

UNIVERSITY OF CINCINNATI

MAY 15, 2003

I, YANA B. YABLONOVSKAYA,

hereby submit this as part of the requirements for the degree of:
MASTER OF COMMUNITY PLANNING

in COLLEGE OF DESIGN, ARCHITECTURE, ART, AND
PLANNING

It is entitled _____

"INTERSTATE HIGHWAY IMPACTS ON URBAN
NEIGHBORHOODS: AN EVALUATION FRAMEWORK"

Approved by:

MICHAEL C. ROMANDS, CHAIR:

ROGER BARRY, FACULTY MEMBER:

CHARLES ELLISON, READER:

INTERSTATE HIGHWAY IMPACTS ON URBAN NEIGHBORHOODS:
AN EVALUATION FRAMEWORK

A thesis submitted to the

Division of Research and Advanced Studies
of the University of Cincinnati

in partial fulfillment of the
requirements for the degree of

MASTER OF COMMUNITY PLANNING

in the School of Planning
of the College of Design, Architecture, Art, and Planning

2003

by

Yana B. Yablonovskaya

B.S., University of Maryland University College, 2000
M.S., Irkutsk State University, Russia, 2001

Committee Chair: Michael C. Romanos

UMI Number: EP26354

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

UMI®

UMI Microform EP26354

Copyright 2009 by ProQuest LLC.

All rights reserved. This microform edition is protected against unauthorized copying under Title 17, United States Code.

ProQuest LLC
789 E. Eisenhower Parkway
PO Box 1346
Ann Arbor, MI 48106-1346

ABSTRACT

Urban extensions of interstate highways dramatically affect inner-city neighborhoods and communities. The available literature describes a wide range of impacts, both positive and negative in nature. Different studies have been performed in order to measure these impacts and determine the range of urban problems caused by interstate highways. The focuses of these studies vary dramatically, from social effects to economic and land use effects. However, rarely do researchers provide a comprehensive view of these effects by creating taxonomies of highway impacts and of the appropriate methods employed for their evaluation.

In this paper, I attempt to create a framework for the evaluation of interstate highway impacts on urban neighborhoods in order to demonstrate how the problem can be approached in a new generalized and flexible way. This framework contains two major parts: taxonomy of impacts and methods for measuring these impacts. These two parts of the framework are interrelated. Further, I demonstrate the relationships that exist within these parts, i.e. the linkages among types of impacts and the linkages among methods. The framework as a whole is a key to understanding of the nature of highway impacts and evaluation methods.

In this thesis I complete these interrelated tasks with regard to the impacts of interstate highways on urban neighborhoods. First, I provide an overview of these impacts according to a taxonomy I developed. Then, I review selected methodologies that

researchers use for assessing these impacts. Finally, I develop a methodological framework for evaluation of the impacts of highways on urban neighborhoods. This thesis is a methodological review, and the goal of my research was to develop an analytical framework that would address the problem of highway impacts in a comprehensive way.

ACNOWLEDGEMENTS

I would like to thank Professor Michael C. Romanos for providing me with assistance in preparing this project. His professionalism, experience, and willingness to help greatly contributed to the success of the project. I deeply appreciate his support and guidance.

Also, I wish to thank Professor Roger Barry and Professor Charles Ellison for their support during the course of project preparation. I appreciate their contribution and understanding.

TABLE OF CONTENTS

I. INTRODUCTION.....	1
II. PROBLEM STATEMENT	6
III. LITERATURE REVIEW.....	8
3.1 Brief History of the Interstate Highway System.....	8
3.2 Important Definitions.....	12
3.3 Highways in Urban and Suburban Areas.....	14
3.4 Impacts of Urban Extensions of Interstate Highways: General Themes	15
3.4.1. Social Aspects.....	16
3.4.2. Residential Mobility.....	16
3.4.3. Accessibility.....	18
3.4.4. Externalities	18
IV. IMPACTS OF HIGHWAYS ON URBAN NEIGHBORHOODS.....	21
4.1 Introduction.....	21
4.2 Taxonomy of Highway Impacts on Urban Neighborhoods.....	22
4.3 Impacts of Highways on Urban Households	25
4.3.1. Residential Linkages.....	26
4.3.2. Travel Patterns	27
4.3.3. Walking Trips	31

4.4 Impacts of Highways on Neighborhood Image, Identity, and Perception.....	33
4.4.1. The Problem of Intangibility of Image, Identity, and Perception.....	33
4.4.2. Definition of Image.....	35
4.4.3. Definition of Perception.....	38
4.4.4. Definition of Identity	38
4.4.5. Importance of Neighborhood Image, Perception, and Identity.....	40
4.4.6. Highways and Image, Perception, and Identity	41
4.5 Impacts of Highways on Neighborhood Amenities.....	44
4.5.1. Definition of an Amenity	44
4.5.2. Types of Highway Impacts on Neighborhood Amenities.....	48
4.5 Impacts of Highways on Neighborhood Economy	52
4.5.1. Neighborhood as a Unit of Economic Analysis.....	52
4.5.2. Impacts on Neighborhood Business District (NBD)	54
4.5.3. Impacts on Housing Values	61
4.5.4. Impacts on Land Values.....	64
4.5.5. Impacts on Employment	65
4.6 Impacts of Highways on Neighborhood Visual Characteristics.....	67
4.6.1. Functional Impacts vs. Visual Impacts	67
4.6.2. The Importance of Visual Characteristics of the Neighborhood	68
4.6.3. Location of the Highway in Relation to the Neighborhood Boundaries and Its Land Uses as Determinant of Impact.....	69
4.6.4. Highway Design as Determinant of Impact.....	70
4.7 Impacts on Quality of Life.....	73

4.7.2. Reasons for Discussing Quality of Life	74
4.7.3. Highway Impacts on Quality of Life	75
4.7.4. The Place of Quality of Life Framework in the Thesis	76
V. METHODS FOR EVALUATING IMPACTS OF HIGHWAYS ON URBAN NEIGHBORHOODS.....	79
5.1 Introduction.....	79
5.2 Classification of Approaches for Highway Impact Evaluation	80
5.2.1. Evaluation of Future Impacts.....	81
5.2.2. Evaluation of Impacts After Construction	82
5.2.3. Evaluation of Impacts Before- and After-Construction.....	83
5.3 Quantitative and Conceptual Tools for Evaluation of Highway Impacts	84
5.3.1. Quantitative Tools: Regression.....	85
5.3.2. Quantitative Tools: Factor Analysis	87
5.3.3. Conceptual Tools: Quality-of-Life Model	90
5.3.4. Conceptual Tools: Measuring Residential Land Values with “Base Year vs. Hypothetical Scenario” Method.....	92
5.3.5. Conceptual Tools: Hedonic Price Model for Housing Values.....	94
5.4. Conclusion	98
VI. CONCLUSION.....	100
BIBLIOGRAPHY	104

LIST OF FIGURES

Figure 5.1. Relationship Among Approaches to Impact Evaluation, Quantitative Tools, and Conceptual Tools	98
Figure 6.1. Framework for Evaluation of Interstate Highway Impacts on Urban Neighborhoods	102

I. INTRODUCTION

In this thesis I analyze the impacts of interstate highways on urban neighborhoods. The range of the impacts discussed in the literature is very wide, from social to economic and environmental. First, I provide an overview of these impacts according to a taxonomy I developed. Then, I review selected methodologies that researchers used for assessing these impacts. Finally, I develop a methodological framework for evaluation of the impacts of highways on urban neighborhoods. This thesis is a methodological review, and the goal of my research was to develop an analytical framework that would address the problem of highway impacts in a comprehensive way.

The system of interstate highways is a product of unique planning efforts and practices at the regional and national level in the United States. Despite the lack of regional planning in the country in general, the U.S. has “large, highly developed, complicated metropolitan regions” and the example of “the only type of forceful, heavily funded regional planning that occurred over the past 60 years” – the construction of the system of interstates (Ellis 2001, 247).

Interstates became an expression of the American character, an expression of mobility and freedom. The importance of the highways in American life cannot be underestimated. There is need to admit that the overall goal of this tremendous project was achieved: the states were connected by the road network, the demand for increasing

mobility and automobile use was largely met, and the economy of the country received a significant push to prosper. The impact on the country's economy was very profound: the costs of moving goods within the country substantially decreased, less expensive land became available for development, manufacturing efficiency increased and warehousing costs decreased due to the emergence of the possibility of "just-in-time" delivery, and interregional access allowed to create a genuine domestic market with companies that supply their products to larger geographical areas. As a result, labor and capital in the economy became more efficient, and that lead to increased productivity, business expansion, emergence of new businesses, and creation of new jobs along with population growth (Cox and Love 1996, 8-10).

On the international scale, the United States is the world leader in super-highways among the developed countries. Virtually all major urban areas in America are connected to each other, but this is not the case for Western European countries, Canada, or Australia. Again, this brings about a substantial impact on the competitiveness in international trade, since this connectivity directly relates to lower manufacturing and distribution costs and thus makes U.S. products more competitive on the world market (Cox and Love 1996, 11).

Interstate highways also played a major role in reshaping American cities and, more importantly, American way of life. The highways became "a stage on which a great drama [was] played out of contradictions that accounts for so much of the history of this century. On this stage we see all ... fantasies and fears, ... social ideals and racial

divisions, ... middle class aspirations and underclass realities” (Lewis 1997, ix). The system connects American cities and people by roads that carry the life of the nation; “yet to build it, tens of thousands of Americans were dispossessed of their land and saw their homes and neighborhoods destroyed” (Lewis 1997, ix).

The issue of the evaluation of the impacts of the interstate highways is two-fold. First, there is a need to look at the initial goals behind the construction of the interstates: connecting the states and metropolitan regions, providing infrastructure for defense purposes, and increasing mobility of goods and people. Second, it is very important to consider the effects on urban settlements brought by urban extensions of the highways. The system of interstate highways brought both positive and negative effects to American society. Among the great number of positive outcomes, as already mentioned above, are the economic development of suburbs and increased accessibility of land. The negative effects include sprawl, ruined inner city neighborhoods, and increased racial segregation. At one extreme end of the spectrum are urban blight and destroyed social fabric of old neighborhoods; on the other side are increased mobility and lower residential density. This controversy concerning the effects of highways on America also exists in the literature¹. Different methodologies for indicating and evaluating these effects are offered by researchers in the fields of planning, transportation engineering, and social science. The problems that they discuss are multi-dimensional: there are many perspectives from which the issues of highways and their influence are approached.

¹ Baumbach and Borah (1981), Caffrey (1970), Chernoff (1976), and Dansereau (1965), among many others, stress negative aspects of highways in relation to urban neighborhoods. On the other hand, Gable and Davinroy (1978) argue that impacts are more beneficial.

The literature indicates that negative effects of highways on inner-city communities are mostly indirect in the sense that not the highways themselves caused urban neighborhoods to deteriorate, but the direct impacts of the interstates that went through cities influenced the development of negative outcomes that are widely experienced today by American cities. When the highways were planned, rarely did the engineers and planners consider these indirect effects. At the same time, they are as important and significant as the accomplishments of the interstates.

The notation “direct” and “indirect” impacts may seem slightly confusing, since it mostly depends on an individual’s perception what to consider as direct or indirect. However, I present a clear distinction between direct and indirect impacts throughout my thesis when I discuss the immediate influence of highways on neighborhoods (destruction of housing, amenities, and businesses by a transportation facility) as opposed to secondary impacts, which appear as the results of the physical destruction. At the same time, there is a need to admit that it is not always easy to determine what highway impacts serve as initial, or direct, and what impacts are of second order, or indirect. One has to consider cause/result relationship among impacts very carefully.

Also, I want to stress the importance of two highway parameters on direct and indirect impacts: highway design (elevation and the number of lanes) and the presence or absence of exits and entrances to and from a neighborhood. The elevation of a highway and exits and entrances are discussed in Chapter IV in detail; however, I do not discuss the number

of lanes as a factor that determines the nature and degree of impacts, since the literature reviewed does not elaborate on the impacts of this highway parameter. I believe that more thorough research should be performed in order to determine the influence of the number of lanes of a highway on neighborhoods.

The goal of my thesis is to explore the range of impacts of urban extensions of interstate highways on urban neighborhoods, provide a classification of these impacts and review the methodologies for evaluating the impacts. Dansereau (1965) argued that even the narrow framework for evaluation of highway-community relationships would not be able to consider a wide range of economic and social impacts (Dansereau 1965, 76). Even though it would be correct to admit that it is impossible to analyze those impacts in detail within the scope of a Master's thesis, the provision of the analytical framework that would consider the majority of highway impacts and the methods for their evaluation appears to be an attainable task.

II. PROBLEM STATEMENT

Urban extensions of interstate highways dramatically affected inner-city neighborhoods and communities. The literature of different time periods describes a wide range of impacts, both of positive and negative in nature. The increased accessibility of suburbs for housing development and the movement of employers beyond city boundaries along with the post-World War II population increase and the affordability of automobiles caused urban population to seek new, affordable, and larger housing in the suburbs and become employed by the companies located outside of the urban core. As a result of these transformations, central cities and inner-city neighborhoods began losing population and experiencing the decline of business and social activities. The inner-city residents that remained in these neighborhoods were those who could not afford to move due to low income, and the flight of middle- and high-income residents to suburbs dramatically increased racial and income segregation, as well as contributed to physical and social deterioration of urban neighborhoods.

In addition, the issue of physical destruction and transformation of neighborhood land uses that resulted from highway right-of-way clearing very negatively affected neighborhood fabric, local businesses, and housing stock. These negative impacts of highways on urban neighborhoods are virtually the same for every big city in the United States. Different studies were performed in order to measure these impacts and determine the range of urban problems caused by interstate highways. The focuses of the studies

differ dramatically from social effects to land use effects. At the same time, rarely do researchers attempt to provide a comprehensive view on the problem by creating taxonomy of the highway impacts along with the overview of methods for the evaluation of highway construction impacts. Despite the fact that the problem of highway impacts is neither new nor under-researched, no authors attempt to provide a framework for the evaluation of these impacts.

Therefore, I attempt to create a framework for evaluation of interstate highway impacts on urban neighborhoods in order to demonstrate how the problem can be approached in a new generalized and flexible way. The framework contains two major parts: taxonomy of impacts and methods for measuring these impacts. The parts of the framework are interrelated. In addition, I demonstrate the relationships that exist within these parts, i.e. the linkages among the kinds of impacts and the linkages among the methods. The framework as a whole is a key to understanding of the nature of highway impacts and evaluation methods.

III. LITERATURE REVIEW

3.1 Brief History of the Interstate Highway System

To consider that the creation of Interstate Highway System began with President Eisenhower's signature under the Federal Aid-Highway Act of 1956 is to make a mistake of overlooking at least half of the interstate's history. The actual story needs to talk about the events and processes that caused this Act to be signed. Some literature starts telling the story from the introduction of the mass-produced automobile by Henry Ford in the 1920s (Lewis 1997; Cox and Love 1996; Altshuler 1979). Not only did the low-cost automobiles serve as one of the reasons for the development of freeways; along with the "rapid growth of automobility and paved roads," such factors as decline of road construction costs due to mechanization, increases of household income after World War II, increased home ownership, and rapid population growth served as a basis for increasing demand for roads constructed by municipalities and county jurisdictions (Altshuler 1979, 66-67).

The Great Depression, however, reversed the situation: local governments were no longer able to fully finance road construction and it became the prerogative of the federal government (Altshuler 1979, 69). In addition, the Federal-Aid Highway Act of 1921 "made real the idea of a national road system" by funding federal roads with an average of \$75 million a year and designating each state to build seven percent of its roads to be linked with other states (Lewis 1997, 18). The Federal Aid Highway Act of 1925 created

U.S. Highway System, the world's first nationwide network of numbered highways. The system was created in response to confusion created by 250 or so named highways in the country, such as Lincoln Highway, the first named highway from New York to San Francisco. Instead of using names, this new system used uniform numbers and standardized, universally recognizable shields. The most important change, however, was that this new system was administered by the states but not by for-profit private road clubs that promoted their own routes in the early 1920s (*History of the US Highway System* 2002, 1-2).

The Depression increased highway funding as politicians saw the ultimate connection between employment and highway construction. In 1930, federal aid for highways was raised to \$125 million annually with addition of \$80 million in future federal finds (Lewis 1997, 22). The year of 1936 saw federal annual highway aid increase to \$225 million (Lewis 1997, 24). In the beginning of the 1940s, an automobile become an essential part of American life; over a decade from 1929 to 1939, the number of cars on the roads increased by 3 million (Lewis 1997, 45), and miles of travel by motor vehicles increased by 53 percent (St. Clair 1986, 15). The increase of cars and travel can be attributed to two main factors: first, automobiles became more affordable due to the decrease of manufacturing costs; second, the number of super-highways, or U.S. highways, in the country increased after the Act of 1925. By the early 1940s, the success of early super-highways, especially the Pennsylvania Turnpike, increased interest in developing a national toll road system (Cox and Love 1996, 3); consequently, the first approval of the interstate highway system by the Congress took place in 1944 (Cox and Love 1996, 3).

After World War II, new factors emerged that contributed to the increased interest and new policies in highway planning. These interrelated factors were GI Bill of Rights, development of new materials and building methods, increased mobility, and the beginning of Cold War era (Lewis 1997, 73-74; Cox and Love 1996, 3). GI Bill of Rights (or Serviceman's Readjustment Act) accounted for new rights and opportunities for those discharged from the military service at the end of the war. The Act aimed at providing educational opportunities and mortgage guarantees for new homes in suburban areas for the veterans. The problem of housing shortage was addressed by providing lower-cost housing at flexible terms, thus enabling many families to move to suburbs. New materials for construction and new building methods increased housing stock (e.g., Levittown). Educational opportunities allowed the veterans become qualified labor force and get better jobs. The availability of a low-cost automobile that caused increasing mobility of people along with new residential construction and with the movement of employers to the suburbs dramatically increased the demand for new highways, since the amount of traffic could not be handled by the existing roads (Lewis 1997, 82). In addition, the late 1940s brought about the end of World War II and the beginning of the Cold War, which provided the justification for national defense to propose a development of "a highway system to accommodate the quick and efficient movement of military equipment and personnel" (Cox and Love 1996, 3).

