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Issues in Calculating Traffic Impact Fees: A Review of the Literature

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INTRODUCTION

Over time, the concern has grown that government is not funding infrastructure investment in the United States at a sufficient level. Funding of infrastructure has been a joint effort of all levels of government, but reductions in the federal contribution (after adjusting for inflation) have shifted more of the cost onto state and local governments. Many studies have identified massive funding requirements that are not being met (National Council on Public Works Improvement, 1988; Kaplan, 1989; U.S. Congress, 1990). The failure to meet these requirements would be rational if they are based on standards of service which are set unrealistically high or on other conceptual errors; however, failure to provide the funding is likely to result in a deterioration in the level of service which is provided. Thus, the choice is generally between infrastructure expenditures and declining service.

In response to the demand for infrastructure and the reduced availability of other funding sources, many local governments have started levying charges on new development for the purpose of funding off-site infrastructure requirements. These charges are broadly known as Development Impact Fees or Systems Development Charges, and there is substantial controversy about the appropriateness of this source of funds and about the likely efficiency and equity effects of changes in the funding system for local infrastructure. In general, the courts have held that such charges are acceptable if they are levied in response to

demands which development places on the community and if the funds are used for infrastructure related to that development. (Delaney, Gordon, and Hess, 1987; Fulton, 1987; Nicholas and Nelson, 1988; Porter, 1984; Porter, 1985; Synder and Stegman, 1986). However, there are many issues which are raised regarding the level of such fees and the methods by which they are calculated.

Impact fees for roads are complicated by difficulties in separating the different sources of increased demand for road capacity and by possible alternatives to new construction as methods to meet increased demand. For example, it is possible to use various methods, such as increasing transit services and requiring traffic management programs, to reduce traffic volumes. However, we normally expect increases in traffic volume to require increases in road capacity to prevent deterioration of service levels, and much of this increase in traffic volume occurs away from the site of development.

To allocate the costs of increased demand for road capacity it then becomes necessary to separate out the reasons for increases in traffic volume. First, an increase in demand for service may arise among existing residents of a jurisdiction as people buy additional automobiles, drive more, or do more of their driving at peak times. Second, infrastructure may be needed to replace existing items which are aging or deteriorating. Third, changes in the regulatory environment may require changes in the amount of infrastructure, such as changes

in safety requirements. Finally, infrastructure demand can increase in response to growth.

When infrastructure requirements are caused by growth, it is also useful to distinguish between infrastructure directly related to tying the new development into the community system and new capacity required off-site to provide services associated with the increased demand. It is widely accepted that new development should pay for local access streets, but beyond the immediate access, the contributions of new development to traffic problems become harder to quantify.

Development Impact Fees or Systems Development Charges do not have a universally accepted definition, but they are generally accepted as the set of charges or fees levied on new development with the purpose of generating revenue to cover the costs of required increases in off-site capacity of various types of capital for the provision of publicly provided services. We will use the term "traffic impact fee" to denote charges levied on a formula basis to help cover the cost of off-site road development associated with growth.

Communities have historically provided infrastructure funding from general tax revenues, and the use of development fees is a change from historical approaches to the financing of local infrastructure. According to Ryan (1991), the history of impact fees begins with land-use regulations and the provision of public services. Prior to the 1920s, local governments willingly extended infrastructure to undeveloped land to serve existing

demand and to induce economic development (Nelson, 1988a).

The Standard State Zoning Enabling Act, enacted in 1922, led states to encourage local governments to take control of service and facility extensions (Nelson, 1988a). During the Depression years, many local governments could provide trunk line facilities, but could not afford to bring the services to every house. As a result, during the 1940s, it became customary for developers to connect services to each lot or home from the perimeter of the property.

Ryan (1991) points out that beginning in the 1960s, a "quiet revolution" in land-use regulation gave regional and state interests a role in policy-making, while the environmental movement questioned the continuing benefits of growth. Nelson (1988a) also observes that government capital financing had not kept pace with inflation or population growth since 1965. The rise of many of the charges, especially in California, can be traced to the property tax limitations of the 1970's.

