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Part 2

SMART GROWTH AT RESEARCH CENTERS

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5

Using a Geographic Information System (GIS) to Help Shape Redevelopment of Small Urban Centers

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This chapter is about the involvement of the National Center for Neighborhood and Brownfields Redevelopment (the Center) in a two-year university-based effort to assist six small towns in New Jersey plan for their collective redevelopment in concert with smart growth principles. In the first year of the project, the Center worked in partnership with a steering committee of regional, county, and local municipal officials to collect data; identify specific areas or neighborhoods that might accommodate growth; develop a baseline geographic information system (GIS) build-out model; examine such economic implications of added growth as vehicle trips and employment opportunities; and measure potential impacts of such growth on local educational systems. In the second year of the project, the Center helped the six communities build their decision-making capacity in order to plan for smart growth on a regional scale.

Overview of the National Center for Neighborhood and Brownfields Redevelopment

Established in 1998 at the Edward J. Bloustein School of Planning and Public Policy, the Center was designated by the Rutgers Board of Governors as a strategic planning initiative of the university. It is one of six major research centers at the Bloustein School and is funded primarily through project-based grants from private foundations and federal, state, and county governments. The university funds the Center director's salary and the facilities; the remaining salaries, hardware/software, and expenses are funded by grants. The Center operates in the belief that restoration and revitalization of urban neigh-

borhoods will improve job opportunities, the local quality of life, and public health. Through educational and outreach programs, and especially applied community-level research, the Center is committed to the betterment and long-term vitality of neighborhoods and the health of the public.

The Center's staff includes a mix of Rutgers faculty, full- and part-time researchers, postdoctoral associates, and students. The Center employs doctoral, masters, and undergraduate students to work on a range of projects. Several doctoral students in Rutgers's Urban Planning and Policy Development program have completed their dissertations as part of the Center's research; the masters and undergraduate students working with the Center gain valuable experience in environmental planning and community development, while working in a professional environment.

The Center's mission focuses on two complementary areas: (1) the control of sprawl, with concentration on its related adverse environmental impacts on our natural resources; and (2) the revitalization of our cities and old industrial suburbs, with special consideration given to areas in need of redeveloping contaminated, abandoned, or underutilized properties. A goal of the Center is to be active in smart growth urban redevelopment in New Jersey.

New Jersey's Smart Growth Strategy

New Jersey is one of several states, including Colorado, Maryland, and Wisconsin, that actively focus on smart growth from the state level. New Jersey's approach stems from its state plan (New Jersey State Planning Commission 2001), which depicts the growth management strategies needed for the most densely populated state in the nation. New Jersey initiated the state plan in response to the declining economy and quality of life in urban centers, sprawling development, increased traffic, degradation of natural resources, and loss of open space. The state plan is in essence a statewide smart growth initiative that urges communities to develop more compact, mixed-use designs that protect the environment and provide for more efficient infrastructure systems, while at the same time permitting expected growth to occur. One of the key elements in designing the state plan was to assign *designated centers:* places that will accommodate the state's projected growth. The state offers incentives to these centers, in the form of technical assistance and funding, to plan for and accommodate the growth.

The study area represents three New Jersey state plan-designated centers, consisting of six towns in Somerset County: the entire town limits of Bound Brook, Manville, Raritan, Somerville, and South Bound Brook, and a small portion of Bridgewater Township. As part of a designated center, the towns

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in the study area are willing to accommodate further growth and have sought assistance in planning for it.

The Center joined this project to provide the designated centers with the technical resources needed for smart growth. It formed a partnership with Somerset County and each of the six towns to develop a strategic planning initiative. One of the main steps in the process was to pull together the existing but scattered players and pieces. The Somerset County Planning Board, as do other statewide county planning boards, has the responsibility for countywide and regional planning, but does not have the authority to legislate or directly make local land use decisions. The state planning agency serves as a technical and funding resource with the power only to influence local land use decisions through statutory or permit-driven regulations. The state plan serves as a template document that, when applied, brings with it technical resources, priority funding, and recognition of compliance with statewide initiatives.

Study Area: Somerset County and Designated Centers

Somerset County, one of twenty-one counties in the state, occupies 305 square miles of central New Jersey and consists of twenty-one individual municipalities (see Map 5.1).

Based on data from the 2000 U.S. Census of Population and Housing, Somerset County's population was 297,490, and it had a land density of 975.4 persons per square mile (less than the New Jersey average density of 1,134.5 persons per square mile). From 1990 to 2000 the county population increased 24 percent compared with 9 percent for New Jersey as a whole. During this period Somerset County grew more rapidly than any other county in the state (Census Bureau 2000), which makes the need for smart growth planning urgent.

As can be seen in Table 5.1, the study area has a population of 43,809. It has a lower percentage of nonwhite persons (17 percent) compared with the county as a whole, as well as the state and the nation; it has a relatively large percentage of Hispanic or Latino persons (18 percent). While the study area's median household income is higher than the national average, it is lower than both the New Jersey and the Somerset County averages (it is 64 percent of the county's median household income). The study area has the lowest public transit user rate (3 percent) compared with the other areas. In terms of education, as measured by the percent of the population with college and advanced degrees, the study area has fewer educated persons (21 percent with associate's or bachelor's degree; 8 percent with an advanced degree) than the comparison area. As in Somerset County as a whole, there is a low rate (4 percent) of vacant housing

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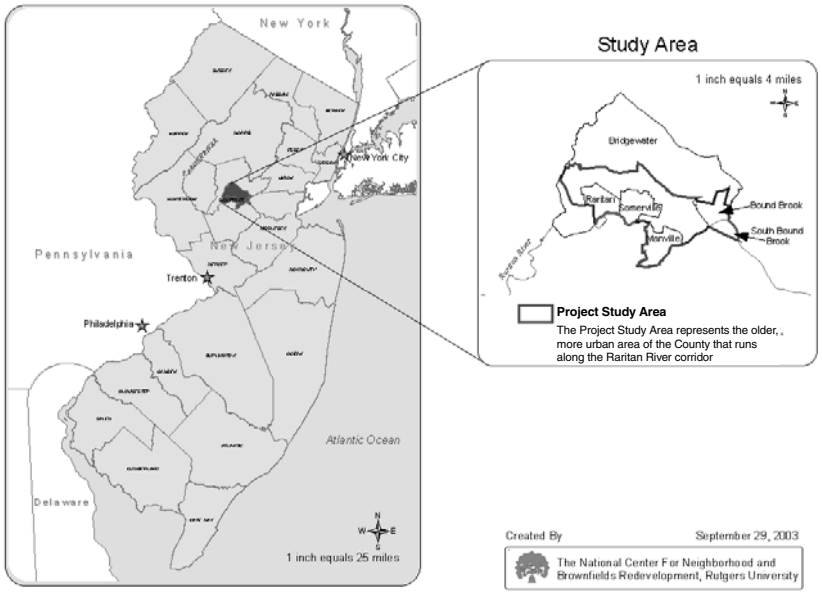
Map 5.1 **Project study area, Somerset County, New Jersey**



Source: The National Center for Neighborhood and Brownfields Redevelopment, Rutgers University (September 29, 2003).

in the study area, and while the county has a higher-than-average rate of owner occupancy than both the nation and New Jersey, the study area has a lower rate. Housing rentals in the study area cost more than the New Jersey and the national averages, but less than the average for the county. Fewer people on average in the study area purchase their homes than in the state and county, but the rate is higher than the national average.