The Federal-Aid Highway Act of 1956 (also known as the Interstate Highway Act) displaced many of the U.S. routes originated after the Act of 1925 with divided Interstate

highways; some of the routes were eliminated, some shortened and replaced. Most of U.S. highways remained signed until their corresponding Interstate highway was completed. For example, the famous U.S. Route 66 was eliminated and replaced by I-15 and I-40 in 1972 (*History of the US Highway System* 2002, 4). Therefore, so-called U.S. highways (or routes), first named and then numbered, served as a basis for the creation of Interstate Highway System.

The Interstate Highway Act of 1956 was “a milestone in highway legislation” (St. Clair 1986, 160). This act made the National System of Interstate and Defense Highways possible: it authorized \$25 billion for twelve years to accelerate the construction, created Highway Trust Fund supported by increasing the federal tax on gas and diesel fuel from two to three cents, increased federal portion of construction costs to 90 percent, provided for advance acquisition of right-of-way, created building standards that would allow to handle projected amount of traffic for 1972, authorized 41,000 miles of highways (later the length was increased to 42,500 miles), and proclaimed the completion of the system in 1972 (Lewis 1997, 119-122; Cox and Love 1996, 5). The states became involved into construction very soon after the Act was signed; however, only 10,000 miles were completed by 1960, and by 1970, the total of 30,000 miles were open to traffic. As of 1980, 40,000 miles were complete. Even though some of the elements of the system are to be built, more than 42,700 miles of interstate highways serving 49 states are now completed (Cox and Love 1996, 10).

3.2 Important Definitions

Before starting the discussion about the influence of interstate highways on urban neighborhoods (communities within the urban area), there is a need to provide a set of definitions of the terms that I will be operating throughout my thesis very extensively. First of all, a *neighborhood* is defined as a residential area with similar social and economic characteristics (McLean and Adkins 1971, 96) and as a smallest unit in the social and political organization of the city (Park and McKenzie 1967, 7). At the same time, White (1987) argues that the term is “at once common and vague,” expressing the “physical reality” yet loaded with symbolism (White 1987, 2). *Community* is a term close to a *neighborhood* due to its feature of homogeneity; however, *community* usually “denotes common interests and values ... [and] need not be physically defined,” unlike a *neighborhood* (White 1987, 4). Moreover, *urban community* implies sentiments and attachments to a geographically-defined area and rests on social characteristics (White 1987, 4). Therefore, both *neighborhood* and *community* possess the characteristic of homogeneity, mainly of social and economic nature; the first term also brings about spatial characteristics while the second one reflects more social features. In my analysis, I use *neighborhood* more often than *community*; however, when the discussion becomes more centered around sociological issues, *community* appears to be a more proper term to operate with.

The terms *highways*, *expressways*, and *freeways* are often used as interchangeable concepts in the literature. *Expressway* is defined as a major arterial divided highway that

features two or more traffic lanes in each direction, with opposing traffic separated by a median strip; elimination of grade crossings; and controlled entries and exits (Creighton 1970, 94; Debroy 2002, 1). An expressway has smoothly flowing traffic, with no traffic lights or intersections (Debroy 2002, 1). McLean and Adkins define *freeway* as a limited-access highway having two or more lanes in each direction and a permanent median divider (McLean and Adkins 1971, 96). Therefore, there are four common features of expressways and freeways: two or more lanes in each direction, median divider, limited access (meaning special entries and exits), and no traffic lights; these features make the terms *expressways* and *freeways* synonymous, even though the American Association of Highway Officials tentatively adopted the term *expressway* rather than *freeway* (Creighton 1970, 94; Cincinnati, OH City Planning Commission 1951, 1). The commonality between an expressway or a freeway and a highway is that a highway may have median strips and more than two traffic lanes in either direction. The main difference between highway and expressway is that a highway, unlike expressway or freeway, may have traffic lights, intersections and crossroads (Debroy 2002, 1). In addition to the terms discussed above, *Interstate Highway System* refers to the system of all urban roadways in the United States (urban, intercity, and rural) (Cox and Love 1996, 4). With consideration to all the differences in definitions, I use the term *highway* as synonymous to *expressway* and *freeway* due to the fact that the literature more often uses this term to denote limited-access, multi-lane divided roads.

3.3 Highways in Urban and Suburban Areas

There is a need to distinguish between the impacts of interstate highways on urban and suburban areas. The majority of the literature reviewed in this thesis is discussing the impacts of interstate highways on metropolitan regions, cities, urban neighborhoods, or census tracts in urban areas. The common feature of these analyses is that the researchers mainly look at the effects of the urban extensions of interstate highways on different aspects of life in American cities. I am also focusing my analysis on the impacts of the extensions of interstates on urban neighborhoods.

However, the general overview of effects of highways on suburban communities needs to be provided in order to contrast these impacts with the effects on urban communities, presented in the next part of the literature review. Overall, suburban and rural areas received substantial amount of growth after the introduction of the highways primarily due to the increased accessibility of land. The population of suburban regions grew dramatically due to new housing developments; the level of educational attainment of the residents of such areas increased; building and construction increased; and demand for local services and planning and zoning grew. The construction of interchanges of the highways created favorable conditions for new business establishments. The increased demand for land caused land values to rise. The right-of-way property acquisition did not impose significant impacts since the initial demand for land in suburban areas before highway construction was low and the land values were low as well (Thiel 1965; Dansereau 1965).

Totally different was the situation in cities. The urban extensions of the highways that cut through central city neighborhoods produced virtually the reverse effects in comparison to the effects on suburbs. The next section deals with reviewing different opinions about the impacts of interstates on different aspects of urban life.

3.4 Impacts of Urban Extensions of Interstate Highways: General Themes

Even though no author dares to state that the effect of interstates was totally negative and the system should not have been constructed, some authors tend to stress more positive consequences and express greater enthusiasm than others (Gamble and Davinroy 1978). The scope of these authors' research is diverse and the array of impacts identified varies from paper to paper. In some cases, authors focus on looking at one aspect of neighborhood's life that was affected by a highway without looking at other related aspects (Politano 1980; Khasnabis and Babcock 1980; Hall and Breston 1978; Ellis 1968). In other cases, authors approach the problem in a comprehensive fashion, looking at several aspects of neighborhood life that are interconnected, and this connection is revealed when a highway impacts one of the aspects (Sale and Steinberg 1971; Liu 1972; Chernoff 1978; Bishop et al. 1970). There are several "themes" that can be observed from the literature: impacts on social aspects of a neighborhood; impacts on mobility and accessibility and larger-scale outcomes that resulted; and impacts on congestion and environmental quality (externalities). Even though most of these "themes" are discussed in the next chapter of the thesis in more detail, I review them briefly in this section in order to present the general picture of the discussion.

3.4.1. Social Aspects

Highways brought about a tremendous impact on social aspects of residential areas. The category of sociological impacts of interstate highways is very broad, and different terms used by the authors often express similar meaning. The literature discusses community consequences (Ellis 1968), social impacts (Kemp 1965), social effects (Thiel 1965), neighborhood organization (Bishop et al. 1970), sociological effects (Levin 1965), and sociological considerations (Horning and Ream 1968). Discussion of these concepts in the literature is focused around the impacts of highways on the residents of the areas through which or adjacent to which the highways go.

The literature that discusses social aspects of highway influence in suburban areas is very scarce; in most cases, the authors note that the impacts of highways on such areas are minimal. However, when it comes to the discussion of impacts on densely-populated areas, the majority of authors emphasize negative consequences. In short, social impacts of highways are the following: relocation of households due to right-of-way acquisition leads to community disruption (Ellis 1968); social composition of the area changes dramatically (Chernoff 1978); social linkages among the residents are interrupted (Thiel 1965; Ellis 1968; Kemp 1965); overall community cohesion is harmed or destroyed (McLean 1971; Steiner 1978, 54).

3.4.2. Residential Mobility

There is no doubt that mobility of people and businesses increased with the construction of highways (Ellis 2001; Sale and Steinberg 1971; Gamble 1976; Lewis 1997; Cox and

Love 1996; Creighton 1970). However, the evaluation of the outcomes of increased mobility varies from very positive to very negative. Cox and Love (1996) state that interstate highways “permitted the freedom of personal mobility to flourish” (Cox and Love 1996, 2). The area in which users can operate has expanded significantly (Cox and Love 1996, 15), people got an opportunity to choose from a wider range of options and activities for employment and entertainment. In addition, interstate highways allowed more freedom for choosing residential location and, consequently, provided more options for finding low land prices and larger houses to satisfy family’s needs (Cox and Love 1996, 16).

I would agree that highways made the “American dream” of having a separate home in pleasant and clean environment become a reality for many families; however, sprawl became a reality as well (Gamble 1976, 18). Due to the increased mobility, families moved farther and farther from inner cities and first-ring suburbs, since they were not tied to the places of their employment anymore (Cox and Love call it “employment freedom” (Cox and Love 1996, 16)). Businesses also took the advantage of cheap land and increased their investment beyond city boundaries (Hott and Lewis 1997). The result of increased mobility of people and businesses can also be viewed as highly negative since it brought the decay of cities due to “inefficient community services and high taxes” (Gamble 1976, 19) and “[abandoned] downtown centers ... for the easy-access malls that sprang up at exit ramps” (Lewis 1997, x).

3.4.3. Accessibility

The issue of mobility is closely related to the concept of accessibility. Whose accessibility to what goods and services increased and whose decreased in the long run? Cox and Love (1996) argue that, in general, citizens acquired opportunities to have access to jobs, shopping, and entertainment, while businesses got better access to land and new markets on the inter-regional level (Cox and Love 1996, 8). Even though highways “made many people wealthy, [they] dispossessed others and left them in poverty” (Lewis 1997, x). People who could not afford having an automobile or those unable to drive were left behind in this celebration of increased accessibility. No longer could neighborhood residents walk to a store or a post office; employment opportunities of the urban poor greatly diminished since the companies were following the majority of labor force in its movement to suburbs (Gamble 1976; Ellis 2001, 262; Sale and Steinberg 1971, 173; Creighton 1970, 11; Steiner 1978, 90).

3.4.4. Externalities

Another set of problems related to transportation includes accidents, congestion, air pollution and noise, and lack of aesthetics in the way transportation facilities generally look (Creighton 1970, 6-14). There are two opposing arguments about the influence of highways on the frequency of traffic accidents. Cox and Love (1996) state that the highway system is actually safer than other roads. The estimations were made to compare fatality and injury rates that occurred on the roads that did not belong to the interstate system and deaths that happened due to accidents on interstate highways (Cox and Love 1996, 12-14). On the other hand, it would be quite logical to argue that the more people

are driving, the more accidents happen. Increased use of an automobile and the need for people to drive to get to their work and entertainment raises the rate of traffic accidents.

One of the goals of the creation of highway system was to decrease congestion (St. Clair 1986; Cox and Love 1996, 3-12; Lewis 1997). The opinions about whether this goal was reached or not vary dramatically. Ellis (2001) argues that “fragmented, low-density, autodependent land use patterns” produced congestion as one of the consequences (Ellis 2001, 262). In other words, more people who moved to low-density remote areas produce traffic congestion since their travel paths and times highly overlap. The decreased use of public transit put more cars on the roads and resulted in congestion (Gamble 1976, 19-20); that is the pattern every urbanized area is facing now.

Air pollution, noise, poor aesthetics, and physical disruption brought by highways are considered as environmental effects and represent another significant set of arguments that appears in the discussions both in favor and against interstate highways. Some authors argue that air pollution has decreased due to the changed driving patterns: “more consistent speeds and smoother traffic flows” contribute to improved health and reduced air pollution (Cox and Love 1996, 17). However, if we consider the sum of gas emissions that sharply increased due to the increasing number of automobiles and especially the air quality in densely-populated urban neighborhoods through which highways go, the argument would look completely reversed (Gamble 1976, 20; Sale and Steinberg 1971, 173; Ellis 2001). Highways destroyed inner cities by reducing air quality, increasing noise, and negatively changing urban landscape. “[N]ew highways had the power to

divide rather than unite... and ... they [transformed] a once vibrant neighborhood into a cold, alien landscape” (Lewis 1997, x). Moreover, “[a]cross the landscape of the continent, Americans left the imprint of their movement – increasing number of wide roads and streamlined highways” (Lewis 1997, xii). Interstate highways caused significant environmental damage to both urban and rural areas of the country.

IV. IMPACTS OF HIGHWAYS ON URBAN NEIGHBORHOODS

4.1 Introduction

Urban extensions of interstate highways in residential areas impose tremendous impacts on virtually all areas of neighborhood life. The literature that elaborates on the impacts of the highways on urban communities talks both about positive and negative impacts that highways bring. However, each publication tends to take either positive or negative position in evaluating the impacts; no author evaluates highways in neighborhoods comprehensively. In other words, each author "takes sides." Therefore, the materials about the impacts of highways can roughly be divided into two broad groups: one group demonstrates that positive change was brought to different aspects of neighborhood life by highways, while another group proves that neighborhoods became worse off in many ways after the highways were constructed. Obviously, both groups of literature support their findings with sufficient results of research performed both involving the citizens and without citizen participation but by means of manipulation of socioeconomic data.

At the same time, the question concerning the validity of dividing the impacts of highways into two broad groups (positive and negative) arises. Is it really sufficient to look at highways impacts only from the point of view of harm or benefit for urban communities in order to provide a comprehensive framework for evaluation? How does this "black and white" grouping of impacts contribute to the understanding of long-term

consequences of highways on residential areas where so many factors play important role in the life and development of neighborhoods? It is important to recognize that even though the literature makes the division of positive and negative impacts, such view on the classification of impacts would be too narrow and insufficient in order to create a sound framework for highway evaluation. Therefore, the classification of highway impacts should not be based on positive and negative effects. Instead, there is a need to classify the impacts on the basis of the areas of neighborhood life that are affected by highways, since the same neighborhood variable that is influenced by a highway can have different implications for different aspects of a neighborhood.

4.2 Taxonomy of Highway Impacts on Urban Neighborhoods

Before laying out the array of impacts, let us describe an urban neighborhood from the point of view of its aspects, since this would provide an explanation of the taxonomy of neighborhood characteristics on the basis of which highway impacts are analyzed. There is no doubt that a neighborhood can be described as a complex organism where interactions among its components take place (White 1987; Jargowsky 1996). Earlier the definition of a neighborhood was provided (McLean and Adkins 1971; Park and McKenzie 1967; White 1987); however, that definition accounted for describing a neighborhood in a way that the latter can be distinguished from, for instance, a city or a rural settlement. The description of a neighborhood looked at this concept as on a unit of analysis possessing spatial characteristics (a limited place) and socioeconomic features (homogeneity) (White 1987, 4; McLean and Adkins 1971, 96). That definition provided

an external view on a neighborhood. In order to look at a neighborhood in terms of its internal components, the following aspects can be analyzed:

1. **Households.** The individual household is a major component of a neighborhood. In most cases, the majority of a neighborhood's land is residential. Households are comprised of families or individual(s) (US Census Bureau 1990). The main characteristic of a household is its connection to the neighborhood itself and to the area beyond neighborhood boundaries. This connection can take different forms and can be maintained by various means (Ellis 1968; Ellis and Worrall 1969). Later sections describe these links in more detail.
2. **Community as a whole.** This aspect of a neighborhood can be described by such characteristics as image, perception, and identity. In other words, this concept includes such factors as the place of a community in the urban fabric, its reputation compared to other neighborhoods, pride of the residents for their neighborhood, the identity of the neighborhood, and its distinctive features in comparison to other neighborhoods (Kemp 1965).
3. **Neighborhood amenities.** This group of characteristics includes those aspects of neighborhood life that comprise the willingness of the non-residents to move to the neighborhood or the attraction/desire of the residents to stay in the neighborhood. Amenities play a very important role in decision-making; they include neighborhood services, recreation opportunities, landmarks, community

centers, churches, cemeteries, libraries, and schools (Chernoff 1978; Kemp 1965; Dansereau 1965; Ellis 1968; Levin 1965; Meyer and Miller 1984; Thiel 1965).

4. **Economy.** In the context of this discussion, the term “economy of a neighborhood” stands for any economic activity that takes place in a neighborhood (Bishop et al. 1970). The intensity of the activity may vary, the kinds of activities may differ from neighborhood to neighborhood (consider, for example, the following extremes: a community with a small business district with a dozen of retail outlets or a neighborhood with a large industrial area or office developments). At the same time, any kind of neighborhood business is crucial for the community since it generates additional activity and development (Bishop et al. 1970; Buffington et al. 1997a).
5. **Visual characteristics.** This group of neighborhood features includes open space, aesthetics, and other characteristics that contribute to the visual perception of a neighborhood by the residents and visitors (Horning and Ream 1968).
6. **Quality of life.** This concept is related to the comprehensive approach to neighborhood analysis and needs to be described and recognized as an overarching concept that includes, but is not narrowed down to, the characteristics discussed above.

There is a need to recognize that neighborhood aspects or characteristics described above are not isolated from each other. They interact not only with each other but also with the external environment. A neighborhood can be viewed as a living organism that carries its functions but each function is not completely autonomous. It is very important to keep this fact in mind while analyzing highway impacts because the impacts affecting one neighborhood characteristic can later impose effect on other ones. At the same time, in order to simplify the approach to analyzing highway impacts, the neighborhood characteristics described above can be treated more or less autonomously. For the sake of the analysis performed in this thesis, the fact that the characteristics interact is recognized but highway impacts discussed in the literature are sorted out according to the classification of neighborhood features that are affected by highways.

