

December 2009

*Handbook on Applying "Other Social  
Effects" Factors in Corps of  
Engineers Water Resources Planning*

09-R-4



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*The OSE account has appeared, in various forms and nomenclatures, in federal guidance for many years. What has varied is the “status” of the account—whether required—and its importance—whether considered in formulation and plan selection. EC 1105-2-409, Planning in a Collaborative Environment (EC 409), greatly increases the emphasis and potential application of the OSE account by stating all four accounts (NED, EQ, RED and OSE) will be considered in project analysis and decision making. OSE is not respected by many as a factor in the decision making and the overall success of a project. Next to solid engineering, it may be the most important factor in the success of a project.*

*Events surrounding Hurricane Katrina and its aftermath have increased awareness of the importance of considering influences beyond NED. A white paper (Theoretical Underpinnings of the OSE Account) has been produced which explores the basis for fully integrating other social effects into the project analysis and decision process. The Corps’ emerging collaborative planning framework is moving away from an NED-centric focus and will consider OSE factors in project analysis and decision making. OSE information should be used in the planning process to help form planning objectives, help form and evaluate alternatives, and help stake-holders understand and explore the consequences of alternatives on their situations and interests.*

*However, the Corps has recognized that there are many implementation issues that need to be addressed if OSE factors are to play a greater role in water resources planning. The Corps’ Institute for Water Resources was directed to provide tools to Corps planners to help integrate OSE analysis into project planning. This OSE handbook provides tools and methods for developing OSE information and a framework for using such information in the planning process. The handbook presents procedures for applying OSE factors in each phase of the Corps six-step planning process. Examples and case study illustrate key points.*

*Of particular note, the handbook includes procedures for formulating and evaluating OSE management measures as part of water resources plans. Additionally, the use of place vulnerability analyses to identify social vulnerability “hot spots,” is showcased for its application to flood damage reduction and emergency management issues. The handbook also presents information on using “Loss of Life” estimation procedures for incorporation into with-versus without project- analyses. The application of OSE analysis in Corps business lines is also presented.*

*Fully incorporating social well-being factors into the planning process in a substantive way has great potential value for better ensuring that water resources solutions address a broad array of issues and concerns that better meet stakeholder needs and expectations. This handbook, by providing much of the technical information necessary for OSE analysis, provides a necessary, but not sufficient step, in the process of fully integrating the OSE account into the Corps planning framework. The critical remaining ingredient to ensuring successful integration is for leadership to affirm commitment to the new planning paradigm and the importance of social well-being factors in this paradigm.*

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## PREFACE

### Preface

This report was prepared to support the application of collaborative planning, particularly use of the Other Social Effects account, in project analysis in the Corps of Engineers Civil Works program as presented in Engineering Circular (EC) 1105-2-409 “Planning in a Collaborative Environment” (31 May 05). This work was performed by the Institute for Water Resources (IWR), under the direction of Lillian Almodovar, in support of Headquarters, U.S. Army Corps of Engineers (HQUSACE). Harry Kitch is the HQUSACE proponent. The report was prepared by Mark Dunning, Ph.D., of Marstel-Day, LLC, 2217 Princess Anne St., Suite 101-1A, Fredericksburg, VA 22401 under Contract Number: W912HQ-D-0007, Task Order 82. Susan Durden of IWR served as co-author and technical monitor for the report. For further information contact Lillian Almodovar, 703-428-6021, [Lillian.Almodovar@usace.army.mil](mailto:Lillian.Almodovar@usace.army.mil), Susan Durden, [Susan.E.Durden@usace.army.mil](mailto:Susan.E.Durden@usace.army.mil), or Dr. Dunning, 703-966-2398, [md@marstel-day.com](mailto:md@marstel-day.com).

### Dedication

**This handbook is dedicated to Dr. L. George Antle for his passionate concern with improving the lives and social security of people through water resources development, and for his innovative efforts to meaningfully bring social factors and regional economic development concerns into the Corps of Engineers project formulation process.**



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## Executive Summary

- Social well-being factors are constituents of life that influence personal and group definitions of satisfaction, well-being, and happiness. The distribution of resources; the character and richness of personal and community associations; the social vulnerability and resilience of individuals, groups, and communities; and the ability to participate in systems of governance are all elements that help define well-being and influence to what degree water resources solutions will be judged as complete, effective, acceptable, and fair. In large measures these issues are the province of the Other Social Effects (OSE) account.
- The OSE account has appeared, in various forms and nomenclatures, in federal guidance for many years. What has varied is the “status” of the account—whether required—and its importance—whether considered in formulation and plan selection. EC 1105-2-409, Planning in a Collaborative Environment (EC 409), greatly increases the emphasis and potential application of the OSE account by stating all four accounts (NED, EQ, RED and OSE) will be considered in project analysis and decision making. OSE is not respected by many as a factor in the decision making and the overall success of a project. Next to solid engineering, it may be the most important factor in the success of a project.<sup>1</sup>
- Events surrounding Hurricane Katrina and its aftermath have increased awareness of the importance of considering influences beyond NED. A white paper (*Theoretical Underpinnings of the OSE Account*) has been produced which explores the basis for fully integrating other social effects into the project analysis and decision process. The Corps’ emerging collaborative planning framework is moving away from an NED-centric focus and will consider OSE factors in project analysis and decision making. OSE information should be used in the planning process to help form planning objectives, help form and evaluate alternatives, and help stake-holders understand and explore the consequences of alternatives on their situations and interests.
- However, the Corps has recognized that there are many implementation issues that need to be addressed if OSE factors are to play a greater role in water resources planning. The Corps’ Institute for Water Resources was directed to provide tools to Corps planners to help integrate OSE analysis into project planning. This **OSE handbook provides tools and methods for developing OSE information and a framework for using such information in the planning process**. The handbook presents procedures for applying OSE factors in each phase of the Corps six-step planning process. **Examples and case study** illustrate key points.
- Of particular note, the handbook includes **procedures for formulating and evaluating OSE management measures** as part of water resources plans. Additionally, the use of **place vulnerability analyses to identify social vulnerability “hot spots,”** is showcased for its application to flood damage reduction and emergency management issues. The handbook also presents information on using **“Loss of Life” estimation procedures** for incorporation into with-

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<sup>1</sup>Manuals for NED can be found at: <http://www.hq.usace.army.mil/nedp/index.asp>. Note that a separate handbook for RED is under development.

versus without project- analyses. The application of OSE analysis in Corps business lines is also presented.

- Fully incorporating social well-being factors into the planning process in a substantive way has great potential value for better ensuring that water resources solutions address a broad array of issues and concerns that better meet stakeholder needs and expectations. This handbook, by providing much of the technical information necessary for OSE analysis, provides a necessary, but not sufficient step, in the process of fully integrating the OSE account into the Corps planning framework. The critical remaining ingredient to ensuring successful integration is for leadership to affirm commitment to the new planning paradigm and the importance of social well-being factors in this paradigm.

## Part I: Applying OSE Analysis in the Corps 4-Accounts Planning Process

### 1. Introduction

#### 1.1 Purpose

*How are social connectedness, community social capital, and community resiliency likely to change in the absence of a solution to a water resources issue? How are vulnerable populations likely to be affected?*

*How can such factors be included and given weight in Corps plan formulation and evaluation procedures? How can options be formulated which address such concerns? How can project contributions to social well-being be described, evaluated, and traded-off?*

This handbook describes how the social effects of water resources problems and solutions can be meaningfully addressed and included in the Corps water resources planning process. A concern for social effects associated with water resources development and management has long been part of federal water resources planning guidance, appearing as the Social Well-being Account in the 1972 “Principles and Standards” (Water Resources Council), and later (and currently) as the Other Social Effects (OSE) account in the Principles and Guidelines (P&G) adopted in 1983 (Water Resources Council) and in the Corps’ ER 1105-2-100 (see Box 1). However, since the adoption of the P&G there has been a tendency to discount the role and importance of OSE factors in water resources planning. Now, new guidance being promulgated and implemented – principally EC 1105-2-409, “Planning in a Collaborative Environment” (U.S. Army Corps of Engineers 2005) – is placing much greater emphasis on the importance of including a broad range of considerations in planning. In addition to National Economic Development (NED) factors, other considerations, including social factors addressed in the OSE account, are to be used to develop appropriate water resources solutions (see Box 2). There is thus a need for a broad reintroduction to the OSE account to provide information about key social concepts and their importance in water resources planning. This handbook addresses this need and is intended to provide Corps planners with the basic concepts, methods, and procedures to integrate social factors into water resources plans.

#### Box 1. Other Social Effects Account

Other Social Effects (OSE) Account. Most water and land resource plans have beneficial and adverse effects on social well-being. These effects reflect a highly complex set of relationships and interactions between inputs and outputs of a plan and the social and cultural setting in which these are received and acted upon. These effects will be reported as appropriate in the system of accounts for each alternative plan. The OSE account is a means of displaying and integrating into water resource planning information on alternative plan effects from perspectives that are not reflected in the other three accounts. The categories of effects in the OSE account include the following: Urban and community impacts; life, health, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation.

—ER 1105-2-100, Appendix D  
Amendment #1, 30 June 2004

## **1.2 Structure of the Handbook**

The handbook consists of three parts and two appendices. **Part I** establishes the conceptual framework for OSE and applies it to the Corps planning process and to Corps business lines. The primary objective of Part I is to enable Corps planners to understand why OSE analysis is important and how it can be included in the normal Corps planning process. **Part II** of the handbook presents a catalogue of OSE assessment tools and indicators and includes some views on measurement and presentation of social effects information. Three appendices, one on performing social profiles, one on online data resources, and one on the Trauma Benefit Method (TBM) are provided. Social profiling is a basic component of almost every OSE undertaking, and the appendix

provides step-by-step instructions for constructing a social profile. The second appendix highlights the many helpful websites and online data resources available to analysts. The TBM was an innovative way of characterizing and monetizing the social costs of flooding which may merit more widespread application. The fourth appendix presents a case study which illustrates key points made in Part I and the use of OSE indicators and tools presented in Part II. Box 3 below provides a handy way of finding some of the key topics in this handbook.

### **Box 2. Developing Appropriate Water Resources Solutions**

b. In continuing to implement the policy of the 1936 Act, all Corps planning studies will evaluate, display and compare the full range of alternative plans' effects across all four Principles and Guidelines' accounts (National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED) and Other Social Effects (OSE)). Planning Reports will include a full discussion and display of the beneficial and adverse effects of each plan, and a comparison of costs and effects among plans as well as cumulative effects. The discussion and display will address each of the four accounts and will not be limited to any on account....

—EC 1105-2-409, Paragraph 7.b.

### **Box 3. Topic Quick-Finder**

Here are hot links to selected topics in this handbook:

- Social effects factors described ([Part I, Section 2](#))
- Social effects analysis in the 4-Accounts planning process ([Part I, Section 4](#))
- OSE flood damage reduction project example ([Part I, Section 4.7](#))
- Special topics ([Part I, Section 5](#))
- OSE applications in Corps business lines ([Part I, Section 6](#))
- Key OSE tools described ([Part II, Section 1](#))
- OSE indicators ([Part II, Section 2](#))
- Performing a social profile ([Appendix A](#))
- Online resources for OSE topics ([Appendix B](#))
- Trauma Benefit Method ([Appendix C](#))
- Case studies ([Appendix D](#))



## 2. What Are “Social Effects” and Why Are They Important?

*Social effects*, in a general sense, refers to how the constituents of life that influence personal and group definitions of satisfaction, well-being, and happiness are affected by some condition or proposed intervention. Social effects as a category of concern in water resources have a long history. The Flood Control Act of 1936, the foundation of the Nation’s flood control policy, makes it clear that people’s well-being is a fundamental concern for the Federal Government’s involvement in flood control.<sup>2</sup> As early as Senate Document 97 in 1962, an objective of water resources planning included the “Well-Being of the People” (Yoe and Orth 1996, p. 67). Later, in Section 209 of the Flood Control Act of 1970, Congress expressed its intent that water resources development should have four objectives, one of which was the “well-being of the people of the United States” (U.S. Congress 1970). It is also noteworthy that Section 122 of this same Act provides a listing of the effects that Congress believed needed to be considered in determining the public interest for making public water resources investments. Table I-1 below presents a number of ways that “social effects” have been identified in three foundational documents: Section 122 of the Flood Control Act of 1970; the Principles and Guidelines (1984); and the Corps regulation governing water resources planning, ER 1105-2-100 (2000, amended 2004).

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<sup>2</sup> Flood Control Act of 1936 Declaration of Policy Section 1: It is hereby recognized that destructive floods upon the rivers of the United States, upsetting orderly processes and causing loss of life and property, including the erosion of lands and impairing and obstructing navigation, highways, railroads, and other channels of commerce between the States, constitute a menace to national welfare; that it is the sense of Congress that flood control on navigational waters or their tributaries is a proper activity of the Federal Government in cooperation with States, their political sub-divisions and localities thereof; that investigations and improvements of rivers and other waterways, including watersheds thereof, for flood-control purposes are in the interest of the general welfare; ***that the Federal Government should improve or participate in the improvement of navigable waters or their tributaries including watersheds thereof, for flood-control purposes if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise adversely affected (emphasis added)***. For more information on the development and importance of the 1936 Flood Control Act see Reuss 2004; Allen 1996.

