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# Interstate Highway Interchanges Reshape Rural Communities

*Highway interchanges offer rural counties practically ready-made sites for development. And with over 42,500 miles of interstate highways, the opportunities for interchange development are nearly everywhere. But some interchanges offer better development opportunities than others. This article, based on the Kentucky experience, offers a guide to the factors that make a difference in development, so local officials can anticipate the development prospects of future interchanges and monitor the development already under way around existing interchanges.*

Interstate highways have proven a valuable spur to rural development as people, commercial establishments, and industrial enterprises find rural location desirable and profitable. While the reasons for moving out of urban areas range from the economic to the esthetic, development of the countryside could not have occurred at as rapid a pace without interstate highways. Most of the development spurred by the interstates takes place around the interchanges, which give travelers easy access to and from the road network.

The National System of Interstate and Defense Highways, the interstate highway system, has grown from a proposed network of 26,700 miles in 1939 to over 42,500 miles since construction began in 1956. The system comprises slightly more than 1 percent of the Nation's road and street mileage yet carries over 20 percent of all traffic.

While the construction of a superhighway through a rural area has immediate effects, these often pale in comparison

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Henry Moon is an assistant professor of geography and planning at The University of Toledo, Toledo, OH.

with the changes that follow soon after, as residential, commercial, and industrial developers use the interstate system to reach into rural America. The interchanges pinpoint the areas of heaviest influence on the previously undeveloped landscape. This look at development around interchanges in rural Kentucky can help local officials anticipate, plan for, and even stimulate development in their own areas.

In spite of the millions of acres and dollars involved in development around interchanges, little has been known about the factors that contribute to it. Development is often mistakenly perceived to be random or haphazard as transportation planners typically focus only on the physical characteristics of the routes themselves, paying little or no attention to the development spurred by them. Most of the local attention to highway transportation focuses on the construction and main-

tenance of roads. As an interchange is developed, the process of development becomes more of a local land use/planning issue. Once begun, the development can draw more land and people into the zone of influence around the interchange.

## Interchanges Are Critical Points

Highways and interchanges are major catalysts in converting undeveloped rural land to urban-type uses. The role of these routes in reshaping suburban and urban fringe areas is well documented, but highways through rural communities bring about an even greater change. Because there are generally few alternate routes to a rural highway, each one serves a larger area and consequently induces a clustering of providers of goods and services at intersections.

Development around interstate highways is limited to interchange areas because they are the only access to or exit from the interstate system. Commercial businesses such as fast food restaurants or gas stations that need to serve large populations to be viable locate at high-volume interchanges or at interchanges near cities and towns where they serve both resident and transient populations. Other businesses and industries dependent on interstate truck traffic, as clients or as shippers of their products or raw materials, also find interchange locations cost effective. The same locational decisionmaking