PRIVATE FUNDING OF ROADS

The reduction in general fund provision of infrastructure has led to a variety of approaches that involve private funding of roads and other infrastructure. These include special assessments, negotiated fees, exactions, development fees, and impact fees (Cervero, 1988; Meisner et al, 1988; Synder and Stegman, 1986; Angell and Shorter, 1988).

One of the simplest methods involving private funding allows growth to continue until some key infrastructure system reaches

capacity, requiring the next development to augment capacity before approval will be granted for that project. These improvements can be far in excess of the impact of a particular development. The developers that follow will use this excess capacity until facilities again become inadequate, requiring the next developer to provide additional capacity. This system is widely agreed to be unfair and inefficient.

Requiring that all developers provide some infrastructure before project approval is granted can spread the cost more fairly among developers. This can be accomplished with either exactions or negotiated fees. However, this process can lead to substantial uncertainty as to the ultimate cost. In addition, different developers may have unequal bargaining power, leading to inequitable distribution of costs among developers.

Systems development charges, or more specifically, traffic impact fees, are a method to share the cost of infrastructure development in a more predictable and consistent manner, with the developer's share based on that development's trip-producing characteristics. Traffic impact fees are charges to new development by local governments to pay for the cost of improving roads to serve the additional traffic generated by the new development. These one-time fees are based on traffic studies that determine future needs and use a fee rate that is calculated on the basis of the number of trips generated by various land uses and the cost of constructing highway capacity to accommodate those trips. However, an overview of the programs in place

indicates that there is a considerable amount of variety in variables used for calculating fees. For example, Draper (1987) studied impact programs in localities in five states and found a broad range in levels and types of fees.

Purham and Frank (1987) report the results of a survey conducted in 1985, using a random sample of cities and counties (11,722) stratified to ensure appropriate representation by size. They estimated from the results that "41.2% of communities never require developers to make cash payments for any type of facility whatsoever" (p. 137). For those that required fees, 25.9% used a formula, 17.4% used a case-by-case basis, 7.9% used a standard with some flexibility and 4.7% varied by facility type. The facilities for which these fees were charged were most commonly on-site (40.3%). The study did not distinguish among types of cash exactions.

Bauman and Ethier (1987) used a study of 1000 communities nationwide, with a 22% response rate. 30.8% of the respondents required impact fees for roads. The method most often used for calculation was a flat rate. The authors noted that some planners felt that the terms "on-site exaction, off-site exaction, in-lieu-fee, and impact fee" were too imprecise.

Cervero (1988) studied impact fees, special assessments and negotiated fees used in California. 58 counties, 103 cities with population greater than 40,000 and 53 smaller cities were surveyed, with a response rate of 63%. Impact fees were rated "good" or "excellent" by two-thirds of the respondents. He found

negotiated programs were rated the least desirable.

FORMULA-TYPE FEE STRUCTURES

One of the essential elements in calculating impact fees is establishing the rate mechanism to be used in the formula. In a recent national study, Leithe and Montaven (1990) found that, of the 31 communities charging impact fees for roads, the range was from $298.50 to $5,000 per dwelling unit, with an average of $1,329. In addition to fees per single-family dwelling unit for roads, other methods referred to trip ends (e.g., $30 per trip end or $150 per trip end, which could vary by subarea); average multifamily rates ($831 per unit); average business rates ($260 to $8,414 per 1000 sq. ft. of space); and pm peak hour trips through a specific intersection ($355 per peak hour trip). Other rates included 10% of the value of new business construction, $300 per house or $1.00 per sq. ft. of space, $0.20 per sq. ft. for dwellings, $300 residential ($450 non-residential) per vehicle mile for PM peak hour traffic, and $130 per acre (p. 17). Over two-thirds of the respondents had separate fee schedules for residential, commercial and industrial developments.