**Table I-1. Other Social Effects as Identified in Key Water Resources Documents**

Section 122 FC Act of 1970	Principles and Guidelines	ER 1105-2-100
<ul style="list-style-type: none"> <li>▪ Air, noise, and water pollution</li> <li>▪ Destruction or disruption of man-made and natural resources, aesthetic values, community cohesion, and the availability of public facilities and services</li> <li>▪ Adverse employment effects and tax and property value losses</li> <li>▪ Injurious displacement of people, businesses, and farms</li> <li>▪ Disruption of desirable community and regional growth</li> </ul>	<ul style="list-style-type: none"> <li>▪ Urban and community impacts               <ul style="list-style-type: none"> <li>– Income distribution</li> <li>– Employment distribution, especially the share to minorities</li> <li>– Population distribution and composition</li> <li>– Fiscal condition of the State and local governments</li> <li>– Quality of community life</li> </ul> </li> <li>▪ Life, health and safety</li> <li>▪ Displacement effects</li> <li>▪ Long-term productivity</li> </ul>	<ul style="list-style-type: none"> <li>▪ Urban and community impacts               <ul style="list-style-type: none"> <li>– Effects on real incomes</li> <li>– Effects on employment distribution, especially the share to minorities</li> <li>– Effects on population distribution and composition</li> <li>– Effects on the fiscal condition of the State and local sponsor</li> <li>– Effects on educational, cultural, and recreational opportunities</li> </ul> </li> <li>▪ Effects on security, life, health, and safety</li> <li>▪ Displacement of people, businesses, and farms</li> <li>▪ Long-term productivity effects include maintenance and enhancement of the productivity of resources for use by future generations</li> <li>▪ Effects on emergency preparedness</li> <li>▪ Other effects as relevant</li> </ul>

## 2.1 Social Well-being Factors

Listings of variables such as those in Table I-1 do little to provide a deeper understanding of the nature of social effects and why they may be important. This section presents some social well-being factors that are based on human needs theory<sup>3</sup>. These concepts portray, in large measure, the kinds of OSE effects that affect individual and group definitions of satisfaction and well-being. These social well-being factors are used in section I-6 of this handbook to describe potential social-effects issues associated with Corps business lines. Additionally, the concepts form the basis for discussing key OSE tools and indicators in Part II of the handbook.

<sup>3</sup> The foundational concept in human needs theory is that people must have a number of essentials to survive and thrive. The best known human needs theorist, Abraham Maslow, postulated a hierarchy of needs starting with basic physiological requirements for survival – food, water, and shelter (1943). As basic needs are met, people seek to satisfy successively higher-order needs in the following general order: physiological needs, safety, love/belonging, status (esteem), and actualization. Other needs theorists have perceived human needs as being less a hierarchy and more of an ensemble of essentials for human development that are sought simultaneously (see National Research Council 2002). To the categories of needs defined by Maslow, human needs theorists exploring the roots of conflict have added a number of essential human needs including identity, freedom, participation, and distributive justice (Burgess and Burgess 2005). For a fuller treatment of these concepts as they relate to social well-being factors see Dunning and Durden (2007).

### 2.1.1 Health and Safety

A basic human need is for personal and group safety. Conditions that are seen as unsafe or unhealthy create personal stress and dissatisfaction among those affected. The level of perceived risk associated with conditions or alternatives is also a factor in determining satisfaction.

### 2.1.2 Economic Vitality

Personal and group definitions of quality of life are influenced by an economy's ability to provide a good standard of living for residents now and into the future. Factors such as employment opportunities, income mix, poverty and unemployment dynamics, educational opportunities, and access to markets affect economic vitality and may be affected by a water resources issue or by solutions offered. Such effects will likely be of great interest to stakeholders.

### 2.1.3 Social Connectedness

Related to the fundamental human needs described by Maslow as “Belongingness” and by conflict theorists as “Identity Needs,” social connectedness refers to the pattern of social networks within which individuals interact, which largely provides meaning and structure to life. A current term to focus this concept is *Social Capital*, popularized by James Putnam in his book *Bowling Alone* (2000). Social networks are composed of horizontal associations that are generally focused at community and family levels of interaction and also of vertical associations that bridge across communities and levels of society.

Social capital theorists generally focus on the benefit to be gained by cultivating an array of diverse voluntary associations in communities to build “civic infrastructure” that can provide individuals with greater opportunities for connectedness, build reciprocity, improve communication and coordination, and strengthen intergroup relations. Studies suggest that communities and regions having such robust civic infrastructure are likely to be more economically and socially progressive and resilient than communities and regions where such patterns of connectedness are not present (Putnam 1993). The World Bank has established a “Social Capital Website” (<http://www1.worldbank.org>) noting that the cultivation of community social capital is an essential component of generating development and reducing poverty.

### 2.1.4 Identity

*Identity* is the sense of self as a member of a group, distinct from and distinguished from other groups by values, beliefs, norms, roles, and culture. Many theorists see the need to cultivate group identities as part of humans' social nature. Related to the concept of identity is the concept of *cultural security*: the need for the recognition and honoring of one's language, traditions, and values. Identity and cultural security are factors in well-being and satisfaction in that they are seen to confer a core sense of definition and

grounding. In circumstances where basic identity needs are threatened, dishonored, or violated, dissatisfaction and conflict are likely to develop.<sup>4</sup>

### 2.1.5 Social Vulnerability and Resiliency

*Social vulnerability* refers to the capacity for being damaged or negatively affected by hazards or impacts. Vulnerability is associated with characteristics of the population – i.e., certain groups (the aged, the poor, minorities) are generally more vulnerable than other parts of the population (Boruff et al. 2005; Cutter et al. 2000; Rygel et al. 2005; Heinz Center 2000) (See Box 4). Such groups may lack the resources and capacities to resist the hazard (as, for example, the inability to effectively mobilize opposition to a highway alignment or a waste facility siting, or to evacuate from a hurricane) or to recover from the effects of a hazard (as, for example, poor people and communities may lack the financial resources to rebuild after a devastating flood). *Resiliency* is the capability to cope with and recover from a traumatic event. Studies show that social institutions such as families and public and private organizations play an important role in mediating the effects of disasters (see, for example, Boruff et al. 2005). Individuals who have strong social ties, and communities that have a strong *civic infrastructure* – i.e., well functioning and interdependent networks of formal and informal organizations – are likely to be more resilient than individuals who are isolated or communities that have a weak civic infrastructure (National Civic League 1999).

Overlaying the spatial distribution of vulnerable populations with hazard zones associated with flooding or other potential disasters using Geographic Information System (GIS) technology produces an assessment of *place vulnerability* (see Cutter et al. 2000). Place vulnerability analysis offers a way of examining where vulnerable populations are in relation to hazardous areas and has great applicability for disaster management.<sup>5</sup> For example, areas having greatest hazard potential and the greatest concentration of vulnerable populations would likely require different sorts of emergency preparedness and response strategies than low hazard/low vulnerability areas.

### 2.1.6 Participation

*Participation* means being able to interact with others to influence social outcomes. Complex social structures pose greater challenges for participation. Theories of democracy recognize the critical role of participation in legitimizing group action and building group cohesion (Delli Priscoli 2004). A 1976 United Nations conference on human settlements recommended that public participation should be an indispensable element of all planning strategies, noting, “Meeting basic human needs and improving the quality of human life in human settlements requires critical choices in the allocation of scarce resources, the utilization of available resources, and the harnessing of new ones; this process cannot be effective without the active involvement of the people affected by such decisions.” (United Nations 1976).

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<sup>4</sup> John Burton, an imminent conflict resolution scholar has postulated that the need for “identity” is among the most fundamental definers of humanness and is the source of many of the world’s deep-seated and intractable conflicts when identity needs go unmet. See, for example, Burton 1990.

<sup>5</sup> See the case study on Martin County, FL, in [Appendix D](#) of this handbook for an example of a place vulnerability analysis.

Similarly, the 1992 UN Conference on Water and Environment in Dublin (United Nations 1992) developed the so-called “Dublin Principles” on water and sustainable development, including the following:

*Principle No. 2 — Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels. The participatory approach involves raising awareness of the importance of water among policymakers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.*

### **2.1.7 Leisure and Recreation**

Having leisure time and being able to spend it in preferred recreational pursuits is an important aspect of well-being for most people. To the degree that water resources problems or solutions affect leisure time and/or recreational opportunities they are likely to be perceived as important considerations in selecting preferred solutions.

### **2.1.8 Conclusions**

Well-being is an ensemble concept composed of multiple dimensions. In particular the distribution of resources; the character and richness of personal and community associations; the social vulnerability and resilience of individuals, groups, and communities; and the ability to participate in systems of governance are all elements that help define well-being. A water resource planning process that is exclusively or even essentially focused on maximizing “National Economic Development” is missing a huge range of important issues that will influence to what degree the water resources solutions that are developed will be judged as effective, acceptable, and fair. In large measure, such issues are the province of the Other Social Effects account.

#### **Box 4. Social Vulnerability and Hurricane Katrina**

Hurricane Katrina struck the Louisiana, Mississippi, and Alabama coasts on August 29, 2005. The devastation of the hurricane and the flooding of the City of New Orleans produced by levee breaks from the hurricane created a catastrophe without precedent in the United States. As part of the comprehensive assessment of the performance of hurricane protection infrastructure undertaken by the Corps of Engineers through the Interagency Performance Evaluation Team (IPET), a team of nine social scientists was assembled to consider the socio-cultural effects of the disaster.

While carefully caveated to reflect the difficulties in gaining definitive answers in a chaotic situation, the researchers' conclusions, nevertheless, provide stark testimony to the social effects of a disaster on vulnerable populations:

*“It is clear that Katrina and the flood represent catastrophic physical damages with potentially vast social, cultural and historic consequences. At all levels of social interaction it is possible to observe the potential for trauma. A few examples demonstrate this. At the interpersonal level, families and social networks have been disrupted, perhaps permanently. The linking mechanisms between households and organizations, social support services, schools, health care and more have been severed in many cases and have been slow to repair. Faith in the system that was depended on for life-saving rescue has probably been undermined. Connections to large-scale institutions such as the school sector, the political process and the economic system have been dramatically altered.*

*Thus, at all levels it is possible to observe profound alterations. Perhaps what is most poignant comes from the neighborhood level though, where neighbors and organizations had labored valiantly to transform their areas and to enable Greater New Orleans to rise from its beleaguered social problems pre-Katrina. Those social processes and grass-roots efforts to improve local life chances have been abbreviated and perhaps irrevocably taken away. To understand disasters, it is necessary to examine the intersection between the built environment (e.g., levees, homes, business districts), the physical environment (wetlands, meteorological conditions, elevations) and the socio-cultural environment (the people). Disasters result from a misfit between these three key systems (Mileti 1999). To provide for an appropriate level of protection for the people, then, discussion must take into consideration the other two systems. Ultimately, what determines the line between acceptable and unacceptable risk reflects social, political and even economic contexts and realities. Any decision about levels of protection reflects these realities; what is key to understand from the perspective of this chapter is that the socio-cultural dimension is a critical component that cannot be divorced from engineered solutions.”*

—IPET 2006b; VII-4-94

### 3. Social Effects in the 4-Accounts Planning Framework

The intent of this section is to provide a broad overview of the role that social effects analysis can play in the 4-Accounts planning framework. In order to make this presentation meaningful, however, we must first distinguish how the 4-Accounts process differs from the previous (current) planning process.

#### 3.1 The 4-Accounts Planning Framework

*“P&G...do not adequately reflect contemporary water resources planning principles and practices....Examples of specific revisions to the P&G which the committee recommends include: (1) movement away from the consideration of the National Economic Development (NED) account as the most important concern. Today, ecological and social considerations are often of great importance in project planning and should not necessarily be considered secondary to the maximization of economic benefits.”*

*—National Research Council 1999, p. 4*

There is general, broad agreement within the water resources community that balanced, sustainable development using multiobjective, collaboratively developed watershed-based solutions is the preferred vision for water resources management (see Dunning and Galloway 2007). A quote from a water resources expert is illustrative of this perspective (Viessman 1998):

*Water policies for the 21st Century should have the following attributes:*

- They should focus on the right **problemshed**. That is, they should be system-encompassing, to assure that policy boundaries are defined by their true temporal, spatial, environmental, and institutional dimensions.*
- They should be flexible; standardized, uniform formats for dealing with water management should be avoided. The key is to look for the approach that works for the problemshed and problem to be addressed.*
- They should be holistic, considering all of the relevant interacting components of the system of concern.*
- They should be designed to support sustainable development.*
- They should embrace public views.*
- They should encourage partnership approaches to resolving conflicts and designing water management strategies.*
- They should be the driving force for regulatory programs, not the result of them.*

The Corps’ [Civil Works Strategic Plan](#) also commits the Corps to “responding to the nation’s water resources challenges through integrated water resources management and a watershed focus” (U.S. Army

Corps of Engineers 2004, p. 5), and highlights four key components of this direction: systems approaches, spatial or geographical integration, balance across multiple uses or functions, and employing collaborative approaches (pp. 6–7). Similarly, the Corps Policy Guidance Letter 61, Planning in a Watershed Context, lays out an ambitious policy for incorporating a watershed perspective into Corps planning (U.S. Army Corps of Engineers 1999) noting that the analytical framework for plans will be “founded on factual scientific, social, and economic information, allowing for the assessment, evaluation, and comparison of alternative plans, including positive and negative effects on economic development, the environment, and social well-being.”

The Corps’ Engineering Circular (EC) 1105-2-409, issued in 2005, lays out the clearest expression of the Corps’ intent to change its planning process to embrace the principles expressed in Policy Guidance Letter 61 and the Civil Works Strategic Plan. The EC makes several major changes in Corps planning policy:

- Collaborative planning activities with other Federal agencies and embracing solutions that reflect issues beyond traditional Corps responsibilities will be given budget priority;
- Plans no longer need recommend the NED plan (though cost-sharing policies concerning NED plans remain in effect). Any alternative plan may be selected if, on balance, it has net beneficial effects in the four P&G accounts. Planning reports must discuss and display the beneficial and adverse effects of each plan in each P&G account and compare the effects across plans.

### **3.2 The Role of OSE Information in the 4-Accounts Planning Framework**

What role should OSE information play in a collaborative planning framework? **First and foremost, OSE information should be used to make better decisions.** OSE information should be developed and used in the planning process to help parties involved to understand the situation and issues and to develop a deeper understanding of the views, positions, and underlying interests of those involved. The intent of this communication process is that stakeholders come to a deeper understanding of all views, as well, and that opportunities for shared interests and greater collaboration may be discovered and differences and choices crystallized.<sup>6</sup>

The OSE analysis requires flexibility and an open mind and should be a process of exploration that is heavily influenced by the issues and concerns of stakeholders. However, it is likely that stakeholder concerns and issues will be grounded in the well-being concepts that have been reviewed in Section II. The questions noted in Box 5 are illustrative of the kinds of issues that the OSE analysis should be addressing.