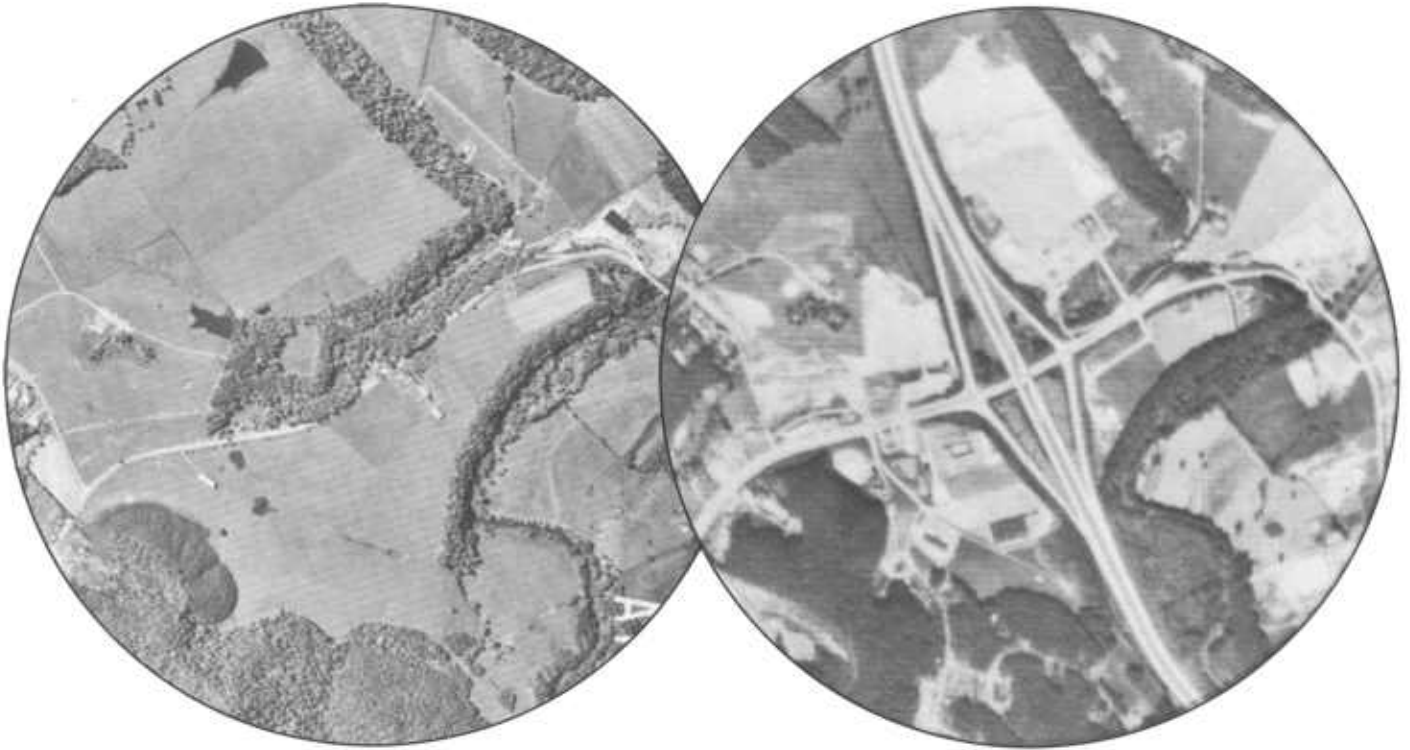
### A Case Study

Interchange 4 (as numbered by the Federal Highway Administration) on Interstate 24 in western Kentucky is a multifunctional interchange village. It opened to traffic in 1974 in rural McCracken County approximately 3.5 miles from the city of Paducah (population 29,000). Aerial photographs show only 53 structures within the study area before the interchange was built, 52 of which were either single-family residences, farm barns, sheds, or garages. No commercial or industrial firms existed in the study area before the interchange was built. As of January 1987, 247 structures lay within this once-rural, chiefly agricultural area.

The single most significant feature of this interchange village is the Kentucky Oaks Mall, the largest in the State. Within the village, 173 structures are commercial establishments while 74 are residential or

residence related. Gasoline stations and truckstops situated near the interchange capture through traffic, but they are considerably larger than similar firms at other interchanges that rely exclusively on the interstate for clientele. The retail businesses of this village seem to profit by tapping two distinct populations, that of Interstate 24 and that of the surrounding region, which includes not only western Kentucky but southern Illinois and southwestern Indiana as well.

A regional social characteristic that enhances the village as a central place is its designation as a wet area surrounded by dry counties. Since this interchange features the nearest liquor-serving restaurants and retail stores for hundreds of thousands of people, its role as a central place is pronounced.



**These aerial photos show the development that followed construction of an Interstate highway and interchange in rural Rowan County, KY. The photos above show what the area looked like before (1965, left) and after (1983, right) construction. The photos below show a similar effect in Barren County, KY, for before construction (1964, left) and after (1981, right).**

Photos provided by the author



process works in the public sector. Government agencies use interchange locations to provide easy access to field offices for county and regional populations. Residents of more remote areas

build homes near interchanges to improve their commuting opportunities.