4.3 Impacts of Highways on Urban Households

Individual households are the major components of neighborhoods, since residential land usually constitutes the largest percentage of neighborhood land. In the process of building the framework for the analysis of highway impacts, a household serves as the smallest unit of analysis (Park and McKenzie 1967, 7). Other neighborhood characteristics describe the neighborhood as a whole from many different perspectives. However, it would be a mistake to look at the whole without looking at the elements of that whole. In case of neighborhoods, households are essential elements of a community that need to be analyzed in relation to highways (Ellis 1968). A household is defined by the US Census Bureau as

“all the persons who occupy a housing unit. A housing unit is a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied as separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from the outside of the building or through a common hall. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements” (US Census Bureau 1990).

In analyzing highway impacts, it is important to investigate how a highway affects individuals. However, a household is the next large unit of analysis after an individual, and since most households are families or related persons with similar values and interests within them, individuals can be analyzed in groups, or households.

4.3.1. Residential Linkages

One of the dimensions that can be analyzed for highway impacts on individual households is the concept that is called residential linkages. They are described as ties between the housing site of the household and other spatially distinct points which are of importance to the individuals involved. The existence of the linkage implies that communication between the housing and activity site takes place. In this case, it is not

necessary that the movement of goods or people occurs (Ellis 1968; Ellis and Worrall 1969).

Now that the linkages are defined, there is a need to determine which of them are affected by highways. First, it was mentioned that linkages can be expressed as physical movement from one destination to another, and one of the destination for a household is a housing unit. Therefore, linkages occur in space. Second, linkages can also be defined in terms of communication that does not involve movement in space (the examples are mail, newspaper, and telephone communication) (Ellis 1968, 42). Which of the two broad types of linkages is affected by a highway? Since a highway is associated with physical movement of people and goods, it is a spatial phenomenon. Hence, a neighborhood physically interacts with a highway that goes through it or adjacent to it. This statement brings up the idea that linkages that are expressed by physical movement can be affected by a highway.

4.3.2. Travel Patterns

The conclusion that highways affect households by influencing their physical linkages generates a question of what kinds of linkages are affected and in what ways. In order to answer this question, there is a need to find out about the travel behavior of households, i.e. where they are traveling and how often. In fact, transportation planning literature characterizes urban travel by the use of several factors: trip purpose, temporal distribution of trip making, spatial distribution of travel, selection of the mode used, and the cost of making the trip (Meyer and Miller 1984, 21). For the analysis of

neighborhood/household-highway relationship in terms of residential linkages, all of these factors are not necessary to consider, since the cost of trip and temporal distribution of trips along with the spatial distribution of travel are more often analyzed for areas larger than a neighborhood. The most important is trip purpose, since it provides information about the destinations of trips made by households. Selection of the mode of travel is discussed later in this section.

The statistics on travel behavior in Chicago Area Transportation Study reveals that 26 percent of all travel (with no regard for the mode) is going to work, 22 percent is shopping, and 22 percent is social/recreational activities, which includes church, civic meetings, concerts, parties, and visiting friends. Personal business is the purpose for almost 12 percent of all travel; going to school is four percent² (Meyer and Miller 1984, 22-23).

As these statistics indicate, the majority of travel has work and shopping destinations. How does this data help in determining the impacts of highways on change in travel patterns and/or travel destinations? When a highway is constructed through a neighborhood, it terminates some of the paths for travel that residents used to take before the highway (Ellis 1968; Ellis and Worrall 1969). It is extremely difficult to identify which of the desire lines were terminated and replaced as a result of a new transportation line and which of them were not affected; however, it is possible to indicate by means of

² This statistic only considers other-than-home travel destinations. Forty-two percent of total trips made by individuals are returning home from other destinations (Meyer and Miller 1984, 22).

common judgment which destination points are more likely to be situated in a neighborhood and which paths that lead to these destinations are to be broken by a highway.

Work Trips

Since a neighborhood is a relatively small territory, most work trips are headed outside of neighborhood boundary. In case a highway that dissects a neighborhood has an exit to and from the community or an overpass (a tunnel) (Horning and Ream 1968, 68-73), the commute to work may be even easier after the highway than before. If the highway has no physical connection to the neighborhood, the trips to the outside of the community may become longer and more time-consuming; the residents would experience difficulties leaving the community for the place of work. Therefore, the impact of a highway on residential linkage that is responsible for work commute depends on the presence or absence of highway infrastructure in the neighborhood.

Shopping Trips

The impact of a highway on residential paths for shopping is also not clear, since the linkage depends on the location of the shopping destination. If the trips are made to large shopping centers that are remote from the neighborhood, the impact would be similar to one discussed for work trips (Ellis 1968). If, however, the trips are aimed at retail establishments in neighborhood business district, the highway would create a physical barrier and would bring dramatic effects in the communication process. In this case, the linkage of a household and neighborhood retailers would be significantly modified (the

residents would have to find a way around the highway) or terminated (the residents would choose more accessible stores to shop over the stores they used to shop before the construction of a highway).

Social Travel

Travel of residents for social events and recreation seems to be more connected to the neighborhood locationally than travel for work or travel for shopping. Participating in community activities, church messes and events, visiting friends and relatives, and going to a nearby park are more associated with the neighborhood itself than with any other remote areas. Therefore, the linkages of the residents to the places of recreation and social activity would be modified by a highway to larger extent than those to work or even shopping since the destination points for social travel are lied more or less to the boundaries of a neighborhood. When a highway goes through a neighborhood, it creates barriers for movements within the neighborhood. As a result of this physical barrier, the residents experience difficulty in moving from one point to another when a highway intervenes with the "desire line."

When one linkage is terminated, a new one is created. In the case of social travel, residents may have to choose to go to another park, and this would probably not be a problem. However, when traveling to see friends or relatives or to go to church creates difficulties such as decrease of accessibility or dramatic increase of travel time to get from home to a destination, social linkages of a household get severely modified (Ellis and Worrall 1969). This impact of a highway on a residential neighborhood in general

and a household in particular is critical due to the fact that it affects the conditions of life for the residents. Social interaction is very important for people, and when the circumstances prevent them from it, people become frustrated and willing to leave the neighborhood (Kemp 1965).

4.3.3. Walking Trips

Up to now, the discussion of residential linkages and types of travel that constitute them did not focus on the means of travel. In fact, travel patterns for residential neighborhoods presented earlier accounted for total number of trips without any significant consideration to means of travel. The research performed on studying the walking trips and paths is minimal even though the role of walking trips is very important when it comes to the discussion of residential linkages for households and barriers that highways impose on them (Ellis 1968; Horning and Ream 1968).

In a neighborhood, some of the destination points for residential linkages are situated within the boundaries of the community and within the walking distance. The examples of such destinations (without regard to trip patterns) are: church, community center, NBD retail, local library, park, local branch of a bank, a bakery, a barber shop, a drycleaner's, or a coffee shop. Depending on the size of the neighborhood and the degree of its social and economic development, the destinations for walking trips may differ; however, virtually any community has a place or a set of places which is accessible to almost all residents by walking. By walking from home to a destination point within the community, each resident develops and maintains residential linkages that are vital for

him or her (Ellis 1968). Some points may be more important than others – consider, for instance, the importance of going to the same church over using the service of the same drycleaners'. Each destination point appears to be more than just a convenient location; it brings about the need for communication among the residents of the same neighborhood. Compared to a community center, even a coffee shop or a library can serve as a place to meet the neighbors and communicate.

When a highway is constructed through a neighborhood, walking linkages of residents and households suffer dramatically due to the fact that a highway creates a physical barrier for walking from one point to another (Horning and Ream 1968). When residents find that their old "desire line" to be terminated by an obstacle, they either eliminate the old link and find a substitute for the destination point (for instance, another branch of the bank or park that can be reached by driving) or continue to travel to the old point but change the means of transport (they now have to drive to their church so they could pass the highway). The decision to either keep the linkage but modify means of travel, or terminate the linkage and create a new one, depends on the value of the linkage to a household. Church or community center, for instance, is not as easily substituted as a grocery store or a park (Chernoff 1978, 8).

4.4 Impacts of Highways on Neighborhood Image, Identity, and Perception

4.4.1. The Problem of Intangibility of Image, Identity, and Perception

Neighborhoods can be described by analyzing the changes and trends in their physical, economic, social, and environmental characteristics. These categories of characteristics can be considered in more detail for closer analysis. For instance, one can describe neighborhood's environment by looking at air quality, soil pollution, levels of noise, etc. (Ridker and Henning 1967; Meyer and Miller 1984; Politano 1980). Economic characteristics of a neighborhood are usually comprised of the features of businesses that operate in a neighborhood, the range of products and services offered to the residents, and the level of diversification of businesses in neighborhood business district (Meyer and Miller 1984; Bishop et al. 1970). When a neighborhood is described from the point of view of physical characteristics, land use is taken into account as well as aesthetics, open spaces, and accessibility, to name a few (Khasnabis and Babcock 1980; Meyer and Miller 1984; Politano 1980). Finally, social characteristics help draw neighborhood profile by analyzing the data on demographics, income of residents, housing quality, and neighborhood institutions (Dansereau 1965; Khasnabis and Babcock 1980; Hall and Breston 1978).

Most of the neighborhood characteristics described above can be put in the form of quantitative data and analyzed by revealing changes, trends, and patterns of change over time. It is an acceptable way of looking at a neighborhood in order to understand the way it develops and to predict its future (Bishop et al. 1970). Therefore, quantitative data

serves as a basis for analyzing a neighborhood in terms of its change over time. In addition, a researcher can describe some of the neighborhood's physical characteristics in a qualitative manner. For instance, aesthetics, even though it is a subjective issue, can be discussed on the basis of observation and the observer's artistic taste.

The common feature of these characteristics is that they can be measured and described either by using numbers (population, income, number of businesses, acres of vacant land) or by using observation of physical objects (open spaces, condition of housing stock). In other words, in most cases the researchers are dealing with more or less tangible characteristics of a neighborhood, with something that can be observed or calculated. However, there are some attributes of a neighborhood that are neither tangible nor measurable. Neighborhood image, perception, and identity cannot be described by numbers or pictures. These characteristics are purely qualitative and totally subjective yet very important for portraying a neighborhood as a whole and its place in the urban fabric.

There is no doubt that "measurable" characteristics of a neighborhood influence the "intangible" characteristics. For instance, high crime rates in comparison to the rest of the city would definitely contribute to negative image of a neighborhood (Jargowsky 1996), or high housing prices and high median incomes of the residents would make a neighborhood appear as an "upscale" community. However, there is no distinct way of determining whether positive "tangible" characteristics would contribute to strong "intangible" features of a neighborhood. In other words, it does not necessarily mean that

a poor neighborhood with high crime rates would lack its identity and the residents would not care about neighborhood's image and perception³.

Before discussing the importance of neighborhood image and related concepts in describing a neighborhood, there is a need to define these issues. The terms themselves and the ways people perceive them differ dramatically. However, common ground in defining these terms is necessary in order to continue with the discussion of highway impacts on them. The definitions below may appear somewhat subjective but one has to keep in mind that it is almost impossible to define these concepts in such a unified way that everyone would agree with. It would be easier to stress the subjective character of these definitions and continue the discussion on the basis of them rather than try to find widely acceptable explanations for the concepts that are differently perceived by people.

4.4.2. Definition of Image

Every neighborhood has its place in the city, and the place is not only geographical. The long-term residents of a city do not only have a clear picture of the locations of city's neighborhoods but also their opinions about these neighborhoods (Kemp 1965). For some people, the opinions are just one-word ("good," "dangerous," or "expensive"). For others, they are comprised of a set of characteristics ("nice houses, good shopping," "good parks but be careful after dark," "blue-collar and good schools," "diverse and friendly," etc.) (White 1987, 2). In any way, virtually all long-term city residents can use one or several

³ Over-the-Rhine in Cincinnati serves as a good example of such a notion. The neighborhood has a negative reputation among the city's residents but the inhabitants of Over-the-Rhine are proud of their community in terms of its historic heritage, authentic character, and diversity.

characteristics to describe any neighborhood in the city. These “images” reflect how people think about a neighborhood (Francis 1983). There is no doubt that these images are based on knowledge people gained about a neighborhood. The sources for the knowledge (information) on the basis of which the residents built their opinions vary. For instance, one can base his or her opinion about a neighborhood on personal experience; other person might have gotten the information from others, while someone else could have absorbed the knowledge from the mass media.

No matter what way of gaining the knowledge about a neighborhood was used or how these methods were combined, each individual ends up having his or her opinion about a neighborhood based on the information, or facts. It is obvious that the image of a neighborhood is formed under the influence of certain factual knowledge; in other words, an image would not appear without any supporting facts. As an example, consider the following hypothetical situation: one of the city neighborhoods have a negative image of being dangerous. This image is shared by many city residents, and they avoid walking in this area, especially at night. Even though many people agree with such an image, the information (facts) that justifies their opinion about the neighborhood comes from different sources. Some individuals see this neighborhood often appear in local news on television when there is a report of another crime committed. Others have to drive through the neighborhood every day and they see people hanging out on street corners at the middle of workday (therefore, the fact that someone is not working provides a perception that he or she is a criminal). Others or their friend(s) or family member(s) have been robbed in this neighborhood. Finally, some people watch TV, read

newspapers, observe, and make conclusions on the basis of the information from multiple sources. No matter how the image of a neighborhood is formed, there are always the facts in the past or the present of the neighborhood that maintain that image (Francis 1983).

Another important feature of an image is that it is extremely hard to change over time. The facts serve to form the image but the existing image is very hard to break by the new facts. In other words, dramatic changes in a neighborhood will not immediately be reflected in the change of the image. As an example, consider the same hypothetical neighborhood with “criminal” image. The city tripling the number of police officers on duty and beginning a new program for the unemployed in the neighborhood would not lead to the immediate change of the resident’s opinions about the neighborhood⁴. They would still feel uncomfortable walking in the neighborhood and even driving through.

Finally, an image of a neighborhood is usually possessed by non-residents. Since the main feature of the image is that it is based on the information seen or heard, which, in fact, does not always appear to be correct, non-residents are only able to judge the neighborhood from the outside, not from the inside. There is a distinction between the terms “image” and “perception.” The latter belongs to the insider and is based on his or her opinion about the neighborhood, supported by what he or she sees from the inside of the neighborhood boundaries. The former, on the other hand, is a “picture,” a “cover” of the neighborhood that is visible from the outside.

⁴ This statement is derived from my personal observation of the situation in Cincinnati, Ohio of this city’s attempts to change the image of the Over-the-Rhine neighborhood. The image of this community has been negative and the city increased police presence in order to ensure safety in it.

4.4.3. Definition of Perception

As it was already mentioned, a perception is another way to describe a neighborhood but it differs from the image in a way that a perception is an opinion about a neighborhood expressed by its residents rather than the outsiders. Like an image, a perception is subjective yet based on facts. However, residents of a neighborhood get the facts mostly from what they observe rather than from what they hear from others. Residents know their neighbors, participate in the life of their neighborhood every day, and see their community change over time. Residents of a neighborhood have more comprehensive knowledge to form their opinion than non-residents (Francis 1983, 116).

Perception of a neighborhood by its residents can change over time, and the change is gradual. The causes of the change of the perception can be positive and negative, and the reaction to these causes also differs. The residents may become willing to move out in case their perception of the neighborhood becomes more negative with time as a result of negative changes. On the other hand, their commitment to the neighborhood will grow if positive changes occur and their perception evolves in a similar fashion (Francis 1983; Kemp 1965).

4.4.4. Definition of Identity

Identity is another characteristic that describes a neighborhood. Usually, identity is an opinion about a neighborhood that differentiates it from others. There are two major grounds on which image, perception, and identity can be compared among each other. First, image and perception are distinct on the basis of who judges a neighborhood

(image is expressed by non-residents and perception by residents). Identity, at the same time, is an opinion about a neighborhood that is expressed by both groups of people. Second, identity is almost always brings a positive meaning, a sense of pride for the neighborhood, whereas image and perception can be negative (Francis 1983, 188-130).

Identity is a feature, a quality of a neighborhood that allows that area to appear distinctive among others in a city. As a result of this distinctiveness, neighborhood boundaries are pronounced, residents feel committed and proud to identify themselves with the neighborhood. Non-residents also recognize the neighborhood if its identity is strong enough to provide the differentiation between the neighborhood and the rest of the city (The City of Albuquerque Planning Department 2003). It does not mean, however, that there should be only one neighborhood in the city with its strong identity. They may be numerous but their identities will differ (White 1987; Ellis 1968; Bishop et al. 1970).

One can argue that identity can easily be achieved by putting neighborhood welcome signs at the boundaries (The City of Albuquerque Planning Department 2003). However, that would be a too narrow look on this concept. There is no doubt that welcome signs contribute to the identity; at the same time, people's ability to identify the neighborhood among others extends beyond mere recognition of the boundaries. Neighborhoods with strong identity have their own authentic environment that allows them to stand out and attract visitors and residents.

4.4.5. Importance of Neighborhood Image, Perception, and Identity

The fact that such concepts as neighborhood image, perception, and identity cannot be estimated by calculation or observation does not mean that these issues are not important for analyzing the neighborhood. One may attempt to look at the neighborhood and describe it by using only those characteristics that are easier to define and analyze than these three subjective ones. Even though image and perception are based on the facts about a neighborhood, the subjectivity in determining them lies in the interpretation of the facts by different people. At the same time, the opinion shared by the majority of people creates image and perception. Neighborhood identity is also a feature that is recognized by a majority, even though this recognition is somewhat stronger than in case of image and perception (White 1987; Francis 1983).