Barnebey et al (1988) used a basic structure of half the average trip length times the trip generation rate divided by the capacity per lane mile. This was then multiplied by the average cost of constructing a new lane mile. Duncan et al (1989) report roadway costs were determined by the number of peak hour trips generated by current land uses, average trip lengths, peak hour

lane-mile capacity at different levels of service using average capital construction and right-of-way costs per lane-mile for new roads. Delafons (1990) looked at the amount of road space required to service each type of land use.

Cervero (1988) describes one unique program which required developers to pay a one-time tax of 4.5% of building permit valuation for residential or commercial development or one percent of building permit valuation for industrial development (lowered as an incentive to industry). This program applied to all areas of the city, except the downtown.

Adjustments For Trip Chaining Behavior

Estimates of trip generation rates typically do not differentiate new trips from other stops. Making multiple stops on a single trip is known as trip chaining, and counting each stop as a full trip overstates the impact on roads. When such trips are considered, the sequencing and causality may affect the impact which will be felt on the road system. For example, a fast food restaurant may have many trip ends, but if the people stopping were driving by on their way to other destinations, the traffic system impact of the trips would be quite different than if each customer had made a special trip.

Wilsey and Ham (1985) recommended adjusting rates by reducing them "60% for shopping centers and 80% for individual retail and service uses" (p. 27) to reflect adjustment for trip chaining behavior on road impact.

Nicholas, Nelson, and Juergensmeyer (1991) approached the

problem of determining which trips were 100% attributable to a development and which were not by adding the variable "percentage of new trips". The rationale for the adjustment factors came from national studies. However, according to the authors, "the percentage of new trips is, ultimately, a professional judgment" (p. 130).

Synder and Stegman (1986) looked at the formula structure used in Orange County, Florida. It used a "percent new trip" factor to adjust for "impact and nonimpact shopping trips". Nonimpact trips were designated as trips to commercial land uses "that occur only after the vehicle is already on the road network...and have no independent effects on overall trip generation rates" (p. 116). The Orange County planners claimed that 100% of residential and office trips were impact, while "only about half of those generated by retail land uses in commercial centers are impact trips. The remainder are so-called diversionary trips that take place only after the vehicle is on the roadway for another purpose" (p. 116).

Barnebey et al (1988) observed that the results of the formula used in Manatee County, Florida, were reduced by a "capture and diversion factor." In their case, studies of travel behavior regarding nonresidential destinations showed "that office development actually generates only 50 percent of the trips normally assigned to it....20% for drive-in bank tellers" (p. 26). The fee was then adjusted to that percentage.

Duncan et al (1989) found that many communities in Florida

reduce the ITE trip rates for retail uses by a factor for pass-by trips, defined as "trips that would be on the road anyway and for which the retail stop is not the primary destination" (p. 27). The authors state that, for retail shopping centers, the passby rate decreases as the size of the center increases, since larger centers are more likely to be primary destinations than small ones. They use a formula provided in the ITE manual for determining pass-by trips for shopping centers: Percentage of Passby trips = 45.1 - .0225 (A), where A is the square feet of gross leasable area measured in thousands. The formula for percentage of new trips is 100% minus the passby rate. "These new trip rates range from 50% for the smallest neighborhood shopping centers to 89% for a 1.25 million square foot regional shopping center" (p. 27). The ITE manual is less useful for other non-residential trips. As a result, the authors used 50% as the new trips factor for other uses.

Tindale (1991) concluded that trips in a line between origin and destination should be considered "captured"; and he observed in his study of Pinellas County, Florida that as trip rates per square foot increased, the percentage of trips captured also increased.

Peak Hour Adjustment

The basic method of calculating traffic impact often does not differentiate for the amount of travel at peak versus off-peak times. Long peak-hour trips cause the greatest impact on the demand for new road capacity. A case can be made for

charging either only for such trips or more heavily for these trips. The basic problem is determining which trips are likely to be peak ones.