The more affluent communities in the county, widely known for large houses, equestrian activities, and golf courses, are located in the rolling foothills. This is in strong contrast to the communities in our study area, which lie in the Raritan River valley, once the home of such large industrial facilities as Johns Manville in Manville, GAF in South Bound Brook, American Cyanamid in Bridgewater, and Woolen Mills in Raritan (Mayer, Danis, and Greenberg 2002, 353). Industrialization left an estimated 435 known contaminated sites in the county, of which 104 are located in the study cities (Somerset Coalition for Smart Growth 2000, 4). These sites were once the employment and economic centers of the county, but now they are defiled community eyesores. The loss of jobs and resulting idle land have also translated into higher tax rates on the remaining residences and businesses in the municipalities (Rutgers 2000, 73–77; Somerset County Board of Taxation 2000).

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Table 5.1

Quick profile of the study area and surrounding regions

	United States	New Jersey	Somerset County	Study Area Towns
Total population	281,421,906	8,414,350	297,490	43,809
Nonwhite population	25%	28%	21%	17%
Hispanic or Latino	13%	13%	9%	18%
Journey to work: use public transportation	5%	10%	4%	3%
Education: associates or bachelors degree	22%	24%	33%	21%
Education: advanced degree	9%	11%	19%	8%
Median household income in 1999	$41,994	$55,146	$76,933	$49,892
Poverty rate	12%	8%	4%	7%
Vacant housing	9%	7%	3%	4%
Owner occupancy	66%	66%	77%	58%
Median rent asked	$469	$660	$900	$752
Median housing value	$111,80	$167,900	$222,400	$156,200

Source: The National Center for Neighborhood and Brownfields Redevelopment, Rutgers University.

The towns in the study area have much in common: they share many transportation and other infrastructure facilities; they are relatively small; and they have limited resources. Leaders in each of the towns believed that the best strategy for their future was for the towns to cooperate and collaborate for regional smart growth.

Project Implementation

The project was the result of a partnership between the Center; the county's planning director; the Regional Planning Partnership (RPP), a local nonprofit organization that had developed a GIS build-out model; and several local officials who were serving on an EPA brownfields pilot project. The Center served as the university resource and conduit for knowledge and technology to communities unable to staff a full-time planner and/or had limited local resources. It worked alongside the County Planning Board staff and local officials to develop the project's steering committees and establish its smart growth principles by applying a combination of technical resources, local knowledge, and collaborative decision making.

The project focused on two key elements: (1) bringing stakeholders together

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through a steering committee and individual community meetings, and (2) using GIS models to evaluate redevelopment alternatives. The Center staff and graduate urban planning students worked with mayors and other town representatives to gather individual redevelopment plans and ideas and to examine both the localized and regional impacts of the associated projected growth in population and jobs. Land use decisions in New Jersey are largely in the domain of local governments; it was thought that a bottom-up planning process involving all the towns would have a greater chance of success in building a regional perspective than more traditional top-down efforts from the county or state. It was important, therefore, to design a project that reflected input from local officials, because they ultimately are responsible for the redevelopment decisions in their towns. Toward this end, the Center was careful to include on the project's steering committee the director of planning for Somerset County, several other county staff members, the mayor, and at least one other representative of local government from each of the six municipalities.

The Center's interaction with the steering committee followed four phases. First, the Center collected data about existing land use and infrastructure in the study area. Preliminary meetings with the committee showed that local governments lacked the resources necessary to provide information to the Center; they were also unsure of how to share data with others. As a result, the Center gathered the information and sent it to the local governments to check for accuracy and completeness. The Center then met and shared data with each town and gathered feedback at a steering committee meeting. Although towns were reluctant to perform data collection, they were willing to comment on whether or not the information that the Center put together was representative and up-to-date.

Second, the Center worked with local governments to identify areas or neighborhoods with vacant or underutilized properties that could accommodate new development. The partnership discussed the property details and considered redevelopment alternatives, which were based on existing or proposed plans and local stakeholder input. In these discussions, the county and each town talked about their redevelopment challenges, hopes, and dreams for their community; they shared thoughts on their joint and individual needs and difficulties or obstacles for making them a reality. The discussions revealed that each town has similar needs and challenges. The participants began to focus on appropriate land use options, enhancing their transit options, building on the local downtown economy, and, finally, increasing the downtown residential population.

Third, the Center used a GIS model to evaluate redevelopment or rezoning impacts. As they planned for redevelopment, the communities found themselves routinely stalled by concerns about the limitations in existing infrastructure. They identified wastewater and water supply systems as a major concern.

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To address this issue, the Center invited the operators of such systems to participate in discussions with the steering committee to determine the impact of alternative land uses on local infrastructure. But confirming the condition and capacity of existing systems in these communities and the region was difficult, if not impossible. It became apparent that for many communities and service providers, sharing data or planning information was not part of their operating practices. As a result, one of the project recommendations is for Somerset County to develop a technical task force to evaluate thoroughly existing infrastructure conditions, particularly water and wastewater systems.

The Center, working with the RPP and the county, took the lead in redevelopment modeling. In order to keep on task, the Center needed the communities to move forward with their ideas, not to get caught up on impediments to planning for revitalization. Each town presented a redevelopment option, and the steering committee meetings offered an opportunity to view a live-model demonstration of the potential impact of these options and to ask questions and discuss the implications. It was important that these meetings were action-based and that they kept the officials updated on the agenda for the next meeting. It was important, too, that each town had representation at the meetings. As a result, they were well attended; officials who have busy schedules and are not full-time mayors or planners found the meetings productive and an opportunity to gain insights about their towns as well as their neighbors.

Fourth, the Center examined those redevelopment projects that required intermunicipal and county cooperation. It facilitated discussions with the local officials that focused on building partnerships. As this project came to an end, the steering committee was concerned that, after two years of working together, all the knowledge and new relationships would just disappear. Because the County Planning Board was an active partner, however, there was an opportunity to use the county's master plan–update initiative as a way of continuing the work. These six towns, which serve as the growth centers for the county, were already on board, informed and able to continue collaborating as part of a subarea for the countywide initiative. Such continuity was critical to these communities, and concerns began to surface about what the next steps might be. Once the towns realized that the project was not just an academic study, the partnership could move forward and tie into other planning projects within the communities and the county.

The Impacts and Effects of Zoning and Planning: The Role of GIS

Instead of continuing to talk in abstract terms about development and impacts, the Center decided to use GIS-based tools to help local officials visu-

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alize existing and proposed land uses in relation to their neighboring communities. The Center used the Goal Oriented Zoning (GOZ™) model, which RPP developed, to work with the towns on residential and commercial build-out scenarios based on existing or proposed zoning. The results of the build-out data were then used to compute associated impacts on the community, such as increases in population, number of schoolchildren, local jobs, vehicle trips and miles traveled, water and sewer demand, and air and water pollution. By making refinements to the model, the Center was able to take already developed land and run "what if" redevelopment or rezoning scenarios, and compare them with current conditions. In short, the Center gave local officials a hands-on planning tool that was reflective of their town and useful for evaluating alternative situations for revitalization and planning for future growth. This was of particular value to these communities, which have large brownfield sites that are pivotal to the redevelopment of their downtown areas and critical to their economic sustainability. Such a tool also provided them, for the first time, an opportunity to work side by side with neighboring towns in visualizing and examining the cumulative environmental and infrastructure impacts of their individual plans.