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<sup>6</sup> This crucial communication process is intended to help inform the analytic process of formulating, evaluating, and ultimately selecting a recommended plan. In this process there are national interests and policies represented in planning guidance that must be adhered to as well.



Instrumentally such social effects information should be used to assist in several key planning tasks:

- **Forming planning objectives:** Planning objectives are the distillation of a process of identifying problems, needs, and opportunities. In this process information about who is affected and how they see the situation is critical. It is particularly important that the interests of those who may be most vulnerable to risks be included in the process (see Willeke 1974; Creighton 1982).
- **Forming and evaluating alternatives:** Alternatives need to address social issues of concern. Specific OSE management measures that address important social issues and concerns can be developed and included in alternatives. Where possible and feasible, stakeholders should actively participate in the design of alternatives. At the very least, alternatives need to be formed with the expectation that they will be evaluated against social preferences of diverse stakeholders. Once again there should be a special responsibility to ensure that those stakeholders most vulnerable or at risk are afforded the opportunity – even provided special assistance – to participate in the exploration of alternatives. Another aspect of this overall facilitation of a communication process may also be to help ensure that those within the agency clearly understand the concerns, preferences, and issues raised by stakeholders.
- **Helping to crystallize important choices:** Communicating the socioeconomic implications of alternatives and helping stakeholders to understand them and explore the consequences of alternatives on their situations and interests can help differentiate the choices that alternatives present.
- **Resolving conflicts:** While not exclusively the province of the OSE practitioner, nevertheless the social analysis should help clarify issues and interests of stakeholders and should form the foundation for collaborative problem solving about finding appropriate and acceptable solutions (Creighton et al. 1998).

#### Box 5. Some Key OSE Questions of Concern

- What is the history and historical development of the local and regional area?
  - What is the history of the water resources situation?
- What groups have economic, cultural, and other “stakes” in the situation?
- What are the dynamics of social life in the local and regional area?
  - How is the social landscape configured – what basic “social statistics” can be used to describe the population and portray quality of life factors?<sup>1</sup>
  - What groups are especially vulnerable?
  - What is the structure and functioning of the civic infrastructure?
- How are social life and quality of life factors likely to change in the absence of a solution to the water resources issue? By potential ways of addressing the issue? How are vulnerable populations likely to be affected? How are social connectedness, social capital/social resiliency, and risks to human health and safety likely to be affected?
- What are issues of concern in the solutions being offered for solving the water resources issue?
  - How do stakeholders view the issues?
  - What preferences do stakeholders have for addressing the water resources situation? What interests and values appear to be advanced with the particular suggestions being made by stakeholders?
  - What appear to be intersections of interests? What are clear differences in interests or values among stakeholders?

### 3.3 Summary

In contrast to the relatively limited role for social effects information and analysis in the pre-EC 1105-2-409 planning environment, there is a more robust role for social effects information and analysis in the 4-Accounts framework. Table I-2 below compares the role that social effects information plays in the 4-Accounts framework with the pre-EC 1105-2-409 framework. Section 3 focuses more completely on the role of social effects information and procedures in each of the planning steps.

**Table I-2. Comparison of the Role of OSE Information in 4-Accounts Planning Framework with Pre-EC 1105-2-409 Planning Framework**

<b>Planning Step</b>	<b>Pre EC 1105-2-409 Planning Framework</b>	<b>Role of OSE/ Social Information in Pre-EC Framework</b>	<b>4-Accounts Planning Framework</b>	<b>Role of OSE/ Social Information in 4-Accounts Framework</b>
	Current paradigm defines problems narrowly, according to specified authorities. Projects are largely single purpose.  Problems, constraints, and planning objectives are defined by Sponsor/Corps.	Role may include conducting scoping workshops, generally as part of the EIS process.	4-accounts framework defines problems more broadly and focuses on the full range of water resources problems that are beyond traditional authorities.  There is multipurpose, multi-agency involvement.	Role includes identification and analysis of social conditions and stakeholder identification and analysis. “Consensus-forming activities” help build common definitions of problems, opportunities, and constraints, and help determine planning objectives.
Inventory and forecast conditions	Current paradigm develops most likely future without-project condition, based on forecasts and models.	Role is generally limited to population and employment forecasts.	Engages stakeholders in discussions about the future to create either “shared vision” of future without- project conditions or potential multiple without- project conditions.	Portrays social effects in future without-project conditions – based on models, forecasts, and expert opinions – to help stakeholders fully participate in the shared visioning process.
	Largely in-house technical process links management measures to planning objectives. Optimizes the NED objective, except for combined plans.	Generally presents broad socio-economic information as part of the EIS process; does not include formulating alternatives.	Links management measures to planning objectives, unconstrained by NED or agency authorities, in cooperation with full range of stakeholders and participating agencies.	Actively involves stakeholders in development of OSE measures that address social issues and concerns. Uses conflict analysis tools to help identify interests that need to be addressed in alternatives.

**PART I – APPLYING OTHER SOCIAL EFFECTS ANALYSIS IN THE CORPS  
4-ACCOUNTS PLANNING PROCESS**

<b>Planning Step</b>	<b>Pre EC 1105-2-409 Planning Framework</b>	<b>Role of OSE/ Social Information in Pre-EC Framework</b>	<b>4-Accounts Planning Framework</b>	<b>Role of OSE/ Social Information in 4-Accounts Framework</b>
Evaluate effects	Alternatives are evaluated against the objectives and rated on completeness, effectiveness, efficiency, and acceptability where the dominant evaluation is NED.	As above.	Alternatives are rated on completeness, effectiveness, efficiency, and acceptability.	Social effects of alternatives are disclosed as part of acceptability review in an open process with stakeholders. Conflict resolution processes help build forums for discussing issues and negotiating alternatives.
Compare alternatives	Plans are compared and ranked on the basis of NED and other effects as appropriate.	As above.	Plans are compared and ranked using information from all four accounts.	Social effects of plans are described with particular emphasis on plan contributions to desired future conditions. Stakeholder understanding of effects and choices among plans is facilitated.
Select recommended plan	Selection is made of NED plan unless exception is granted by ASA(CW).	Confined to EIS.	Plan is selected on a broader array of factors including NED and acceptability. Plan may not lead to a Corps project in the traditional sense, but may be a watershed management plan.	Continues as above, with emphasis on conflict resolution analysis and actions to help arrive at a final acceptable plan.

### **3.4 Challenges of OSE Analysis**

Integrating OSE information into the planning process presents a number of challenges that planners need to recognize. The first challenge is that the meaning of OSE information is contextual. This subjectivity stands in contrast to NED analysis, which employs a set of procedures, grounded in a substantial body of theory, about the behavior of markets and monetary valuation that yields information about benefits and costs to “society” independent of stakeholders’ evaluations. In contrast the OSE analyst must actively engage with stakeholders about the meaning of the social effects that are occurring or predicted.

Another challenge is that social conditions that are observed and described, and whose future states may be of concern, are complex, multidimensional concepts produced by a multitude of causes. Project alternatives may or may not have much influence in relation to the other causes operating to create the social condition. Instead, it is generally preferable to talk about the potential for change that a project may introduce, noting that the actual manifestation of desired change in social conditions depends on the action of others to utilize the project to create the desired outcome. For example, a study conducted by the Institute for Water Resources in the 1970s examined why positive social and regional economic

development effects associated with the construction and operation of the Arkansas McClellan-Kerr Waterway occurred in some communities adjacent to the waterway but not others. The study concluded that the waterway conferred an opportunity for positive social and economic development but that taking advantage of the potential was influenced by the quality of community leadership and having a focused economic development strategy in place (Antle 1975).

Finally, while OSE factors may be important in determining the need for a project, given their contextual and multidimensional natures it may be too difficult to distinguish levels of OSE impacts among alternatives in a quantitative way. For example, while it might be shown that some form of flood protection would positively affect community resilience, it might be very difficult to distinguish how increments of protection differentially affect resilience. In this regard OSE factors may often be better used as a screening tool to distinguish, in a broad way, those alternatives that address important OSE concerns.

The bottom line is to recognize that OSE information is an important part of the information that should shape a project, but getting the most benefit from OSE analysis requires interaction with stakeholders about the meaning of effects, the choices that are crystallized by the consideration of social effects, and ultimately the preferences expressed by stakeholders for project alternatives taking social effects into account.

## 4. Building OSE Analysis into the Corps Planning Process

This section describes in greater depth the kinds of social effects information and procedures that can be employed in each phase of the Corps' six-step planning process. More information on the six-step planning process can be obtained in *The Planning Primer* (Orth and Yoe 1997) (<http://www.iwr.usace.army.mil/inside/products/pub/iwrreports/97r15.pdf>). Sections 3.1 – 3.6 describe each step of the Corps' six-step planning process, focusing on:

- OSE products that are produced in a planning step
- Key OSE questions that should be asked to assist in developing the appropriate planning products
- Tools that would commonly be employed to address the questions. References to tools are hot-linked to those sections of the handbook that provide detail on the tool.

To help clarify the presentation of concepts in this section, an example is provided in section 4.7 that details the role of the OSE analyst in each step of a typical study process.

### 4.1 Define and Bound the Problem; Select Planning Objectives

*“Identifying the problems and opportunities you face is the most important step in the planning process. Once the problems and opportunities are described, the next task is to define the objectives and constraints that will guide your efforts to solve those problems and achieve those opportunities.”*

*The success of the entire planning process depends critically on the success of this first step. Every planning investigation, from a multimillion-dollar multiple-purpose comprehensive investigation to a several thousand-dollar preliminary study, and everything in between, should produce two sheets of paper early in the study. One of them lists problems and opportunities, the other the objectives and constraints. The first sheet says this is what is wrong here, the second says this is what you intend to do about it.”*

—Orth and Yoe 1997

In the first step of the planning process it is critical to gain a good understanding of the water and related land problems and issues, to identify constraints and opportunities, and to settle on planning objectives. The social effects analyst should play a key role in all of these activities. Table I-3 summarizes the kinds of products that the OSE analyst should be providing and questions and methods that the OSE analyst can employ to provide these products.

A key first step is helping the study team to gain a better understanding of the social landscape – e.g., identifying who lives in the study area, who has a stake in the problem or issue, and why it is important to them. A fundamental first step in these undertakings is to perform a [profile](#) of the area in terms of basic social statistics and to make such a presentation of information meaningful by providing useful comparisons and rankings. Additionally it important to identify [stakeholders](#) – i.e., those groups that are

likely to have a stake in the problem, issue or outcome – and provide an opportunity for these groups to present their views on problems, needs, opportunities, and constraints (what should be avoided) and what kinds of effects they are interested in achieving or in preventing. The social effects analyst should also do some [historical analysis](#) to explore and present the history of the problem or issue. To the degree that the analyses point out special circumstances or issues, more specialized types of analyses can be done. For example, in a study which is primarily focused on flood damage reduction, particularly vulnerable populations (e.g., the elderly, low-income groups) would likely be special focuses for analysis.

While Orth and Yoe identify this step in the planning process as being the most important, there may be a tendency to rush it and accept definitions of what the key problem and the key planning objectives<sup>7</sup> should be in order to mesh with existing authorities or the way in which a project sponsor has communicated its wishes. Approaching the task from the 4-Accounts focus, however, will undoubtedly place greater emphasis on proceeding carefully in this step and systematically exploring problems and potential objectives in ways that are comprehensive and that may provide opportunities for greater collaboration among Federal agency programs.

**Table I-3. OSE Analysis Contributions to Planning Step 1 – Specify Problems and Opportunities**

<b>Desired Output of Analysis</b>	List of key stakeholders, issues, problems, preferences of stakeholder groups, inputs to planning objectives
<b>Key OSE Questions</b>	<ul style="list-style-type: none"> <li>▪ What is the history and historical development of the local and regional area?             <ul style="list-style-type: none"> <li>– What is the history of the water resources situation?</li> </ul> </li> <li>▪ What groups have economic, cultural, and other stakes in the situation?             <ul style="list-style-type: none"> <li>– How do stakeholders define the problems, needs, opportunities, and constraints? What are their priorities? What kinds of effects are they interested in achieving/avoiding?</li> </ul> </li> <li>▪ What are the dynamics of social life in the local and regional area?             <ul style="list-style-type: none"> <li>– How is the social landscape configured? What basic “social statistics” can be used to describe the population and portray quality-of-life factors?</li> <li>– What groups are especially vulnerable?</li> <li>– What is the structure of the civic infrastructure, and how does it function?</li> </ul> </li> </ul>
<b><u>Common Tools</u></b>	Stakeholder identification methods, workshops, interviews, surveys (OMB-approved, and those obtained from other sources), historical analysis, content analysis, social profiling

## 4.2 Inventory and Forecast Conditions

*“Step 2 is the information gathering step. It is, perhaps, the most familiar planning task. Gathering information about historic and existing conditions produces an inventory. Gathering information about potential future conditions requires forecasts.*

<sup>7</sup> See <http://www.svp.iwr.usace.army.mil/NDSstep2.cfm> for a discussion and examples on creating planning objectives.

*Inventories and forecasts are generally concerned with the conditions of resources that will be affected by solutions to the problems. These resources may be natural, economic, or social. Their precise identities vary from study to study. The one thing they all have in common is that they will help shape the plans to be considered, or they will be affected, intentionally or unintentionally, by one or more of the plans to be considered.”*

—Orth and Yoe 1997

The key questions of concern to the OSE analyst in this phase of the planning process are:

- “How are social conditions currently being affected by the water resources situation?”
- “What are social conditions likely to be in the future in the absence of a water resources intervention?”

A first step in addressing these questions is to continue with the compilation of basic social profile statistics about the area that was begun in step 1 of the planning process. However, don’t confuse the preparation of the social profile with the OSE analysis. Social profiling provides a basic level of understanding about social conditions, but more in-depth analysis is required to target areas of special concern or relevance to the specifics of the water resources issues, problems, needs, opportunities, constraints, and planning objectives developed in the first planning step.