Some jurisdictions include the impact of peak hour travel behavior in their formulas. Phillips (1990) recommends an adjustment to the basic trip generation model ranging from .75 to 2.00 based on land use categories (p. 23). Cervero (1988) indicates that the data sources used to generate peak-hour travel projections varied widely. The ITE manual was used by 37% of the counties and 28% of the cities. 12% of the counties and 36% of the cities used their own staff engineers or hired consultants to project peak hour travel. 12% of the counties and 7% of the cities used the trip generation assumptions from their general plans. Only 8% of counties and 10% of cities used trip generation projections from environmental impact reports of each project (p. 539).

Duncan et al (1989) used peak hour trips as determined by transportation planners. 18% of all daily trips occur during the two peak hours, 8% in the AM and 10% in the PM. They concluded that the most important factor in calculating roadway costs is the average peak hour travel distance.

Trip Length Adjustment

If all other factors are constant, roadway costs increase proportionately with trip length. Trip lengths vary by the distance between residences and employment, by density, and by mix of land use among other factors. However, if trip chaining

behavior is ignored, trip lengths associated with a single trip result in "a vast overstatement of actual travel" (Nicholas, Nelson and Jeurgenmeyer, 1991, p.130). Adjustments to trip generation rates to reflect differences in trip lengths for various land uses are necessary to more accurately reflect the impact on roads. Tindale (1991) concludes that land development activities that have high trip rates also had a tendency to have shorter trip lengths.

Adjustments For Road Type

Impact fees are generally used to address greater demand for arterial or collector roads rather than the impact on local roads or highways. However, trip generation formulas do not differentiate between the types of roads on which trips occur nor do they allocate trip length by road type. In addition, the percentage of trips on each road type are likely to differ depending on trip length and destination.

In addition to differences by land use type within a community, there may be some inconsistencies in using formulas based on total road cost to generate fees for some subset of the road system. Communities show substantial differences in the types of roads which are intended to be covered with existing fees. The Technical Committee of the Colorado/Wyoming Section of ITE (1989) point out that in Loveland, Colorado, traffic impact fees are referred to as "street fees" and are collected to fund system-wide street improvements. The funds are not used to improve existing deficiencies, however. Synder and Stegman

(1988) found that Orange County, Florida, used all roads in their assessment, but Raleigh, North Carolina, only used major arterials.

Adjustments For Geographic Differences

A single rate does not allow for geographic variations which affect traffic demand, trip length, or construction costs. For example, Wilsey and Ham (1985) felt that Washington County had large disparities between "subareas with respect to growth rates and the maturity of the transportation system." (p. 11) To address these concerns, they recommended a system which determined rates by subarea activity. Barnebey et al (1988) report on a district divided into two parts to represent different average travel lengths for urban and rural areas. Leithe and Montaven (1990) observed that two-thirds of the respondents in their study assessed fees on a jurisdiction-wide basis while 15% assessed fees on specific areas only.

Cervero (1988) found that one-third of the counties and half the cities in his study with impact fees applied their programs uniformly across the jurisdiction. Impact fees were used in 38% of the cities and in 16% of the counties. Some communities limited the geographic scope of the fees because of development in concentrated areas while others, such as San Diego with 42 planning areas, varied the fees to take account of differences in construction costs and other factors.

Duncan et al (1989) found only two of the six jurisdictions with impact fees used a locationally-sensitive variable fee rate

for their impact fee program. They claim that downtown residents either work downtown or commute against peak flows out to the suburbs, and thereby create little or no need for additional capacity. However, new downtown offices and industrial uses "compound already existing peak hour traffic problems, thereby creating the need for increased land capacity" (p. 34). Downtown retail uses, however, have much less impact on peak hour traffic. In one of the jurisdictions, the residential rates in the CBD are less than half the rates in the suburbs, while the office CBD rates are 50 to 100% higher.