Many GIS planning support systems enable users to evaluate different development or redevelopment scenarios. The Center found that this ability to model alternatives quickly was of great interest to the communities. Most local officials, planners, and stakeholders want to see rather speedily what a change in residential density or land use will mean for their communities in terms of people and traffic, for example. The fiscal, environmental, or infrastructural impacts that the GOZ™ model developed, however, was less understood by the general audience; those impacts were best comprehended if they were compared with existing conditions. For example, how much additional potable water would a town need as a result of a build-out scenario? The communities also responded to GIS as a local planning support system because it provided a quick picture of where redevelopment was occurring and the direct impacts that changes in density or floor area ratio would impose on population size, schoolchildren, and traffic.

The modeling and ensuing discussions led the mayors and other town officials to think beyond the day-to-day problems and issues associated with managing a local government, and to raise questions about how they would like to see their communities develop over the next ten to twenty years. Their initial focus was on whether the model could provide better impact information on a handful of areas that they were promoting for redevelopment. But they have begun to rethink how these properties could be best used to meet the community's needs, and to consider them in the context of similar redevelopment plans within their miniregion. The use of a GIS model did not

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obfuscate the planning discussion; instead, it served as a powerful visual and learning tool that empowered the communities to expand their thinking about how redevelopment could look.

One of the challenges in working with GIS is the frequent lack of current and representative data to build the database. The New Jersey Department of Environmental Protection (NJDEP) land use data were from 1995 to 1997; in a county that grew by 24 percent between 1990 and 2000, the existing baseline conditions did not represent the county's current land use conditions. Thus, the data gave a false starting point for any build-out projections. This outdated GIS baseline condition would be true of any GIS model analysis. Responding to this concern, the Center developed an approach for updating the NJDEP data to 2002 conditions using orthophotographic images and ARCGIS, a software program used for geospatial analysis.

Examples of Using GIS

The town of South Bound Brook, which was 0.9 square miles in size, realized that the traditional approach for stimulating economic growth in their main street area was based on the idea that dense commercial zoning would spur economic development. In the words of the mayor during one of the planning meetings, the thinking was that "if the town zoned for economic development, the businesses would come." When the existing zoning conditions were modeled, the build-out based on floor area ratio values indicated that approximately four thousand jobs could be available in this small area. Nevertheless, in reality, there are about nine hundred jobs available in the entire town, which currently includes a twelve-acre brownfield site along the river and low-density strip mall centers. The use of GIS permitted this town to better understand the implications of zoning and local land use ordinances and to recognize the mismatch between zoning and existing conditions. The zoning at the time also did not allow for mixed-use development and limited professional office opportunities. As a result of the build-out analysis, the mayor and town officials rethought the redevelopment stance for the brownfield site and looked again at existing zoning for the commercial area and the overall community. The county helped the town in applying for state funding to plan for redevelopment of the main street area and brownfield site as a mixed-use community that linked commercial and residential growth to the surrounding transit opportunities while preserving the beauty and integrity of the river. As a result, both the state and national brownfields community saluted the town as a leader in innovative redevelopment.

The town of Raritan, which continued to be overshadowed by Somerville,

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the county seat, decided that it needed to rethink the main street linkage to its neighbor, while maintaining the quaint residential character and generating tax ratables. The existing zoning for this area, however, limited commercial growth and did not permit professional office development. As a result of collaborative planning discussions, town officials decided to present several alternative zoning and land use ordinance changes for the area. The Center performed a GIS build-out analysis of these alternative floor area ratio and density values for that zone, and also discussed and evaluated the impacts of alternatives. As a result, the town moved forward with rezoning to promote professional office use and light commercial development. This also prompted the town to rethink their streetscape and architectural design guidelines to ensure that they maintained the character of the community. They, too, benefited from state and county planning grants to support their planning initiatives.

Reflections on the Project

The process of working collaboratively through a steering committee, with the Center serving as a neutral partner, was well received by all involved in the project. In fact, this project was the first time that the towns had sat down together to plan for their future. They listened to their peers, local officials, consultant planners, state regulatory representatives, and academics as a united group working for a better future for themselves and their stakeholders. They learned that they could achieve more for their respective communities as a group than as competitors for limited business and residential properties. For years they had competed for economic development initiatives and municipal service contracts; they are now aware that they need to collaborate and find a unified voice.

The Center met individually with each town to review its existing information on the town's land use, demographics, economics, and infrastructure. After these meetings, the Center created for each town a unique inventory of its existing resources (land use, infrastructure, and so forth) and planning data that were required in evaluating future growth and redevelopment plans. Most of the local officials found their inventory to be invaluable—they did not have the capacity (trained planning staff and funding) to create one on their own, yet it yielded the crucial information they needed for smart growth planning. As a university partner, the towns welcomed the Center as a source of information and research capacity, and for bringing an objective perspective to the table regarding information and redevelopment.

The use of GIS was essential to developing the big-picture perspective of what local decisions mean to the region. The technology was particularly valuable in enabling the Center to present the idea of creating a mixed-use

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downtown environment to support the communities' economic, transit, and quality of life concerns. At the beginning of the project, most of the communities did not understand how they might implement smart growth in their downtowns and large brownfield sites. In the end, however, the communities realized that they can create a more vibrant pedestrian-friendly downtown by evaluating zoning, parking, and land use policies. They also understood that there is a need for continued collaboration in addressing economic and infrastructure concerns as they plan for regional smart growth.

The Somerset County Planning Board is developing the Strategic Smart Growth Plan for the county with a $250,000 grant from the New Jersey Economic Development Authority. According to the director of the planning board, the project served as an opportunity for the board and the six towns to test the effectiveness of GIS and modeling in facilitating master plan activities. Building on the information collected from this project, the planning board has contracted with the Center to continue compiling the GIS modeling data for the entire county and to have the university serve in support of the smart growth strategic planning effort. This continuing work for the county, which was widely supported by the municipal governments, shows the potential worth of university-based centers to impact urban redevelopment and smart growth projects.

Lessons for Future Smart Growth

The project served as a practical application of grassroots regional planning. It inspired the county and the towns to think differently about their existing zoning, ordinances, and redevelopment plans. For example, the town of South Bound Brook reevaluated its existing redevelopment plan for a large brownfield in their central business district. Because of participation in this project, the town updated their existing redevelopment plan to incorporate more housing and design guidelines. In another example, Somerville, the county seat, was concerned about whether parking availability in the downtown area could support increased residential development. The Center performed a GIS evaluation of the downtown to consider several mixed-use options and parking requirements. The findings suggested that if the town were to rethink its approach to on-street parking and implement a permit system, there would be parking sufficient to support denser housing than their current zoning permits.

The final conference for the project brought together the communities, county, state, and private agencies, planning consultants, local business owners, academics, and graduate students to refine and discuss the needs of small urban centers. The conclusion spotlighted partnerships, the need for better data and more technical resources at the local level, and, most of all, the

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greater power they command as a group than as individuals. At the meeting, the partnership developed a set of recommendations specifically for New Jersey; however, these suggestions would be valid for communities across the country as they plan for smart growth:

1. Develop legislation that will empower counties as planning agencies to provide oversight to municipal planning approvals;
2. Provide more opportunities for municipalities to have access to planning support systems;
3. Improve the infrastructure knowledge of local, county, and state entities regarding the capacity and condition of wastewater systems in particular;
4. Confront critical transportation needs;
5. Encourage state agencies to address small-scale local issues, instead of focusing solely on larger regional issues, and to examine the concerns of older bedroom communities; and
6. Tackle issues about enhancing the downtown economy, and creating a twenty-four-hour/seven-day-a-week residential population to support it.