The development process around rural interstate highway interchanges has clear

commercial, industrial, and residential components. Clusters of activity arising from these components serve areas of hundreds of square miles and thousands of rural residents. This activity occurs in

## About The Study

Kentucky lies on a crossroad between the East and the Midwest and North and South. It comprises five distinct topographical regions ranging from the flat floodplains of the Mississippi River in the west to the Appalachian Mountains in the east. While predominantly rural, the State has several large urban areas around Louisville and Lexington and also contains part of the Cincinnati metropolitan area to the north, including the major airport serving that city. The airport, of course, is connected to its Ohio and Kentucky patrons by a network of interstate highways. The five interstate routes that traverse Kentucky are of different types, directions, and ages, thereby providing an investigator a representative sample of places and highways. Among Kentucky's interstates are I-65, one of the system's oldest, and I-24, one of the system's newest.

Since the primary impetus of this analysis is rural interchange development, only interchanges in nonmetro areas of Kentucky and outside cities with a population greater than 25,000 were included. During a 6-week period in 1985, a 502-acre area around each of Kentucky's 58 qualifying interstate highway interchanges was examined for residential, commercial, and industrial development. In this study, development is defined by the number and size of actual structures near an interchange. The study area size was determined by its use in several earlier interchange investigations and because it

performed well in a trial run. Base maps and aerial photographs provided excellent pre-study glimpses of the 58 study sites. Each of the 58 interchange study areas was examined before and after highway construction using aerial photographs and field surveys. Every structure was counted, classified, and weighted according to its function, size, and ability to generate traffic or other commercial activity. The classification scheme was implemented to measure the variation in interchange development so visible to those that frequent the system but difficult to quantify by those studying the system.

The following data were collected at each study site:

- (1) amount of development,
- (2) amount of preconstruction development,
- (3) average daily interstate highway traffic,
- (4) type of interchange (diamond, cloverleaf, etc.),
- (5) highway direction (north-south or east-west),
- (6) interchange age,
- (7) type of highway intersected,
- (8) topographic region,
- (9) distance to the nearest neighboring interchange,
- (10) distance to the farthest neighboring interchange,
- (11) distance to the nearest city,
- (12) distance to the nearest Metropolitan Statistical Area,

- (13) distance to the nearest city with a population greater than 25,000,
- (14) whether the interchange exits to a recognized tourist attraction,
- (15) number of workers commuting into the county,
- (16) number of workers commuting out of the county,
- (17) county population,
- (18) percent of the county's population that is urban,
- (19) dominant soil capability classification at the interchange (a measure of limited topography),
- (20) size of the developable portion of the interchange area (study area minus the interchange structure),
- (21) number of preinterstate ownership parcels,
- (22) whether the area prohibits the sale of alcoholic beverages, and
- (23) whether the interchange is within Appalachia (a measure of latent transportation demand).

Then, a STEPWISE multivariate regression analysis identified the share of the variation in amount of development that can be explained by the most influential group of variables drawn from variables 2 through 23. The results from such a statistical analysis provide a list of contributing factors to the interchange development process, and order those variables according to their level of impact.

conjunction with that generated by passers-through with demands of their own.

An interstate highway interchange connects what used to be an isolated community with the Nation's principal transportation network. And while the interstate system was built to connect the country's major urban centers, rural communities between them are affected by development opportunities created by the system.

### Factors Involved In Interchange Development

The impact of interstate highway interchange development can be expected to vary from place to place depending on characteristics of the site and region.

Traffic volume and distance to an urban area are known to be major factors that influence interchange development.

However, a comprehensive approach is required to understand the complex set of factors (historical, spatial, economic, population, and social) that contribute to development.

In this Kentucky study, nearly 70 percent of the variation in interchange development was explained by 7 of the 22 variables examined (see box, "About the Study"). Five of those variables contributed to development and two detracted from it. In order of their influence, the factors were:

- amount of development in place before the interchange was built,

- location in or outside of Appalachia,
- distance to the nearest neighboring interchange,
- traffic volume,
- whether sale of alcoholic beverages was permitted,
- distance to the nearest city, and
- ruggedness of terrain.