The study conducted by the Colorado/Wyoming Section of ITE (1987) found that municipalities generally required impact fees within entire jurisdictions, while counties used them for certain corridors or subareas.

Rate Adjustments and Credits

There are a variety of issues which arise with respect to the need for credits when impact fees are used. In the literature, the term "credit" is used for two distinct types of adjustments. The first type of credits relate to the contributions which new development will make through property taxes, gasoline taxes, and other general sources of revenue towards existing road needs. It is widely accepted that these revenues should be credited to the development in determining the level of fees. (Porter, 1986; Nicholas, Nelson, and Juergensmeyer, 1991; Moore and Muller, 1990; Angell and Shorter, 1988). These credits will be referred to as rate adjustments for

our purposes. The second type of credits given by communities are reductions in the calculated liability to reflect expenditures made by developers on road improvements not directly related to the development. These may be expenditures required by the community or the community may offer the developer an option of making such improvements. In either case the community may allow a credit for these improvements in calculating the impact fees.

Leithe and Montaven (1990) found that only 20 percent of the respondents in their study gave credit (or rate adjustments) for the amount of other revenues that a new development was anticipated to generate, suggesting that "relatively few impact fee programs have incorporated detailed estimates of other revenues contributed by new residents in determining the amount of the impact fee charges. However, these respondents may, in effect, credit new development for other contributions made by setting the amount of the impact fee at less than the total cost of providing capital facilities" (p. 21). The credit most widely given is an allowance for future gasoline tax payments, followed by motor license fees, retail sales, and property taxes (Synder and Stegman, 1986).

TRIP DISTRIBUTION METHODS

Some communities have approached traffic impact fees using a variable fee developed with transportation modeling techniques rather than a formula process (Samdahl, 1991). McNeil, Rossi, and Hendrickson (1987) state that "the design of equitable

variable impact fees can be achieved through the direct application of highway cost allocation methods such as attribution of costs to vehicles by 'incremental assignment' or 'uniform removal'" (p. 74).

Broward County, Florida, uses a trip distribution model to determine traffic impact fees (Thompson, 1986; Downing and McCaleb, 1987; Auerhahn, 1988; Frank, 1984; Knack, 1984; Frank, 1988; Stewart, 1984; Synder and Stegman, 1986). It is a computerized system, called TRIPS (Traffic Review and Impact Planning Systems). Johnson (1990) describes it as the "pay-as-you-go" or "extra-cost" method. According to Nelson (1988b), it "involves an algorithm in which the assessment depends on the location of the development and the variable cost of adding new or expanding existing facilities" (p. 122).

This procedure has the advantage of distributing impact fee burdens more precisely based on cost estimates of different projects. After running through a four step process, TRIPS determines how a development will impact current traffic patterns. No impact fee is charged if the level of service is not changed. However, this also means that earlier developments can "soak up" capacity without having had to pay an impact fee. Nelson (1988b) suggests that a variable impact fee system can be designed to avoid the problem. If the development will contribute to congestion, the model computes the fee based on "the proportion of the improved capacity that can be assigned to the traffic generated by the development" (p. 124).

Lee (1988) finds one obvious error in calculating traffic impact fees based on the congestion caused by a new development's traffic. This method violates the basic principle of efficient pricing, that all users face the marginal cost. Removing some existing users would eliminate the congestion, indicating that any group of users could be called "marginal". If existing residents are not paying peak prices, why should new residents? Lee concludes that as with other forms of infrastructure, it only matters that the agreed-upon miles of road are provided, not which roads are paid for by which development.

Bladikas and Pignataro (1990) point out that if impact fees are computed "only on road segments that are already over capacity, a proposed development may be charged substantially different fees depending on location" (p. 286). According to Frank (1988), using a fee structure of this nature creates "the possibility of creating incentives for infill development" (p. 211) to locations for which road capacity is available. However, he admitted there is no hard data to support this "in-fill" effect. He points out also that customized fees have uncertainty associated with them not found in formula/schedule types. He concludes that computerized models may be more costly than general formulas or schedules, but that the resulting improved quality of road planning may be worth it.