This partnership exemplifies how university-based centers can serve as resources to towns and counties and demonstrates the power of GIS as a planning support system. As the design and implementation of policies to address development concerns move forward in the most densely populated state in the nation, the Center should serve as a valuable asset in developing a clear-eyed grassroots vision for the state.

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Encouraging Smart Growth in a Skeptical State: University-Stakeholder Collaboration in Central Indiana

Greg Lindsey, John Ottensmann, Jamie Palmer, Jeffrey Wilson, and Joseph Tutterrow

In 1981 the Indiana General Assembly eliminated the State Planning Services Agency, thus effectively ending the state's role in encouraging land use planning and developing a capacity for planning at the local level. In the mid-1990s county commissioners in suburban Morgan County, near the Indianapolis International Airport, abruptly ended a comprehensive planning process and dismissed its planner because of citizen complaints about the erosion of property rights, confiscation of property, and intrusion of government into private affairs.

These two incidents reflect historical and, to a large degree, prevailing attitudes toward planning and growth management in the state. Indiana has been and remains conservative and deeply suspicious of the reach and scope of government. Hence, the fervor and debate over smart growth that have preoccupied planners and policy makers in Maryland, Oregon, Florida, and elsewhere across the nation have scarcely surfaced here. In Indiana the debate instead has focused more on the merits of planning and whether it offers benefits to the residents of local communities. It has emerged not because of concern over sprawl, but because of the loss of farmland—policy makers believe that the agricultural basis of their rural, rustic lifestyles and Hoosier culture are at risk.

University-stakeholder collaborations on land use issues in Central Indiana both are shaped by this culture and represent attempts to expand policy discussions to address a broader range of issues related to land use and growth.

Since the late 1990s, university faculty and staff at the Center for Urban Policy and the Environment (the Center) in the School of Public and Environmental Affairs (SPEA) at Indiana University–Purdue University, Indianapolis (IUPUI), have collaborated with the Indiana Land Use Consortium (ILUC), a loose-knit stakeholder organization, and the Indiana Land Resources Council (ILRC), a state commission headed by the lieutenant governor, to facilitate discussions about planning and growth management, to educate people about the principles of smart growth, and to provide information and tools for planners to work more effectively in their communities. This chapter describes such collaborations and considers their outcomes. It then concludes with a discussion of lessons for future collaborations both in Indiana and beyond.

Program Activity Planning and Collaboration

University collaborations with policy makers and stakeholders on land use and smart growth have evolved over time in both planned and unforeseen ways. The process perhaps best matches the conceptual models of adaptive and incremental planning. That is, collaborators generally have not established particular goals related to smart growth or pursued a specific approach. Rather, collaborators have worked together in an organic process, using their expertise to respond to and shape external forces and events, and to initiate and revise particular projects according to perceived needs. Although the three projects on which this chapter concentrates have been pursued systematically and rigorously within specified time periods, they have occurred in a dynamic environment and been shaped by fortuitous events. Like any evolutionary or adaptive process, the origins of these collaborations on land use and growth issues are difficult to pinpoint.

Focused on here are collaborations between January 2000 and May 2003, although the association predates this time period (Table 6.1, pp. 98–99). From the university perspective, the rationale for the partnership is rooted in the IUPUI mission of civic engagement and the SPEA commitment to "making a world of difference." IUPUI and SPEA created the Center in 1992 with a large award ($8.5 million) of general support from a major foundation to undertake research and service related to their public service directives. The Center's mission is to produce information that will help inform policy decisions related to quality of life in the region and state.

IUPUI and SPEA have provided additional financial support for the Center, including the director's salary and funds for a senior scholar. Professional staff employees, faculty from both SPEA and other units in the university, and graduate research assistants carry out the Center's work. Ac-

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tivities include policy-oriented, community-based research supported by major foundations and other sources as well as contract research and service undertaken for clients in the public, nonprofit, and private sectors.

Although the Center does not have an explicit educational mission, it has worked to support SPEA's educational goals in a number of ways. Annually it supports between five and ten graduate students as research assistants in SPEA's master of planning and master of public affairs programs. These students participate in nearly all Center activities, gaining valuable hands-on experience in community-based research and service. Many have been co-authors of Center publications. In addition, students in the master of planning workshop course and other SPEA classes have worked on planning projects for community clients through the auspices of the Center. SPEA students also have participated in many other Center research projects, especially ongoing studies of the use of greenways in Indianapolis and in Indiana as a whole.

Subsequent foundation awards ($3.4 million in 1999; $4 million in 2002) have enabled the Center to initiate a broad program of research in Central Indiana focused on community investments. It then extended particular projects statewide and across selected regions in other states. The primary objectives of this program have been to build relationships with key organizations and leaders in a region and to study investment strategies used by governments, businesses, nonprofit organizations, and households. As one element of this broader program, the Center financially supported collaborative projects on land use. The rationale for addressing planning and smart growth issues as part of a research program focused on investment is that planned, coordinated investments across sectors are likely to be more efficient and to lead to improvements in regional performance and quality of life. Like other Center initiatives, this research was designed to provide graduate research assistants with opportunities that complement their formal classroom instruction.

From the perspective of the state government, the ILUC, and stakeholders concerned with land use issues, the collaborations are outgrowths of statewide agricultural policy initiatives in the 1990s, including the Hoosier Farmland Preservation Task Force (1997–1999) and its predecessor, the Ag and Natural Resources Working Group, which produced a report for the legislature in 1997, *Indiana Land Use on the Edge.* The Indiana Land Use Consortium was founded in 1997 by a group of stakeholders that included the Indiana Farm Bureau, Indiana Planning Association, Indiana Association of Realtors, Indiana Association of Cities and Towns, and a number of state agencies and entities within several universities, including the Center. The mission of the ILUC is to serve "as a catalyst for education and a forum for discussion

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Table 6.1

Evolution of university-stakeholder collaborations on land use issues in Indiana

Collaborators	Pre-1999	1999	2000	2001	2002	2003
Indiana Land Use Consortium (ILUC)	1997, founded 1998, 1st conference	2nd conference	3rd conference Land use principles adopted	4th conference Elkhart County pilot project	5th conference Data catalog published. Putnam County pilot project	6th conference Putnam County pilot project continues
Indiana Land Resources Council (ILRC)	1997–1999, Governor's Hoosier Farmland Preservation Task Force	General Assembly passes enabling legislation (no sunset), mission defined	Members appointed Director hired Educational programs initiated	ILUC conference ILUC project sponsor. Funds Center to extend inventory and land use change project statewide. Land use forum created	White papers issued. ILUC conference. ILUC project sponsor. Educational programs continue	Forms Rural Waste-water Task Force. Farmland Task Force. ILUC conference. ILUC project sponsor. Educational programs continue
Center for Urban Policy and the Environment (the Center)	1992, founded 1992–1998, planning and land use projects	Foundation award through 2001. Staff is ILUC vice chair. Research aligned with ILRC mission	Work on land use and planning projects. Regional outreach forums	Work on land use and planning projects	Foundation award thru 2004. Staff is ILUC chair. Staff is Indiana Planning Assn. president. Research linked with Indiana Advisory Commission on Intergovernmental Relations	Work on land use and planning projects continues

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Land cover change project	Project conceptualized	Mapping of land use change in central Indiana initiated	Central Indiana mapping finished Complete Indiana mapping initiated	Indiana mapping finished. Results in ILRC newsletter	Land use change issue brief. Academic talks and journal submittals
Planning inventory and smart growth audit	Project conceptualized	Planning inventory issue brief Stakeholder design of audit template	Planning tools issue briefs Conference talks	Conference talks Low-density issue brief	Audit summary report
Land Use in Central Indiana (LUCI) model	Project conceptualized	Prototype developed and conceptual model refined Date assembled	Satellite imagery incorporated Model estimated Programming and beta version developed Stakeholder input	Program demonstrations and debugging Conference talks	LUCI released LUCI issue brief. Regional seminars *Public Works and Management Policy* article LUCI used in contract research

to foster responsible land use decisions and practices in Indiana."[1] The ILUC holds an annual conference, "Communities at the Crossroads," and has adopted a set of guiding principles for land use that embraces some elements of smart growth. It supports work by state and local agencies to educate people about alternative strategies for managing land use. The ILUC followed the work of the Farmland Preservation Task Force and joined hands with it in recommending that the legislature create a permanent state body to address issues relating to land use, which it did in 1999.

