected to be the worst in the Southern half of the U.S., with Florida, North Carolina, South Carolina and Georgia being among the states with the highest projected rates (Burchell, et al, 2005).

Where water and sewer services are provided to outlying development, huge subsidies can be required. Between 1985 and 1995, for example, the Louisville and Jefferson County (KY) Metropolitan Sewer District spent more than $500 million "addressing infrastructure deficiencies related to poor or misaligned planning and zoning policies," and has continued to spend more public funds correcting those same problems since then (G. R. Garner, personal communication, 26 Nov 2005; Governor's Task Force, 2001).

Unplanned growth is known to require billions of dollars in public subsidies. For example, a projected extra $56 billion will be needed in just South Carolina between 1995 and 2015 (Burchell, et al, 2005). The added costs to install water and sewer service in the Orlando area is expected to cost an extra $8.8 billion (McKay, 2006).

Yet most Americans still erroneously assume that growth always provides fiscal benefit to its host municipality. Prior to approving new developments, few municipal officials are provided economic-impact analyses of the costs to extend the infrastructure to the new homes and businesses that voters demand, including roads, schools and utilities. If they were, they would very likely see a losing proposition (Kinsley and Lovins, 1996).

The consequences of this failure to consider the bigger picture has led to a multitude of expensive negative consequences—in an era of when elected officials are expected to do more and more with less and less, and few dare to propose raising taxes.

Examples of unintended negative consequences of unplanned growth include:

- Exponential growth in vehicle-miles traveled
- Increasing shares of school budgets lost to building new schools and transportation costs, in addition to over-crowded schools
- Persistently hazy, polluted skies and increased asthma rates
- Delays in police, fire and EMS response times
- Streams with high bacteria counts and excessive wet-weather scouring
- Hollowed out, disinvested older neighborhoods
- Homes without access to natural gas or fire hydrant service, if not dependent on hauled-in drinking water
- Added strain to already stretched municipal budgets
- Delayed maintenance of existing infrastructure, adding to costs later on

For a graphic depiction of the changes in population and acres of developed land over time in each U.S. state, visit http://www.epa.gov/watertrain/smartgrowth/states_set.htm

The available resources on the unintended negative consequences of the sprawl model of development—and alternative approaches to development and redevelopment—are plentiful, clearly written and well illustrated. A number of examples are listed in the Annotated Bibliography.

Highway congestion

Part I:
Realities That Every Reader Needs to Know

The following examples of the expensive outcomes of poorly planned growth occurred in Kentucky, but could have happened in many communities throughout the United States:

(*Note: To ensure candor and protect contributors' anonymity, the author has omitted some identifying details*.)

1. A developer proposed a large, upscale residential development on acreage well beyond the existing service area of the municipal wastewater utility in 2003. A $7.5-million system including a pumping station and force mains had to be installed to move sewage from that development to a location where it could flow by gravity to treatment facilities. Sizing the system to serve only that project would not have made sense, since replacing it later with a larger system as other development back-filled the intermittent area would have been too disruptive and even more expensive. The utility sized it to serve the entire future service area or sewershed, as if fully built out at existing zoning densities (four single-family homes per acre).

   This over-sizing meant sewage would collect too long in the wet wells before triggering the pumps to operate, and then sit too long within the lengthy force mains, becoming corrosive and foul smelling. The utility calculated that it would spend an extra $20,000/year to add corrosion- and odor-reducing chemicals for the system's first 20 years—until back-fill development reached the project.

   The developer paid a small fraction of the capital expenses precipitated by this development. The remaining capital costs and extra $400,000 in operation and maintenance costs are being borne by the utility's ratepayers, subsidizing the developer and buyers of its upscale houses by approximately $7 million.

2. In 2006, suburban residents next to a nearly 300-acre farm were dismayed when their local planning commission rezoned the farm from "single-family residential" to "planned employment center," allowing distribution centers, offices and light industry. The planning commission noted its lack of authority over

Exurban sprawl

the decision to allow the sewers that made development in the area possible. Only then did residents learn that the farm was only a fraction of the downstream development to come.

The wastewater utility had begun to address its budget crunch—due to billions in expenditures largely related to accommodating poorly-planned growth—by offering developers a faster option for getting the sewers that would allow them to develop new acreage which was previously off-limits. Under their "Recapture Agreement," the developers are responsible for the cost of constructing nearly four miles of sewers and a large pump station. In return, the utility will reimburse them via the connection fees that it will charge subsequent developers who back-fill the created 3000-acre sewer shed.

Compared to more compact development, utilities serving sprawl cost more to install per household or business served, generate less revenue per mile of infrastructure and very often require large subsidies.

Unplanned growth can increase the costs of providing water and sewer service to new development by 20 percent to 40 percent per dwelling. Simply put, more miles of infrastructure must be installed to serve spread out homes, businesses, schools, etc, than would be needed in more compact developments (Burchell, et al, 2005).

Utility managers, elected officials and consumers in all communities trying to provide utilities while managing growth face the following challenges:

The availability of water and sewer service is most likely to be the deciding factor for approval of a particular development.

The *provision* of sewer service often determines the feasibility of a proposed development. Situations vary from place to place, but some meaningful differences frequently cause proximity to sewer lines to make or break a project's feasibility. Provision of service involves both installation and operation within developed areas.

Access to public water and sewer service significantly increases land values, because they allow development of land that would otherwise not be developable (Scott, 2005). And because many communities limit on-site sewage systems, e.g., septic tanks and lateral fields to large lots (five to 10 acres per house in some places), the availability of sewers can make subdividing an old farm especially profitable.