Importance of these concepts in analyzing neighborhoods cannot be overestimated. Even though image, perception, and identity of a neighborhood cannot be measured, they can be identified and analyzed in order to contribute to the comprehensive profile of a neighborhood. Image, perception, and identity are unique features of a neighborhood, which can be considered as a living organism (White 1987; Jargowsky 1996). In addition, these features provide evidence that the organism interacts with the urban environment (Francis 1983, 116). Therefore, analyzing these three concepts along with social, economic, physical, and environmental characteristics would provide sufficient ground for determining change in a neighborhood.

4.4.6. Highways and Image, Perception, and Identity

Neighborhood image, perception, and identity serve as important indicators in the process of analyzing the impacts of highways on neighborhood (Ellis 1968; Kemp 1965). As it was discussed above, these characteristics of a neighborhood play an important role for a community as social or economic ones. Therefore, image, perception, and identity are affected by agents of change, highways. The literature discussing the impacts of highways on these three neighborhood characteristics is extremely scarce. In most cases, the authors are discussing more “tangible” qualities of neighborhood affected by highways. The reason for that is probably the subjectivity that underlies the identification of image, perception, and identity in the context of a neighborhood. It is hard to determine the change of these three characteristics since everyone has his or her own opinion about them.

Highway Impact on Neighborhood Image

As it was already mentioned, image is an opinion about a neighborhood that is shared by the majority of city residents who do not live in the neighborhood. Image does not change over a short period of time, and it is supported by facts or knowledge that non-residents possess about the neighborhood. When a highway is constructed through a neighborhood, the change of image does not occur quickly, since the people absorb the new information about the neighborhood transformation gradually. Since the image is determined on the basis of subjective judgment, the attitudes of non-residents toward the highway in the neighborhood may vary. Some of them may be concerned with the destruction of historic properties on the right-of-way that were providing contribution to the positive image of a

neighborhood. Other people may consider the displacement of the neighborhood poor from the right-of-way parcels as a good remedy for high crime rates in the area. Others, on the other hand, may not care at all about the neighborhood and the impacts of highway, so the image of a neighborhood would not change for them. Many different opinions about the influence of highways on neighborhood image exist, and the examples can be plentiful. Unfortunately, the possibility of estimating the reaction of the majority of non-residents to a highway in a neighborhood is very low. Instead, it is possible to consider the following three scenarios: the image will become more negative, more positive, or will not change. The image is likely to change when a highway influences those aspects of neighborhood life that the non-residents consider important for the formation of their opinions about the neighborhood.

Highway Impact on Neighborhood Perception

Perception of a neighborhood is the residents' opinion about their community. The opinion is supported by the information about a neighborhood that the residents have. In other words, perception is how the "insiders" think about the place where they live. Unlike the change of neighborhood image after the introduction of highways, the change of perception is easier to predict due to the fact that the residents have more information about the neighborhood than the outsiders and they have more opportunity to observe the change of the area.

Again, the literature discussing the influence of highways on neighborhood perception is very scarce. At the same time, some sociological studies indicate that perception is likely

to change to more negative than positive after a highway is introduced to a neighborhood. The residents indicate in the interviews that their neighborhood is not the one it used to be: some of their neighbors and friends had to move out; it became harder to walk from one place in the neighborhood to another; some areas became dilapidated; the neighborhood is not quiet anymore; increase of renters make people care less about the future of the neighborhood; income and racial diversity of the residents changed (Kemp 1965).

Highway Impact on Neighborhood Identity

Identity of a neighborhood is a characteristic that makes it distinguishable among other city neighborhoods. The information about how a highway can affect neighborhood identity appears not to exist – the research of the available sources reveals that no one was studying the link between a highway and a neighborhood identity per se. However, since identity and image and perception are connected, and some elements of highway/neighborhood studies touch on exploring the link between perception and highways, it would be possible to assume that identity is also affected by highways.

In the previous section on perception it was mentioned that highways have more negative than positive impacts on how the residents perceive their neighborhoods (Kemp 1965; Dluhy et al. 2002). Identity is formed by the residents and recognized by non-residents. Hence, when the opinion of the residents about their neighborhood changes to a negative one, the identity also changes. Identity, unlike perception, is described as strong or weak. Strong identity is associated with the pride of the residents to live in a neighborhood.

When the pride and satisfaction diminishes, the identity becomes weaker or may even disappear. Therefore, when citizens observe negative change, their perception of a neighborhood becomes negative and the identity becomes weaker.

4.5 Impacts of Highways on Neighborhood Amenities

4.5.1. Definition of an Amenity

Certain factors are crucial to consider when analyzing the reasons of new residents to move in the neighborhood or current residents to stay in the neighborhood. There is no doubt that various factors that characterize a neighborhood play an important role in the process of decision-making for a family that decides to settle down in that neighborhood (Chernoff 1978; Kemp 1965; Dansereau 1965). It is important to determine which factors influence the decision to choose one neighborhood over another. Some neighborhood characteristics that are critical for making a choice are more easily identifiable than others. This is because some characteristics are more universal and less linked to the particular aspects of a household than others (for instance, an average-income family would not move to a high-poverty neighborhood (Jargowsky 1996)), In other words, the degree of the influence of some aspects is stronger for some people and weaker for others. The features of the neighborhood that draw residents have different degrees of attractiveness, they are not uniform for everyone (Kemp 1965). For instance, married couples with children are definitely attracted by the quality of schools in the neighborhood (Chernoff 1978, 4), while older couples look at church communities and parks (Dansereau 1965; Ellis 1968, 41-43).

Since it is hard to estimate precisely what community features are critical for which groups of people, the task of determining the major groups of amenities of a neighborhood that serve as possible attractions to the residents should be performed. The analysis of the literature on neighborhood amenities proves that generalization of this issue is quite legitimate and it is possible to identify several broad groups of attractions that serve as magnets both for those who decide to move in the community and for those who decide to stay in the community (Chernoff 1978; Ellis 1968; Dansereau 1965; Kemp 1965). The knowledge of general human values allows predicting which neighborhood features influence the process of residential decision-making.

Also, there is a need to note that amenities are not neighborhood features that are essential for everyday life of the residents; amenities are “extras” that make a neighborhood more attractive in comparison to other areas. For example, sewer system is not an amenity but instead a requirement for healthy living. Roads, police and fire protection, as well as garbage collection cannot be considered amenities as well; they are neighborhood services that are essential for the residents. On the other hand, parks and green space are the attributes of human life that bring pleasure from recreation and, in general, the need for the residents to spend some of their free time in the park is not vital.

Again, a neighborhood amenity is a feature of the neighborhood life that makes current residents willing to stay or future residents desire move to the neighborhood. Amenities serve as “accessories” of neighborhood life. Even though some amenities play more

important role for some residents and less crucial for the others, these attractions can be listed and grouped according to the purpose they serve. It is possible to distinguish among five separate groups of amenities: places of gathering, presence of social events, places of sports and recreation, learning facilities and opportunities, and quality of neighborhood support services.

Places of Gathering

Amenities that facilitate social life in the neighborhood are churches, community centers, local clubs and organizations, and neighborhood events such as parades and shows. The presence of these amenities in a community attracts residents since these features offer opportunities to socialize and experience neighborhood pride and commitment. Churches serve not only as establishments of religious faith, they provide the residents with the opportunity to know their neighbors better and to deliver community service (Kemp 1965, 100). Community centers play similar role, serving as places for gathering to discuss community issues and socialize. Local clubs and organizations allow residents with similar interests and hobbies get together and exchange information in the field of their interest (the examples of such social establishments are women's clubs, gardening clubs, local historical societies, etc.) (Kemp 1965).

Presence of Social Events

The traditions for conducting annual or semiannual neighborhood events such as shows and parades also bring the residents together to celebrate holidays or seasons (for instance, Fourth of July parade or a flower show). The events can be very attractive to

the residents of a neighborhood. The availability of the opportunity to participate in social life of a community is important for the newcomers as well.

Places of Sports and Recreation

Recreation is one of the aspects of human life; a neighborhood that is able to provide recreational opportunities to its residents is a more desirable place to live than the one that has nothing to offer and whose residents have to satisfy their needs for recreation outside of the community. Amenities of recreational character include parks and green spaces; sports facilities, such as fitness centers, stadiums, and pools; playgrounds; landmarks, fountains, and spaces around them; and neighborhood squares. The initial purpose of these places is to provide the residents with recreation opportunities to spend their free time. The significance of places for recreation for the neighborhood youth cannot be overestimated. In addition, such amenities as landmarks, parks, and squares give the community its personal flavor and aesthetic attraction. However, another goal that is achieved by the presence of such amenities is socialization and the establishment of communication among the residents of the neighborhood (Kemp 1965, 101).

Learning Facilities and Opportunities

Neighborhood libraries, schools, and even nursery schools belong to the group of amenities that serve educational purpose. The presence of a library or a kindergarten in a neighborhood is valued by the residents, since the need for going outside of the community to seek educational opportunities for themselves or their children does not exist. At the same time, the presence of schools in the community does not serve as

amenity by itself, since most neighborhoods have schools. What is considered an amenity is the quality of schools: the level of the professionalism of teachers, high standard test scores of the students, the level of school facilities (computers, stadiums, etc.), and the degree of safety. High quality of schools attracts families with children to the neighborhood. In fact, schools quality is one of the critical factors for such families when it comes to the criteria for choosing a neighborhood of residence (Levin 1965; Ellis 1968, 42).

Quality of Neighborhood Support Services

Even though earlier it was noted that neighborhood services such as police protection or garbage collection cannot be amenities, high level of the services can be an amenity for the residents. As in case of schools, there is nothing exceptional or attractive about the fact that the basic services are delivered to the citizens; instead, the high level of the services provided can serve as an amenity. The examples of such an amenity would be high degree of safety in the neighborhood or regular sweeping of streets and trimming of trees (Levin 1965, 83; Ellis 1968, 42; Gamble 1976, 19).

4.5.2. Types of Highway Impacts on Neighborhood Amenities

Highways that run through neighborhoods impose certain impacts on neighborhood amenities. Unfortunately, the literature that describes and discusses highway impacts in relation to amenities is scarce; the research did not reveal any sources that consider the influence of highways on amenities *per se*. Instead, the focus of the literature is the sociological aspect of the problem, which covers a variety of issues, touching upon

neighborhood amenities (Kemp 1965; Ellis 1968; Meyer and Miller 1984; Chernoff 1978; Levin 1965; Thiel 1965).

Decreased Access to the Amenities

A highway that is going through a neighborhood creates physical barrier for the residents to move from one point in a neighborhood to another. The paths that existed for the residents before the highway construction become either terminated or significantly modified. In most cases, the physical barrier created by a highway brings disruption to the communication of the residents and their points of destination (communication in this case means physical movement of people from one point to another; telephone and mail communication is not considered). As a result of the termination of communication lines, the destination points in the neighborhood become less accessible due to the emerged necessity for the residents to find other, less convenient ways of getting to their destinations (Ellis 1968, 42-43).

When such neighborhood amenities as churches, parks, squares, libraries, and community centers are utilized by the residents on a regular basis, the residents have their own established lines of communication (or paths) that they use to access these facilities (Ellis 1968, 42). In case the lines of communication are destroyed by a highway, two major outcomes emerge. First, new, less convenient paths are established. Residents experience difficulties in getting to their places of destination (Chernoff 1978, 8) but the commitment to the destination remains strong enough to tolerate the problems. The examples of such commitment are churches and community centers (Kemp 1965, 100).

Second, if destination points are important but not as significant as community or religious institutions, the paths terminated by a highway are not reestablished due to the fact that the cost of getting to the destination point exceeds the benefit from the use of the amenity. The examples for such amenities are parks, neighborhood squares, playgrounds, libraries, and places with landmarks. In this case, instead of using neighborhood amenities, the residents will choose the ones that are more accessible or terminate the use of any amenities (Ellis 1968, 43-44). As a result of this process, the local amenities will be underutilized and will no longer attract the residents. The reason for the underutilization will be the decrease of value, or utility, that a facility offers to the residents (cost exceeds benefit). This, in turn, will lead to the physical deterioration of facilities due to poor maintenance and the decrease of attractiveness of amenities (Kemp 1965, 101).

Direct Impacts: Physical Elimination of Amenities

The amenities can be destroyed as a result of the highway's right-of-way. Since the intention of planners is to disrupt as less residential land as possible, local parks, playgrounds, and squares can be eliminated to provide land for the new transportation facility. As a result, the amount of open space in the neighborhood is reduced and recreational opportunities for the residents diminish (Chernoff 1978, 8). The buildings and structures that represent or contain the amenities can be destroyed as well. Community centers, local landmarks, and stadiums, located on the path of the highway, are demolished (Ellis 1968, 42). The reduction in the number of amenities makes the neighborhood a less desirable place to live (Kemp 1965, 96).

Cumulative Effects on the Quality of Amenities

Such amenities as high-quality schools, safety, and clean streets can also be affected by highways that run through a neighborhood. Even though the relationship between the transportation facility and the quality of amenities is very hard to trace, there is no direct impact of highways on the quality of neighborhood services and schools. Unlike the more or less direct influence of highways on accessibility of the amenities, the decline of the level of services is more connected to the factors of the overall decline of a neighborhood. The decline, in turn, leads to the decrease of the quality of the services (Levin 1965, 83).

For example, a highway can cause some areas of the neighborhood to deteriorate due to their destruction by the right-of-way. Some of the residents leave the neighborhood in order to find a more pleasant and less noisy place to live. The residents that stay in the neighborhood are more likely to be those who cannot afford to move to a better area due to low income and minimal opportunities. As the proportion of poor people in the neighborhood increases, the quality of the schools decreases and crime rates increase (Jargowsky 1996). Overall, the amenities that the neighborhood was known for (good schools and high level of safety) have diminished due to the change in socio-demographic characteristics of the population. Thus, the highway influenced the quality of neighborhood amenities through the impact on the population of the neighborhood.

4.5 Impacts of Highways on Neighborhood Economy

4.5.1. Neighborhood as a Unit of Economic Analysis

The discussion of economic impacts of interstate highways on urban areas is very diverse in the literature. However, there is a need to note that rarely does any author emphasize the impacts of highways on neighborhood economy. In most cases, the discussion is either focused on larger-scale economic impacts (for instance, the scope can be a city as a whole or a region) (Gordon et al. 2002; Buffington et al 1997b, 44; Khasnabis and Babcock 1980) or on housing- and land use-related impacts on neighborhood, city, or regional level (for example, change of land and housing values or changes in land use as a result of a transportation project) (McDonald and Osuji 1995). The research reveals that the majority of the literature does not consider a neighborhood as a unit for economic analysis, and this fact appears to be quite logical. When it comes to the discussion of economic component of life of a residential urban neighborhood, it is not easy to find a pattern for analysis as opposed to the process of analyzing the economy of a jurisdiction or a region. Urban neighborhoods differ in their economic characteristics in many respects. For instance, a neighborhood may or may not have a neighborhood business district (NBD). There may or may not be a major employer or a few employers that draw their labor force from the population of one or more neighborhoods. In fact, some neighborhoods are mostly residential and the discussion of their economy would not appear relevant.

Therefore, there are two major reasons for neighborhood economic analysis not to appear in the literature on highway impacts. First, a neighborhood is a very small unit of analysis (Jargowsky 1996; White 1987), and an attempt to examine its economic characteristics apart from the surrounding area is irrelevant due to the fact that, in terms of economics, a neighborhood is a part and parcel of the city it is situated in (White 1987). The businesses located in a NBD usually do not impose a dramatic influence on the economy of the city as a whole. Second, urban neighborhoods are very different in terms of their economic characteristics. As it was already mentioned, a neighborhood may or may not have a business district to serve local residents, and the reasons for that can also vary. Therefore, neighborhoods are so diverse in terms of their economic characteristics and so small for economic analysis that they are rarely studied in a traditional way as cities or regions are.

There is a need to recognize that a neighborhood can be affected by city-wide economic changes, including the ones that resulted from the construction of a highway through the city's territory. In other words, it is not necessary for a highway to be physically connected to the neighborhood territory in order for the neighborhood to experience economic change.

However, it is vital to attempt to describe economic or economy-related impacts of highways on urban neighborhoods. It is possible to describe economic impacts with consideration to the diversity of neighborhood's economic characteristics. There is no doubt that the degree of highway impact is directly related to the degree of economic activity in the neighborhood. In other words, the more significant the presence of

businesses in the neighborhood is, the more it is expected of a highway to influence these businesses.

There is a need to note, at the same time, that in the following section I discuss the impacts of highways that are either crossing or directly adjacent to neighborhood boundaries since it would be quite logical to assume that, in most cases, highways that are not physically connected to the neighborhood bring insignificant impacts on neighborhood economy. Thus, the location of a highway in relation to neighborhood boundaries is a very important factor of estimating the degree and nature of highway impacts on neighborhood economic activity.

4.5.2. Impacts on Neighborhood Business District (NBD)

Definition of NBD

Before discussing the impacts of highways on a NBDs, there is a need to provide a definition for them. It is important to recognize that NBDs differ from neighborhood to neighborhood; however, their common feature is that they primarily serve the neighborhood residents, their day-to-day needs of retail and service character. For instance, the city of Bellevue, Washington, provides the following definition of a neighborhood business district in the city comprehensive plan:

“Neighborhood Business (NB) – A land use designation that provides for the retail sale of convenience goods and personal services for the day-to-

day needs of the immediate neighborhood. These sites may also accommodate a limited amount of administrative office space, provided the office use does not interfere with the site's primary neighborhood-serving function" (City of Bellevue 2002).

Therefore, the distinct feature of a NBD is that the businesses located there serve the needs of the community. The mix of businesses differs from neighborhood to neighborhood, since the social characteristics of the market serve as determinants of businesses to make a decision to locate in the neighborhood. For example, middle- to upper-class communities may have wine stores or specialty shops; low-income neighborhoods may have "dollar" stores and check cashing establishments as well as variety stores; neighborhoods surrounding a university campus may have record stores, fast-food places, and tattoo and body piercing establishments.