The Indiana General Assembly created the Indiana Land Resources Council to "(1) collect information; and (2) provide: (a) educational assistance; (b) technical assistance; and (c) advice; to local governments regarding land use strategies and issues across the state."[2] The ILRC, headed by the lieutenant governor and including nine members representing diverse interests, is authorized to facilitate collaboration, compile data on land resources, coordinate educational programs, give technical assistance, write and publish model ordinances, and help communities to obtain grants. Formation of the ILRC in some respects signifies a reversal of the legislature's previous decision to eliminate the State Planning Services Agency, but the ILRC has been given few resources and has funding only for a director and a part-time assistant. Since its inception, the ILRC has supported ongoing activities such as the ILUC conferences, begun development of information resources to enhance its educational initiatives, and developed a number of policy documents and papers on land resources issues.

Collaborative efforts between the university and land use stakeholders solidified in 2000 following the creation of the ILRC, the Center's receipt of the second foundation award for work in Central Indiana, and an explicit decision by the Center's leadership to align some of its research initiatives with the mission of the ILRC (Table 6.1). Specifically, the Center committed funding to document historic and current land cover and land cover change, to describe the scope of local planning, and to provide tools for stakeholders to understand the consequences of land use policy choices. Collaboration among Center researchers, ILRC staff, and ILUC members was thereby intensified. Members implemented projects designed to provide neutral, credible information, to build trust among stakeholders, and to increase understanding of the strengths and weaknesses of planning.

Program Activity Implementation

The Center's work on each of the three Central Indiana projects was started more or less simultaneously in spring 2000 (Table 6.1). The land cover change project and the planning inventory and smart growth audit were completed

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for Central Indiana in 2001; the ILRC then provided financial support to extend the projects statewide. Data and insights from these two projects provided the technical foundation for development of the Land Use in Central Indiana model (LUCI) and shaped the types of policy options and scenarios for users of the model to explore. Key elements of each project are summarized in Table 6.2.

The level of collaboration across projects varied, with greater stakeholder input on the research design for the smart growth audit and on development of the LUCI model than on the methodology for the land cover change project. The ILRC and the ILUC focused the research by identifying policy issues and research needs, reviewing research design and templates for data collection and analysis, evaluating model output, testing and debugging the LUCI model, and deciding how to disseminate and use the findings. This collaboration was especially important in the early phases of implementation because it led to a sense of shared understanding of the problems and, more important, of trust that collaborators were committed to common efforts. As stakeholders contributed to the research design, for example, their suspicions that the work was being done to advance a particular point of view diminished, and they became more accepting of the idea that the research would produce information useful for all stakeholders.

Land Cover Change Project

Concern about the preservation of agricultural land in Indiana manifested in 1997 with the formation, by executive order, of the Hoosier Farmland Preservation Task Force (see Table 6.1). Although the task force described the loss of farmland in its 1999 report to the governor, questions remained about the rate and spatial distribution of lost farmland and about the role of urban development in contributing to such loss. The ILRC was authorized to collect additional information about Indiana's land resources. Center faculty and staff recognized that the conversion of agricultural land to other uses could be best understood in the broader context of urban development and other land use changes, and that satellite imagery could track land cover changes. Hence, internal resources were allocated from general foundation support to develop a time-series database of changes in land cover/land use in Central Indiana, which also supported development of the LUCI model.

The Center discussed these plans with ILRC members to illustrate how the database would provide information helpful to the ILRC, particularly in their compiling data on land resources. Hot-button issues in the state concerned the rate of agricultural land loss and the extent to which urban development caused it. It became clear that this research could help inform the debate over these issues, and ILRC members voiced support for the initiative.

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Table 6.2

Three major collaborative projects on land use in Central Indiana

	Land cover change project	Planning inventory and smart growth audit	Land Use in Central Indiana (LUCI) model
Objective	Document land cover change between 1985 and 2000 in Central Indiana and balance of state. Create data foundation for LUCI model	Inventory county and municipal plan commissions in Central Indiana and balance of state. Assess comprehensive plans. Assess subdivision regulations	Develop model for predicting effects of policy choices on regional land use patterns
Collaborators	ILRC: Funded balance of state analyses ILUC: Supported project to document loss of farmland	ILRC: Funded balance of state inventory ILUC: Helped develop smart growth template	ILRC: Input on structure of model and policy scenarios ILUC: Input on structure of model and policy scenarios
Scope	Central Indiana and state. Scalable, spatial database for analyzing change in 16 categories of land cover	Central Indiana and state inventory: all counties and municipalities over 2,500. Audit: 35 counties and 50 municipalities	Central Indiana Bureau of Economic Analysis region: 44 counties,17,369 square miles. 18 policy options
Data	Landsat Thematic Mapper and Enhanced Thematic Mapper Plus satellite imagery for 1985, 1993, and 2000, 30 meter^2 resolution	Comprehensive plans. Subdivision regulations. Smart growth templates	Satellite imagery, census data, farmland, wetlands, riparian buffers, slopes, sewer and water, tax rates, school test scores, and employment
Technical methods	Computer-based, unsupervised classification of imagery with manual checking; GIS integration of databases	Professional judgment. Intercoder reliability assessments	GIS to integrate databases. Logistic regression to estimate aggregate discrete choice model. Programming in Visual Basic

(*continued*)

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	Land cover change project	Planning inventory and smart growth audit	Land Use in Central Indiana (LUCI) model
People	Faculty: 1 @ 0.25 FTE for 1.25 years. Students: 2 @ 20 hours/week for 10 weeks	Faculty guidance Staff supervision: 1 @ 0.5 FTE for one year; 1 @ 0.3 FTE for one year. Students: 3.5 @ 20 hours/week for one year. Staff support (clerical, editing)	Faculty: 1 @ 0.5 FTE for four years. Students: 1 @ 20 hours/week for ten months; 1 @ 20 hours/week for five months. Staff support
Resources	Center: $20,000 ILRC: $30,000	Center: $90,000 ILRC grant: $9,900	Center: $200,000
Outcomes	Land cover change database. Center issue brief. ILRC newsletter articles. AAG and Indiana GIS conferences. Journal article submittals. Student gained experience in GIS and remote sensing. Better understanding of rates of urbanization and loss of agricultural land	Three Center issue briefs. ILRC newsletter articles. ACSP, APA, IPA conference presentations. Local use of templates. Students gained research experience, coauthored issue briefs, and gave talks at IPA conference. Better understanding of scope of planning in Indiana and obstacles to implementing smart growth	LUCI model and Web site. Center issue brief; ACSP, IPA conference talks. 17 regional seminars. Students gained GIS experience. Metropolitan Planning Organization evaluation of census urbanized areas. Two sponsored applications: watershed land use change ($27,000), and transportation planning ($48,000). *Public Works Management and Policy* article

Note: FTE = full-time equivalent.