The OSE analyst should concentrate efforts on developing baseline information about those social conditions that are of special concern to stakeholders – particularly broad areas of concern that have been continually expressed. For example, a concern repeatedly voiced by residents in a flood-prone area might be “People are moving out of the neighborhood because of the flood threat.” Given such an issue, the analyst would probably want to concentrate on developing information about neighborhood viability and resiliency, examining variables such as population change, to include number and demographic characteristics such as age, income characteristics, ethnicity, etc., over time, number and types of community associations, economic climate in the community, and housing quality.

The analyst also has the responsibility for asking whether any observed changes in such data appear to be linked to the issue at hand or might just be part of a broader set of circumstances that really don’t have anything to do with the water resources issue. “If...then” kinds of thinking can be done to devise appropriate ways of addressing such concern. For example, “If the changes in population and community organizations I am seeing in the community are really linked to the flood threat, I would expect that the effect would be more pronounced in the most flood-prone areas of the community,” or similar types of statements that will lead to appropriate types of analyses that can provide greater assurance that effects being observed are related to the flooding issue. Similarly, making comparisons of social conditions in the flood-prone community with social conditions in other similar communities that don’t have the flooding problem may provide a basis for reaching conclusions about the relationship between the water resources issue and social effects.

Conclusions reached need to be communicated to the planning team and to stakeholders. The analyst should work with stakeholders to help them develop understanding of the meanings of findings and conclusions and their implications for planning options that should be considered. The basic process to be followed throughout the planning process is shown in Box 6.

**Forecasting Future Without-Project Social Conditions.**

Having developed a greater understanding of relevant social conditions and their relationship to the water resources issue, the analyst must then portray their future trajectory under the future without-project condition – i.e., the future without the intervention of a water resources project. Developing the future without-project condition requires the input of the planning team to identify assumptions about the future that will be factored into or excluded from the without-project condition. For example, a city may be planning a project that would influence conditions – it is on the drawing boards, but hasn’t been funded yet. Should the city project and its intended effects be included in the without-project condition or not? Such decisions about what can and should be included in the without-project condition need to be made in an open manner, and assumptions must be consistent across the entire planning team. The OSE analyst can play an important role in helping the study team discuss and communicate the issues, implications, and options about developing the future without-project condition.

**Box 6. The Basic Process**

**LISTEN:** Find out what’s important to stakeholders and what their concerns are

**EXPLORE:** Gather the right kinds of data to address stakeholders’ concerns and important issues. Use “if...then” kinds of thinking and comparisons to guide your analysis.

**COMMUNICATE:** Share findings and conclusions about important issues and concerns with the planning team and with stakeholders.

**FACILITATE:** Aid planning team and stakeholders’ understanding of the meaning of findings and conclusions and their implications for the kinds of planning options that should be considered.

Forecasting social conditions can be accomplished by a wide variety of means including consulting [independent studies and projections](#) (e.g., those performed as part of a community’s comprehensive plan), forming focus groups of stakeholders to speculate on future conditions, forming a [Delphi panel](#) of experts to examine data and make estimates, and conducting community [workshops](#) to engage participants in [shared vision modeling](#) exercises about future conditions.

**Table I-4. OSE Analysis Contributions to Planning Step 2 – Inventory and Forecast Conditions**

<b>Desired Output of Analysis</b>	Descriptions of current and future state of social conditions of concern to stakeholders in the absence of a water resources project are presented in a way to facilitate understanding among stakeholders and planning team.
<b>Key OSE Questions</b>	<ul style="list-style-type: none"> <li>▪ How are social conditions currently being affected by the water resources situation?</li> <li>▪ What are social conditions likely to be in the future in the absence of a water resources intervention?</li> </ul>
<b>Common Tools</b>	Social profiles, independent studies and projections, focus groups, Delphi panels, workshops, charrettes



### 4.3 Formulate Alternatives – Management Measures

*“Plan formulation is the process of identifying specific ways to achieve planning objectives while avoiding constraints so as to solve the problems and realize the opportunities that got this whole investigation started. This is the most creative part of the planning process.*

*This step of the planning process produces solutions that achieve all or part of one or more of your planning objectives. Solutions are alternative plans built from management measures.*

*A **management measure** is a feature or an activity that can be implemented at a specific geographic site to address one or more planning objectives. It may be a ‘structural’ feature that requires construction or assembly on-site, or it could be a ‘nonstructural’ action that requires no construction. Management measures are the building blocks of alternative plans.”*

—Orth and Yoe 1997

Whereas the primary focus of the preceding step was describing things as they currently are and are likely to be in the future without a project, this step in the planning process is concerned with making meaningful changes in the future. Given that the essential problems and concerns have been identified, planning objectives selected, and forecasts made of what the future could look like if nothing is done, the key questions that energize activity in this step are What should the future look like, and What should be done to achieve it? Stakeholders can play a big role in articulating visions for the future. The planning team needs to have a clear understanding of stakeholder preferences about the future so that the team can consider those preferences in formulating options.

The OSE analyst should play a key role in serving as a communications bridge between stakeholders and the team to help ensure that preferences about social conditions are understood by the team. Of course it is likely that different stakeholders may have quite different visions of the future, and some may be in conflict. Many stakeholder visions about a preferred future are likely to be expressed in terms of specific measures or plans – e.g., “We want a levee along the river.” While this is important information for the planning team, equally important is to gain a better understanding of why something is expressed as a preference. A focus on and a better understanding of “why” can help illuminate the interests that stakeholders have, and this knowledge of interests can help the planning team develop new interest-based solutions that may bridge across seemingly incompatible stakeholder preferences.

#### 4.3.1 Formulating OSE Management Measures

Management measures (MM) are activities or features that address one or more planning objectives. The OSE analyst should take an active role in identifying potential management measures to address social issues of concern that are consistent with planning objectives. For example, a flood-damage reduction planning objective would likely focus on reducing the negative economic and social effects of flooding. OSE management measures can be developed that target specific social issues as discerned from listening to stakeholder views on problems, needs, opportunities, and constraints. To continue with this example, a

specific OSE MM might be the development of a flood warning system targeting the community’s elderly or other especially vulnerable populations. Another OSE MM might focus on instituting a community leadership development program to work to expand community social capital.<sup>8</sup>

**Table I-5. OSE Analysis Contributions to Planning Step 3 – Formulate Alternatives**

<b>Desired Output of Analysis</b>	Descriptions of desired future social conditions; rankings and priorities among stated desired future conditions; specific management measures that may be preferred to achieve a desired social future condition and an understanding of why measures are preferred  Assessment of key underlying interests that management measures and alternatives should address
<b>Key OSE Questions</b>	<ul style="list-style-type: none"> <li>▪ What should the future look like with regard to social conditions of concern?                     <ul style="list-style-type: none"> <li>– What needs to be changed? What needs to be preserved or improved?</li> </ul> </li> <li>▪ What are the most important future social conditions that need to be achieved? Why?</li> <li>▪ What kinds of measures are needed to achieve these social conditions?                     <ul style="list-style-type: none"> <li>– Why is (are) the measure(s) preferred? What are key underlying interests?</li> </ul> </li> </ul>
<b>Common Tools</b>	Visioning workshops, focus groups, charrettes, interviews

#### **4.4 Evaluate Plans; Display Effects**

*“What difference does your plan make? The first three planning steps give you a list of different solutions for the problems and opportunities. The remaining three steps lead you to the best of those solutions. The evaluation step tells you what difference each plan can make. That difference is quantified by comparing without-project and with-project conditions to identify the effects of alternative plans.”*

—Orth and Yoe 1997

The analyst’s chief role in evaluating plans should be to help communicate alternative plans’ social effects in ways that illuminate the choices that the various plans constitute. Since not all plans will achieve all objectives in the same way, or perhaps not to the same degree, there are likely to be choices necessary. The analyst can help stakeholders consider such issues and establish preferences by addressing concerns and questions that are raised about effects of alternative plans. Additionally, this step in the planning process is not static but is one where alternative plans can be “tweaked” or perhaps combined to better address the planning objectives.

To provide valuable service in this step, the analyst needs to describe the plans’ effects on the key social concerns that were expressed in the future-without-project condition, as well as on any other social, environmental, and economic effects associated with the plan that may be important for stakeholders to

<sup>8</sup> Such a MM would be considerable outside the scope of a normal Corps of Engineers project, but it was selected to illustrate that, under the 4-Account framework, novel and non-traditional measures may be identified and added to the project alternatives if by doing so a more complete and acceptable plan is achieved. Funding for such measures would remain outside of Corps authorities and alternate sources would need to be located.

consider in their evaluation. A first step is describing or characterizing the plans’ effects in terms of descriptors such as *magnitude* – the numbers of people or groups affected; *location* – where the effects are likely to occur; *timing and duration* – when effects will start, how long they will last; and *risks* associated with the plan. Questions and issues about such descriptions may point to the need for further work to develop additional information.

The OSE analyst should also emphasize stakeholders participation in evaluating plans’ contributions to the desired future social conditions expressed as part of step 3 (Formulating Alternatives). As in Step 2 (Forecasting Future Without-Project Condition) forming focus groups and expert panels, using workshops or charrettes, are all ways that stakeholders can dialogue about, evaluate, and ultimately express preferences about plans. In evaluating plans stakeholders should consider the following dimensions of adequacy (USACE, 2000, ER 1105-2-100, p.2-4):

- **Completeness:** Does the plan address all the social issues of concern?
- **Effectiveness:** How well does the plan address the social issues of concern?
- **Efficiency:** Does the plan address the social issues of concern in a cost-effective way?
- **Acceptability:** Is the solution proposed acceptable: is it consistent with the future vision articulated in Step 3?

**Table I-6. OSE Analysis Contributions to Planning Step 4 – Evaluate Plans**

<b>Desired Output of Analysis</b>	Descriptions of plans’ effects on social conditions of concern; evaluation of each plan’s adequacy in contributing to desired future social conditions
<b>Key OSE Questions</b>	<ul style="list-style-type: none"> <li>▪ What are plans’ social effects in terms of magnitude, location, timing and duration?</li> <li>▪ What risks are associated with each plan?</li> <li>▪ How adequate are plans with respect to completeness, effectiveness, efficiency, and acceptability?</li> </ul>
<b>Common Tools</b>	Workshops, focus groups, expert panels, charrettes

## 4.5 Compare Plans

*“The best plan cannot be selected from among a set of good plans unless you have some way to compare them. It is only by comparison that a plan is no longer good enough, or that a good plan becomes the best plan. The purpose of plan comparison is to identify the most important effects and to compare the plans against one another across those effects. Ideally, the comparison will conclude with a ranking of plans or some identification of advantages and disadvantages of each plan for use by decision makers.”*

—Orth and Yoe 1997

In this step the full array of economic, environmental, social, and other effects of the plans that have been carried forward are displayed so that they can be evaluated and compared. The end result of the process is

arriving at a recommended plan (Step 6), but to get to this point a full airing of each plan’s pros and cons is needed. Once again plans need not be static – the process of evaluating and comparing may suggest new alternatives or variations that may be superior to original alternatives.

As in the previous step, the OSE analyst’s role is to describe social effects associated with plans – particularly those social issues of concern that have been expressed as key problems, needs, opportunities, or constraints – and to facilitate the team’s and stakeholders’ understanding of these effects. At this stage there may be new information requests from stakeholders about social issues and effects to help them make choices.

**Table I-7. OSE Analysis Contributions to Planning Step 5 – Compare Plans**

<b>Desired Output of Analysis</b>	Descriptions of plans’ effects on social conditions of concern; evaluation of each plan’s adequacy in contributing to desired future social conditions
<b>Key OSE Questions</b>	<ul style="list-style-type: none"> <li>▪ What are plans’ social effects in terms of magnitude, location, timing, and duration?</li> <li>▪ What risks are associated with each plan?</li> <li>▪ How adequate are plans with respect to completeness, effectiveness, efficiency, and acceptability?</li> </ul>
<b>Common Tools</b>	Workshops, focus groups, expert panels, charrettes

## 4.6 Select Recommended Plan

*“This is the big decision-making step. Countless decisions are made throughout the planning investigation. You decide which problems and opportunities to address, the planning objectives and constraints, the data to be collected and so on. You also decide which plans qualified on their own, and which plans deserve further consideration following their comparison. Plan selection in early iterations of the planning steps is a winnowing process. The final iteration of Step 6 completes the planning process. Decision makers must purposefully choose the single best alternative future path from among all those that have been considered.”*

—Orth and Yoe 1997

In planning guidance prior to EC 1105-2-409 the primary criterion in determining a recommended plan was the selection of the NED plan – i.e., the plan having the greatest net NED benefits. Comparisons of economic benefits and costs were generally relatively straightforward and expressed in monetary units<sup>9</sup>. However, the 4-Accounts framework uses the concept of “net beneficial effects” (see Box 7) and indicates that a plan must be judged to have a net beneficial effect when considering effects across all four P&G accounts. Doubtless many details remain to be clarified and fine-tuned, however, the key point is that evaluation and comparison of plans should consider all relevant issues in determining the alternative plan selected for submission as the recommended plan.

<sup>9</sup> Ecosystem Restoration projects are recognized as an exception to this conclusion.

Of course the process of weighing, comparing, balancing, trading off, and ultimately coming to conclusions about disparate effects spread over four accounts is overtly subjective. However, it is not particularly unusual or remarkable – individuals, businesses, and governments do it all the time.<sup>10</sup> While not unusual, it is important to clearly present the rationale and thought processes for arriving at a final selection, so that, while reasonable people may disagree with the conclusion, they can see how the various decision factors were considered.<sup>11</sup>

**Box 7. Plan Selection**

Any alternative plan may be selected and recommended if it has, on balance, net beneficial effects after considering all plan effects, beneficial and adverse, in the four Principles and Guidelines evaluation accounts: National Economic Development, Environmental Quality, Regional Economic Development, and Other Social Effects. Current policies on cost sharing will apply.