Most utilities need only *deliver* services to the customer. Wastewater utilities have a more complicated task of *collecting* sewage from its customers, usually involving some use of decentralized pumping systems, and treating and discharging it somewhere without back-ups in basements or overflows to streams along the way.

Installation: Situations vary from place to place, but the following considerations usually apply and function to make installing sewers the most challenging utility to provide to perimeter development:

- Electrical, telephone and cable TV lines can be easily strung on overhead poles.
- Natural gas and water pipes function under pressure and can be laid in shallow–and therefore relatively inexpensive–trenches.
- In some areas, natural gas and cable TV are viewed as luxuries that can wait until their availability is closer to newer developments–and therefore more affordable.
- Stormwater ditches flow by gravity and are relatively easy to design and construct.
- Sewers are underground and generally function by gravity, and therefore often must be installed in very deep, expensive to construct, trenches.

Some communities have allowed developers to install privately-owned wastewater treatment plants (termed "package plants," because they are ordered from catalogs and typically designed for short-term use). Most such communities subsequently learn the following hard lessons:

- The plants' substandard equipment is prone to failure and pollution–especially after the developer finishes building homes, starts work on another subdivision and loses interest in day-to-day operation and maintenance.

- Replacing them is expensive, if not technically challenging. Louisville, KY, for example, is still saddled with dozens of "temporary" treatment plants, some dating from the 1960s (G. R. Garner, personal communication, 17 March 2006).

The capital costs of installing linear utilities are commonly assessed on an "average-cost basis," meaning all customers pay the same, regardless of the real costs of extending service to them.

When using the most common method for recovering installation costs, the municipality or utility assesses the same charges to each property owner along the line. The costs are sometimes partially prorated, usually on the basis of frontage and/or acreage, but they are more likely simply divided among the lots served, especially at the residential street level (Kinsley and Lovins, 1996).

Example: Assume that installing water lines in a new residential development costs $50 per linear foot, plus $700 per water meter. How does the density of development impact the cost of providing water service?

a. 4 single-family lots/ac, requiring 480 ft of frontage along the water line:

([480 ft/4 units] x $50/ft) + $700 = $6,700/unit

b. 8 single-family lots/ac, requiring 480 ft of frontage along the water line:
([480 ft/8 units] x $50/ft) + $700 = $3,700/unit

c. 12 multi-family and mixed-use units/ac, requiring 480 ft of water line:
([480 ft/12 units] x $50/ft) + $700 = $2,200/unit

An analysis of sprawl versus compact residential development located both close to and far from treatment facilities showed that an average of 78 percent of the costs of installing water distribution and wastewater collector mains to housing is tied to spatial pattern within the subdivision. More specifically, compact development closer to water and wastewater treatment plants can be served for 60 percent and 66 percent, respectively, of the costs of providing them to sprawl development far from those plants. (Speir and Stephenson, 2002)

It should be noted that the days of federal subsidies for the construction of water and wastewater distribution/collection systems and treatment plants are essentially over. Federal funds are still occasionally available via HUD grants, but most utilities must find their own financing for capital projects. And just as most consumers must take out loans to buy homes and new cars, municipalities typically must float bonds to amass the capital to pay for projects, and recoup repayment funds via rate increases (G. R. Garner, personal communication, 17 March 2006).

Leapfrog development can add significant hidden costs.

Development of land that requires utilities to "leap" over adjoining land tracts that lack utilities often creates significant extra costs, usually requiring many years of subsidies by the utilities and their ratepayers. Water lines, for example, operate under pressure–not just enough pressure to allow guests to shower on the upper floors of a hotel, but enough pressure to support effective fire fighting. The pressure put on the lines at the water treatment plant only suffices for so many miles. Hilly terrain adds to pressure requirements as well.

After a certain distance, transmission systems including booster pumps must be installed, operated and maintained to serve outlying developments. If the costs of that additional infrastructure were borne solely by the first leapfrog development, few customers could afford to buy those houses. As a result the utility and their customers often fully subsidize those costs, until back-fill projects can contribute toward cost recovery.

Utilities are often required to be underground in areas where newer development occurs.

Burying utilities that would otherwise be strung overhead on poles (electrical, telephone and cable lines) is very popular with homeowners and the norm in 90 percent of new subdivisions. Nearly half of the capital expenditures for transmission and distribution wires made by investor-owned electric utilities between 1993 and 2002 was spent on underground systems (Johnson, 2004), though burying distribution lines costs two to four times more per mile than stringing them overhead (Edison Electric Institute).

However, electrical utilities charge customers for buried lines varies greatly. For example, Mississippi Power charges customers the cost differential for whatever burying lines costs over stringing them overhead. Some utilities require developers to pay only the trenching and backfilling costs. Others charge several hundred dollars more per lot. For instance, the Cobb Electric Membership Corp. in Georgia charges only $260 per customer and subsidizes the remaining costs (Johnson, 2004).

It is widely understood that buried utilities experience fewer storm-related failures. However, the fact that underground lines require more time to repair is less well known. The three investor-owned utilities in North Carolina studied the reliability of overhead versus buried electrical lines and concluded that overhead lines failed twice as often as buried lines, but buried lines took 60 percent longer to repair. The added delays are created by the need for three specialized crews using differing equipment to a) find, b) excavate, and c) repair the failure. Buried wires have a significantly shorter useful lifetime and are prone to failures due to moisture infiltration, especially during floods and hurricanes (Johnson, 2004).

The economics of buried utilities requires that residents living in newer developments receive more expensive services. Because they pay the same rates as all customers, their electric, telephone and cable services are subsidized.