The primary objectives of the project were to produce a scalable, spatial database that would permit planners to query for data on land cover change at local to regional scales; to provide a series of visual images of land cover change that would enable the ILRC, the Center, ILUC, and others to inform the public about patterns and processes of land cover change; and to provide data for development of LUCI (Table 6.2). Analytic work began in fall 2000 with the acquisition of sixteen satellite images of the forty-four-county study region from the Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper Plus (ETM+) remote sensing system, in the mid-1980s, early 1990s, and 2000–2001. Modeling approaches using the geographic information system (GIS) were applied to categorize image pixels into one of sixteen land

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cover classes. These categories then were collapsed into eight more general categories for purposes of analysis, and the resulting maps were compared with one another to produce estimates of land use conversion. After seeing the initial results in spring 2001 and discussing their implications, the ILRC commissioned the Center to extend the analyses statewide.

The Central Indiana results show that rates of conversion from agricultural and forested land to developed cover are substantial (Figure 6.1) and are greater than rates of population change. Agricultural and herbaceous land (e.g., grassland) accounted for approximately 80 percent of all land converted to urban use between 1985 and 2000. Most of the remaining converted land had at one time been forested. In general, more land was changed to urban use in counties that already had higher proportions of urban use. While the analyses show clearly that substantial areas of agricultural land have been transformed, it is difficult to determine exact amounts because cover in the categories of agricultural and herbaceous land can change over time, depending on cropping practices.

Developing the land cover change database required about sixteen months of effort by a faculty member and two graduate student assistants from the IUPUI Department of Geography, who gained valuable experience in the interpretation of remotely sensed data. The total cost of the work for Central Indiana was approximately $20,000, while the costs for the balance of the state were $30,000, bringing the total to about $50,000. The greatest challenge in this research was interpreting results and relating findings to those of other studies and databases on lost agricultural land. Some stakeholders have found it difficult to understand and accept that there may be many reasons for a rate of agricultural land loss. It is possible also that a rate amount depends on how it is measured. Few technical challenges were encountered in this research because standard techniques were used in the analyses.

Inventory and Assessment of Planning Practices

Indiana has 92 counties and more than 550 municipalities. Planning is not required at the local level, and since the demise of the State Planning Services Agency, no state organization has had responsibility for tracking or monitoring local planning activity. Hence, at the time the ILRC was established, no centralized source of information about the scope of planning in Indiana existed in state government, although the Indiana Planning Association did maintain a list of plan commissions. The Center realized that information about planning methods would be helpful for the ILRC in meeting its statutory mandate. Basic data from an inventory of planning institutions were a prerequisite to undertaking more detailed investigations into planning prac-

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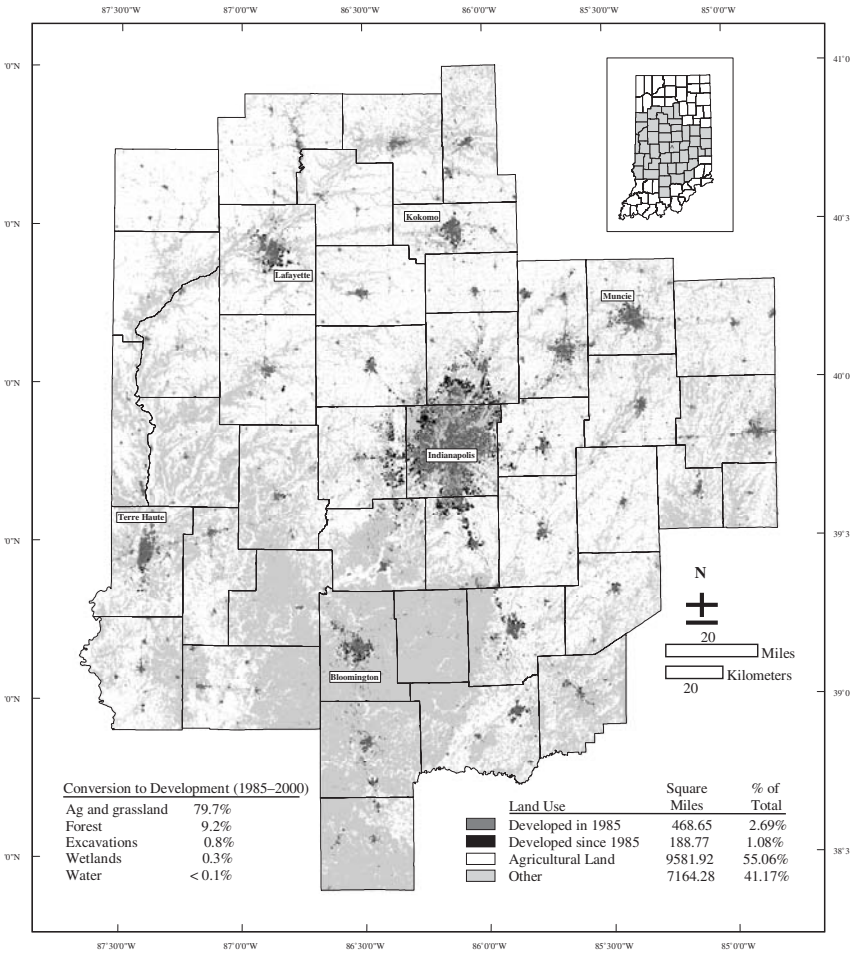
Figure 6.1 **Simplified land use change map of Central Indiana study region (1985–2000)**



tices. First inventoried were the planning practices in the 44-county Central Indiana region, which determined that 35 counties and 47 of 51 municipalities with populations of more than 2,500 that do not participate in a county plan commission had adopted comprehensive plans and had in place zoning ordinances and subdivision regulations.

Following this inventory, the Center met frequently with stakeholders from ILUC, ILRC, and other organizations to develop templates to guide audits of comprehensive plans, zoning ordinances, and subdivision regulations. Although the explicit purpose of the meetings was to fine tool the templates, an

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implicit objective was to build trust among stakeholders with different views on land use issues. Some stakeholders representing development interests were suspicious of smart growth and considered it a euphemism for regulation; they doubted the objectivity of smart growth research. Over time, however, participants came to realize that the proposed research could inform local choices, not justify preordained political positions.

The final templates, which were comparable with those used in a similar project in Illinois, addressed six principles of sustainable development (Berke and Conroy 2000, 21), eleven principles of smart growth, and other issues important to Indiana policy makers. For example, the audit of comprehensive plans addressed such smart growth tenets as compact urban form, maximizing use of existing infrastructure, providing variety and choice in housing, establishing a balanced multimodal transportation system, improving development review processes by increasing flexibility, and creating mixed-use, walkable neighborhoods—and other smart growth features. The audit of regulatory tools included a review of such innovative development and infrastructure standards as shorter setbacks, maximum lot sizes/minimum densities, reduced parking requirements, narrower street widths and pedestrian easements; restrictions on use of agricultural land and sensitive environmental areas such as wetlands, floodplains, and steep slopes; and provisions to encourage traditional neighborhood design. The templates were used to guide smart growth audits of planning tools used by Central Indiana counties and municipalities. To complete the audits, research assistants read, interpreted, and coded each comprehensive plan, zoning ordinance, and subdivision regulation. The students coauthored the Center reports on this work and presented them at planning conferences.