While distance to a city and traffic volume are well-known influences in development, the role of the other five factors has been overlooked until now.

Interstate highway interchanges are not built on featureless planes but on larger roads already fostering some development. As a result, the factors that spawn development appear to be similar before and after interchanges are built. This fact is generally not considered in the trans-

## The Typical Interchange

The interchange area studied consisted of the land within a half mile radius of the interchange (502 acres). Before construction, the typical interchange area contained an average of only 28 structures;

several years after construction, it contained over 102 structures. Single-family residences were most common while industrial facilities were least common.

Type of structure	After construction	Before construction
	<i>Average number of structures</i>	
Single-family residences	47.43	14.37
Simple nonresidential structures	32.65	12.77
Small commercial or small institutional facilities	2.83	.14
Large commercial, large institutional, or small industrial entities	16.57	.71
Multifamily residential structures	3.00	.14
Large industrial operations	.14	0

portation planning process. A related variable may be the pattern of landownership. Development plans can bog down when they must be negotiated among a large number of owners.

Appalachian interchanges are 50 percent more developed than interchanges outside of the region. This increased development may stem from Appalachia's latent demand for enhanced access both from within the region and outside of it. Appalachia's previous isolation explains the region's strong development response to the interstate highway system. The process of Appalachian development is twofold: residents seek increased accessibility, while public and private agencies and firms outside the area desire to tap the region's market and service potential. Given these different but related forces of latent demand, Appalachian interchanges spur more development than non-Appalachian interchanges.

Interchanges that were closer together generally stimulated more development than interchanges that were farther apart. The most developed interchanges in Kentucky are the closest together.

Some Kentucky counties prohibit the sale of alcoholic beverages. In doing so, these "dry counties" also hinder development because restaurateurs and motel operators who want to sell alcoholic beverages seek wet interchanges for their businesses. Interchanges in "wet counties," which allow the sale of alcoholic beverages, and in the wet part of "moist" counties (with both wet and dry communities)

are twice as developed as interchanges in dry counties or in the dry part of moist counties. In this case, a community's social attitude affects its development potential.

Topography also turned out to be a significant factor in interchange development. Perhaps developers are more conscious than transportation analysts of the influence of physical surroundings on projects, whether measured in environmental or fiscal terms. Commercial developers, seeking to maximize not only access to travelers but visibility as well, tend to avoid sites where visibility is restricted.

### Implications

Interstate highway interchanges are important factors in rural development. Toyota Motor Company and General Motors Corporation recently announced plans to locate industrial complexes near two interchanges in Kentucky and Tennessee. Officials from both firms identified the superhighway and the interchange itself as prime factors in their decisions. Nonetheless, the effects of interchanges on rural development have been mostly unaddressed by researchers and local decisionmakers. Most rural interchange areas are subject to little land use planning, zoning, or regulation in general, so they undergo "freestyle" development. Local officials need to become more aware of the development potential of interstate highway interchanges and then work to understand, monitor, and guide it.

Only a handful of analysts seem to understand the complex land conversion/development process occurring around rural interstate highway interchanges. The results of this study suggest that those interested in rural development can have a stronger grasp of and influence on the investment and construction that takes place around interchanges.

Rural interchange development is not random but controlled by specific economic, social, and geographic variables. At certain interchanges, these factors combine to bring about tremendous change in the once rural landscape. Some interchange areas are actually evolving into "interchange villages," concentrated centers of commercial, industrial, administrative, educational, religious, and residential activity. It is unclear, however, if this development is new to the region or has shifted from other areas within the region. Local officials, by understanding the forces at work, can guide interchange growth toward the best use. On the other hand, if local planners fail to understand and address this process of often large-scale change, they will eventually face haphazard land use patterns, traffic congestion, and the difficulty of catching up to the needs of newly forming commercial centers. **FDP**

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