Burying electrical, telephone and cable lines can add indirect costs to installing utilities that must go underground. For each additional utility buried, logistical and easement complications increase; greater complications mean higher costs. For example, water pipes and sewers are typically required to be separated by at least 10 feet horizontally and two feet vertically. If space within the available easement is too cramped and more space cannot be bought, then these must be encased in concrete, again adding costs for extra time and materials.

Directional drilling can sometimes allow utilities to trade higher installation costs for lower landscape and/or pavement restoration costs and reduced traffic disruption. Easements must still be acquired and installation crews must dutifully avoid whatever other utilities have already been laid. Public health, safety, and environmental quality could be threatened by accidentally cutting through a gas pipe, shooting a telephone line through a water line or breaking open a sewer next to a stream or river. Both acquiring additional easements and requiring crews to take the time to ensure accuracy increases costs.

Operation and maintenance costs are disproportionately increased by unplanned growth.

The costs of delivering utilities to customers are location dependent. As service trunk lines lengthen between the utility plants and new development, intermittent pumping stations are needed to maintain adequate pressure on water and natural gas lines and push wastewater over hills. Electrical line losses also increase.

Suburban golf course surrounded by McMansion-style homes

The amount of infrastructure which must be maintained per customer varies with development model, as does the nature of maintenance costs. Older utilities tend to require more maintenance to remain reliable, but newer utilities serving unplanned growth creates more to be maintained, passing costs on into the future.

Utilities pass on their operation and maintenance costs to their customers, typically on the basis of customer class. All residential customers are usually lumped into one class and all are charged at the same rate. All commercial customers are commonly treated similarly, though charged at a different rate. Industrial customers are usually placed in a variety of classes and are assessed specialized rates. Industrial customer classes are usually defined on the basis of quantity of service required, e.g., the amount of power consumed, water used or wastewater generated. Additional delineations can be based on time-of-day factors, like whether electrical consumption occurs during peak or off-peak hours, and qualitative factors, like the nature and concentration of pollutants in an industry's discharges to sewers.

Providing stormwater management infrastructure for auto-oriented developments can require significant expenses and subsidies.

Currently, suburban developers are required to provide parking for peak demand at each and every individual retail location. This regulation does more than drive up construction costs. For instance, shoppers using public transportation are subjected to navigate among automobiles and other vehicles as they hike to and from roadside bus stops. Extensive parking lots also add significant run-off to drainage systems with every precipitation event, requiring those systems to be sized larger than would be necessary in more compact, less auto-dependent developments.

Streams that serve as drainage systems for parking lot run-off suffer from bank erosion and pollutants (including not also litter, salt and sand, but oil, antifreeze and fuel), all of which greatly reduce aquatic biodiversity.

Competing demands often lead to the postponement of other priorities.

The fiscal and administrative pressures to provide services to less-compact new development, even where it can be done without inordinately large subsidies, frequently forces utility managers to postpone a) preventive maintenance of existing infrastructure (Burchell, et al, 2005), and b) compliance with ever-evolving regulatory demands, such as increased drinking-water monitoring and wet-weather programs.

When economic times are good, especially when interest rates are low, the rate of new construction usually accelerates. While booms do generate more revenue from connection and user fees, they rarely generate enough new revenue to allow the addition of extra staff to review the flood of permit requests or inspect the surge in new construction for compliance with design standards. New growth routinely fails to provide enough new revenues to allow utilities to keep up with the new operation and maintenance demands (Kinsley and Lovins, 1996). The obvious solution of raising rates puts utility managers in conflict with elected officials and customers who have convinced themselves that growth and/or continuously better management (of increasingly inefficient systems) can preclude rate increases.

Sprawl can create socio-economic inequities.

Sociologists, demographers, and environmentalists have long argued that the steady transfer of families, jobs, and wealth to the suburbs and exurbs severely damages the tax base and the social fabric of the city centers and older neighborhoods left behind. These inequities are especially troubling because homebuyers in new developments tend to have higher-than-average incomes, while the cost of subsidizing these developments is placed on all taxpayers, including those who are lower income (Kinsley and Lovins, 1996).

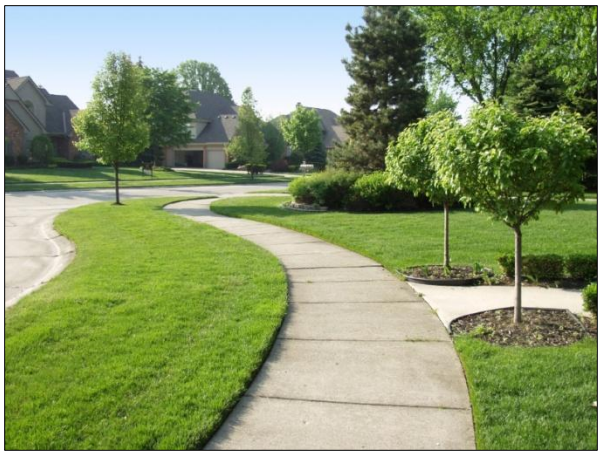
James E. Frank, an urban-planning professor at Florida State University, studied the cost of providing new sewer hookups to various neighborhoods in Tallahassee, Florida. According to his findings, the actual costs were about $4,447 for the mostly black, center-city neighborhoods nearest the sewage treatment plant but $11,443 for the upscale Lakeshore neighborhoods at the northern edge of town, where politicians and lobbyists tend to live.

Despite this nearly $7,000 difference in real cost, all households pay the same price, about $6,000, for sewer connections, regardless of where they are located. That means that the poor families living near the sewer plant not only have to endure its odor but also pay considerably more for their sewer hookup than it actually costs the government to serve them. Meanwhile, affluent residents escape both the smell and the full bill for their waste treatment (Longman, 1998).