The research showed that counties and municipalities cooperate, but few jurisdictions have integrated smart growth principles into their planning documents. Most Indiana local governments rely on traditional regulatory requirements that, in many cases, have the potential to actually contribute to sprawl. For example, county governments, on average, adopted only 16 percent of the seventy-five specific development controls that were assessed, and only 22 percent of the counties adopted 20 percent or more of these controls. And, despite the state's focus on farmland preservation throughout the 1990s, only two counties use agricultural zoning for farmland protection. Following completion of the inventory, the ILRC commissioned the Center to extend the inventory statewide.

The inventory and smart growth audit took about three months for two Center researchers and required about fifteen months of work by four graduate students, who shared responsibility for reading and assessing the planning tools. A faculty member helped conceptualize and supervise the work,

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the costs of which totaled about $90,000. The costs for the inventory of the balance of the state were $9,900, bringing the total to more than $100,000, since this estimate does not include costs for faculty supervision or clerical and editorial staff assistance.

Challenges in completing the audit included convincing stakeholders that results were not predetermined, developing the templates used to assess the planning tools, obtaining the planning documents, and ensuring consistency in evaluation. As stakeholders' understanding of the research grew, their trust in the process also increased, and, by critiquing drafts, they played a critical role in developing the templates. Obtaining documents for their review was a problem because several communities had only single original copies and were unable or unwilling to duplicate them. Several community visits were required to complete the audits. Finally, to ensure consistency in evaluation and minimize error associated with interpreting by analysis, a subset of each type of document was read and coded twice. Potential variation associated with coding decisions was documented, and it was determined that differences stemming from interpretation were minimal.

The Land Use in Central Indiana Model

In fall 1999, as the Center developed its research agenda on investment in Central Indiana and continued conversations with members of ILUC, it became clear that there was substantial interest in developing a model to predict changes in land use (Tables 6.1, 6.2). The Center leaders decided to support development of the model, and intensive work on it commenced in early 2000. Version 1.0 was released in May of 2003.

The LUCI model predicts the probability of conversion of nondeveloped land to residential use in 17,369 one-square-mile grid cells in Central Indiana. It uses aggregated logistic regression to estimate a discrete choice model for the conversion of land from nonurban to urban use. Data from the land cover change project provide the foundation for the LUCI model. Independent variables in predicting development include proximity to existing development; accessibility to employment by zip code; the location of transportation, water, and sewer infrastructure; and school district standardized test scores.

The LUCI model was designed to be utilized by policy makers and citizens, not just planners and other experts with training in modeling. In addition, as part of a strategy to maximize use, the model was planned from the outset to be freely available to potential users, who can manipulate eighteen policy variables to construct different scenarios. Because the purpose of the model is to illustrate the effects of policy choices on development patterns,

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results from any given scenario always are juxtaposed and compared with a current-trends or a user-specified scenario. Output is available in both map and tabular format; the latter includes dozens of statistics ranging from acres of agricultural land and wetlands that were developed, to increases in the average commuting time. The current-trends scenario indicates that substantial amounts of land will be converted to urban use by 2040 (Figure 6.2).

From conception to completion, the development of LUCI took more than two years for its creator and required the support of two research assistants who helped build databases necessary for estimation of the model. One graduate student of planning collected and digitized information on the areas provided with water and sewer service from all of the utilities in Central Indiana. A geography graduate student was responsible for assembling many of the layers of GIS data required for the model. Both gained valuable experience in the application and use of GIS. Costs for the project are difficult to estimate because LUCI's creator devoted much of his discretionary research time to the project. Direct labor costs to the Center, which account for a substantial portion of total costs, have been more than $200,000.

Development of the LUCI model presented a number of challenges, ranging from data assembly to explanation of the structure of the model to stakeholders who had no background or basis for conceptualizing it. For example, since there is no centralized source in Indiana for information about the availability of water and sewer service, all utility providers in the region had to be contacted, then service regions were digitized. The model and its potential value in informing policy decisions was explained to stakeholders. Although participants generally indicated support for efforts to develop the model, they did not always understand it or thought that it might have little practical value. Their support clearly increased after working versions of the tool became available and its capacity to inform policy debates became evident.

The Nature of Collaboration

Community-based research at academic institutions is closely related to the paradigm of action research and related approaches that aim both to contribute to social science and to develop solutions to practical problems in ways consistent with community and academic values (Rappaport 1970; see also Stringer 1999). Community-based research is informed by and initiated in response to priorities and needs identified by people within the communities that are served (Bringle and Hatcher 2002; Strand 2000). It is, therefore, collaborative and action-oriented, with an explicit objective of social change. An inherent challenge in community-based research is the need to build trust and effective working relationships among collaborators.

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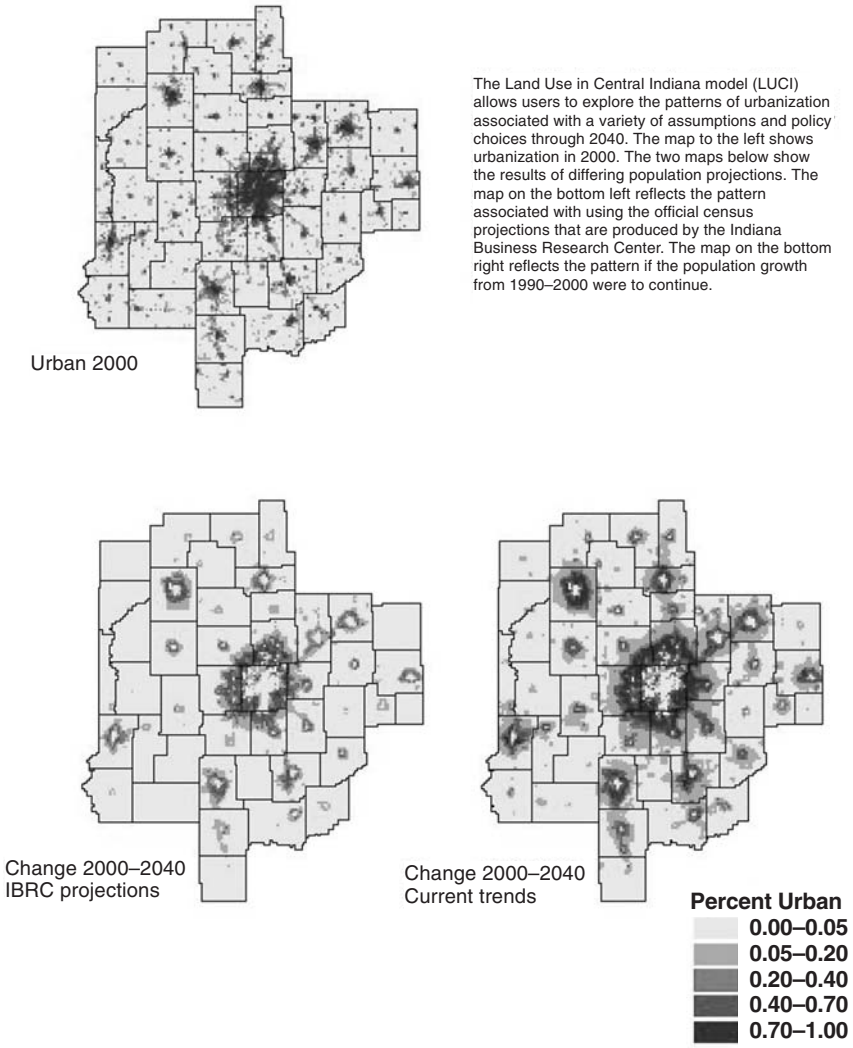
Figure 6.2 **LUCI forecasts of conversion of land to urban uses, 2000–2040**



The Land Use in Central Indiana model (LUCI) allows users to explore the patterns of urbanization associated with a variety of assumptions and policy choices through 2040. The map to the left shows urbanization in 2000. The two maps below show the results of differing population projections. The map on the bottom left reflects the pattern associated with using the official census projections that are produced by the Indiana Business Research Center. The map on the bottom right reflects the pattern if the population growth from 1990–2000 were to continue.