—EC 1105-2-409, Para 4c(3)

**Table I-8. OSE Analysis Contributions to Planning Step 6 – Select Recommended Plan**

<b>Desired Output of Analysis</b>	Descriptions of plans' effects on social conditions of concern; evaluation of each plan's adequacy in contributing to desired future social conditions. Identification of plan that on balance provides net beneficial effects, and rationale for choice.
<b>Key OSE Questions</b>	<ul style="list-style-type: none"> <li>▪ What are plans' social effects in terms of magnitude, location, timing and duration?</li> <li>▪ What risks are associated with each plan?</li> <li>▪ How adequate are plans with respect to completeness, effectiveness, efficiency, and acceptability?</li> </ul>
<b>Common Tools</b>	Workshops, focus groups, expert panels, charrettes

**4.7 Example: The Role of the OSE Analyst in a Typical Flood Damage Reduction Study in the 4-Accounts Framework**

A community of approximately 50,000 persons is located on a medium-size river. The community has experienced periodic flooding over its 150-year history and has an existing levee providing approximately a 50-year level of protection. In the 1980's the community experienced two 100-year events in rapid succession. Large sections of the community were flooded. The community's central business district, which is located near the river, was especially hard-hit, with some businesses electing to leave the area after the second flood. Several neighborhoods had to be evacuated twice within a six-month period, and many residential properties in the neighborhoods suffered severe damage. The community obtained authorization for a Corps study for "flood damage reduction and related purposes."

<sup>10</sup> There is growing body of knowledge on the topic of making decisions involving complex, multidimensional criteria (see, for example, Figueira and Ehrgott 2004). A number of multicriteria decision support computer programs are in wide use. Among the best known are Expert Choice and Criterium Decision Plus.

<sup>11</sup> The Record of Decision process in NEPA may offer a suitable model for presenting the balancing and selection process.

**Step 1: Identifying Problems and Opportunities**

A key role for the OSE analyst is to illuminate the social landscape for the planning team to help their understanding of key stakeholders and social issues and concerns that should be factored into planning objectives and constraints. The OSE analyst would likely begin this process by reading local histories of the community and other background material about the community. A good source of information about the community’s past and its aspirations for the future is the comprehensive plan. Additionally, the analyst would check local newspapers for reporting on past flood events and letters to the editor or other reporting about issues and concerns related to flooding, noting groups or individuals expressing a point of view or taking a position. These individuals and groups will likely be some of the stakeholders for the study.

The analyst would also likely meet with local planning staff to obtain planning reports and studies that bear on the flooding issue (e.g. population estimates or censuses, surveys of residents, etc.) and obtain planning staff insights about social dynamics and trends in the community.

As part of the overall study scoping process the OSE analyst would likely help set up one or more community workshops, walking tours, or other community involvement venues to provide an opportunity for public input about key problems, needs, opportunities, and constraints.

Let us assume that based on all of the above, the analyst has concluded the following (Table I-9):

**Table I-9. Illustrative Specification of Problems and Opportunities**

<b>Key Stakeholders<sup>12</sup></b>	<b>Views Pertinent to Problems, Needs, Opportunities, Constraints</b>
<b>Business Community</b>	The community is in danger of losing its economic base. Save the business district; help keep in-town residential neighborhoods protected and close to shopping.
<b>Neighborhood Associations</b>	Keep city neighborhoods intact and dry; property values and viability of neighborhoods are at risk; properties have deteriorated after the floods and some residents have left the community. Older people and poor people are at increased risk from floods. More recreation facilities needed.
<b>City Government</b>	Tax base is eroding as people and businesses leave. A flood-damage reduction project provides an opportunity for community revitalization and achieving the community plan’s vision for a riverside greenway.

Let us also assume that this information has been carried forward in the development of the following planning objectives:

- Reduce the negative economic and social effects of flooding on the community
- Reduce the vulnerability of at-risk populations in the community to flooding

<sup>12</sup> While it would be expected that more stakeholders would be identified and involved, for simplicity’s sake only three stakeholders will be presented in this example.

**Step 2: Inventorying and Forecasting Conditions**

The OSE analyst has distilled stakeholder input, background research on the social landscape as well as insights from the social profile into the primary social concerns of maintaining/enhancing community resiliency<sup>13</sup> and reducing the vulnerability of at-risk populations. The analyst’s job is to inventory existing conditions and to develop analytically defensible forecasts of these concepts in the future without-project condition. To accomplish this task the analyst would likely break the concepts into appropriate specific variables<sup>14</sup> that have a relationship to community resiliency and vulnerability and compile trend information on them (see Table I-10). Much of the information could be obtained from census records and local planning documents. More challenging than obtaining such information, however, is deriving meaning from the data. Key questions to be addressed would be (1) What happened to these variables after each of the major flood events, and (2) What would be the likely effect of additional major floods in the future?

To address these questions the OSE analyst might form panels of experts or citizens to discuss the indicator variables and arrive at estimates of future community resiliency and vulnerability in the without-project condition. Such estimates could be based on percentage changes of composite variables (e.g., forecasts of population changes and business activity over the next twenty years). Additionally, the analyst might work with the community to develop a composite scale or set of descriptive categories of community viability that takes all the indicator variables into account and provides an overall qualitative rating<sup>15</sup>. For example, a scale might range from 0–100, where 80–100 indicates a vibrant community, 60–80 indicates a community with significant long-term viability issues, etc., while descriptive categories might provide ratings in terms of “average” or “poor”, etc. (see Table I-11). The key point is that such assessments must present a reasoned rationale for arriving at their conclusions that are based on a consideration of the indicator variables chosen to represent the concept.

**Table I-10. Illustrative Framework for Presenting Information  
About Key Social Issues of Concern**

<b>Social Issues of Concern</b>	<b>Recent Trends and Current Condition</b>	<b>Future Condition</b>	<b>How Estimated</b>
<b>Community Resiliency</b> (*Indicator Variables)			
*Population growth			
*Age structure			
*Education			
*Incomes			
*Employment			
*Business growth			

<sup>13</sup> See Part II for insight into the measurement of these concepts.

<sup>14</sup> Part II provides more detail on the process of linking social variables to concepts (known as operationalization in the social sciences).

<sup>15</sup> This procedure is followed in implementing the National Civic League’s Civic Index for rating community “civic infrastructure” (National Civic League 1999; Hoagland 2005).

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<b>Social Issues of Concern</b>	<b>Recent Trends and Current Condition</b>	<b>Future Condition</b>	<b>How Estimated</b>
*Civic Infrastructure			
**# of community voluntary organizations			
**Proportion of population voting in local/ national elections			
<b>Vulnerability</b>			
Proportion of population 65 years or older			
Proportion of population disabled			
*Proportion of population in poverty status			

**Table I-11. Illustrative Descriptive Categories for Rating Current and Future Community Resiliency**

**Stakeholder Characterization of Current and Future State of Community Resiliency  
(\*Indicates Stakeholder Characterization)**

	<b>Dying or Dead</b>	<b>In Decline</b>	<b>Holding its Own</b>	<b>Vibrant and Growing</b>
Current Condition		**	*****	
Future Without-Project Condition		*****		

**Step 3: Formulating Alternative Plans**

In Step 3 the OSE analyst and team identify what needs to be different in the future with regard to community resiliency and vulnerability. Additionally, the analyst would want to learn about preferred measures for addressing the flooding problem, and importantly, why those measures are preferred. Let us assume that engaging with stakeholders about the key OSE questions presented in Table I-5 provides the following information about preferences for the future:

<b>Key Stakeholders</b>	<b>Preferences for the Future</b>
Business Community	Vibrant business district, people stay in the community to shop, stay downtown to enjoy the river and attend civic events <b>Preferred Measure:</b> improved levee <b>Why:</b> provides needed protection and follows existing footprint with little additional land required



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<b>Key Stakeholders</b>	<b>Preferences for the Future</b>
Neighborhood Associations	Safe and vibrant neighborhoods with easy access to shopping; diverse population spanning all socio-economic ranges  <b>Preferred Measure:</b> None expressed, but want to make sure that elderly and poor are provided protection and that special needs will be addressed in flood events  Want better access to river and place for community events
City Government	Develop the city consistent with comprehensive plan, provide increased access to river, provide 100-year level of protection to entire city along river  <b>Preferred Measure:</b> levee/floodwall with setbacks for river greenway and recreational use  <b>Why:</b> provides protection, access, and consistent with comprehensive plan vision for future

This information about preferences is important and should be factored into the planning team’s plan-formulation process. Additionally, information on underlying interests relating to “why” something is preferred can be used by the team to focus on the kinds of measures that should be developed to address the underlying interests of stakeholders. From the preferences expressed such interests include:

- Don’t take too much commercial space for flood protection
- Provide better community access to the river
- Provide a place for community events
- Be consistent with the community’s vision as expressed in the comprehensive plan
- Be sensitive to special needs of especially vulnerable residents

**Step 4: Evaluating Alternative Plans**

In response to stakeholder input about community viability as well as a host of other formulation criteria expressing other important environmental quality, economics, and hydrologic and engineering considerations, the planning team has formulated three alternative plans for addressing flooding problems. Plan A is a levee protecting the entire community’s frontage along the river; Plan B is a levee protecting the entire community’s frontage along the river but includes floodwalls in the Central Business District (CBD) and also includes purchase of a development easement on the floodplain across the river from the community; Plan C is a levee protecting the CBD and the southern portions of the community. The OSE analyst’s challenge now is to describe each plan’s effects on social conditions. This information will serve as input to allow stakeholders to understand and evaluate each plan.

Let us assume that the following information has been developed about the plans’ effects (Table I-12):

**Table I-12. Illustrative Characterization of Plans’ Effects**

<b>Effects</b>	<b>Plan A</b>	<b>Plan B</b>	<b>Plan C</b>
<b>Magnitude</b>			

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<b>Effects</b>	<b>Plan A</b>	<b>Plan B</b>	<b>Plan C</b>
Population at risk for flooding (500 year/100 year)		30,000 25,000	
Population provided protection	22,000	25,000	17,000
Number to be relocated	1,000	700	500
Business to be relocated	30	3	30
<b>Location</b>			
% of 100-year flood plain protected in:			
▪ CBD	100	100	100
▪ Neighborhood A	100	100	0
▪ Neighborhood B	100	100	100
▪ Neighborhood C	100	100	100
*Disruptive effects of plan localized in:	CBD	Few	Neighborhood A
<b>Timing &amp; Duration</b>			
Time before flood protection provided	8-10 yrs	10-12 yrs	5-7 yrs
Duration of construction	4 yrs	6 yrs	3 yrs
<b>Risk</b>			
Risk of loss of life in events exceeding design capacity	Minimal	Minimal	Minimal-Moderate
<b>Effects on key interests expressed by stakeholders</b>			
Preservation of commercial space	Somewhat	Yes	Yes
Provide community access to river	Yes, in cooperation with sponsor and other programs	Yes, in cooperation with sponsor and other programs	Yes, in cooperation with sponsor and other programs
Provide space for community events	Potentially, in cooperation with sponsor and other programs	Potentially, in cooperation with sponsor and other programs	Potentially, in cooperation with sponsor and other programs
Consistent with community vision	Somewhat	Yes	No
Addresses special needs of elderly, poor, and disabled	Yes, in cooperation with sponsor and other programs	Yes, in cooperation with sponsor and other programs	No

The effects information is discussed and clarified with the team. Based on the effects information, each plan's effects are evaluated. As shown below in Table I-13, both Plan A and Plan B were deemed to adequately address concerns about community resiliency; however, Plan C was deemed not to be acceptable on the grounds that it did not adequately address resiliency and vulnerability concerns. **In such a circumstance it would be recommended that the plan not be carried forward for further evaluation or else sent back for additional work to see if a viable revised plan could be formulated.**

**Table I-13. Evaluation of the Adequacy of Plans**

<b>Adequacy Factor</b>	<b>Plan A</b>	<b>Plan B</b>	<b>Plan C</b>
Completeness: Does the plan address all the social issues of concern?	Yes	Yes	No, omits concern for viability of Neighborhood A
Effectiveness: How well does the plan address the social issues of concern?	Some negative impact on CBD	Addresses all issues well	Omits concern for viability of Neighborhood A
Efficiency: Does the plan address the social issues of concern in a cost effective way?	Yes	Most expensive plan	Least expensive plan
Acceptability: Is the solution proposed acceptable?	Yes	Yes	No, divides the community into haves and have-nots, and leaves Neighborhood A vulnerable

**Step 5: Comparing Alternative Plans**

In this step information on plan effects are displayed and used to establish which plan is preferred and why. All relevant information should be considered. The primary purpose of displaying and discussing the information and rationale for arriving at a preferred plan will be to communicate with decision makers who will actually select the recommended plan in the next step.

Let us assume that the planning team has assembled all the relevant information about plan effects, summarized it into key points, and presented it in Table I-14.

**Table I-14. Summary Comparison of Effects of Plans**

<b>Effects</b>	<b>Plan A</b>		<b>Plan B</b>	
	<b>Pros</b>	<b>Cons</b>	<b>Pros</b>	<b>Cons</b>
NED	\$1.5 M average annual NED benefits	\$1 M average annual cost	\$1.7 M average annual NED benefits	\$1.5 M average annual cost
EQ	Preserves 500 acres of riverine habitat	Loss of 5 acres of wetlands	Preserves 600 acres of riverine habitat	Loss of 5 acres of wetlands
RED	Local business income increases 30%	1% increase in local taxes for cost share	Local business income increases 35%	1.5% increase in local taxes for cost share
OSE	Provides the opportunity for continued growth and development of community having robust civic infrastructure and diverse and vibrant neighborhoods	Increased tax burden on all, but greater impact on the community's working poor	Provides the opportunity for continued growth and development of community having robust civic infrastructure and diverse and vibrant neighborhoods, plus a more economically resilient business community, and slightly more recreational access to the river for the community	Increased tax burden on all, but greater impact on the community's working poor

The OSE analyst should try to present an overall summary conclusion that communicates the central point and avoid putting so many details and caveats into the presentation that it clouds the key point that is being communicated.

During this step the planning team will subjectively weigh and balance the effects associated with each plan and decide which plan to recommend to decision makers. Naturally, this valuation process is not done in a vacuum but depends on policy and the input of sponsors, stakeholders, other agencies, and others.