Part II:
Mitigation Strategies

Most U.S. communities have been expanding, whether their populations have grown or not. Given the likelihood that they will continue to grow, more communities have been employing strategies and tactics for reducing the unintended negative impacts of growth, with varying degrees of success. An extensive study concluded that changes, which include a) a nine percent of growth from rural and exurban areas to suburban and urban areas, b) suburban and urban home developments built to 20 percent denser patterns, and c) 25 percent of lots dedicated to single-family homes rezoned to accommodate townhouses and multi-family homes, would save $5.5 billion in the South between 2000

and 2025 (Burchell, et al, 2005). Even though this may appear to be a recent trend, a handful of ahead-of-the-curve communities initiated these principles 30–50 years ago. Some of their efforts were essentially modified zoning rules; others were incorporated as planning principles of Smart Growth or New Urbanism.



Typical four houses per acre single-family home development

The Smart Growth Network uses the following framework for Smart Growth principles, most of which relate to utilities, directly or indirectly:

1. Mix land uses.
2. Take advantage of compact building design.
3. Create a range of housing opportunities and choices.
4. Create walkable neighborhoods.
5. Foster distinctive, attractive communities with a strong sense of place.
6. Preserve open space, farmland, natural beauty, and critical environmental areas.
7. Strengthen and direct development towards existing communities.
8. Provide variety of transportation choices.
9. Make development decisions predictable, fair, and cost effective.
10. Encourage community and stakeholder collaboration in development decisions (http://www.smartgrowth.org/about/default.asp).

New Urbanism development

Compact building design; multi-family housing

The consensus among planning experts is that stand-alone measures are not particularly successful and can even lead to the substitution of a new set of problems. The most common criticism, for example, is that restrictions merely push development into the adjacent jurisdictions. Experts who have studied various communities' efforts to manage growth generally see a more holistic approach as the most effective option. Efforts to better manage growth include the following approaches:

Infill development

Infill development, which is the development of empty or abandoned parcels of land that are located amid existing development, has the greater chance that existing infrastructure will be in place that is adequate, usable, and available for the desired new uses. Infill development can be more affordably utilized than constructing new infrastructure in outlying areas. Other benefits include increased pedestrian activity (encouraging better health and greater social engagement), less dependence on private automotive transportation (reducing travel times, costs, and tailpipe emissions), and reviving older neighborhoods (including preserving historical structures).

Infill projects tend to be smaller than *greenfield* projects. The term "greenfield" refers to development on farmland or other open areas where there has been no previous development, except perhaps cultivation. These projects are more likely to be proposed by smaller, local, developers, with more flexibility to adjust to site-specific conditions than larger, regional firms bounded by uniform, home-office designs for large, open tracts of former farmland.

The most common obstacle to infill projects is resistance from adjacent property owners, who prefer existing views of undeveloped acreage, fear increased traffic, etc. When affordable housing for families is not currently available in that part of town, a residential infill project for low- to moderate-income households can stir ugly fears about the addition of new neighbors of different socioeconomic groups and/or races.

Reuse of greyfields and brownfields

A *greyfield* is an older, economically obsolete development, such as a shopping center or mall past its prime and/or experiencing declining levels of occupancy. A *brownfield* is an abandoned, idled or under-used industrial or commercial site with or without structures, on which redevelopment is complicated by real or perceived environmental contamination. Both greyfield and brownfield can be redeveloped as *adaptive reuse*. This term refers to the conversion of obsolete or historic buildings from their original or most recent use to new uses, e.g., the conversion of school buildings into apartments.

Like infill development, adaptive reuse of grey- and brownfield sites can usually use existing infrastructure, after confirming adequate sizing and acceptable location. For example, if an old warehouse (with one toilet and a hand sink) were replaced with a sit-down restaurant (requiring large restrooms, several prep sinks and a pair of commercial-sized dishwashers), the existing water service will need up-sizing. Similarly, cost savings

can be lower if the sewer connection is on the other side of new parking lot, rather than near the kitchen side of the new building.

Eastgate Mall was Chattanooga, Tennessee's first suburban-style mall and was so popular when it opened in the early 1960s downtown shops experienced a decline in business and revenues. Ironically, the mall was forced into greyfield status in the late 1990s after a newer shopping mall was built further out. Anchor retailers left and replacements couldn't be lured back. Its huge buildings sat far back from the road, surrounded by acres of parking lots.

Progressive developers, seeking a location for a large call center, bought the property. Seeking to utilize the site more effectively and efficiently, they conducted public hearings and design charrettes to solicit redevelopment ideas. A *charrette* (pronounced, shuh-RET) is a process wherein designers, property owners, developers, public officials and citizens, and future users or occupants, collaboratively apply their different perspectives to create a better, more agreeable project. (For a good introduction, see the "Meaningful Public Involvement: Charrettes for Community Change" presentation on Smart Growth America's Smart Growth Shareware CD-ROM, listed below under References.) The resulting Eastgate Town Center utilized the original buildings, plus several new structures built atop old parking lots. Besides the call center, there are offices, restaurants, shops, services, gym, an ice-skating rink, and a community college. Call center employees can easily run errands during their lunch hour, such as stopping at the bank or dry-cleaners, and work out or take courses after work without driving (Benfield, et al, 2001).