At the same time, a NBD can be of city-wide or regional importance as well. The location of a neighborhood in relation to the rest of the city and the proximity to transportation networks may affect the location of office space in a NBD. Also, a NBD can serve the customers beyond neighborhood boundaries. In case a NBD contains such businesses as, for example, a car dealership or a "big-box" store such as Wal-Mart, Target, Sam's club, or even a shopping mall, a NBD will serve not only neighborhood residents but also the customers that live in other areas of the city and the surrounding territory⁵.

⁵ This information is based mostly on my personal observation of NBDs in Cincinnati and its neighboring jurisdictions in CMSA.

Importance of Highway Location in Relation to NBD Location

The impacts of highways on NBDs differ due to two major factors. First, it is the physical location of a highway in relation to the location of NBD (Horning and Ream 1968; Buffington et al. 1997b). Different impacts can be expected from the following scenarios: a highway runs through a neighborhood at the territory of the business district; a highway runs through the neighborhood but the right-of-way does not include the territory on which a NBD is located; and a highway runs along the border of the neighborhood. Second, it is the presence or absence of highway exits on the territory of the neighborhood that imposes impacts on the business district in case “pre-highway” businesses are not eliminated by the right-of-way (Winfrey and Zellner 1971, 112).

Highways That Cross a NBD

A highway imposes a direct impact on a NBD when a highway right-of-way lies within the area of NBD. In this case, business district is totally or partially physically destroyed. Unfortunately, the cases of physical destruction of a NBD are quite typical when highways are constructed in primarily residential neighborhoods without pockets of urban blight. Planners consider the territory of the NBD as the only alternative in placing a piece of a highway due to the fact that the costs of relocating and elimination of housing of fair condition exceed the costs of replacing the businesses for a NBD (Hill 1973; Ellis 1968). Also, historically, a business district is in most cases located along a major road that runs through a neighborhood and is connected to other major transportation arteries of the city; so, replacing a busy and congested street with a highway is one of the

solutions both for solving some of the environmental problems⁶ and making major transportation nodes of the city more traffic-efficient (Gamble and Davinroy 1978).

Even though from the city-scale point of view the impact on businesses produces more positive outcomes than negative (Gable and Davinroy 1978), from the neighborhood perspective the impact appears to be somewhat harmful (Buffington et al. 1997b; Politano 1980). In the case when a new business district will not appear after the old one is destroyed due to the fact that the old one was surrounded by primarily residential land, the residents of the neighborhood will be underserved and will experience inconvenience doing their everyday shopping or acquiring services (Chernoff 1978). Before the destruction of NBD, residents could shop for groceries or use drycleaner or hairdresser services without having to drive to another area because the services were conveniently located within the walking distance. In addition, those people who are unable to drive or cannot afford a car relied on a NBD to satisfy their needs (Kemp 1965); with the elimination of the businesses that served them, those people will face difficulties of having to use public transit in order to get essential services.

Another perspective to consider in discussing the elimination of a NBD by a highway is to look at the businesses that have to leave the neighborhood. After the construction of a highway that swept away the businesses from the neighborhood, the majority of the residents that supported them is unable to do so any more (Hartman 1970; Caffrey 1970).

⁶ Some of the literature argues that environmental quality of an area can be improved in terms of noise and air pollution if a busy street is replaced with a highway (Gable and Davinroy 1978).

As a result, the majority of businesses that have to relocate will lose their customers, since most of the businesses are locally-oriented. Small, family-based establishments that are losing their local clientele become economically vulnerable and face the threat of going out of business.

Highways That Cross a Neighborhood Without Crossing a NBD

Another kind of highway impact on a NBD can be observed when a highway crosses the neighborhood but does not physically eliminate a NBD with its right-of-way. In this case, local businesses can also be affected, and there are three major scenarios that can occur. First, the number of customers of the existing businesses can decrease and this may lead to the decline of the establishments. When a highway is crossing a neighborhood, it creates a physical barrier for the residents, when they move from one place to another within the borders of the community (Horning and Ream 1968). Since the neighborhood businesses are usually located in a way that the residents can access them either by walking or taking a short drive, the new highway can become a barrier for those residents who live on one side of the highway while the NBD is located on the other. As a result, the accessibility of the businesses will decrease and they will experience economic decline. Also, the customers that no longer have direct access to goods and services offered by the local businesses will face the need to either spend more time on driving to the NBD or choose other locations to shop for everyday services and necessities. Therefore, the attractiveness of local business establishments to neighborhood residents will decline (Politano 1980, 64).

Second, the neighborhood businesses can be indirectly affected by a highway through the impact on the characteristics of the population. As it was mentioned in the previous sections of the thesis, a highway can impose changes on social characteristics of a neighborhood; as the neighborhood itself experiences physical change, new people become attracted to the community while long-term residents may leave (Kemp 1968; Thiel 1965). As a result of these transformations, social characteristics of residents, such as educational level, income, and race can change as well. Local businesses that are oriented toward serving the community can also experience changes in order to serve the people better. It is widely known that the target market determines the kinds of products or services a company offers. With the changing needs of customers, a business will experience changes that will go along with the changing market.

For instance, consider a hypothetical neighborhood that used to be lower- to middle-income residential community. After the construction of the highway that cut through its territory, the population began to change toward low-income, blue-collar residents, since middle-income families chose to move to other areas with higher quality of life. As a result, the local businesses that served more well-to-do persons will have to change the products or services they offer in order to better serve the existing residents who could not afford to move out and new residents that decided to move in due to inexpensive housing. Not only do the existing businesses will have to change; some establishments can close down and relocate because of decreased demand for their products and services and, more importantly, new businesses can locate in the neighborhood when the demand for certain products will be unfulfilled. For example, “dollar stores” or fast-food

restaurants can be established on the space which used to be occupied by coffee houses or antique shops.

Finally, the third scenario to consider when discussing the impacts of highways that cross neighborhoods is the emergence of new businesses somewhere within the affected neighborhood (Buffington et al. 1997b, 42-44). The factor that determines the increase of business activity is the presence of highway exits on the territory of the neighborhood. In most cases, businesses take advantage of locating at the intersections of highway exits and major roads, since this provides increased accessibility to the land they are located on. When a highway exit lies within the territory of the neighborhood, the community becomes more accessible to non-residents. As a result, new businesses can be established. Also, there is a possibility of increased office space in the neighborhood (Thiel 1965).

This tendency of new emerging businesses can be accompanied by the change in land use of the neighborhood. A neighborhood that contained mostly residential land before the construction of the highway can experience the increase of commercial land due to the fact that the land becomes more accessible. Again, the increase of accessibility can be attributed to the construction of exits from the highway to the territory of the neighborhood. If a neighborhood is not connected to the highway, the accessibility of the land will not increase.

However, do these changes bring any benefit to local businesses and residents? Since establishments located at the exits and intersections of major roads are aiming at

attracting the customers who pass by, neighborhood residents do not benefit from these businesses. Gas stations, fast-food restaurants, and convenience stores choose intersections and exits as their locations, and they do not intent on serving the local community (Buffington et al. 1997b, 45). In addition, there is no evidence on the influence of these businesses on a NBD. It is unknown if these establishments compete with the businesses located in the NBD or influence them in a way that brings significant changes of either positive or negative character.

Highways That Are Adjacent to a Neighborhood

Finally, there is a need to consider the impacts of highways on a NBD in case a highway is adjacent to the neighborhood (runs along or close to its boundary). Again, two scenarios are possible – there may or may not be exits off the highway to the neighborhood. If there are no exits, a highway does not seem to impose any impact on a NBD. If there are exits, the impact on the NBD can be similar to the one described earlier. At the same time, it is not clear from the literature how the new businesses at highway exits can affect local establishments.

4.5.3. Impacts on Housing Values

In most cases, the literature that discusses the change of housing values as a result of introduction of highways to neighborhoods emphasizes the increase of values due to increased accessibility that results from building a highway (Buffington et al. 1997b, 45; Bishop et al. 1970, 105). However, as it was mentioned earlier, there is need to distinguish between highways in urban areas and suburbs. There is no doubt that

suburban areas received growth in residential housing and its values since the residents obtained easy access to these areas. Urban areas, on the other hand, experienced different outcomes from building the highways. In some cases, the accessibility was also the advantage that helped attract new residents. At the same time, highways that cut through residential neighborhoods brought depreciation of housing values as well (Politano 1980). The literature indicates that one of the most important factors to consider when analyzing housing values and highways is the distance of housing to the highway facility. Also, there is a need to investigate indirect impacts of highways on housing values, which (impacts) result from the socio-economic changes in the neighborhood that occurred after the construction of a highway (Bishop et al. 1970, 106).

Distance to a Highway as Determinant of Impacts

Accessibility of a neighborhood can be increased by means of a highway, and housing values are most likely to rise for properties that are not too remote from a highway yet far enough to provide for noise-free environment and aesthetics of the surrounding area. Boarnet and Chalermpong (2001) suggest upon the results of their “before-after” study of highways and house prices in Orange County, California that houses located within the distance of up to 1,125 feet from the highway are less likely to experience increase in value since “noise and other disamenities” are of no attraction to the residents (Boarnet and Chalermpong 2001, 581; Bishop et al. 1970, 106; Ridker and Henning 1967).

On the other hand, the researchers estimated that housing values after the construction of highways rose almost equally in the areas 1,125 feet-1 mile from highway and two-three

miles from the highway. The fact that the houses located more than three miles from the highway were not even studied indicates that a house can be considered too remote from a highway and accessibility is not a determinant for increasing housing values (Boarnet and Chalermpong 2001). Thus, it can be concluded that houses located adjacent to a highway are more likely to lose value due to the environmental effects brought by the transportation facility (such as noise, pollution, and aesthetics) (Politano 1980; Bishop et al. 1970); housing values can rise for properties located within three miles from the highway as a result of increased accessibility; and houses situated more than three miles from a highway will not change in value due to the significant distance from it.

Indirect Impacts: Change of Neighborhood Socio-Economic Characteristics

Housing values can also be affected by the factors that resulted from the construction of the highway through a neighborhood. As it was mentioned in the previous sections on impacts on community image, identity, and perception, a highway can damage or destroy community cohesion and make some residents leave the neighborhood due to the negative consequences of a highway that make the quality of life decrease (Buffington et al. 1997b, 47; Steiner 1978, 96). Neighborhood amenities can also be destroyed along with other attractions that served as magnets for new residents before the construction of a highway. Negative changes in the physical and social environment of a neighborhood lead to decrease in housing prices. Naturally, as the neighborhood becomes more run-down and the income level of the residents declines, houses in that area become less desirable, and that is reflected in housing prices (Politano 1980; Jargowsky 1996).

Housing ownership is another characteristic of neighborhood housing that can be affected by a highway. As social changes in the neighborhood take place, housing ownership will change. The demand of rental housing will increase as the income level of the neighborhood residents declines (Jargowsky 1996). The number of single-family housing units will decrease while the number of multi-family units will increase. As a result, home ownership rates will decrease. Rental housing units are usually not as well-maintained as owner-occupied units; therefore, the quality of housing stock in the neighborhood will decrease along with the housing prices.

4.5.4. Impacts on Land Values

For urban residential neighborhoods, land values are closely connected to housing values (McDonald and Osuji 1995). Therefore, the impacts of highways on land values are similar to those on housing values. As accessibility is a significant factor for determining land values, the cost of land will increase when a highway is constructed in the neighborhood and only if the neighborhood has direct access to the highway (exits).

If the overall image of the neighborhood turns more negative due to social changes that resulted from the construction of the highway, land in the neighborhood will decrease in its value (Jargowsky 1996; McLean and Adkins 1971). Also, the cost of residential land adjacent to the highway will decrease because of negative effects of the highway on the environment (noise, pollution, and aesthetics) (McDonald and Osuji 1995, 276; Hall and Breston 1978; Ridker and Henning 1968).

The cost of non-residential land is also affected by a highway. Accessibility plays a greater role in this case – the better the access to the land, the higher the cost of the land. Properties in a NBD will change their values depending on the location of a highway in relation to a NBD (discussed above) (Buffington et.al 1997a; Caffrey 1970; Winfrey and Zellner 1971). Properties can depreciate if the neighborhood businesses are negatively affected by a highway. At the same time, when a highway access leads to the increase of the number of people that are served by neighborhood businesses, the land in a NBD will be of more demand and thus will increase in value.

When the highway has exits on the territory of the neighborhood, the price of land at those exits will increase due to the fact that the land would become accessible to larger number of people (Gamble and Davinroy 1978).

4.5.5. Impacts on Employment

As it was mentioned above, neighborhoods vary in terms of kinds and amount of businesses they contain. Some neighborhoods are entirely residential, while others can contain areas occupied by large businesses. There may be a large office park with a variety of different businesses, a headquarters of a large company, a manufacturing facility, or a shopping center. Even though it is rarely the case when a major business in a neighborhood employs mostly neighborhood residents, a large company or a complex of businesses can attract residents that are employed by them to the neighborhood. Norwood in Cincinnati, Ohio can serve as an example of such situation. When a General Motors plant located in Norwood, the population of the neighborhood started to increase

due to the fact that a substantial amount of the labor force of the plant preferred to live in Norwood or nearby neighborhoods. When the plant closed down, the population of Norwood experienced a decline, since the workers had to seek employment with other companies or other GM plants in the area (Hunter 1997; Dettmer 2002; US Census Bureau 2000).

There may be two major impacts of a highway on neighborhood employment. First, the increase of accessibility of the neighborhood land and changes in land use (decrease of residential land and the corresponding increase of commercial and/or industrial land) may lead to the emergence of new employers in the neighborhood that would draw labor force from the community and the nearby areas. In this case, the population of the area will grow due to the increased attraction of the neighborhood in terms of new employment opportunities and the unemployed current residents of the neighborhood will seek employment with the new businesses (Gamble and Davinroy 1978).

The reverse impact will be observed when a highway running through or close to the neighborhood physically eliminates business facilities totally or partially. In this case, the businesses will face the need to relocate their facilities. As a result, the unemployment rate in the community will increase and some of the residents employed with the business will have to relocate in order to find a job (Steiner 1978, 93). This, in turn, will lead to the decrease of neighborhood population (Hartman 1970; Frankland 1970).

4.6 Impacts of Highways on Neighborhood Visual Characteristics

4.6.1. Functional Impacts vs. Visual Impacts

It was already mentioned in the previous sections of this analysis that a highway in an urban neighborhood can create a physical barrier for the residents in many different ways (Horning and Ream 1968; Ellis 1968; Sale and Steinberg 1971). For instance, a disturbance of residential linkages can occur when a highway runs through the neighborhood and prevents the residents from accessing their everyday destinations such as shops, recreational facilities, community centers, or churches (Ellis 1968). Also, physical impacts of highways can impose change on the neighborhood business district, decreasing the access to it or even destroying it due to highway right-of-way, when a highway runs through the business district itself (Dansereau 1965).

However, all the physical impacts of highways discussed previously refer mostly to highway physical interventions that bring about functional disturbances in the neighborhood life. I use the term “functional” since the analysis in the previous sections touched on the direct physical impact of a highway which, in turn, resulted in affecting social and economic functions of the neighborhood. For example, the analysis of neighborhood image, identity, and perception in relation to the highway that is located in the neighborhood indicates that the function of the community connectedness to its residents and the outsiders can be modified as a result of the construction of a transportation facility within neighborhood boundaries or in close proximity to them (Kemp 1965; Dluhy et al 2002). The disturbances or modifications of the economic

functions of the neighborhood (the functions of the business district, the values of housing and land) also take place after the highway is constructed. The physical impacts of highways, in this case, play an important role as they impose effects on the economic environment: elimination of businesses, creation of new businesses, and changes in housing and land prices (Buffington et.al 1997a; Caffrey 1970; Winfrey and Zellner 1971; McDonald and Osuji 1995, 276; Hall and Breston 1978; Ridker and Henning 1968).

The category of impacts that has not been discussed yet refers to visual, or aesthetic, impacts. It is related to physical impacts in a sense that visual impacts are also the products of highway's physical influence. At the same time, as it was already mentioned, the influence of physical impacts is much broader than that of visual ones. Therefore, visual impacts of highways on neighborhoods form a sub-category in a broad dimension of physical impacts, some of which are functional while others are visual.

4.6.2. The Importance of Visual Characteristics of the Neighborhood

Different individuals perceive the surrounding environment differently, so the concept of "beauty" or "ugliness" is sometimes controversial. At the same time, people always try to make the visual environment more aesthetically pleasing. Artistic tastes of people differ, but it is possible to find common ground when judging the physical environment from the point of view of its aesthetics. It is common sense to assume that the majority of neighborhood residents would dislike the situation when their homes' windows face concrete walls or dirt fields. On the contrary, the presence of green space would be

widely preferred by the residents of the community (Buffington et al. 1997b; Lynch 1970; Park and McKenzie 1967).

Some of the literature on the impacts of highways on urban communities slightly touches on the visual impacts, usually referring to them as a part of the larger group of environmental impacts. The impact on aesthetics is discussed in the sense that this aspect of community life should be accounted for as well as noise, soil pollution, and air quality when a highway-community relationship is studied (Buffington et al. 1997b, 51). At the same time, virtually no sources solely focus on visual impacts of highways, so it can be concluded that the literature on this topic is limited.

4.6.3. Location of the Highway in Relation to the Neighborhood Boundaries and Its Land Uses as Determinant of Impact

There is a need to note that the location of a highway in relation to the neighborhood boundaries plays a critical role in determining the strength of the visual impacts. From the term “visual” itself, it is clear that the impacts exist only when they are observed. Unlike other kinds of impacts, visual impacts are identified upon the observation; if nothing has changed in the neighborhood environment from the visual standpoint after the construction of the highway, no impacts exist. Therefore, if a highway is situated within the neighborhood boundaries or in close proximity to the neighborhood, visual impacts can be observed.