**Step 6: Selecting a Plan**

In this step the decision maker selects the recommended plan. The recommended plan is compared with the future-without condition (No Action Alternative) (unless the No Action Alternative is the recommended plan, in which case it is compared against other required plans), and with other required plans (e.g. the NED Plan). The rationale for making the choice of recommended plan should be explained, making pertinent comparisons of effects with the No Action Alternative and other plans. Summary tables such as Table I-15 can help present such information. The role of the OSE analyst is to help in the presentation and arraying of information on the social effects of concern under each of the plans presented to make clear the rationale for the choice of recommended plan.

**Table I-15. Illustrative Summary Table**

	<b>No Action</b>	<b>Plan B</b>	<b>Other Required Plans...</b>
NED Effects			
EQ Effects			
RED Effects			
OSE Effects			

## 5. Special Topics

### 5.1 OSE in Cross Cultural Settings

Culture has been described as “*the way we do things around here.*” In more formal terms it refers to the system of norms, beliefs, and modes of interaction which define and structure our understanding of reality. We carry this system around in our heads in a fairly unconscious way. It’s like the air we breathe – not really noticed – when we’re in an environment where nearly everyone shares those same cultural outlooks and orientations. But what happens if we’re operating in a different cultural context, where norms, beliefs, and interaction processes are quite different? Often the cultural “air” we took for granted becomes opaque, dense and uncomfortable as miscommunication and misunderstanding occurs. Or, sometimes, particularly in the case where an analyst represents the “dominant culture” they may continue to be unaware that others operate in a different manner and may not understand why those from a different culture just don’t “get it” and why it’s so hard to pull good information out of them (Box 8).

Analysts are likely to need to be mindful of potential cross-cultural issues whenever they will be interacting with stakeholders from nationalities, ethnicities, racial groups, localities, or socioeconomic circumstances that might be considered not of the dominant culture. In such circumstances the analyst should do some background research about the group in question to gain an appreciation for cultural characteristics. More importantly, finding a guide – i.e., someone who knows and understands the culture – to provide insight and sensitivity about the most appropriate and effective means of communicating can be invaluable. And, finally, there is no substitute for proceeding with the self-awareness that cultural differences are real and important.

#### Box 8. Recognizing and Appreciating Cultural Differences

“The evaluation of OSE effects follows our ‘white man’ approach to problem solving. We talk about collaboration, involving stakeholders, providing conflict resolution, etc. What we don’t mention is how to undertake these activities when the Corps culture differs from the stakeholder culture.

For example: I had this conversation with one of my student interns yesterday as we prepare to go to a Alaska Native village to interview folks about constructing protected moorage in their community. The ‘white man’ approach to conversation is to fill in the blank spaces, debate the point, convince others of the merits of our argument, and thereby win our way. For most Alaska Natives, silence is the preferred ‘action’. For in listening they can gather all the information they need, think carefully about their response, and weigh the implications of their response on their friends and neighbors before answering. Because they live in a community where individualism is not preferred, but doing for others and thinking about the community as a whole is preferred. Among most Alaska Natives, decisions are not and can not be made immediately, nor do individuals make a decision for the whole community. The delays related to these different approaches to decision making often result in frustration, or federal agencies pushing for quicker solutions or collaboration.”

—Lorraine Cordova, Alaska District

### 5.2 Communicating Risk and Uncertainty in OSE Analyses

*“The planner’s primary role in dealing with risk and uncertainty is to characterize to the extent possible the different degrees of risk and uncertainty and to describe them clearly so that decisions can be based on the best available information.”*

**Risk** is generally defined as a situation where a loss can be described according to a known probability distribution, while **uncertainty** describes a situation where patterns of loss do not conform to known probability distributions (ER 1105-2-100 E-4a.). Many risks associated with natural phenomena, such as floods and with man-made interventions such as flood damage reduction strategies, are capable of being estimated; other dynamics such as future land use and population changes are sources of uncertainty.

The interpretation and meaning of both risk and uncertainty in decision making are dependent on people’s knowledge and perceptions. The OSE analyst can play an important role in ensuring that communication strategies about risk and uncertainty issues are developed that are appropriate to the needs of stakeholders in the population. For example, concepts like “level of protection,” “100-year floodplain,” or “100 year flood” are commonly used when discussing flood damage reduction strategies. Such terms are easily misunderstood by the public and need considerable clarification if a reasoned discussion about flood damage reduction alternatives is to take place.

Additionally, toleration of risk among the population may be influenced by many factors (see Box 9), including social factors such as vulnerability and resiliency. The OSE analyst can explore such potential variations and help sharpen the planning team’s messages based on social factors. Tolerance of

uncertainty is likely to be based on the trust in the planning process (HHS 2002, p.18). Once again the OSE analyst can play an important role in clarifying trust issues and concerns that may be present among the public or segments of the public and in working with the planning team to address them.

Finally, public input should also influence how the acceptability of risk is judged, help determine trade-offs among acceptable levels of risk and residual risk, and assist in the design of strategies for coping with remaining levels of risk and uncertainties (Renn 1998; Macgill and Siu 2005). Once again the OSE analyst should play a role in helping to ensure that public views about these issues are solicited and that they are incorporated into the plan evaluation framework.

**Box 9. Factors Affecting Acceptability of Risks**

<b>Risks Perceived to...</b>	<b>Are More Accepted Than Risks Perceived as ...</b>
Be voluntary	Being imposed
Be under an individual's control	Being controlled by others
Have clear benefits	Having few benefits
Be distributed fairly	Being unfairly distributed
Be natural	Being manmade
Be statistical	Being catastrophic
Be generated by a trusted source	From an untrusted source
Be familiar	Being exotic
Affect adults	Affecting children

*(Source: HHS 2002, p.20)*

### 5.3 Loss of Life as an OSE Issue

Methods to calculate economic losses from floods are fundamental to the planning process. However, economic losses only capture part of the impact of flooding and plans based only on reducing such damages miss a wide range of other important effects. The most important missing element from the current flood damage assessment approach is estimating the potential for loss of life and injury associated with flood events and flood damage reduction interventions. While methods to provide such estimates have not reached the level of sophistication of economic damage estimation procedures, sufficient progress has been made that the basic approach described in this section can be used to focus attention and discussion on this topic as part of the planning process.

The initial development of loss-of-life estimation methods came from the dam safety community in the 1980s and was focused on quantifying the risk to populations residing below dams should a dam break occur (Brown and Graham 1988; Graham 1999; DeKay and McClelland 1991). Additionally, a model, *LIFESim*, based on these procedures and incorporating GIS technology, has been developed (Aboelata et al. 2003; McClelland and Bowles 2002). Procedures for estimating loss of life specifically focused on flood events have also been developed (Tapsell et al. 2002; Defra 2005).

While procedures vary, they all contain several key elements:

- Characteristics of the flood event (velocity, depth, area flooded, time of day)
- Warning provided and amount of lead time
- Number and characteristics of population at risk (PAR)
- Predictive relationship between flood characteristics, warning, and PAR based on empirical analysis of past events

#### **Example**

The United Kingdom’s Department for Environment, Flood, and Rural Affairs (Defra) “Flood Risks to People Methodology” is similar in focus to the place vulnerability analysis mentioned in section 2.1.5 combining analyses of area vulnerability and social vulnerability. The number of injuries in a flood hazard zone is estimated by the following equation:

$$N_{inj} = N_z \times HR \times AV \times Y$$

where,  $N_{inj}$  = number of injuries within a particular hazard ‘zone’;

$N_z$  = number of people within the hazard zone (at ground/basement level);

$HR$ =Flood Hazard Rating, a function of flood depth/velocity (within the hazard zone being considered) and debris factor;

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AV = Area Vulnerability, a function of effectiveness of flood warning, speed of onset of flooding and nature of area (including types of buildings);

and

Y= People Vulnerability, a function of presence of people who are very old and/or infirm/disabled/long-term sick<sup>16</sup>

The Defra methodology provides a look-up table (Table I-16) showing Flood Hazard Rating (HR) values based on a combination of velocity and depth:

**Table I-16. Flood Hazard Rating Values**

Velocity (mps)	Depth (meters)																									
	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.5																
0.0	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25																
0.5	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50																
1.0	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75																
1.5	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00																
2.0	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25																
2.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50																
3.0	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75																
3.5	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00																
4.0	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25																
4.5	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50																
5.0	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75																
<table border="0"> <tr> <td></td> <td><u>From</u></td> <td><u>To</u></td> <td></td> </tr> <tr> <td><b>Class 1</b></td> <td>0.75</td> <td>1.25</td> <td>Danger for some</td> </tr> <tr> <td><b>Class 2</b></td> <td>1.25</td> <td>2.50</td> <td>Danger for most</td> </tr> <tr> <td><b>Class 3</b></td> <td>2.50</td> <td>20.00</td> <td>Danger for all</td> </tr> </table>												<u>From</u>	<u>To</u>		<b>Class 1</b>	0.75	1.25	Danger for some	<b>Class 2</b>	1.25	2.50	Danger for most	<b>Class 3</b>	2.50	20.00	Danger for all
	<u>From</u>	<u>To</u>																								
<b>Class 1</b>	0.75	1.25	Danger for some																							
<b>Class 2</b>	1.25	2.50	Danger for most																							
<b>Class 3</b>	2.50	20.00	Danger for all																							

(Source: Figure 3.2, Defra 2005, p. 9)

Area Vulnerability (AV) is derived from examining the parameters presented in Table I-17.

**Table I-17. Area Vulnerability Parameters**

Parameter	1 – Low Risk Area	2 – Medium Risk Area	3 – High Risk Area
Speed of onset	Onset of flooding is very gradual (many hours)	Onset of flooding is gradual (an hour or so)	Rapid flooding
Nature of area	Multi-storey apartments	Typical residential area (2-storey homes); commercial and industrial properties	Bungalows, mobile homes, busy roads, parks, single storey schools, campsites, etc.

<sup>16</sup> The UK census records this datum in contrast to the United States Census. The rationale for its inclusion is that post-flood morbidity is higher where flood victims suffer from preexisting health problems (Tapsell et al. 2002, p. 1522).



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Flood warning	Score for flood warning = $3 - (P1 \times (P2 + P3))$ where P1 = % of Warning Coverage Target Met P2 = % of Warning Time Target Met P3 = % of Effective Action Target Met
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Area Vulnerability (AV) = sum of scores for 'speed of onset', 'nature of area' and 'flood warning'

Source: Defra 2005, Table 4.4, p. 15

The methodology then combines the information to generate estimates of injuries and deaths (Table I-18).

**Table I-18. Estimates of Numbers of Injuries and Deaths**

Flood Zone	1 Nz	2 $N(ze)=AV * HR$	3 Y	4 No. of Injuries= $2 * Y$	5 No. of Deaths= $2 * HR * Col 4$
Z1					
Z2					
Z3					
Etc.					
Total					

Source: Defra 2005, Table 6.5, p. 22

### Conclusions

Loss of life estimates provide a basis for discussions about with- versus without-project conditions which address this important social issue. Loss of life estimates are not usually monetized<sup>17</sup>; however, risk-versus-cost considerations are likely to be central to discussions of flood damage mitigation issues. Concerns such as level of protection and remaining loss of life risks from events beyond level of protection; the potential for conveying a false sense of security; and strategies for reducing risk by flood control designs, improving warning system effectiveness, and addressing social vulnerability issues – e.g., improving identification of and evacuation procedures for especially vulnerable populations – are all likely topics for discussion based on the information provided by loss of life estimates.

The OSE analyst and the planning team should recognize that methods and procedures are available and are being refined that can address the vital issue of injury and loss of life from flooding. Because this topic is sensitive, it is highly recommended that the planning team obtain expert assistance in the selection and use of appropriate methods. Further information on the use of loss of life methods can be obtained by consulting the Institute for Water Resources.

<sup>17</sup> FEMA procedures do, in fact, assign a value of \$2.2 million per human fatality for inclusion in FEMA benefit cost procedures. See *What Is a Benefit?* (FEMA 2001, p. 2-11).

## 5.4 Environmental Justice

Closely allied to the concept of social vulnerability described in section 1.2.3 is that of environmental justice (EJ). Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, mandates that each federal agency “identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” The EJ Executive Order was created to combat the fact that poor and minority groups often have been exposed to greater human health and safety risks than society at large and have borne more than their share of the negative effects of development. The EO directs federal agencies to disclose the distribution of social and environmental effects on minority and poor populations and to ensure that such groups are afforded opportunities to fully participate in agency decision-making procedures. Various agencies such as EPA and the Federal Highway Administration have developed extensive EJ websites and offer guidance and training in the conduct of EJ analyses.<sup>18</sup>

## 5.5 Monetizing Social Effects

Some social effects are monetary in scope and can easily be presented in monetary terms – e.g., various emergency service costs and income and employment effects. For such effects it is entirely appropriate to describe their monetary costs and benefits and where permissible under evaluation policies to include them in the NED account. However, the thornier problem of monetization refers to the use of monetary proxies to represent individuals’ preferences for social concepts such as vulnerability, connectedness, and resiliency that may be associated with different alternatives. While some very creative and innovative work in the use of contingent valuation to obtain estimates of Willingness to Pay or Willingness to Accept Compensation has been done, there are significant problems with the method – particularly in adequately controlling for various types of bias (see Young 2005, Arrow et al. 1993) that pose real obstacles to the use of the method.

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<sup>18</sup> Federal Highway Administration Website: <http://www.fhwa.dot.gov/environment/ej2.htm>  
Environmental Protection Agency Website: <http://www.epa.gov/environmentaljustice/index.html>

In some respects the push toward monetization of social effects has been an artifact of the dominance of NED analysis. If the only things that counted were NED and the benefit cost ratio, it was preferable to try to monetize important social effects and get them into the b/c ratio (see Box 10). With the renewed emphasis on using all four accounts and the relaxation of a single focus on NED analysis, some of the pressure to monetize all effects may be lessened. Others may take a less optimistic view than the one expressed here noting the long-time dominance of the NED paradigm and the expectations of OMB for NED as the primary justification of a project's value. If this view is accepted, then putting effort into a strategy of monetizing OSE impacts so that they can be included as benefits or as mitigation costs may be warranted.