Thompson (1986) concludes that the computerized system is better than a formula method because it is believed that "it is fairer that the developer who chooses a site with adequate

roadway facilities does not pay a high impact fee because of the others who develop near congested roadways" (p. 18). Draper (1987) notes that using TRIPS appears to be a simple matter of comparing future traffic with or without the proposed development. "In reality, it involves a considerable degree of judgment and a good technical understanding of the subtle effect of different assumptions when applying the methodology" (p. 71).

ADMINISTRATIVE AND IMPLEMENTATION ISSUES

Ease of administration is an important consideration in the implementation of any impact fee program. The cost of the initial study and later updates, the tracking of funds, the collection and disbursement of revenues, the determination of credits for construction in lieu of cash, and the need to transfer accounts to future buyers can be burdensome for small jurisdictions (Meisner et al, 1988).

Cervero (1988) found that planning offices cited three problems most frequently. The greatest problem was technical difficulties, either because of frequent changes in lot ownership or the use of complicated formulas for allocating costs. The second problem was administrative burden, with major time commitments required of staff, often inexperienced with the mechanisms, along with the need for coordination among local, county, and state jurisdictions. The third problem cited was financial, the inability of programs to "raise enough money for meaningful-scale projects, due either to inadequate fee levels or the devaluing effect of inflation" (p. 540).

Leithe and Montaven (1990) found sixty-one percent of the respondents to their survey update their fees for inflation on varying time intervals. Their study revealed the problems faced with impact fees included: determining levels of demand and costs of construction; setting rates that were accurate; and "fairly apportioning costs among residential, commercial, and industrial units" (p. 30).

Meisner et al (1988) concluded that traffic impact fees are, on the whole, considered equitable for all types and sizes of development. However, Cervero (1988) concludes from his study that a "sizeable gap" remains between theory and practice. He cites most of the problems with implementation stemming from the inability of program designers to "accurately and fairly apportion the cost of infrastructure improvements to developers and gauge the spatial and temporal extent of the traffic impacts of new developments" (p. 540). He cites the need for horizontal equity, where developers in similar situations should be treated the same.

POLITICAL CONCERNS

Developers are often opposed to traffic impact fees while existing residents of a jurisdiction generally favor them. Political decision-makers often have to trade off the concerns of each group in determining the actual level and administration of such fees (Link, 1988a; Link, 1988b).

Lillydahl et al (1988) cite five political objectives of local communities using impact fees: to shift the capital

financing burden to new development; to synchronize new development with the installation of new facilities; to impose economic discipline on land development decisions by requiring development to absorb the costs of providing new services and facilities; to enhance the quality of life within communities; and to mollify anti-growth or slow-growth interest groups (p. 4).

Meisner et al (1988) claim that traffic impact fees, if known in advance and included in feasibility studies for projects, often do not significantly affect the cost of a development. They identified a set of politically desirable conditions for a successful program: existing traffic congestion which is perceived by the public and the developer as being a problem; recent rapid growth and resulting traffic growth which polarizes a community into promoting a policy of making new development pay; a perceived strong economy where it is assumed that development will occur regardless of fees; strong citizen participation, with political influence; support from the business community; previous experience with an impact fee program; larger projects, as they have a greater impact and are more capable of funding infrastructure than small projects; and project types that are relatively high density, high cost or "upscale" and high generators of traffic volume. They also observed impact fees being set at a level significantly below anticipated costs, which they attributed to local governments taking into account the "need" by the public at large for the proposed facilities.