In addition, the strength of the impacts depends on the location of the highway in relation to the land uses in the community. For instance, a highway can be located on the outskirts of the neighborhood behind a wooded area or on the land occupied by an industry. In this case, the residents of the community would rarely observe the highway facility because they would not visit the area frequently. On the other hand, if the highway is located in the residential area or a business district, the visual impact will be intense – people's perception of the environment will be influenced by a highway.

4.6.4. Highway Design as Determinant of Impact

Visual impacts of a highway will be different depending on the kind of the highway that runs through the community. There are three basic kinds of highways: elevated (above the surface), at-grade (in the level of the surface), and depressed (below the surface). In general, the kind of the highway is determined according to the engineering parameters and the qualities of the landscape (Horning and Ream 1968; Buffington et al. 1997a; Buffington et al. 1997b). When the road network is complex, elevated highways are built in order to allow for traffic increases in limited space. In this case, highways overpass each other. This kind of approach is utilized when highway interchanges should allow for the traffic to go into different directions. In most cases, elevated highways can be observed when a highway runs through a densely built environment with large amount of traffic. Also, an elevated highway can be constructed when there is a need to preserve the space below it. In the 1960s and 1970s, elevated highways were proposed as a way that allowed keeping the territory of urban territories intact but still having traffic move

through it. In addition, elevated highways sometime help save space in the dense environment or cope with the hilly landscape of the area.

Elevated highways impose the most severe visual impact, since they are hard to hide behind trees or walls. Even though proposed for bringing certain benefits to communities by saving space, such highways create tremendous visual barrier and disrupt visual cohesion of a neighborhood (Horning and Ream 1968). Not only do the facilities themselves look unpleasant. The space below the highway is rarely utilized due to noise and vibration, and that leads to bad maintenance of that unwanted space. Poorly-lighted areas below the highway can cause the intensification of criminal and drug activity in the neighborhood or simply serve as places for garbage disposal (Horning and Ream 1968, 35). Houses and businesses located in proximity to an elevated highway experience the lack of sunlight and bear negative visual perception of the area.

The second highway design is at-grade. There is a need to note that, from the engineering standpoint, this kind of highway is easier to construct. However, unlike an elevated highway, at-grade kind requires land to be taken as right-of-way. An at-grade highway running through an urban community can bring about negative visual impacts. In general, the appearance of a highway is not aesthetically pleasing unless it is hidden from the observer. Therefore, when a highway is not isolated from a viewer by any kind of a visual barrier, visual impacts appear to be negative. At the same time, there is a need to consider the visual barrier itself and identify if it is aesthetically satisfying. My observations of highways in Cincinnati indicate that not always the barriers look nice.

In some cases, I noticed concrete walls or fences that serve as dividers between highways and the neighborhoods. Sometimes, however, thick vegetation served as a natural wall, and this was much more pleasant to see than a concrete fence. In fact, green space is considered as a positive element of urban environment in general (Lynch 1970); and when the literature on highway design discusses the aesthetic aspect of highway construction, the most frequently recommended divider is vegetation (Buffington et al. 1997b, 51-103; Hornning and Ream 1968). The presence of green space along the highway diminishes the negative visual impacts.

Finally, a depressed highway is the one that runs below the surface, either in a tunnel or in an open space. Such highway design can be applied when the landscape does not allow an at-grade highway. Depressed highways produce fewer negative visual impacts because they are not seen to the observer. At the same time, there may be the case when a wall still runs along the segments of a highway in order to provide protection to neighborhood residents. In this case, the visual impact is similar to that from at-grade highways, when the wall itself serves as a visual barrier. Again, vegetation can diminish this impact if located along the wall or the protective fence.

4.7 Impacts on Quality of Life

4.7.1. Definitions of Quality of Life

There are different definitions of the Quality of Life (QOL) concept that are found in the literature. However, there are two major questions that arise: What characteristics are included in the concept, and What is the scope of application of the QOL model? The answer to the first question varies from author to author, even though there are some commonalities among the different definitions. One of the broad definitions of the QOL states that it is simply another term for the “general welfare” of the citizens. In this case, QOL serves as a goal for the government to promote in order to protect the environment, to sustain and enrich human life, and to ensure the happiness of the citizens by increasing the wealth of the nation. In this case, QOL can be measured by different indicators that measure the quality of the environment and the economic growth (Liu 1975, 9; Freeman 2003; Bram 2003).

Another definition of QOL looks at the issues from citizens’, not government, perspective. According to one of the surveys, the respondents indicated that their perception of the QOL relates to improved standard of living, secure life, environmental protection, and personal happiness (Liu 1975, 10-11; US Department of Housing and Urban Development 1974, 6; Freeman 2003, 19). Therefore, citizens’ definition of QOL carries a component of subjective judgment, since such concepts as “happiness,” “well-being,” and “satisfaction” have different meanings for each person. However, Liu (1975) proposed that the QOL concept has two dimensions: the wealth itself and psychological

factors which are personal and subjective in their nature. Within this conceptual framework, QOL is a collection of social, political, economic, and environmental factors that make a life of an individual pleasant. Liu's model employs different indicators that help measure the QOL (Liu 1975, 12-13).

The definitions of QOL provided above are not the only two that exist. Various authors put different variables in the model itself as well as use different methods of data processing (Dalkey and Rourke 1971). The sources mention the term of QOL in many contexts, and it is interesting to note that the concept is used to describe and evaluate life for neighborhoods, cities, metropolitan areas, and even the nation as a whole. Some authors put emphasis on social aspects of life (Ellis 1968), others on physical characteristics of urban space (Crawford 2000, 37-38). Liu, on the other hand, provides a comprehensive model which accounts for social, political, economic, and environmental aspects of life in urban neighborhoods and metropolitan areas (Liu 1972; Liu 1975). I consider Liu's model to appear the most suitable for the evaluation of highway impacts on urban neighborhoods, since one of his publications discusses the QOL for highway impact assessment (Liu 1972).

4.7.2. Reasons for Discussing Quality of Life

The previous sections on highway impacts on urban neighborhoods discuss the impacts on many different aspects of neighborhood life. Some impacts are direct, which means that there is a direct relationship between the neighborhood characteristics or aspects of life and the highways. Examples of direct impacts are impacts on neighborhood land use,

destruction of community amenities, and relocation of businesses from the highway right-of-way. Indirect impacts, on the other hand, are the ones that result from direct impacts of highways. In this case, the highway does not serve as a primary reason for some neighborhood characteristics to change; rather, the changes of other characteristics lead to the transformation of some aspects of neighborhood life. For instance, the indirect impact of increased crime rates in the neighborhood can emerge as a result of middle-income residents' relocation due to the disamenities brought by a highway.

It is possible to classify impacts on the basis of the aspect of neighborhood life affected by a highway, and such classification is applied in the sections above. The QOL approach differs from other approaches in terms of its comprehensiveness. Since QOL is a concept that attempts to include every aspect of life, from social to economic and environmental, the model recognizes and accounts for the multiple links that exist among all these aspects.

4.7.3. Highway Impacts on Quality of Life

The simple approach to considering the change in neighborhood QOL as a result of a highway is to consider three scenarios: QOL will decline, QOL will increase, or QOL will not change. QOL can be considered to overcome positive, negative, or no change over time, unlike the individual impacts on the aspects of neighborhood life that were included in the taxonomy of the impacts in the beginning of this chapter. In other words, the impacts on social, economic, and visual characteristics cannot be identified as either

positive or negative, while QOL in the neighborhood as a whole can be affected in positive or negative manner by highways.

The major finding of the research on highway impacts is that the degree and the character of highway impacts depend directly on the location of the highway in relation to the neighborhood boundaries. If the highway does not run through the neighborhood or along its border, the impacts on the neighborhood itself are minimal. Significant impacts are expected when a highway divides the neighborhood, creating a physical and visual barrier for the residents and visitors. Therefore, the QOL will change if a highway runs through or along the border of a neighborhood and will not be affected if a highway is not spatially related to the community.

4.7.4. The Place of Quality of Life Framework in the Thesis

The issue of QOL is two-fold: first, it relates to citizens' perception of the environment they live and work in; second, it accounts for one of the planner's policy concerns. Within this framework, the impacts of highways can also be viewed from these two perspectives – the first part relates to the impacts that occur after the construction of the highway while the second part relates to policies that need to be implemented in anticipation of these impacts. However, the scope of this thesis involves only the first part of this framework, namely impacts that can be observed after the construction of the highway and that affect the QOL in urban neighborhoods, involving citizens and businesses. In addition, I do not attempt to describe each and every aspect of QOL that was affected by highways. Instead, I focus on those aspects of QOL that I consider

essential in terms of them being affected by the construction of highways. Still I believe that the range of the discussed impacts allows for drawing conclusions about the impacts of highways on the neighborhood QOL.

In general, it can be concluded on the basis of the discussion in the previous sections that a highway that crosses the neighborhood or runs along its boundary can lead to the change in neighborhood QOL. The decrease of the QOL results from the highway which creates physical barrier for the activity in the neighborhood or destroys the components of neighborhood social and economic life with its right-of-way. The highway that is not connected to the neighborhood but runs through its territory creates a wide array of negative impacts. On the other hand, some positive changes in the neighborhood and the increase of the QOL can be caused by the highway which is connected to the neighborhood by means of exits. The increase of neighborhood accessibility can lead to positive changes in many aspects of the life of the community. At the same time, it is wrong to assume that any highway that runs through a neighborhood without exits will bring totally negative changes and any highway with exits will increase the QOL in the neighborhood. A neighborhood that has a highway running through it or along its border will experience a mixture of impacts due to the fact that each community has unique characteristics.

Even though the characteristics of a neighborhood that are affected by highways lie within the QOL framework, it would be incorrect to state that only these characteristics are the ones that affect the QOL. There is a need to recognize that it is not possible within

the scope of this thesis to comprehensively analyze the impact of highway construction on the QOL as a whole. However, the impacts discussed in the previous sections can impose effect on neighborhood QOL.

V. METHODS FOR EVALUATING IMPACTS OF HIGHWAYS ON URBAN NEIGHBORHOODS

5.1 Introduction

It is important at this point to review the specific methods used for impact evaluation in order to complete the framework for the evaluation of interstate highway impacts on urban communities. The previous chapter lays out a taxonomy of impacts and analyzes each component of the taxonomy separately. But the thesis would be incomplete if it contained only the description of the impacts and the links among them. It is vital not only to identify and describe the impacts but also to provide the classification of approaches to evaluation and description of the methods for identification and evaluation of these impacts. The goal of this chapter, then, is to provide a general classification of evaluation approaches along with the description of several quantitative methods that can be used for evaluating highway impacts on different areas of neighborhood life. There is a need to note the following:

1. The methods described below can be used within more than a single approach;
2. Some of the methods described in this chapter are quantitative (statistical) techniques, which are not only used for evaluation of transportation projects but for evaluation of project impacts in general. The goal of describing these

techniques in this thesis is to demonstrate that they can be used within one or more approaches to evaluation of highway impacts;

3. The approaches and methods described can be used for evaluation of highway impacts on neighborhoods; however, the scope of evaluation is not necessarily a neighborhood. In other words, the scope of the use of the approaches and methods should not be narrowed down to neighborhoods only; the selected methods can as well be applied to cities, MSAs, or regions;
4. This chapter is linked to the previous chapter in the sense that it provides the description of methods for evaluation of the impacts discussed in detail before.

There is no uniform methodology for evaluating impacts of projects. The literature on transportation projects and the impacts of transportation facilities presents a variety of methods for evaluation (Lichfield 1996; Echenique 1996). For this reason, I begin with laying out the classification of the approaches that can be utilized for identifying impacts of highway construction. Then, I present conceptual methods and statistical techniques for evaluation and link the techniques to the approaches discussed.

5.2 Classification of Approaches for Highway Impact Evaluation

Three broad approaches can be used in the process of identification and evaluation of the impacts of highways on neighborhoods: consideration of impacts before the highway is constructed, consideration of the impacts after the construction, and before-after analysis of the impacts. The basis for such grouping of approaches is the evaluation of impacts in

relation to the point of time of highway construction. It is quite logical to assume that these approaches would require different techniques due to the fact that the data available for analysis would be different before and after the construction.

The literature on highway planning, transportation engineering, and transportation planning provides the description of the numerous methods for evaluating projects. In addition, there is a need to note that the assessment of the impacts involves evaluation methods from other disciplines, not only engineering and planning. For instance, in the evaluation of the economic impacts, cost-benefit (Lichfield 1996) or input-output analysis (Gordon et al. 2002) can be performed. When it comes to the evaluation of social consequences, social science methods can be used (Kemp 1965). For environmental impacts, a different set of methods is utilized (Hall et al. 1978). However, it would not be reasonable to describe these methods within the scope of this thesis since the goal of this analysis is to provide the overview of the possible approaches to evaluating highway impacts in general.

5.2.1. Evaluation of Future Impacts

The literature that deals with highway planning discusses methods for analyzing the impacts of transportation facilities that are to be build (Creighton 1970; Hill 1973; Lichfield 1996; Gordon et al. 2002). The purpose of such an approach is to consider the possible impacts of highways in order to develop and build facilities that would bring less negative impacts and more positive impacts. Future impact assessment and evaluation are very important for making a decision on the location of the facility and for choosing the

appropriate location among the alternatives. The assessment of the impacts of transportation facilities performed with the help of these methods is the part and parcel of any transportation plan, since the choice of the location of the facility should be justified and all negative consequences of the project should be considered.

However, I do not describe the methods for future impact evaluation since the overall focus of the thesis is considering the impacts that already take place, i.e. the impacts that emerged after the highway was constructed. There is no doubt that the so-called “after-impacts” can be accounted for and forecasted before the facility is constructed; more importantly, it is possible to conduct the analysis of the anticipated impacts with a high degree of accuracy (McDonald and Osuji 1995). However, some impacts can be identified only after construction, and the most reliable approach is to compare neighborhoods with and without a highway (cross-sectional analysis of affected and control neighborhoods) or compare the characteristics of the affected neighborhood before the construction of a highway and after the construction (both approaches are discussed below in detail). After all, if all the impacts were easily predictable, there would be no negative impacts that can be observed today from highways built in the 1970s.

5.2.2. Evaluation of Impacts After Construction

The approach of evaluation the impacts of a highway after the facility is constructed is not widely used due to the fact that it does not allow to identify which area characteristics changed as a result of the highway and which were preexisting. In most cases, such kind

of approach is used for analyzing the static picture and highway-community relationship. However, this approach can provide valuable insights if the cross-section analysis is performed. For example, a neighborhood with a highway can be described and compared to a neighborhood without a highway (in this case, neighborhoods should be similar in their characteristics and the same characteristics of the neighborhoods should be compared). Such comparison can provide a researcher with the information on the impacts of a highway and answer the question, How would a neighborhood develop with and without a highway. The problem with this kind of analysis is the difficulty of finding identical neighborhoods with similar characteristics. The examples of the approach when the areas with and without highways are compared are quite frequent in the literature. For example, Chernoff (1978), Liu (1975), McLean and Adkins (1971), and Hall et al. (1978) study the impacts of highways on urban areas by comparing the characteristics of affected areas (with highways) and control areas (without highways).

5.2.3. Evaluation of Impacts Before- and After-Construction

Before-and-After evaluation of the impacts of highways is the most frequently used approach. It is quite logical to assume that the best results in determining the impacts of a transportation facility on an area is to create profiles of the area before the construction and after the construction and then compare these profiles. The problem of the cross-section comparison of study and control areas does not exist in this case, since the area is compared to itself at different points of time. The problem with before-and-after analysis, however, is that there may be other reasons for change in the study area that are not

related to the highway. It is important to identify which impacts are highway-imposed and which are not.

There are many sources that use before-and-after approach for evaluating the impacts of transportation facilities. The areas that the researchers study with this approach differ from census tracts to metropolitan areas; however, this approach is also used for evaluating impacts on urban neighborhoods. There is a need to note that before-and-after analysis is applied to studying distinct characteristics of study areas (Boarnet and Charlempong 2001; McDonald and Osuji 1995; McLean and Adkins 1971; Wisconsin Department of Transportation 1998) and to performing comprehensive impact evaluation (Dansereau 1965; Khasnabis and Babcock 1980; Buffington et al. 1997a).

5.3 Quantitative and Conceptual Tools for Evaluation of Highway Impacts

After the discussion of the broad approaches that can be used for the evaluation of highway impacts, there is a need to discuss the tools that can be used within these approaches. It is not possible to describe each and every method due to the following reasons:

1. Each research has a set of specific questions that need to be addressed by collecting specific data, it is impossible to provide a description for every possible kind of research on highway impacts;

2. The range of the impacts of highway construction on urban neighborhoods is very broad, as the previous chapter demonstrated; thus, providing evaluation method for each kind of impact is not a feasible task;
3. It is not necessary to provide a method of evaluation for each kind of impact; instead, there is a need to set some methodological directions for evaluation.

Then, it is essential to distinguish between quantitative and conceptual tools for evaluation of impacts. Quantitative tools are techniques that help process that data collected and make conclusions out of the data. Such tools can be used in a variety of disciplines, not only planning or engineering. However, conceptual tools have a narrower, specific meaning; they allow to measure and analyze specific issues within the area of study. The link between quantitative and conceptual tools is that the latter can be utilized with the use of the former. The sections below clarify the relationship between quantitative and conceptual tools and provide examples of models that synthesize these tools and illustrate their use in evaluation of highway impacts.

5.3.1. Quantitative Tools: Regression

Regression is the mathematical tool that allows analyzing relationships among variables. Before performing regression analysis, one should collect data and have a hypothesis to test. Then the data are analyzed in order to test the hypothesis (Kahane 2001, 1). The simplest form of regression is linear regression, when the relationship between two variables is determined. The equation for linear regression is

$$Y=a+bX, \tag{1}$$

where X is an independent variable, Y is a dependent variable, b and a are constants that are referred as an intercept and a slope, respectively (Kahane 2001, 5).