It is this writer's opinion that the OSE analyst should put most effort into describing and clarifying the social effects under without-project and alternative conditions to assist stakeholders in understanding the choices that are available. Methods and procedures should be selected with this purpose in mind. If effects can be expressed in monetary units in a straightforward manner, and if doing so helps the consideration of issues, then do so. However, if issues surrounding monetization are likely to become the focus of discussion and disagreement, or if social effects expressed in monetary units serve to cloud the key issues or choices (e.g. by collapsing a complex, multifaceted concept into a single number) monetization is probably inappropriate.

#### **Box 10. Human Costs Assessment**

One of the most creative procedures to monetarily estimate the social effects of flooding was the so-called Trauma Benefit Method (TBM) that was developed in the 1970s. This method employed a scale measuring personal and social stress experienced in a flood event and then linked stress scores on the scale to American Medical Association diagnoses of trauma, which were then linked to Veterans Administration payments for degree of impairment from trauma. While creative, the many links in the logical chain never proceeded to a stage of professional verification and validation and the procedure served more as a call to action than as an actual benefit category (see IWR, 1980). Because this approach has been path-breaking and addresses a critical issue in flood damage assessment studies, [Appendix C](#) presents detailed information on conducting a TBM assessment.

## **5.6 OSE and Regional Economic Development**

Regional Economic Development (RED), another P&G account, describes changes in employment and income occurring in a local or regional area as a result of expenditures associated with project alternatives (Durden and Almodovar 2006). A handbook prepared under the direction of the Institute for Water Resources on RED analysis is currently nearing completion (USACE forthcoming). RED analysts generally use regional economic impact models to compute the multiplier effect on local/regional economies generated by increased employment opportunities and income streams. Such income and employment changes may produce derivative other social effects. For example, additional income and employment opportunities may encourage population growth and positively affect economic vitality and community resiliency. It is also possible that rapid economic growth and population in-migration could over-stimulate a local area, creating negative "boomtown" social effects such as over-taxed community services and erosion of sense of community (see, for example, Flynn et al. 1983; Dietz and Dunning 1983). The OSE analyst should work closely with those performing the RED analyses to ensure that the

full scope of local and regional socio-economic effects of project alternatives are fully described, displayed, and communicated to stakeholders.

## **5.7 When to Get Professional Help**

Despite the title, this section confronts a serious question: When should the OSE analyst turn to others for help in conducting the OSE analysis, and where can he or she find assistance? The short answer to the first part of this question is that analysts should begin to search for assistance whenever they begin to get that queasy feeling in the pit of the stomach that they are in over their heads and a “what if?” exercise about an upcoming planning check point or public review produces a sense of panic.

In general the best approach is to keep things as simple as possible. Conducting stakeholder interviews and employing online secondary data collection using census resources can often go a long way in producing credible and useful OSE analyses. Another valuable approach can be to use published sources that bear on your analysis. Such materials could include surveys and indices that have been produced as part of community planning exercises, results from community workshops and visioning sessions produced as part of a community’s comprehensive planning or visioning efforts.

At some point, however, the analyst will likely be confronted with the need to extend beyond the comfort zone (Box 11). Common areas in which the analyst should probably seek outside assistance include crafting and conducting custom surveys (see the section on [surveys in Part II](#) to see some cautions about OMB requirements), developing indices and scales to measure some social characteristic, and times when the analyst sees the need for applying an unfamiliar tool or technique (e.g. designing or facilitating a workshop, conducting a focus group, or convening a Delphi panel). In those cases the analyst should probably turn to their PDT for advice and assistance. Additionally, posing questions to the Planning Community of Practice and contacting the Institute for Water Resources, the Corps Planning and Policy think tank (<http://www.iwr.usace.army.mil/index.cfm>), can be beneficial. Locally, there is likely to be professional assistance that can be found at universities and other centers offering specialized services. Dealing with outside professionals can create other problems, however, in that it is sometimes difficult to communicate needs and requirements to those not familiar with the Corps planning process.



### **Box 11. Caution! Assistance Likely Needed For:**

- Survey design and sampling
- Construction, validation and use of indices and scales
- Unfamiliar tools and techniques

#### **Finding Assistance:**

- Within the Corps: PDT; Planning CoP; IWR
- Locally: Local universities (e.g. survey research centers, mediation centers, etc.), consulting firms

## 5.8 Telling Your Story Effectively

OSE information must be presented in a way that is understandable and compelling if it is to fulfill its role of helping to clarify choices about solutions to water resources problems. Too often, however, analysts stumble at this critical stage and OSE information fails to have the impact that it should. Presenting OSE information effectively rests on a number of basics that apply to all forms of good communication. These basics have been written about extensively (see, for example, Yoe and Orth 1996, Chapter 14); Ewing 1979; Strunk and White 2000).

**Make Sure You Understand What Is Important to Communicate.** It is very difficult to communicate something's importance to another if you haven't first determined what is important beforehand. You should have a clear understanding of what others need to know about social issues as they relate to planning objectives and project purposes. It is often helpful to organize your thinking using the "rule of three" – i.e., what are the three most important points that need to be communicated? What three factors are relevant to a key point? Or, imagining that you only have 30 seconds to present the key points can also help focus your thinking. Determining what needs to be communicated leads to the question of why something is important. In general, information about a social effect will be important to communicate if people have expressed concern about the issue and if the information can help them express preferences about future conditions that are material to the alternatives being considered.

**Understand the Audience.** The audience for written communication about social effects is likely to be quite varied, including the planning team, stakeholders, the sponsor, internal and external reviewers, other agencies, OMB, and Congress. Each audience has its own needs and expectations for information, and these may not necessarily agree. To the degree that specialized products can be produced for specific audiences, information can be better targeted to meet specific needs. In the final instance, however, you must make a choice about who to have in your mind's eye as you structure information into a report. As Yoe and Orth (1996, p. 242) have noted in this regard:

*The purpose of a report is to communicate ideas to another person. Once you have identified the reader, empathize with her throughout the writing process. Put yourself in the reader's position. Don't write for the study team or for your own personal glory. Write for that person who is going to be reading. Tell her your story in a way that she can understand it.*

**Use Visual Aids.** Social effects information is often presented in tables, graphs, and charts. These visuals are quite useful in conveying lots of information; however, readers must be assisted in their interpretation. Statements such as "Table X shows that..." or "As can be seen in row 3 of Table X..." should be used to draw the reader's attention to key points. Photos can be used to great effect to "put a human face" on conditions or issues in ways that text and tables cannot and should be used to illustrate key points or issues.

**Edit for Clarity and Quality.** There really is no substitute for having your report read by a “cold reader” – i.e., someone not connected with the project – for clarity and understandability<sup>19</sup>. Also communicate that a professional job has been done by having the report edited by someone with the skills to assure that it reads well and conforms to standards of good grammar and punctuation.

## 5.9 Role of the OSE Analyst

For OSE information to be meaningful to the 4-accounts planning framework, those developing the information must have a self-conscious orientation about their role in the planning process as that of “action researcher” versus that of “assessor.” The philosophy and approach of action research was first developed by Kurt Lewin (1948). *Action research* is described as “comparative research on the conditions and effects of various forms of social action and research leading to social action.” The point of view of the researcher is not that of outside, disinterested observer, but one of an activist interested in change: “It commences with an interest in the problem of a group, a community, or an organization. [Action research’s] purpose is to assist people in extending their understanding of their situation and thus resolving problems that confront them” (Stringer 1999, p. 9)<sup>20</sup>. This role stands in contrast to the traditional “scientific” model of the disinterested researcher, dispassionately observing and taking pains not to interfere with or “contaminate” the “experiment.” Planning is a social undertaking, not a laboratory experiment, and the action research model uses the tools of science – careful observation and analysis – to help guide action.

Action research works through three basic phases<sup>21</sup>:

- **Look:** build a picture and gather information
- **Think:** interpret and explain
- **Act:** resolve issues and problems

Within the context of the collaborative planning framework these phases would be oriented to the following iterative tasks:

- Identifying potential social well-being issues associated with the current situation and the future-without condition. Discovering what stakeholders think about the water resources situation and what ideas they have about ways that it should be addressed. (Look phase)

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<sup>19</sup> This is a potential role for colleagues in the Community of Practice.

<sup>20</sup> In reflecting about the proper role of the OSE analyst in examining the impact of Hurricane Katrina, George Antle, a former Corps economist, put it this way: “The most painful thing about the public response to Katrina was the deaths of so many sick, aged persons who died while awaiting relocation from hospitals and nursing homes. The job of OSE is to make the information about these impacts so vivid that decision makers at all levels can’t avoid worrying, then acting, to reduce and eliminate the likelihood of recurrence of such events.” (G. Antle 2008)

<sup>21</sup> The similarity of this formulation to the “Scan, Focus, Act” nomenclature employed by the Corps of Engineers cadre of facilitators associated with the now-defunct “Fusion Center” is striking and not coincidental.

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- Reporting on how social well-being and quality of life issues may change in the future under the conditions brought about by the various alternatives being discussed and developed. Helping stakeholders understand and explore these implications. (Think phase)
- Applying interest-based problem solving to address acceptability issues associated with options and helping parties with proposals for mitigating unacceptable parts of plans. (Act phase)

Rather than advocating any particular outcome, the OSE practitioner should be an advocate for communication and disclosure and use the principles of science – careful observation and accurate description – to work for improved communication and understanding among stakeholders<sup>22</sup>.

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<sup>22</sup> The role of the OSE analyst as presented above is likely to be challenging in that it might often require reporting what may be unpopular or unpleasant facts. George Antle, a former Corps economist reflecting on this role puts it this way: “The planning analysts who work in the OSE area will be challenged to manage reactions inside the Corps to much of the information you will discover while engaged with those individuals in project areas who are not wealthy, highly educated but are knowledgeable and informed about the local area and the tensions in the community. Listen carefully and explore the issues with other individuals who are open to discussion. This can be invaluable to the Corps team who want to understand how to formulate useful alternative designs and implementable plans. You will find the plight of the underclass and their aspirations. Carefully use this information to help develop wise plans. This may create tension among the Corps Team and some of the Corps partners, so it important to be very diplomatic, but insistent that no relevant information be ignored. This is the challenge for your technical and human relation skills.” (G. Antle 2008)





## 6. OSE Applications in Corps Business Lines

This chapter focuses on tailoring OSE analyses for each business line identifying key issues and concerns that are unique to each mission area.

### 6.1 Flood and Storm Damage Reduction

*“During the 20th century, floods were the number-one natural disaster in the United States in terms of number of lives lost and property damage. They can occur at any time of the year, in any part of the country, and at any time of the day or night. Most lives are lost when people are swept away by flood currents, whereas most property damage results from inundation by sediment-laden water. Flood currents also possess tremendous destructive power, as lateral forces can demolish buildings and erosion can undermine bridge foundations and footings leading to the collapse of structures.”*

—USGS 2000

*“The impact on people is what dominates flood control.”*

George Antle

Floods are not only a physical event, but also a social event having many consequences for an area’s social fabric. In some agrarian societies that have adapted to annual flooding cycles, floods are welcome events, replenishing the soil in fertile floodplains. However, in more urbanized areas floods are most commonly associated with losses imposed upon those living on floodplains. Losses include personal treasured heirlooms and personal mementos of little economic value but of great personal value; disruption and loss of valued interpersonal relationships and sense of community; loss of personal sense of safety and well-being; loss of economic vitality as work patterns are disrupted and businesses close or relocate; and strains on political and other community institutions produced by uncertainty and clash with outside bureaucracies (Tapsell 2002; NRC 2006; Allee et al. 1985; Erikson 1976).

Flooding social impacts often fall disproportionately on those lacking resources and access to political power – chiefly the poor, minorities, children, and the elderly. Such groups may not only be least prepared for a flood, but may often be living in more hazardous locations, in substandard housing with the fewest resources, and lack knowledge and/or sense of political efficacy to claim access to resources to assist in recovery.

In general it appears that communities with strong civic cultures having networks of voluntary organizations and a clear sense of vision and purpose are best equipped to respond to disasters such as floods. In contrast, communities without a tradition of voluntary action, without a unifying vision for the future, and having weak leadership are less likely to respond to the challenges posed by a flood. While floods can leave one community focused and ready to recover and take positive actions to prevent future flood impacts, in the absence of strong civic culture flooding can further contribute to and accelerate a downward spiral of deterioration.

Table I-19 presents a summary of potential social effects associated with floods. These effects are arrayed by the key social well-being factors presented in section 1. It should be emphasized that these effects represent things to look for as evidenced from literature and the writer’s experience and are not necessarily what you will find in all cases.