Cervero (1988) found none of the jurisdictions in his study charged developers the total cost of necessary off-site improvements as a formal policy. Half of his survey respondents indicated that they collected less than one-quarter of the cost of highway improvements attributable to new development. "Most indicated that elected officials were politically unable or unwilling to write formal ordinances which pass on the full cost of off-site improvements" (p. 538). Uncertainties about trip generation estimates and concerns over litigation were cited as reasons for these policies. He concludes that the flat fee approach is considered the most politically acceptable and easiest to establish. He states that "since all developers pay the same amount per square foot or per peak-hour trip, few charges of inequities have been aired" (p. 538).

The Technical Committee of the Colorado/Wyoming Section of ITE (1989) found that fees are currently collected at 20% of the calculated impact fee, a policy which is resulting in inadequate funding for necessary projects to be constructed. Duncan et al (1989) found that the greatest percentage of actual roadway costs captured was 34%, and the least was 10%.

Draper (1987) cites a FHWA study on developer-funded improvements which found developers want to minimize up-front capital costs by phasing in improvements (or fees) to coincide with build out; to share with other developers the burden of expense of off-site improvements that benefit more than the new development; and to have control over improvements constructed

with his/her money. "Thus, a developer often prefers to assume responsibility for constructing the off-site improvements so he has more control over the cost and the timing and has assurance that the improvements will be constructed" (p. 69).

Lee (1988) claims that "only some small portion of the street system can be financed efficiently through impact fees and the bulk of this is on-site to most development" (p. 303). Specifically, he claims that impact fees do not promote efficient expansion of the road system nor increase the price to users, so they do not promote efficiency.

Shorter (1989) examined the effect of impact fees on feasibility, claiming every cost is important to a developer's project feasibility and competitive market position. He maintains that a dollar-based fee program may cause a decrease in the reasonable rate of return, which will delay or stop a development. The developer's options are limited to: passing the fee forward or backward; financing the fee as part of the project; absorbing the fee and reduce the rate of return; or a combination passing and financing.

Housing Prices

Affordable housing advocates are concerned that impact fees are adding to the financial burden of future homebuyers. Incidence of the fee is a major concern for most communities. (Nicholas, Nelson, and Juergensmeyer, 1991; Morgan, 1988; Singell and Lillydahl, 1990; Delaney and Smith, 1989a; Delaney and Smith, 1989b; White, 1991; Stegman, 1987; Delafons, 1990).

Nicholas, Nelson, and Juergensmeyer (1991) claim that public officials argue that the land market is competitive and therefore prices of inputs do not dictate the price of new development. The actual structure of the fees should be such that they will be absorbed into lower raw land prices. However, this assumption of pure competition is violated if the sellers of buildable land are enjoying a locational monopoly. With this market power, developers may not be able to force the impact fee backwards onto the landowner. The authors indicate that these developer concerns are not supported through empirical work.

It is worth noting also that without facilities the supply of developable land would diminish, causing housing prices to rise. Impact fees may actually work to forestall or prevent adverse price effects in a competitive housing market.

Community Competition

Communities are often concerned with the prospect of driving away development or losing new development to neighboring communities. If the development is a net drain on the community, this position may not make much sense, but if the new development is expected to generate a net surplus of revenue over cost for the community in relation to all services provided, the community may be better off with the development even if it requires subsidization for some infrastructure.

Synder and Stegman (1986) found that calculated fees are often explicitly "discounted" for seemingly political reasons. In Orange County, Florida, the Commissioner adjusted the fee

formula after deciding that traffic development fees should be reduced to 52% of the calculated fee. In Raleigh, North Carolina, the fee structure had not yet been adopted at the time of their research; however, the authors anticipated that since none of Raleigh's neighboring communities imposed fees, and the maximum allowable road fee on commercial development is "politically unacceptable, fees will have to be uniformly adjusted downward..or selectively reduced to eliminate the extremely high burden on certain types of development" (p. 119).