Communities seeking to encourage infill and adaptive reuses of greyfields and brownfields by discounting or subsidizing developers' costs to access utilities should adopt uniform policies. Knowing whether, where, and to what degree local government or a utility will improve the developer's bottom line should not be decided on a case-by-case basis. Care should be taken not to oversell the availability and capacity of the existing infrastructure and to reduce unrealistic expectations of cost savings until preliminary discussions between the utility and developer can take place.

Adequate Public Facilities Ordinances (APFOs)

Adequate Public Facilities Ordinances (APFOs) generally require adequate infrastructure to be available to support proposed new developments before permits are approved, in effect regulating the location and timing of new projects. APFOs are most commonly used to ensure that roads, water and sewer service, and stormwater systems are available, but are increasingly being employed to address school overcrowding (White, 1996). For instance, Florida has statewide "concurrency" laws requiring developers to show that road, transit, water, sewer, solid waste disposal, and park infrastructure is sufficient to support their proposed projects. If not, then they are required to help to pay for the missing pieces.

Final APFO approvals of proposed developments usually require numerous preliminary approvals from infrastructure utilities, highway and public works departments, fire

fighting agencies, etc. Without meaningful coordination, however, the approval process can function as little more than a signature checklist with non-planners making independent decisions from the narrow perspectives of their agencies' needs and rules.

APFO ordinances are supposed to encourage infill where infrastructure already exists. Ironically, sometimes Florida's APFO laws unintentionally encourage sprawl by prompting developers to drop plans for infill projects on roads deemed too crowded and shift to suburban and rural locations on less traveled roads instead to avoid having to pay to widen the crowded roads (Burchell, et al, 2005).

Requiring developers to pay all costs related to the installation of utilities within their developments.

This approach eliminates a significant portion—though not the longer term operation and maintenance portion—of the "sprawl subsidy." It has become the norm for some services (Kelly, 2004), probably because elected officials and voters understand and view it as fair.

It should be noted, however, that simply allowing developers to do the actual installation of the infrastructure at their expense and then turn it over to the municipality and/or utility for operation and maintenance risks long-term problems and expenses. The design and installation of utilities requires choices. Some choices decrease capital costs, but increase operation and maintenance costs, and vice versa. When one party pays the capital costs and the other party, the operation and maintenance costs, each party seeks to off-load expenses to the other party.

For example, whether a sewer will be a gravity line or a force main has, at minimum, cost implications. Gravity lines are cheap to operate, but require deeper, more expensive, depths. Force mains run along surface contours, meaning shallower digging. Pump stations required to push wastewater through force mains can be cheaper than working in deeper trenches, especially if rock must be blasted out of the way. Yet pump stations demand much higher operation and maintenance expense. If the developer is allowed to install the force main, the utility's customers will subsidize the pump station every year that it is operated. Also, unless a generator is provided, pump stations cease to function during power failures, often overflowing to streams, at risk to public health. Similarly, certain models of motors and pumps cost more to buy but require less electricity to operate, break down less often and/or require less expensive, more widely available parts. The party paying the capital costs has no incentive to buy the better motor or pump sought by the party paying the operation and maintenance costs. Stainless steel cabinets protect outdoor electrical components much longer than cheaper cabinets.

Given that public services are involved, erring on the side of reliability and long-term costs would make sense to perhaps everyone but the developer picking up the tab. Cries of "gold-plating" and "unreasonable demands" often surface when developers learn that they will be required to pay for the more expensive gravity sewer, motor, pump, stainless steel cabinetry, etc.

If decision-makers are left to decide each situation on a case-by-case basis, the resulting infrastructure will very likely consist of a hodge-podge of designs and equipment, making the training of operation and maintenance staff unnecessarily complicated.

At present, manufacturers commonly schedule production in advance and can run out of a particular item before gearing up to make more inventory. Unless the utility goes to the expense of stocking all possibly required spare parts, it could find itself watching sewage overflow into a stream as it waits for pump parts to be delivered. If parts are unavailable, the utility must incur the expense of buying a whole new pump to protect public health.

Municipalities and utilities would best adopt standard designs for most, if not all, infrastructure that will be installed by developers. Those design standards can be adopted after input from the developers, but, most importantly, put them on a level playing field—something the private sector rightly demands of regulations affecting the bottom line.

Inspection

Even after adopting design standards, still more quality control is necessary. Developers usually hire subcontractors to install utilities. Most contractors are reliable, but it only takes one corner-cutter to cause long-term operation and maintenance problems for the inheriting utility. Those carefully thought-out standard designs must be overseen by competent inspectors working for the utility, or the utility will have no idea of what it is inheriting until the infrastructure is placed into service and potentially fails, making repairs much more difficult, disruptive, and expensive. The quantity and quality of bedding material under pipe, the precise slope of each section of pipe, and the tightness of each pipe joint should be checked to assure compliance with design standards and to avoid later problems. The actual location of every element of the job must be accurately shown on the "as-built" plans, so repair crews can find it years later.

Variable impact fees

Impact fees (also called exaction fees and development fees) are an increasingly common method employed by utilities and governments to recover some of the less direct costs of providing infrastructure to new development. Unlike connection or permit fees, which are tied to direct costs, impact fees are based on larger-scale costs. The most common examples include fees imposed specifically to help to underwrite the costs of upgrading, expanding or building new roads, schools and wastewater treatment plants. A new wastewater treatment plant can cost $2.50–$10 per gallon of treatment capacity. At the middle of that range, for example, at $6/gallon of capacity, $1,380 of capacity would be needed to support the average household of 2.3 people, using 100 gallon/person/day. Many communities accordingly assess developers a one-time "capacity fee" for each new hook-up to help repay their capacity costs, though not necessarily the full costs.