From the perspective of social science, this collaboration has tackled the broad academic problems of describing and explaining land use change, assessing local use of planning tools to encourage smart growth, and forecasting regional patterns of development. As an example of community-based research, this collaboration has attempted to address the practical problems of managing land resources in Central Indiana and of educating planning practitioners and decision makers in the region. This collaboration has been

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successful primarily because all partners have come to believe that the research is designed to inform the policy-making process, not to dictate or prescribe particular solutions.

In general, practitioners are skilled at identifying problems, but they sometimes need assistance in conceptualizing solutions or specifying the information required to solve a problem. Conversely, researchers at universities excel at producing knowledge, but sometimes they fail to ask questions of greatest relevance to practitioners responsible for solving problems. This collaboration has built on the participants' respective strengths and has overcome these potential weaknesses through joint problem definition and research design. In the case of the smart growth audit, Center researchers worked with the ILRC, ILUC, and other stakeholders to refine the templates used to assess planning tools prior to the audit. Because stakeholders agreed on the items in the templates, they subsequently did not complain that different items should have been assessed, and they generally interpreted results in the same way. In addition, researchers learned of nuances in local planning tools and increased the relevance of their work. Similarly, during the construction of the LUCI model, its creator periodically asked practitioners to work with iterations of the model and then revised the structure of the model to pay attention to their concerns and incorporate their suggestions. Certain features of the model, including policy options used to construct alternative scenarios, were included because of stakeholder input. These collaborative efforts have resulted in mutual learning, increased both the relevance and quality of the social science, and have been essential to achieving project outcomes.

Outcomes

The collaborations have resulted in increased knowledge and better understanding of the land resources in Central Indiana, current local approaches to managing land use, and policy options for managing future land use. Specific outcomes have included databases, conference presentations and seminars, publications (see Central Indiana Bibliography, below), a computerized planning tool, new contract research, and continuing dialogue among a broader set of stakeholders (Table 6.2). Students have gained valuable professional experience in the use of GIS and remote sensing technologies, and in the design, conduct, publication, and presentation of evaluative research.

This project to understand the dynamics of land use change has produced a scalable spatial database in the region that, with financial support from the ILRC, has been extended statewide. The ILRC's willingness to fund the expansion of the work is evidence of its practical value. Among other applica-

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tions, a work group comprised of representatives from state agencies and stakeholder organizations is using this database to deepen understanding of the rate of agricultural land loss in Indiana. Members of the work group now have a better understanding of the strengths and weaknesses of different databases and why they produce varying estimates of land use change; they have learned that complementary measures provide greater insight into the scope and patterns of the problem.

The smart growth audit provides a factual basis for debates over the merits of current planning practice and an approach that local planners can adapt for updating and modernizing existing planning tools. Planners from several communities responsible for updating zoning ordinances and subdivision regulations have used the template to guide discussions with local planning commissions about proposed regulation changes. Legislators and interest groups have used the planning inventory to inform proposals for changes to state enabling legislation. Graduate students, who shared responsibility for reviewing documents, made especially important contributions to the audit.

The LUCI model, which is built upon a generalized version of the land use change database, perhaps has yielded the most tangible outcomes. Activities associated with the release of the LUCI model included a set of seminars for planners and academics in universities in each of the six metropolitan areas in Central Indiana as well as a number of demonstrations for other agencies and stakeholders. The *Indianapolis Star* carried a feature article about the release of the LUCI model in May 2003, and more than eighty people downloaded the model from the LUCI Web site on the day the article was published. The Metropolitan Planning Organization in Indianapolis used output from a beta version of LUCI to assess preliminary U.S. Census designations of urbanized areas, and the Center has been contracted to use the LUCI model in two projects in the region. A Center project for USFilter, the firm that manages water utility services in Indianapolis, and IUPUI's Center for Earth and Environmental Science involves forecasting land use change in the watersheds of three reservoirs that provide drinking water for the city and its suburbs. A project for the Indiana Department of Transportation involves development of a customized, nine-county version of the model (LUCI-T) that will be used to generate population and employment forecasts for use in transportation models. These applications are evidence of the model's practical value, which was enhanced in large part by input from practitioners. The collaborative efforts have paid off with a tool that people are using to inform themselves of land use decisions.

The three primary products of the collaboration—the land cover change database, the smart growth audit, and the LUCI model—were not produced to meet specific goals established by the Center when it received support for

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its initiative on investment in Central Indiana. Nor were these products commissioned by a community client. Instead, they are the result of decisions made during the collaborative process to address explicit needs for information and tools to improve management of land resources in the state, and they illustrate the incremental and adaptive nature of such a process.

The key challenges in the process were to develop a shared understanding of the need for new information and tools and to overcome skepticism that academic research can lead to better policy and practice. For example, the members of the ILRC knew they needed information about land resources and planning practices to fulfill their statutory mandates to educate and provide technical assistance, but they had few resources and were uncertain how to collect data. Similarly, members of the ILUC knew that information about the likely consequences of alternative planning policies could inform debates over planning at the local level, but none envisioned a GIS-based computer model that could illustrate graphically and statistically the implications of policy choices. Center researchers understood how these databases and computerized models could be developed, but needed better understanding of the policy context in order to develop the most relevant products. These challenges were met through communication and an ongoing dialogue about the rationale for alternative strategies for meeting needs. This dialogue led to trust and a shared understanding of priorities that, in turn, resulted in tangible products and a deeper commitment to continue collaborating.

Conclusion

This work on land use in Central Indiana reflects IUPUI's mission of civic engagement and SPEA's and the Center's commitments to applied research that addresses problems facing the people of the region and state. The work can be distinguished from other initiatives by its scope and longevity. The projects included both the assessment of a resource base and the development of tools for evaluating alternative approaches to manage the resource. It has required application of sophisticated knowledge of remote sensing and GIS technologies, statistical modeling, and policy analysis. The work also has been enduring, continuing for more than four years, which has been possible because of the commitment of key individuals willing to invest substantial time and resources in anticipation of potential outcomes.

The general process used to accomplish this work could be replicated elsewhere, depending on the availability of financial resources. The crucial element of the collaboration has been commitment: the willingness of people from the Center, ILRC, and ILUC to invest in a process based on simple faith

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that shared efforts will result in social change. Researchers and stakeholders elsewhere can replicate this process by incorporating stakeholder input in research design, accepting that problems typically are more complex than they appear, and accepting that time is required to build trust. Such a collaborative process can provide many meaningful opportunities for students to learn about both research and practice.

The Center's projects have required substantial resources that were not available in the public sector in Indiana. Total estimated costs for Center personnel's time exceeds $400,000. The Center has been able to undertake these initiatives only because of a generous award from a private foundation. Depending on the availability of funds from either public or philanthropic sectors elsewhere, university-community partners may have to adjust initiatives.

This collaboration has resulted in a number of related projects and will continue in the future as people work together to improve management of land resources in the state. As initiatives evolve to make Indiana a more hospitable place for planning, university-community partnership will be a necessary, although not a sufficient, condition for success.

Notes

1. See www.indianalanduse.org.
2. See www.in.gov/legislative.

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