Multiple regression is a form of regression that measures the relationship between a dependent variable and several independent variables. Independent variables can predict a dependent variable. The assumption of multiple regression is that there should be strong correlation between the dependent variable and independent variables but the correlation among independent variables should be weak. The equation for multiple regression is

$$Y= b_1X_1 + b_2X_2 + ... + b_nX_n + c, \tag{2}$$

where X_n are independent variables, Y is the dependent variable, b_n are the regression coefficients, and c is the intercept (Garson 2003).

Regression as a tool is very widely used by different disciplines; however, in most cases multiple regression is used more often than linear regression, since the concepts researched are complex. The literature that deals with analyzing the impacts of highways on urban and suburban areas uses multiple regression widely. In fact, the conceptual methods for identifying highway-community relations reviewed below utilize the multiple regression tool to analyze the relationships among different characteristics of neighborhoods.

5.3.2. Quantitative Tools: Factor Analysis

Factor analysis is a statistical technique aimed at simplifying complex sets of data (Kline 1993, 3) by reducing the large number of independent variables to a smaller set of variables that describe the initial set. Factor analysis combines variables into factors (dimensions or constructs which are condensed statements of relationships between variables) and determines the most important variables in the field (Kline 1993; Page 1997, 25-26). Therefore, factors account for variance and explain correlations (Kline 1993, 28). In this sense, factor analysis is based on the assumption that there are a number of general factors which cause the different relations between variables to arise (Schilderinck 1978, 62).

Factor analysis resembles the regression model in terms of the relationship between variables it is looking at. However, the methods for regression and factor analysis are different. In regression analysis, the relationship between a dependent variable and independent variables is explored. In factor analysis, one looks at the basic pattern of interrelations between a number of variables, which include independent and dependent variables. However, despite the difference in procedure, factor analysis and regression analysis complement each other – regression is concerned with explanation of previously assumed relationships, while factor analysis aims at discovering unknown relationships between the variables under examination. Therefore, this form of analysis can make important contribution in support of already theoretical views or encourage the formation of a new system of hypotheses to explain observed facts or phenomena (Schilderinck 1978, 65-67).

The analysis starts with a data matrix, which represents variables and their characteristics (Page 1977, 26). The next step is a correlation matrix – a set of correlation coefficients between the number of variables. Then, factor loadings (correlations of a variable with a factor) are determined utilizing the correlation matrix, and an initial factor matrix is constructed. The relationship between the factor loadings and the characteristics of variables are seen in the following equation:

$$Y = a_1F_1 + a_2F_2 + \dots + a_nF_n, \quad (3)$$

where Y is a characteristic being analyzed in factor analysis, F_n are the factors, which are represented by linear equations, and a_n are the factor loadings corresponding to the characteristics above (Page 1977, 29).

The factor loadings are the correlation coefficients between the variables and factor, row and columns of the matrix, respectively. The squared factor loading is the percent of variance in that variable explained by the factor. In order to get the percent of variance in all the variables accounted for by each factor, there is a need to add the sum of the squared factor loadings for that factor (column) and divide by the number of variables (Garson 2003).

When the initial factor matrix is constructed, the first factor selected has high loadings for all characteristics. The remaining factors have roughly an equal number of positive and

negative relationships to the characteristics. All factors are independent of each other. The factor loadings get closer to one as the degree of correlation between the factor and a characteristic increases; the inverse relationship produces the factor loading which gets closer to -1. Even though the total number of factors is equal to the number of variables, the number of factors that have the meaning and are used in the remaining steps of factor analysis⁷ equals the number of variables minus the number of zero or near-zero sums of the columns of squared factor loadings (Page 1977, 29-30).

In measuring highway impacts on urban neighborhoods, factor analysis can be used as a technique to simplify complicated set of data that indicate, for instance, correlations between the aspects of neighborhood life and the characteristics of a highway. An example of the application of factor analysis is Liu's Quality-of-Life model (described below), where he uses factor analysis for determining the weights for the variables used in his analysis (Liu 1972). Muth and Goodman (1989) also use factor analysis for estimating weights for the parameters of a neighborhood to be put in hedonic price model (described below). Instead of using the whole array of neighborhood characteristics in their model, they identify the most significant ones by means of factor analysis and operate with them in the analysis.

⁷ Next steps of factor analysis are: rotation of the initial factor matrix, calculation of factor scores, and standardization of the values of the factor scores (Page 1977; Kim and Mueller 1978). These steps are not described in this section due to the fact that this requires a high level of technical detail and explanation, while the purpose of this section is just the brief description of the mathematical tools that can be used for impact analysis.

5.3.3. Conceptual Tools: Quality-of-Life Model

The Quality-of-Life (QOL) indicator model tested by Liu (1972) employs a wide range of factors that constitute the term “quality of life” for an urban neighborhood. The research, performed for study and control areas indicated that this model can be applied in highway impact assessment; even though some drawbacks of this model exist, the model provides another useful approach to the problem of evaluation of a transportation project on a neighborhood.

QOL of the community is very hard to measure since this concept involves subjective judgments of individuals concerning the physical and psychological “wants” that make these individuals happy or satisfied. Psychological aspects of the notion cannot be measured, so in this model, psychological attributes are held constant. The major impacted areas of neighborhood life (or neighborhood attributes), according to the model, are economic (EC), education (ED), social and environmental (SE), and mobility and accessibility (MA). These components of quality life are affected by two kinds of changes: highway construction (H) and other exogenous changes (EX). The model, therefore, is described as follows (Liu 1972, 17-18):

$$QOL_{jt}=g[EC(H, EX), ED(H, EX), SE(H, EX), MA(H, EX)]^8, \quad (4)$$

where j denotes the neighborhood and t denotes time period. From this equation, exogenous changes on neighborhood quality of life can be described as (Liu 1972, 18):

⁸ For control neighborhoods, therefore, the equation would be the same except that H (highway construction) would not be accounted for.

$$\begin{aligned}
dQOL = & (\partial g / \partial EC) [(\partial EC / \partial H) dH + (\partial EC / \partial EX) dEX] + (\partial g / \partial ED) [(\partial ED / \partial H) dH + \\
& + (\partial ED / \partial EX) dEX] + (\partial g / \partial SE) [(\partial SE / \partial H) dH + (\partial SE / \partial EX) dEX] + \\
& + (\partial g / \partial MA) [(\partial MA / \partial H) dH + (\partial MA / \partial EX) dEX]
\end{aligned} \tag{5}$$

Even though the model is based on determining QOL for control and study neighborhoods⁹, it can be applied to the study of affected neighborhoods before and after the highway was constructed if time series data exists for them. By measuring QOL for affected neighborhoods, we will be able to determine the impact by comparing these neighborhoods with each other. For instance, the application of this model might reveal that neighborhood bisected by a highway had a lower (or higher) QOL than those touched by a highway.

The criteria that shape neighborhood attributes (EC, ED SE, and MA) in the QOL model are selected on the basis that they are universal, simple, adaptable to changes in values of the residents, neutral, and meaningful and useful. The main assumption of this model, when it comes to identifying the criteria, is that residents of the neighborhoods of study are relatively homogeneous in their perception of values and the characteristics of well-being as well as in their socioeconomic backgrounds (Liu 1972, 18-19).

In short, the method of identifying QOL for neighborhoods involves the standardizing of raw data on each variable constituting a neighborhood attribute and transforming the data

⁹ Liu (1972) compared dQOL's for study and control neighborhoods. The one higher would indicate positive influence of a highway project.

into the conventional Z scores so that the mean of the Z scores becomes 0 and standard deviation becomes 1.0. The model is in an additive linear form, i.e. each of the effects of highway construction on QOL is estimated by summing the effects of highway on four QOL attributes (Liu 1972, 19-21).

5.3.4. Conceptual Tools: Measuring Residential Land Values with “Base Year vs. Hypothetical Scenario” Method

McDonald and Osuji (1995) determined the impact of anticipated transportation improvement on residential land values by comparing land values before the information on the new transportation line became known to the market and after the information became fully known but the line was not yet available. Even though they call their model a “generalized before-and-after method,” I use the title of “base-year values vs. hypothetical scenario values” to avoid confusion between McDonald and Osuji’s “before-and-after when the facility is not yet built” and “before and after the facility is built.”

The technique accounting for the comparison of base-year values and hypothetical scenario values allows for identifying the degree of the reaction of the market on future transportation improvement. In general, this method is based on the analysis of before-and after- land values that takes into account possible influences on land market.

There are two equations that base-year and hypothetical scenario residential land values. For the base year,

$$\ln V_b = \beta_0 + \beta_1 X_{1b} + \dots + \beta_n X_{nb} + \delta_b D + e_b, \quad (6)$$

where V_b is land value on a block, X_{1b} through X_{nb} are various variables that influence $\ln V$, β_0 through β_n are coefficients, D is the proximity to future transit line, δ_b is a coefficient, and e_b is a normally distributed effort term with zero mean and constant variance. The hypothetical-scenario equation is (McDonald and Osuji 1995, 269):

$$\ln V_a = \alpha_0 + \alpha_1 X_{1a} + \dots + \alpha_n X_{na} + \delta_a D + e_a \quad (7)$$

This statistical model permits all variables to have different effects on land values in the two periods. The variables that McDonald and Osuji employed in these equations were taken from census data (racial composition, median household income, population density) as well as calculated as distances to a major arterial street, a downtown, a major shopping center, an industrial site, and a park (McDonald and Osuji 1995, 271-273). The findings of the study indicted that the market had anticipated the opening of the new transportation line with the increase of residential land values and with the reverse effect for the areas adjacent to right-of-way (McDonald and Osuji 1995, 276-277).

This method can be applied in the study of highway impacts on urban neighborhoods. Since residential land values are affected by such attributes as neighborhood demographics and the accessibility of the area, and these attributes are more likely to change after the construction of a highway through a neighborhood (see Chapter IV, sections 4.4 and 4.5), residential land values are more likely to change as well.

5.3.5. Conceptual Tools: Hedonic Price Model for Housing Values

The impacts of transportation improvements on neighborhood can be measured by applying hedonic models. By measuring hedonic prices of housing, the change can be traced and the hypothesis of the influence of a highway on the values of housing in the neighborhood can be tested.

The theory of hedonic prices is formulated as a problem in the economics of spatial equilibrium in which the entire set of implicit process guides both consumer and producer locational decisions (Rosen 1974). Hedonic price theory combines the theory of consumer choice with respect to commodities and locations, expressing property values as a function of housing preferences, accessibility, residential density and housing agglomeration. According to the theory of hedonic prices, the selling price of a house is expressed as a function of the attributes of a house (Williams 1991, 311):

$$y = f(x_1, x_2, \dots, x_n) \quad (8)$$

Marginal implicit price of public goods (or bads) that influence the price must be estimated by hedonic means; individual housing attributes must be regressed against individual sale price or rental value of each house. Then, individual implicit prices must be regressed against observed quantities of consumption of a particular attribute together with household socio-economic characteristics (such as income, education) to estimate

the demand function for an individual attribute. Empirical evidence suggests that hedonic equations are non-linear (Williams 1991, 312).

Hedonic pricing models are generally based on the following assumptions: there is a single urban housing market, relevant data is available, consumers have freedom to choose the location, market equilibrium exists, and consumers have identical factors that bring utility. There are also some econometric problems with hedonic models: selection of appropriate attributes, choice of suitable data, and data quality (Williams 1991, 312-314).

As it was already mentioned, the price of any good is determined by the bundle of attributes, or components. When it comes to the discussion of housing prices, many different aspects of a neighborhood will influence the demand for housing in this particular neighborhood. Therefore, the value of housing in a neighborhood will change with the change in the neighborhood characteristics.

The components that constitute a hedonic price for a housing unit vary from study to study. Among public goods (or bads) that have been valued using hedonic approach are air pollution, social infrastructure, noise level, and ethnic composition (Brookshire et al. 1982, 165). However, all these components are not explicitly valued in the market – they just contribute to the market price of a good that is on the market, in our case, a housing unit. Therefore, housing demand could be decomposed into the demand for the various components of the housing bundle, including the neighborhood (Muth and Goodman

1989, 60). For the analysis of the impacts of highways on neighborhoods, the interest of a researcher lies in those components that directly belong to a neighborhood, not the housing unit itself. Since a highway affects a neighborhood, changing characteristics of the neighborhood affect housing values.

Among the neighborhood socio-demographic characteristics that are included in hedonic price equations presented by different authors racial, ethnic, and class attributes, along with income level, education and condition of neighborhood housing stock are considered to be appropriate (Muth and Goodman 1989, 62-63). However, some of the variables depend on other ones; for instance, class, income level, and education of neighborhood residents are determined by one another. Education level of residents in most cases determines their income and, as a result, their class (or something that is perceived as "class" by residents). At the same time, I consider that all these variables deserve to be included in hedonic price equations, since these parameters determine the perception of the neighborhood and, therefore, may serve as price determinants.

Muth and Goodman (1989) also notice that since the parameters to be put in hedonic equations are numerous, factor analysis can be applied (see section 5.3.2). This procedure is based on the premise that buyers do not usually consider the whole array of neighborhood attributes but rather look at those such as schools, crime, shopping, and neighbors (Muth and Goodman 1989, 64).

Finally, the problem with choosing the variables for a hedonic equation might be based on the formulation of hypotheses. One can assume that preferences of buyers are identical (“identical utility factors” in Williams (1991)). In some cases, however, this may not hold. One of the ways to solve this problem is to focus the analysis on the buyers that seek similar characteristics of a housing unit (Muth and Goodman 1989, 65). This problem was also noticed by Williams (1991), when he was talking about the issue of choosing the proper attributes for analysis (Williams 1991, 314).

In the hedonic analysis of housing demand in the conditions of induced travel (the link between increasing highway capacity and increase in miles of travel), Boarnet and Chalermpong (2001) focus their study on two major neighborhood characteristics – schools and crime – in relation to the introduction of a new highway segment to the urban area. Hedonic price regression, which included housing characteristics and neighborhood characteristics, was used to analyze the impact of the highway on housing prices. Hedonic analysis proved the hypothesis of the relationship between induced travel and the change in development patterns, since new highways increased the accessibility of the area (Boarnet and Chalermpong 2001, 584-600). There is a need to note that their study excluded housing units located within 1,250 feet from the highway (Boarnet and Chalermpong 2001, 581). At the same time, this fact does not indicate that hedonic price model cannot be used to analyze housing units adjacent to a highway or neighborhoods bisected by a highway. Instead, this model demonstrated to be a very useful tool for the analysis of the relationship between transportation improvements and housing prices that are affected by the change in neighborhood characteristics.

5.4. Conclusion

The sections of this chapter discussed three dimensions for the analysis and evaluation of highway impacts on neighborhoods: three broad approaches (analysis of future impacts, after-highway analysis, or cross-sectional analysis, and before-and-after analysis), quantitative tools that can be used for data analysis, and the examples of conceptual models that are used for analyzing the impacts of transportation on specific neighborhood characteristics. The major links between these three aspects discussed in this chapter are depicted in Figure 5.1.

Figure 5.1. Relationship Among Approaches to Impact Evaluation, Quantitative Tools, and Conceptual Tools

Approaches		Evaluation of "After" Impacts		"Before-and-After" Analysis	
Evaluation of Future Impacts		Cross-section analysis		Comparison of neighborhood characteristics before and after highway construction	
Comparison of base-year neighborhood characteristics to "hypothetical scenario" neighborhood characteristics					
Quantitative Tools		Regression		Factor Analysis	
Regression		Factor Analysis		Regression	
Factor Analysis				Factor Analysis	
Conceptual Tools		Quality-of-Life Model		Quality-of-Life Model	
Base Year vs. Hypothetical Scenario Method		Base Year vs. Hypothetical Scenario Method		Base Year vs. Hypothetical Scenario Method	
		Hedonic Price Model		Hedonic Price Model	

Figure 5.1 demonstrates that the conceptual tools described before employ quantitative tools of regression and factor analysis and can be used within three approaches. In addition, there is a need to note that these conceptual tools can be used not only within the approaches described in the initial sources but also within other approaches. For instance, the Quality-of-Life model, which uses both the techniques of regression and factor analysis, can be utilized in the evaluation of “after” impacts (in a cross-sectional analysis, when one can measure the quality of life (QOL) in a control neighborhood and the affected neighborhood and then compare the results) and in “before-and-after” analysis (when one measures the QOL of a neighborhood before the construction of a highway, after the construction of a highway, and then compares the results).

Hedonic Price model can also be used within two approaches, with affected and control neighborhoods or the affected neighborhood only. As for the Base Year vs. Hypothetical Scenario method, which was originally used for measuring the impacts of anticipated transportation improvement, it can be used within two other approaches as well. In the original model, the researchers compared land values when the market did not have the information about the transportation improvement and when the information was known. On the same basis, one can compare affected and control neighborhoods’ land values or land values in a neighborhood before and after highway construction.

VI. CONCLUSION

The research on the impacts of the urban extensions of interstate highways on neighborhoods indicates that the problem of measurement of highway construction impacts can be approached in different ways. In most cases, authors focus their attention on one or several areas of neighborhood life that were influenced by highway construction (social, economic, or environmental aspects) and measure the impacts according to the developed methodology. In addition, the research of the literature on transportation engineering and transportation planning reveals a wide array of approaches and techniques for evaluation of impacts. Since the goal of this thesis is to provide a framework for evaluation of highway impacts, the research aims at identifying the impacts of highways on urban neighborhoods and the approaches and tools to measure the impacts. Therefore, taxonomy of impacts and the review of approaches and tools are provided.