Impact fees may be tied to Adequate Public Facilities Ordinances (APFOs) as in several Florida counties (White, 1996). Impact fees as a stand-alone measure can increase

equity, if the fees are actually spent for the intended purposes. To limit sprawl, impact fees must be tied to other growth management tools (Kelly, 2004). Impact fees are passed directly to homebuyers. Thus, the more realistic they are the greater risk that they will price out low- to moderate-income buyers. When this happens, some argue that it would be better to subsidize just those buyers, rather than subsidize everyone (Kinsley and Lovins, 1996).

Cities and utilities face capacity costs regardless of the type of new development. The distances between the new customers and facilities add to those costs (Speir and Stephenson, 2002). If massive trunk lines must be installed at greater distances from the plant, costs go up because gravity lines must be deeper and/or bigger pumps must power force mains. When variable impact fees are assessed more on the basis of the actual costs of extending trunk lines, the utility's rates are more equitable.

Urban growth and urban services area boundaries

The first U.S. urban growth/services boundary was adopted by Lexington, KY, in 1958 (Freilich, 1999) to protect a) public health by extending sewers to areas that lacked them and b) the thoroughbred horse farms that made the area famous. By limiting the geographical extent to which development would be allowed, local government sought to provide sewers and other services more cost effectively, and to buffer the horse farms from development. The boundary was formed after delineating the terrain into 11 sewersheds and was drawn wide enough to accommodate a projected population of 200,000 (60 percent more than the then existing population of 125,000). The policy limited development beyond the boundary to no more than one new house per 10 acres (Nelson and Dawkins, 2004).

The following evolutions steps occurred in 1973, the first two of which added the critically important element of unified decision-making:

- Residents voted to merge the previously separated governments of the City of Lexington and Fayette County
- The Kentucky legislature approved enabling legislation to allow urban and rural service areas to be established
- The urban growth boundary was expanded due to the sprawling development that had taken place within the original boundary. As a result of this unplanned growth, the original population projections were reconfigured and another seven and a half square miles was added to the urban growth boundary.

The 1980 adoption of a plan to sequence new development—with adequate facilities to support it—helped to mitigate that earlier program failure. Capital improvement plans (CIPs) that supported this phased approach were also adopted. Over the next 15 years, most of the 50+ requests to expand the boundary, totaling over 10,000 acres, were rejected. In 1996, the boundary was expanded by only 1,600 acres, while increased attention was also given to other measures. The imposition of impact fees in the form of

capacity fees for water and sewer service allowed the municipality to extend those services more efficiently and cost-effectively (G. R. Garner, personal communication, 17 March 2006). While many observers would say Lexington has been relatively successful at achieving its goals and adjusting weaknesses in its earliest efforts, critics note that their success precipitated significant leapfrog development in adjacent counties lacking similar restrictions.

Two planning professors from Virginia Tech analyzed 131 U.S. cities using some form of urban containment policy, and categorized them into the following four types:

- Weak-Restrictive, which places a high priority on restricting growth, though with weak containment policies.
- Strong-Restrictive, which places a high priority on containment, without regard to whether development needs are met.
- Weak-Accommodating—the most common—which places priority on accommodating development and uses weak containment policies.
- Strong-Accommodating, which places a priority on preserving open spaces and uses spatial growth limits, while planning to accommodate development.

They concluded that "intergovernmental agreements and state planning mandates suggest that strong regional and state constraints on local decision-making *reduce* the likelihood that local jurisdictions will adopt exclusionary and anti-growth goals and policies" (Nelson and Dawkins, 2004). Another conclusion was that no one containment model is best for all situations. Communities must take the time to assess their goals, decide whether their highest priority is protecting open spaces or accommodating growth, and study their options before choosing a model.

Regional cooperation–via metro government, inter-local agreements or regional commissions

The effectiveness of good planning and growth management is usually correlated with the extent of their jurisdiction. While the trend of merging cities and counties has slowed in the past few decades, planning and growth management can be accomplished via other mechanisms, including special inter-local agreements, memoranda of understanding, and metropolitan planning organizations (MPOs) or planning commissions. For example, when a utility serves more than one political jurisdiction, it can apply uniform policies throughout its entire service area. It could also facilitate planning and growth management by adopting capital improvement programs (CIPs) to link its infrastructure expansion projects and budgets with community development plans, ideally after soliciting input from all stakeholders.

State revolving loan programs and Smart Growth requirements

The federal government provides some funding to states for revolving loan programs, which offer low-interest, long-term loans to municipalities and public-sector utilities for

capital construction. A few states, including Iowa, Massachusetts, Maryland, and Ohio, have responded to EPA calls to add Smart Growth strings to those loans, requiring cities to show that they are using loan money in more sustainable fashions than historically required (Blaha, et al, 2003).

Part III:
Getting Started in Your Community

Meaningful community improvements of any kind rarely happen unless all the relevant stakeholders can honor their differing interests and values, agree on the problem to be solved, and commit to listen to and work with each other to fashion compromises, if not create win-win solutions.

Politics are not always what meets the eye

Participants should be mindful of the following political realities:

1. Political will–or the lack of it–commonly dictates outcomes. Most elected officials and voters/customers pay little attention to utilities, at least until they fail. Buried infrastructure is especially taken for granted. Utility projects compete with higher-profile demands, such as roads, for funding. Pressure to do maintenance may come only from superior governments with oversight powers; when they are also stretched thin, neglect can go essentially unchecked.

2. Change requires political will, which can be transient. The best organized program and most thoughtful regulations for managing growth will mean nothing if the community and its elected officials lack the political will to adequately fund and properly implement them.