Barnebey et al (1988) observed Manatee County, Florida, also used a "competitive factor adjustment." In a compromise between a full fee and fees of surrounding communities, the county commission kept the residential road impact fees at 100 percent, but reduced those for commercial, industrial, and institutional developments. For example, of the 16 commercial land use categories, the county reduced 12 by at least 40% and the remaining uses by about 75% (p. 26). Nicholas, Nelson, and Juergensmeyer (1991) observed a "discount" of between 5% and 15%, being applied to the final traffic impact formula.

According to Angell and Shorter (1988), an underlying concern in selecting a type of impact fee was "how to achieve private-developer participation without discouraging all development" (p. 20). They concluded that there was little evidence that exactions alone dampen development in the communities that used them, nor have they driven development elsewhere. Exaction programs used in a strong real estate market

"do not appear to have placed either developers or communities in a less competitive position. However, many communities do not have alternative plans in the event of a market downturn" (p. 21). The authors recommend using goals and measuring the extent of impact over time, determining the extent to which local real estate market conditions will bear the imposition of impact fees, relating impact fee programs to a master plan, and developing a "flexible formal impact fee program that can be adjusted for changes in the real estate market" (p. 21).

Duncan et al (1989) found most of the jurisdictions with impact fees consider themselves as "pro-growth." "Where the impact fees have been in place for some time, all of the jurisdictions indicated that the fees have not had a noticeable impact on growth" (p. 41). However, over half of the respondents were considering changes to their traffic impact fee requirements.

Moore and Muller (1990) point out that communities can exempt certain users from the fee, such as affordable housing, retention of certain employment or generators of jobs. Explicitly exempting commercial uses may be hard to do, as politically it must be found that there is sufficient public benefit to warrant exempting them. They concluded that communities appear to prefer taking the risk of not collecting sufficient revenues to meet infrastructure expansion requirements by applying impact fees that recover only a portion of the calculated costs in order to avoid lengthy equity disputes.

CONCLUSIONS

Traffic Impact Fees are a viable and growing method for financing at least part of the cost of off-site road construction associated with new development. However, there are many issues which have not been adequately addressed in designing such systems. Communities which are implementing the fees are making a variety of ad hoc adjustments to account for some of the problems which arise, but the ad hoc approach leaves many of the issues unresolved.

Among the most important issues are the level of the fee, the method of determining differences in traffic impact for various types of land use, and the administrative and political problems created by using impact fees. The level of the fee can be determined in principle, but this calculation faces various practical problems. Estimates of both road construction cost and traffic impact have substantial uncertainty. Perhaps more important, there is not a consensus that new development should pay the full cost of the required road construction. The reluctance to charge fees representing the full cost may simply reflect uncertainty about a relatively new financing mechanism or it may reflect more fundamental disagreements about the appropriate level of fees and the methods of determining them.

The issues relating to the level of the fee are also closely tied to the political acceptability of the fees. While there is little evidence that they have any detrimental effect on community growth or on the cost of housing or other development,

the issues continue to be debated. It is unlikely that the impact on cost or development will be resolved without additional empirical evidence.

When a traffic impact fee has been determined to be the appropriate method for financing road construction, there are two distinctly different approaches. One uses detailed studies of the impact of each new development on the existing road system and tries to estimate the specific impact which the development will have. The other relies on estimates of the average impact which development will have and sets fees based on this average cost. The former approach is better for optimizing the use of an existing road system in the short run, but it can treat otherwise identical developments very differently depending on the timing of development. The latter approach is more common, both because it is easier to implement and more uniform. However, there are problems with estimating the average impact on road use and relating this to the cost of road construction.

From a technical perspective, the issues in determining the appropriate basis for traffic impact fees are conceptually easy to address, but they create requirements for data that is not readily available. The impact fee should reflect the demand for road capacity which new development will generate, but there are substantial gaps which must be made between the estimates of trip generation which are readily available and the actual impact on road use which a development will have. In particular, issues like trip chaining, peaking characteristics of trips, average

trip length, and a variety of other characteristics argue for more complex fee systems, but these issues must be balanced against the limited data available and the administrative and other costs associated with complex systems.

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