The impacts of urban extensions of interstate highways on neighborhoods can be grouped on the basis of the area of neighborhood life affected by a highway. Even though it was not easy to group the impacts the literature discussed, the major findings of the research are that 1) impacts take place only when a highway goes through the territory of the community or runs along its border, and 2) these impacts can be both direct and indirect. Direct impacts result from the highway right-of-way's elimination of neighborhood amenities (parks, meeting places, landmarks) and businesses (including those in

neighborhood business district) as well as displacement of residents and creation of physical and visual barriers for the residents and visitors of the neighborhood. Direct impacts can also be of positive nature, when a highway increases neighborhood's accessibility and provides for more economic and social activity in the neighborhood (creation of new businesses at highway exits or construction of new housing). Indirect impacts are those impacts that result from direct impacts; in other words, indirect impacts are of second or even third order. However, indirect impacts are no less important for the analysis of a neighborhood. An example of indirect impacts is the change of population characteristics (race, education, and income) as a result of the decline of neighborhood attractiveness for upper-income residents due to the direct impacts.

There is no standard method for measuring the degree of highway impacts on neighborhoods. The major finding of the research on evaluation methods is that not only the methods that are used by some sources with regard to transportation but also methods from other disciplines can be utilized in the process of impact analysis. Even though the models described in the chapter on methods are related to specific sections of neighborhood life (except for the quality-of-life model which is comprehensive in its nature), the horizons for application of these models to identify and evaluate the impacts of highways on neighborhoods are quite broad. Quantitative tools that are widely used by researchers are regression and factor analysis, and these tools can be applied in the process of measuring any kind of impacts. In fact, multiple regression is a very useful tool for such kind of research because the broad goal of the research process is to determine cause-effect relationship between the presence of a highway and changes of

neighborhood characteristics. As for the factor analysis, it is also very useful since, in some cases, massive amount of data need to be processed to find interrelations and arrive to conclusions. In my opinion, these tools are critical for the analysis of the data collected on different areas of neighborhood life. Approaches and conceptual tools described in Chapter V are much more highway/community-related than quantitative tools; at the same time, flexibility is the quality that characterizes approaches and conceptual tools.

Figure 6.1. Framework for Evaluation of Interstate Highway Impacts on Urban Neighborhoods

Impacts Evaluation	Impacts on Households	Impacts on Image, Identity, and Perception	Impacts on Amenities	Economic Impacts	Visual Impacts	Quality-of-Life (QOL)
Approach	• “After” • “Before-After”	• “Future” • “After” • “Before-After”	• “After” • “Before-After”	• “Future” • “After” • “Before-After”	• “Before-After”	• “After” • “Before-After”
Quantitative Tool(s)	Regression and/or Factor Analysis					
Conceptual Tool(s)	• Elements of QOL Model	• Elements of QOL Model • Base Year vs. Hypothetical Scenario Method	• Elements of QOL Model	• Hedonic Price Model • Elements of QOL Model • Base Year vs. Hypothetical Scenario Method	• Elements of QOL Model	• QOL Model

Figure 6.1 illustrates the groups of impacts identified earlier in the process of the research and the approaches and tools to measure the degree of these impacts. The central idea behind this illustration is to demonstrate how broad approaches, quantitative tools, and

conceptual models described in Chapter V can be applied in the process of analysis of the impacts described in Chapter IV. The focus of the framework is to present general directions for impact analysis by describing the impacts and the methods for their evaluation. The framework in Figure 6.1 is a product of the analysis of the literature and one of the perspectives to view the issue of highway impacts of urban neighborhoods. I am not focusing of describing information collection processes – such descriptions are plentiful and available; instead, I present general and flexible framework for the analysis of the problem, which (the framework) is useful for understanding interrelationships between highway impacts and methods for their measurement.

BIBLIOGRAPHY

Altshuler, Alan. 1979. *Current Issues in Transportation Policy*. Lexington: Lexington Books.

Altshuler, Alan. 1965. *Locating the Intercity Freeway. Inter-University Case Program #88*. New York: The Bobbs-Merrill Company, Inc.

Baumbach, Richard O., Jr., and William E. Borah. 1981. *The Second Battle of New Orleans: A History of the Vieu Carre Riverfront-Expressway Controversy*. Alabama: University of Alabama Press.

Bishop, Bruce A., C.H. Oglesby, and Gene E. Willeke. 1970. *Socio-Economic and Community Factors in Planning Urban Freeways*. Project on Engineering-Economic Planning, Stanford University.

Blount, Jim. 1996. *A History of Travel in Hamilton and Butler County, Ohio*. Hamilton, Ohio: Past/Present/Press.

Boarnet, Marlon G., and Saksith Chalermpong. 2001. "New Highways, House Prices, and Urban Development: A Case Study of Toll Roads in Orange County, CA." *Housing Policy Debate*, vol.12, issue 3: 575-605.

Bram, Jason. 2003. "New York City's Economy Before and After September 11." *Current Issues in Economics and Finance*, vol. 9, issue 2: 1-7.

Brookshire, David S., Mark A. Thayler, William D. Schulze, and Ralph C. d'Arge. 1982. "Valuing Public Goods: A Comparison of Survey and Hedonic Approaches." *The American Economic Review*, LXXII, March: 165-177.

Buffington, Jesse L, Sharada R. Vadali, Katie N. Womack, Richard A. Zimmer, Wayne G. McCully, Michael Nikolaou, and Carol A. Lewis. 1997a. *Social, Economic, and Environmental Effects of Elevated, Depressed, and At-Grade Level Freeways in Texas*. College Station, Texas: Texas Transportation Institute.

Buffington, Jesse L., Katie N. Womack, and Carol A. Lewis. 1997b. *Social and Economic Effects of Elevated, Depressed, and At-Grade Level Freeways in Texas*. College Station, Texas: Texas Transportation Institute.

Caffrey, William. 1970. "Relocation Problems of Business and Commercial Establishments." In *Relocation: Social and Economic Aspects*. Highway Research Board, Special Report #110: 46-52.

Casetti, Emilio. 1964. *Classification and Regional Analysis by Discriminant Iterations*. Ph.D. diss., Northwestern University.

Cheronff, Michael. 1976. "Density as a Determinant of Highway Impacts." *Transportation Research Record* 686: 4-9.

Cincinnati, OH City Planning Commission. 1951. *Expressway System for Metropolitan Cincinnati*. Cincinnati, OH.

City of Bellevue. 2002. *City of Bellevue, Washington. Ordinance No. 5394*. Internet; <http://www.ci.bellevue.wa.us/citygov>. Accessed March 2002.

Cline, Arthur R. 1946. *Interstate Highway System. Analysis and Recommendations. General Location Plan*. Toledo: Lucas County Planning Commission.

Cox, Wendell and Jean Love. 1996. "40 Years of the US Interstate Highway System: An Analysis. The Best Investment A Nation Ever Made. A Tribute to The Dwight D. Eisenhower System of Interstate & Defense Highways." *The Public Purpose. Highway and Motorway Fact Book*. Internet; <http://www.publicpurpose.com/freeway1.htm>. Accessed July 2002.

Crawford, James Homer. 2000. *Carfree Cities*. Utrecht, Netherlands: International Books.

Creighton, Roger L. 1970. *Urban Transportation Planning*. Chicago: University of Illinois Press.

Dansereau, H. Kirk. 1965. "Five Years of Highway Research: A Sociological Perspective." *Highway Research Record* 75: 76-81.

Dalkey, Norman, and Daniel Rourke. 1971. "The Delphi Procedure and Rating Quality of Life Factors" in *Experimental Assessment of Delphi Procedures with Group Value Judgments*. California: Rand Corporation.

Debroy, Bibek. 2002. "Getting on a Highway." *The Financial Express*. October 8, 2002. Internet; <http://fecolumnists.expressindia.com>. Accessed November 2002.

Dettmer, Richard. 2002. "New Life for Norwood, Ohio." Internet; www.norwood-ohio.com. Accessed January 2003.

Dluhy, Milan, Keith Revell, and Sidney Wong. 2002. "Creating a Positive Future for a Minority Community: Transportation and Urban Renewal Politics in Miami." *Journal of Urban Affairs*, vol.24, no.1: 75-95.

Echenique, Marcial and Partners Limited. 1996. *Methodologies for Transport Impact Assessment*. Luxembourg: Office for Official Publications of the European Communities.

Ellis, Cliff. 2001. "Interstate Highways, Regional Planning and the Reshaping of Metropolitan America." *Planning Practice and Research*, vol.16, no.3: 247-269.

Ellis, Raymond H. 1968. "Toward Measurement of the Community Consequences of Urban Freeways." *Highway Research Record* 229: 38-52.

Ellis, Raymond H., and Richard D. Worrall. 1969. "Toward Measurement of Community Impact: The Utilization of Longitudinal Travel Data to Define Residential Linkages." *Highway Research Record*, no.277: 25-39.

Francis, Ray. 1983. "Symbols, Images, and Social Organization in Urban Sociology." In *Urban Social Research: Problems and Prospects*, Valdo Pons and Ray Francis, eds.:115-146. Boston: Routledge & Kegan Paul.

Frankland, Bamford. 1970. "Relocation Effects on the Neighborhood." In *Relocation: Social and Economic Aspects*. Highway Research Board, Special Report #110: 53-56.

Freeman, John R., Jr. 2003. "Transportation's Role in Successful Communities." *Institute of Transportation Engineers Journal*, vol. 3, issue 3: 18-22.

Gamble, Hays B. 1976. "Transportation and Land Development: Societal Problems and Interrelations." *Transportation Research Record* 565: 18-21.

Gamble, Hays B., and Thomas B. Davinroy. 1978. "Beneficial Effects Associated with Freeway Construction: Environmental, Social, and Economic." *National Cooperative*

Highway Research Program Report No.193. Washington: Transportation Research Board, National Research Council.

Garson, David G. 2003. *PA 765: Quantitative Research in Public Administration*. Internet; <http://www2.chass.ncsu.edu/garson/pa765/index.htm>. Accessed April 2003.

Gordon, Peter, James E. Moore, II, Harry Richardson, and Christopher Williamson. 2002. *The Economic Impacts of Caltrans' I-5 Corridor Improvement Project*. San Diego, California: University of Southern California School of Policy, Planning, and Development.

Hall, Fred L, and Barbara E. Breston. 1978. "Effects of Highway Noise on Residential Property Values." *Transportation Research Record*, 686: 38-43.

Hartman, George W. 1970. "Current Research Relating to Relocation of Families and Businesses." In *Relocation: Social and Economic Aspects*. Highway Research Board, Special Report #110: 19-24.

Heikkila, Eric J. 2000. *The Economics of Planning*. New Brunswick, New Jersey: Center for Urban Policy Research.

Hill, Morris. 1973. *Planning for Multiple Objectives: An Approach to the Evaluation of Transportation Plans*. Monograph Series, Number 5. Philadelphia: Regional Science Research Institute.

History of the U.S. Highway System. 2002. Internet; <http://www.gbcnet.com/ushighways/history>. Accessed June 2002.

Horning, Walter R., and Joel S. Ream, Jr. 1968. *A Study of the Social, Economic, and Environmental Impact of Highway Transportation Facilities on Urban Communities*. Pullman, Washington: Highway Research Section Engineering Research Division, Washington State University.

Hott, Lawrence R. and Tom Lewis. *Divided Highways: The Interstates and the Transformation of American Life*. Produced by Allen Moore. 85 min. WETA-TV, Washington, D.C., 1997. Videocassette.

Hunter, Ginny. 1997. "My Heart's Still in Norwood." *The Cincinnati Post* 9 August. Internet; www.cincypost.com. Accessed January 2003.

Jargowsky, Paul A. 1996. *Poverty and Place: Ghettos, Barrios, and the American City*. New York: Russell Sage Foundation.

Kahane, Leo H. 2001. *Regression Basics*. Thousand Oaks, California: Sage Publications.

Kemp, Barbara H. 1965. "Social Impact of a Highway on an Urban Community." *Highway Research Record* 75: 92-102.

Khasnabis, Snehamay, and Willard F. Babcock. 1980. "Analysis of Freeway Impact in Five Urban Areas in North Carolina." *Transportation Research Record* 747: 26-32.

Kim, Jae-O, and Charles W. Mueller. 1978. *Factor Analysis: Statistical Methods and Practical Issues*. Beverly Hills, California: Sage Publications.

Kline, Paul. 1993. *An Easy Guide to Factor Analysis*. New York: Routledge.

Leathers, Rex C. 1984. "Building an Urban Freeway: A Case Study of Problems and Their Solutions." In *Site Planning Organization for Transport Infrastructures*, G. Corona, ed. Amsterdam, the Netherlands: Elsevier Science Publishers B.V.

Leedy, Paul and Jeanne Ellis Ormrod. 2001. *Practical Research: Planning and Design*, 5th ed. New York: Macmillan Publishing Co.

Levin, David R. 1965. "Informal Notes on Sociological Effects of Highways." *Highway Research Record* 75: 82-85.

Lewis, Tom. 1997. *Divided Highways: Building the Interstate Highways, Transforming American Life*. New York: Viking.

Lichfield, Nathaniel. 1996. *Community Impact Evaluation*. Bristol, Pennsylvania: UCL Press.

Liu, Ben-Chieh. 1972. "Neighborhood Quality-of-Life Indicator Model for Highway Impact Assessment." *Transportation Research Record* 686: 17-21.

Liu, Ben-Chieh. 1975. *Quality of Life Indicators in the US Metropolitan Areas, 1970*. Kansas City, Missouri: Midwest Research Institute.

Lynch, Kevin. 1970. *The Image of the City*. Cambridge, Massachusetts: MIT Press.

McDonald, John F., and Clifford I. Osuji. 1995. "The Effect of Anticipated Transportation Improvement on Residential Land Values." *Regional Science and Urban Economics*, vol.25, no.3: 261-287.

McLean, Edward L., and William G. Adkins. 1971. "Freeway Effects on Residential Mobility in Metropolitan Neighborhoods." *Highway Research Record* 356: 95-104.

"Methodologies for Transport Impact Assessment." 1996. *Transport Research APAS Strategic Transport*, vol. VII, no.21. Luxembourg: Office of Official Publications of the European Communities.

Meyer, Michael D., and Eric J. Miller. 1984. *Urban Transportation Planning: A Decision-Oriented Approach*. New York: McGraw-Hill.

Muth, Richard F., and Allen C. Goodman. 1989. *The Economics of Housing Markets*. Chur, Switzerland: Harwood Academic Publishes.

Page, John Michael. 1977. Assessment of Highway Impacts: An Application of Factor Analysis. Master's Thesis, University of Illinois at Urbana-Champaign.

Park, Robert, and Roderick McKenzie. 1967. *The City*. Chicago: University of Chicago Press.

Politano, Arthur. 1980. "Urban Blight and Highways in the Central Cities: Theoretical and Practical Perspectives." *Transportation Research Record* 747; 63-66.

Ridker, Ronald G., and John A. Henning. 1967. "The Determinants of Residential Property Values with Special Reference to Air Pollution." *Review of Economics and Statistics*, XLIX, May: 246-257.

Roddewig, Richard J., and Jared Sharles. 1983. *Analyzing the Economic Feasibility of a Development Project Planning Advisory Service Report #380*. Chicago: APA.

Rosen, Sherwin. 1974. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *The Journal of Political Economy*, vol. 82, no. 1: 34-55.

Sale, James, and Eleanor Steinberg. 1971. "Effects on Nonrelocated Households of Building a Highway in a Dense Urban Residential Area." Abridgment in *Highway Research Record* 356: 173.

Schilderlinck, J.H.F. 1978. *Regression and Factor Analysis Applied in Econometrics*. Leiden, the Netherlands: Tilburg School of Economics, Social Sciences, and Law.

Smart, Walter L. 1970. "Relocation Problems Viewed from the Affected Citizens' Point of View." In *Relocation: Social and Economic Aspects*. Highway Research Board, Special Report #110: 30-32.

St.Clair, David J. 1986. *The Motorization of American Cities*. New York: Praeger.

Steiner, Henry Malcolm. 1978. *Conflict in Urban Transportation: The People Against the Planners*. Lexington, KY: Lexington Books.

The City of Albuquerque Planning Department. 2003. *Community Identity: Proposed Amendments to the Albuquerque / Bernalillo County Comprehensive Plan*. Internet; <http://www.cabq.gov/planning>. Accessed March 2003.

Thiel, Floyd I. 1965. "Seminar on Sociological Effects of Highway Transportation." *Highway Research Record* 75: 75-76.

Turabian, Kate L. 1996. *A Manual for Writers of Term Papers, Theses, and Dissertations*, 6th ed. Chicago: The University of Chicago Press.

US Census Bureau. 1990. *1990 Census of Population, Summary Tabulation File 1A and 1C, Table P-16 to P-18*. Internet; www.census.gov. Accessed February 2003.

US Census Bureau. 2000. *Fast Facts for Norwood, Ohio*. Internet; www.census.gov. Accessed February 2003.

US Department of Housing and Urban Development. 1974. *International Information Series* #26, February 5.

Vogt, Rober S. 1985. *History of Transportation and Its Influence on Development of the Greater Cincinnati Area*. Cincinnati, Ohio: Metropolitan Research and Development Inc.

White, Michael. 1987. *American Neighborhoods and Residential Differentiation*. New York: Russel Sage Foundation.

Williams, Alan W. 1991. "A Guide to Valuing Transport Externalities by Hedonic Means." *Transport Reviews*, vol.11, no. 11: 311-324.

Winfrey, Robley, and Carl Zellner. 1971. "Summary and Evaluation of Economic Consequences of Highway Improvements." *National Cooperative Highway Research Program Report #122*. Washington, D.C.: Highway Research Board.

Wisconsin Department of Transportation. 1998. *The Economic Impacts of Highway Bypasses on Communities: Summary Report*. Madison, Wisconsin: Wisconsin Department of Transportation.