3. Elected officials operate on dual currencies: campaign donations and votes.

    a. Developers universally have more access to elected officials than do average citizens. Most citizens cannot match the campaign donations that developers use to open elected officials' doors.

    b. Savvy citizens have the upper hand for delivering votes—if they are willing to do the requisite hard work. They must be articulate, persistent, and develop an understanding of the issues, local decision-making processes and decision-makers. They, too, must cultivate relationships with local officials.

Getting started requires a few community leaders to persuade all stakeholders to sit at the same table and work collaboratively.

Talk of changing how growth will be managed causes some stakeholders to fear losing some of their property rights, decision-making powers, and/or profits. At best, the

various stakeholders will believe that the others do not understand their concerns. At worst, they will believe that the others do not value—if not hold hostilities toward—their concerns.

The process rarely begins without community leaders requesting that representatives of all the relevant parties participate. For example, if leaders can get regulators, utility staff and some neighborhood association representatives, but no developers, to the table, little will be accomplished in the long run. Leaders must be willing to spend some of their political capital with the missing players in order to get them involved.

Process counts

Even if leaders can get everyone to the table, successful outcomes will occur only if strong leadership and transparency are maintained. Participants must believe they are all being treated fairly. Elected officials may not allow one or more parties to side step the process and cut their own deals. The process will function best if it begins with focusing on identifying the issues upon which most, if not all, of the participants agree. People frequently learn that they generally agree on the problem but disagree on what should be done about it. In the process of getting that far, most participants will develop a better understanding of the concerns of the others at the table, which is critical to agreeing on solutions. The exact process used varies, but whatever process is chosen, it must keep participants enfranchised in the work and results. For example, if group decisions are made by a simple majority, anyone who is chronically on the losing side will not own the outcome and lose interest, if not quit. A professional facilitator is often needed to keep the group working together productively while professional planners usually staff the process.

Consider conducting a Smart Growth audit to benchmark the status quo and identify the most achievable opportunities for improvement.

The U.S. has many jurisdictions without zoning regulations, much less comprehensive planning. Others have detailed comprehensive and capital improvement plans (CIPs) and rules for the smallest details. As more elected officials and property owners learn the benefits of such plans, more communities adopt zoning. Like so many public policies, however, the devil is in the details. Some zoning regulations actually require negative aspects of sprawl and forbid certain Smart Growth design features. For example, retail businesses are routinely required to have enough off-street parking for peak shopping days. Sharing is not allowed between land parcels, even if a clothing store's peak periods are August and December and the next-door lawn-and-garden store's peak period is April-May. Few communities offer parking credits to a location on a major bus line. Worse, zoning rules commonly require new retail stores to be surrounded by tall fences, walls or earthen berms, forcing nearby residents to drive to patronize them.

Conducting a Smart Growth audit is a good way for a community to determine where its policies, plans, and rules stand compared to Smart Growth principles. The American Planning Association has developed an instruction manual for planners that could also be used by reasonably determined citizens (Weitz and Waldner, 2002). After defining Smart

Growth, it presents the concepts of smart-growth audits (and alternative benchmarking approaches), explains preparatory steps, and provides implementation guidelines, plus lessons learned by communities that have conducted audits. The process of conducting such an audit helps the various stakeholders harmonize their perceptions of the problems and opportunities to reduce them by highlighting where they already have agreement. For example, if developers, utility managers, planners, and representatives of neighborhood associations are all looking at the same utility budgets, everyone will be more inclined to acknowledge the existence—and implications—of the unintended costs of extending utilities in low-density developments.

After identifying the problems, tap readily available resources for reducing them.

Why start from scratch and, at best, reinvent the wheel, when a wealth of good ideas has already been used elsewhere? Consult the following organizations and the many others linked to their web sites, for information and lessons learned on addressing the challenges of providing utilities to new development in more equitable and sustainable ways:

American Planning Association
122 S Michigan Avenue, Suite 1600, Chicago, IL 60603
312-431-9985
http://www.planning.org/

APA is the leading professional association for planners, but its publications are some of the best and most straightforward available, especially its Planning Advisory Reports (see References and Annotated Bibliography). Most states have at least one APA chapter.

The Brookings Institution
Metropolitan Policy Program
1775 Massachusetts Avenue, NW, Washington, DC 20036-2188
202-797-6139
http://brookings.edu/metro/

The Brookings Institution's web site says it is a "private nonprofit organization devoted to independent research and innovative policy solutions" . . . "to inform the public debate, not advance a political agenda." A prominent area of their research addresses cities and suburbs, including growth, land use, housing, finance, and sustainability.

International Council for Local Environmental Initiatives
436 14th Street, Suite 1520, Oakland, CA 94612
510-844-0699
http://iclei.org/

ICLEI (pronounced ICK-lee) has a simple organizing principle: Cities everywhere are charged with implementing mandates from superior governments, yet are generally left to figure out the implementation details on their own. With emphasis on sustainability and reducing global climate change, ICLEI facilitates the sharing of "lessons learned"

between cities and provides tools and other assistance. The following examples are documents that address how growth management directly or indirectly relates to utilities:

- Sustainable Transportation Options for Protecting the Climate: A Guide to Local Governments
- Sprawling Towards Climate Change
- Uncovering Auto Subsidies (could be used to estimate sprawl subsidizes, too)

More than 50 U.S. cities have joined ICLEI. Visit http://www.iclei.org/usa, click on the Members tab and then the Our Members button to see if your city is among them.

Local Government Environmental Assistance Network (LGEAN)
International City/County Managers Association
777 N Capital Street, NE, Suite 500, Washington, DC 20002
202-962-3622
http://www.lgean.org

LGEAN's web site bills itself as "a first-stop shop providing environmental management, planning, funding and regulatory information to local government elected and appointed officials, managers and staff." It also provides opportunities for on-line peer-to-peer exchanges and toll-free telephone service.

Smart Growth America (SGA)
1707 L Street, NW, Suite 1050, Washington, DC 20036
202-207-3355
http://smartgrowthamerica.org

Smart Growth America (SGA) states on its website that it as a "coalition of national, state and local organizations working to improve the ways we plan and build the towns, cities and metro areas we call home. The coalition includes many of the best-known national organizations advocating on behalf of historic preservation, the environment, farmland and open space preservation, neighborhood revitalization and more."

SGA's free "Smart Growth Shareware" CD-ROM contains "road-tested presentations and materials by local and national leaders and organizations; immediately downloadable publications and fact sheets and web site links to over 100 additional resources," including guidance on conducting design charrettes, created by the National Charrette Institute for the National Association of Realtors (National Charrette Institute, 2005).

Smart Growth Network (SGN)
International City/County Managers Association
777 N Capital Street, NE, Suite 500, Washington, DC 20002
202-962-3623
http://www.smartgrowth.org

A statement on the website for Smart Growth Network maintains that the organization "keeps local government officials abreast of current environmental funding opportunities, federal policy updates, important legislative activities, new reports and publications and other available tools and resources." Membership is free and includes a bimonthly newsletter (*Getting Smart*), participation in discussions via their listserv, and access to an information hotline.

U.S. Environmental Protection Agency (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, NW, Washington, DC 20460
202-272-0167
http://epa.gov

Besides providing technical and financial assistance to LGEAN, SGA and SGN, the EPA offers additional information and links to still more resources on growth management, including connections between utilities and impacts on environmental and public health.

Compelling reports lead to action.

The work group's findings and recommendations must be written for decision-makers and others in ways that will compel them to act. The Center for an Urban Future's guide to effective policy reports, The Big Idea, clearly presents astute, experience-based advice for writing reports that motivate the necessary interest, commitment, and involvement.

Writing by committee rarely works well; the group should seriously consider having someone whom it trusts to write at least the first draft of the report to convey its work accurately, effectively, and persuasively.

Show. Don't tell.

This axiom of good children's literature applies to educating grown-ups on alternatives to what they take for granted. A picture is worth a thousand words in reports and group presentations, whether to utility decision-makers, elected officials or a neighborhood association, especially when the topic can so easily and effectively be illustrated with photos and drawings of real-world examples. Several of the resources listed under References and Annotated Bibliography provide useful illustrations. Presenters should avoid turning down the lights and reading their PowerPoint presentations to their audiences. They should use that technology where it can show their messages better than they can themselves, but then turn the lights back up and let their audience see, hear, and feel their enthusiasm and hope for better development in their communities. Most audiences respond to data. Presenters should not overload audiences with numbers but a few meaningful, documented figures or statistics can get an audience's attention and leave memorable impressions.

Watch your language!

Advocates of more efficient developmental patterns must choose their words carefully. The goal is to get audiences to stop, set their assumptions aside and entertain new ideas. Adult education is predicated on the learner seeing merit in the lesson, i.e., the educator must understand what a particular group of learners value. Values vary widely, but–if used in tandem–two Smart Growth values can capture the interest of the bulk of most audiences: fiscal efficiency and environmental protection. Smart Growth saves tax dollars and reduces pollution. Presenting it in those terms can capture the interest of constituencies who value one of those values, if not both. A given crowd might include retirees concerned about property taxes, parents interested in places for their children to safely ride their bikes and avid fishers. Smart Growth can speak to all of them if the presenter is mindful of their different values. Research shows the public responds differently to specific terms. For example, adults respond more favorably to "planning" and "reducing poorly planned growth" than "reducing unplanned growth" or "reducing sprawl," especially when presented in terms of preserving land and protecting resources for children and future generations (Weigel, et al, 2004). Similarly, most people respond negatively to "density" but are more open-minded to "compact design" (Pernell and Zykofsky, 2003).

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Benfield, F. K., Terris, J. and Vorsnager, N. (2001). *Solving sprawl: Models of smart growth in communities across America*. New York: Natural Resources Defense Council. Thirty-five illustrated examples of implemented Smart Growth in U.S. cities, suburbs and open spaces. References and glossary. No index. ISBN 1-893340-33-3. (II)

Bower, R. A. (1993). *Capital improvement programs: Linking budgeting and planning*. (Planning Advisory Service Report No. 442). Chicago: American Planning Association. Explains how CIPs can put more order and planning into growth by ensuring that new developments do not get ahead of infrastructure. No ISBN or index. Out of print. (II)

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Robert E. Adamski, PE, Gannett-Fleming, Inc.
Ryan Bell, International Council for Local Environmental Initiatives-USA
T. Vincent Bowlin, PE, FMSM, Inc.
Keith Coombs, PE, Louisville Water Company
Rebekah Doughty, Tampa Bay Water
Dan Emerine, International City/County Management Association
Gordon R. Garner, PE, Ch2Mhill, former Lexington-Fayette County (KY) commissioner for water and sewer service, (late-1970s-1984) and former executive director, Louisville and Jefferson County Metropolitan Sewer District (1984-2002)
John Huber, PE, Louisville Water Company
Ted Niemann, PE, Louisville Water Company
Heidi Saunders, River Fields, Inc.
Marianne Scott, 10,000 Friends
Brent A. Swenger, Division of Planning, Kentucky Transportation Cabinet
Thomas W. Williams, PE, American Water Company