**Table I-19. Summary Characterization of Potential Flooding Social Effects**

<b>Social Factor</b>	<b>Potential Social Effects from Flooding and/or Flood Damage Reduction Approaches</b>
Health and Safety	<p>Residents feel less safe and more apprehensive about their living space/community in the aftermath of a flood.</p> <p>Potential for vector-borne diseases increases.</p> <p>There is a potential for trauma from extreme flooding events.</p>
Economic Vitality	<p>Disruption to the economy, business losses and loss of wages may drag the economy down for some time after flood and contribute to a gradual deterioration of the economy.</p> <p>Recovery may serve as a stimulus to business growth; reconstruction may create temporary building boom and influx of construction workers which may raise rents and create housing shortages.</p>
Social Connectedness	<p>Greater incidence of cooperative behavior is possible during and immediately after a flood as people pull together to face common problems.</p> <p>Disruption and loss of valued personal relationships creates feelings of loss and disconnectedness from neighborhoods. (“Things will never be the same again.”)</p> <p>Extended relocation away from neighborhoods and homes creates feelings of isolation and disconnectedness. Personal and social disorganization is evidenced by increases in health problems, crime, and marital problems.</p> <p>Community civic culture and capital are likely to be challenged by demands to cope with the flood and its aftermath. Those communities with strong cultures are likely to cope better than those communities that have weak civic cultures.</p>
Identity	<p>Flood losses and dislocation may disrupt persons’ sense of cultural security and identity and further create negative patterns of disconnectedness.</p>
Social Vulnerability and Resiliency	<p>Elderly, poor, disabled, minorities, and children may suffer greater relative harm and be less likely to bounce back from the flood.</p>
Participation	<p>Local modes of decision making and participation may clash with flood-recovery bureaucratic approaches, leading to mistrust and recriminations.</p> <p>Development of flood damage reduction strategies offers opportunities for increasing local participation and creation of trust.</p>
Leisure and Recreation	<p>Leisure and recreation activities and opportunities may be disrupted by floods.</p> <p>Flood damage reduction approaches may further or constrain valued leisure and recreational pursuits.</p>

## **6.2 Navigation (Inland and Deep Draft)**

*“The role of the U.S. Army Corps of Engineers with respect to navigation is to provide safe, reliable, and efficient waterborne transportation systems (channels, harbors, and waterways) for the movement of commerce, national security needs, and recreation. The Corps accomplishes this mission through a combination of capital improvements and the operation and maintenance of existing projects. Capital improvement activities include the planning, design, and*

*construction of new navigation channel works and locks and dams. These activities are performed for the navigation of shallow draft (equal to or less than 14-foot draft) vessels on inland waterways and harbors, and coastal and lake harbors and channels.”*

—USACE 2001, p. 11

The basic framework for evaluating potential investments in navigation improvements is the NED analysis of transportation cost savings. Nevertheless other effects associated with transportation options are important to people affected by them and should be presented to decision makers for consideration. The Tennessee Valley Authority, for example, uses a model known as STEAM (Surface Transportation Efficiency Analysis Model) to portray the benefits and costs associated with alternative transportation investments that includes air pollution, accidents, road damage, recycling issues, and noise to address how community livability could be affected (Bray 2006). It has been pointed out that in Alaska navigation channels function as highways connecting small Native Alaskan villages to the outside world and to each other (2007). Navigation channels and harbors often provide an economic stimulus to communities located near them. In an interesting series of studies conducted in the 1970s, the researchers concluded that some communities along the McClellan Kerr Arkansas Waterway were able to capitalize on the waterway and achieve economic growth while others did not (Antle 1975). The research pointed to the importance of social capital of communities – i.e., the quality of leadership, unanimity of purpose and vision among leadership – as being most important in distinguishing between communities that took advantage of the waterway and those that did not. Table I-20 summarizes some of the social effects that can be associated with navigation investments.

**Table I-20. Summary Characterization of Potential Navigation Social Effects**

<b>Social Factor</b>	<b>Potential Social Effects from Navigation Improvements</b>
Health and Safety	Risk of accidents associated with alternative modes of transportation Risk of air pollution associated with alternative modes of transportation Margin of safety for recreational boaters provided by harbors of refuge
Economic Vitality	Provides the opportunity for economic development and investment in local communities. Ability of communities to take advantage of such opportunities may be a function of community social capital.
Social Connectedness	Can serve as highways connecting remote villages and providing opportunity to preserve social connectedness and identity among native peoples. May also provide an avenue of intrusion from outside world which can present challenges to traditional norms and culture.
Identity	See social connectedness.
Social Vulnerability and Resiliency	
Participation	
Leisure and Recreation	Navigation approaches may enhance or constrain valued leisure and recreational pursuits.

### 6.3 Ecosystem Restoration

*“The purpose of Civil Works ecosystem restoration activities is to restore significant ecosystem function, structure, and dynamic process which have been degraded.... Like other types of Civil Works projects, ecosystem restoration projects must be justified. However, they are not justified in monetary terms, but rather through alternative processes which use both non-monetary and monetary information.”*

*USACE 2001, p. 23*

Ecosystem restoration projects are intended to improve the delivery of various ecosystem services, such as water quality, fish and wildlife habitat, sediment management, and protection of shorelines. Many of these services have direct or indirect social values that can be described and in some cases quantified (Coles et al. 1996). For example, there is evidence that wetlands of sufficient size can buffer hurricane storm surges (U.S. Fish and Wildlife Service, <http://www.fws.gov/nwi/stormvalues.htm>). It is also possible that wetlands can prevent rapid runoff and provide floodwater storage. Other social effects associated with ecosystem restoration projects relate to recreation and enjoyment of improved resources provided by the project. Often ecosystem restoration projects have secondary components such as flood damage reduction, and social effects may be associated with those project purposes as well.

### 6.4 Watershed Studies

*“The watershed approach that the Corps envisions reflects what is known internationally as ‘integrated water resources management.’ The benefit of a watershed approach is that it requires one to think about water resources development and management in the context of a larger system than a single project and thus facilitates the search for comprehensive and integrated solutions to achieve objectives set by all concerned parties. By taking into account a multitude of water uses over a wide area as opposed to concentrating on a single use at one project site it becomes possible to integrate a complex array of public values, institutional policies and priorities, regulatory procedures, planning criteria, public participation, and private sector business interests.”*

*USACE 2004, p. 6*

Watershed studies comprehensively examine a watershed as a system, identifying interrelated problems, opportunities, and potential partnerships among agencies and groups for addressing water resources and related issues. Watershed studies are collaborative by nature, requiring the involvement of many different stakeholders across a watershed (Box 12). The added requirement of examining many water resources issues and incorporating the perspectives and programs of other agencies introduces added complexity into the study process. The OSE analyst can play a helpful role in such studies by performing the analyses and tasks that have been enumerated in section I-4 of this handbook (Building OSE Analysis into the Corps Planning Process) to help participants in the study understand watershed social conditions, stakeholders’ perceptions of water resources issues, and study participants’ perspectives regarding preferred futures for the watershed. In this regard the Natural Resources Conservation Service has developed an approach termed “Rapid Resource Appraisals of Watersheds,”

([http://www.ssi.nrcs.usda.gov/publications/borders/1\\_PPCs/PPC024\\_RapidResourceAppraisalsFinal.pdf](http://www.ssi.nrcs.usda.gov/publications/borders/1_PPCs/PPC024_RapidResourceAppraisalsFinal.pdf)). The approach, which takes place early in a watershed study, brings together key watershed stakeholders in a series of educational activities (e.g. watershed tours), review of analyses of the social and economic drivers of watershed land uses and changes, and focused discussions about preferred futures for the watershed.

Watershed planning need not be confined to traditional Corps missions but is encouraged to be broad ranging to search for opportunities that may involve other agencies’ participation (ER 1105-2-100, section 3-9.c.).<sup>23</sup> Table I- 21 presents some of the social effects issues that could be pertinent in watershed studies.

**Box 12. Principles of Collaboration**

- Assess and understand the situation and deal with real conflict.
- Ensure up-front participation of all stakeholders.
- Keep the decision-making process flexible.
- Design ‘capacity building’ efforts to encourage collaborative relationships and help people succeed.
- Leverage resources.
- Build community understanding and enhance technical capabilities.
- Promote learning and adaptation in both processes and products.

—US Forest Service 2006

**Table I-21. Summary Characterization of Potential Social Effects Issues of Concern in a Watershed Study**

<b>Social Factor</b>	<b>Potential Social Effects Issues of Concern in a Watershed Study</b>
Health and Safety	Water quality health and safety issues; other water related health and safety issues
Economic Vitality	Economically sustainable development Improved coordination and integration of existing Federal, state, and local projects
Social Connectedness	Maintaining and enhancing civic infrastructure and Quality of Life (QOL) in the watershed
Identity	Creating and enhancing civic pride in the watershed
Social Vulnerability and Resiliency	Ensuring that socially vulnerable populations are identified and that their views are taken into account Capacity building in watershed organizations and institutions to encourage resiliency and adaptability
Participation	Enhancing opportunities for increasing local participation and creation of trust
Leisure and Recreation	Leisure and recreation activities and opportunities to enhance QOL

<sup>23</sup> Under the 4-Account structure Corps project alternatives can include OSE management measures or can contain measures to mitigate negative social effects. Given the broader mandate of watershed studies it is possible that OSE enhancement plans might be formulated to focus attention on preferred watershed futures for sustainable social and economic development which are beyond the scope of Corps authorities but achievable by collaborative action.

## 6.5 Emergency Response

*“...at its core, disaster means ‘social’ disruption. That social disruption is only partial and somewhat incidentally related to damage to physical structures. Today, of course, we have a number of measures of physical agents and impacts...When we measure all of these dimensions, none of them capture the most important impacts on social life. We have no good measures of broken social relationships created by death, injury or relocation. We have few clues as to the costs of disrupted work patterns and their accompanying economic losses. We have no good measures of the consequences of the segmentation and disorganization of community life, nor do we even attempt to measure the costs of delayed and disrupted futures. In effect, all disasters are failures on the part of human systems where the physical infrastructure fails to protect people from conditions which threaten their well being.”*

*Dynes 1990*

Human response to a disaster like a flood or a hurricane has a life cycle (Fisher 1998) consisting of several phases: pre-impact/warning; impact; immediate post-impact; and recovery and reconstruction. By illuminating the human dynamics that operate at each phase in a disaster the OSE analyst can help emergency managers plan and manage more effectively. During the pre-impact and warning phase, for example, a vulnerability analysis of impact areas can help identify vulnerable populations that may have special needs for evacuation, housing, and post-impact support. Emergency managers can use such information to create plans and policies more sensitive to such populations’ needs<sup>24</sup>. Additionally, during this phase social scientists may be able to offer insights and to communicate messages to diverse populations about risk posed by an approaching storm and what actions they should take. For example, it may be known that some ethnic groups rely on information passed on by esteemed leaders within the community, as opposed to public media. In such a circumstance, effectively communicating messages necessitates reaching leaders within the community with the correct information and using internal networks.

Much has been learned about the social effects of disasters through disaster research studies, and this body of knowledge can be brought to bear in a proactive way to assist emergency managers in better understanding the range of social effects that will likely occur and that will need to be ameliorated. For example, personal impacts associated with disasters include loss of life, sickness, injury, loss of employment, loss of valued personal items, loss of sense of place and sense of security, and family stress and disruption (Quarantelli 1988; Heinz Center 2000). Community impacts include disruption of community services and impairment of community economy, property values, and physical and social infrastructure (Heinz Center 2000; Drabek 1986). Political tensions and crises are also possible during post-impact and recovery periods and include stresses and controversy created by temporary housing, competing post-event visions for the reconstruction of destroyed areas, and contrasts and conflicts

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<sup>24</sup> As noted in section 2.1.5, a place vulnerability analysis overlays physical hazard information with socio-economic information to identify social vulnerability hot spots within jurisdictions. This procedure is demonstrated in the Martin County case study in this handbook (see also NRC 2006, pp. 73-74).

between local culture and ways of doing things and outside relief bureaucracies with their own rules and procedures (NRC 2006, pp. 83-84). Finally, civic infrastructure and social capital can be important in assisting in the recovery of communities impacted by disasters through mobilizing community leadership and networks of agencies and organizations. By providing information about the potential for such effects before hand, and by conducting on-site field work after disaster strikes the OSE analyst can help illuminate the social “hazardscape” (Gall and Cutter forthcoming) so that emergency managers can better anticipate and take such effects into account.

## **6.6 Others (Water Supply, Recreation, Hydropower, Regulatory)**

The Corps’ other principle business lines include water supply, recreation, and hydropower, and the regulatory program. Projects considered in the water supply, recreation, and hydropower business lines, and permit actions considered in the regulatory program’s public interest review process, may have social effects. It should also be noted that the regulatory program permit review process employs a “public

interest review process” (see Box 13) which considers a wide range of effects in determining whether to issue a permit. It should also be noted that the regulatory program’s range is very broad, touching on almost all private or public alterations involving water and related land resources. Effects associated with these business lines are not specified in this handbook. Instead Table

### **Box 13. Regulatory Process Public Interest Review**

“The decision whether to issue a permit is based on an evaluation of the probable impacts (including cumulative impacts) of the proposed activity on the public interest. Evaluation of the probable impacts which the proposed activity may have on the public interest requires a careful weighing of all those factors which become relevant in each specific case. The benefits which may reasonably accrue from the proposal must be balanced against its reasonably foreseeable detrimental impacts. The decision whether to authorize a proposed activity, and if authorized, the conditions under which it will be allowed to occur, are therefore determined by the outcome of the general public interest balancing process. That decision should reflect the national concern for both protection and utilization of important resources. All factors which may be relevant to the proposal must be considered, as must their cumulative effects. Considered are: conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs and, in general, the needs and welfare of the people. No permit will be granted if issuance is found to be contrary to the public interest.”

—EP 1165-2-, Chap. 21

I-22 presents a series of questions that can help the OSE analyst in identifying those social effects that may be relevant.

**Table I-22. Questions to Assist in Identifying Relevant Social Effects**

<b>Social Factor</b>	<b>Questions</b>
Health and Safety	What risks and benefits to human health and safety are associated with future without- and future with-project conditions?
Economic Vitality	How are jobs, incomes, employment opportunities, and population growth of communities likely to be affected in future without- and future with-project conditions?
Social Connectedness	How are community interpersonal networks, leadership, visions for the future, and relationships among voluntary organizations likely to be affected by future without- and future with-project conditions?
Identity	How are communities seeking water supply's sense of cultural security and identity affected by future without- and future with-project conditions?
Social Vulnerability and Resiliency	Are any groups differentially exposed to hazards or impacts from hazards under future without- and future with-project conditions?
Participation	Are opportunities for all affected groups' participation provided for in all phases of the planning process?
Leisure and Recreation	How are leisure and recreational opportunities affected by future without- and future with-project conditions?



## Part II: Catalogue of OSE Assessment Variables and Tools

### 1. OSE Indicators

The social well-being factors presented in this handbook are concepts which influence personal and group satisfaction, well-being, and happiness. These concepts have real meaning in our lives; however, we don't actually see concepts like "social connectedness" or "social vulnerability." We can't weigh social connectedness or take the social vulnerability's temperature or measure its height. Instead we see evidence of their reality through *indicators* that have some logical relationship to the concept. Indicators are real, observable things which give evidence of the presence or absence of a concept (Babbie 1979).

The OSE indicators listed in tables in this section have been identified on the basis of other social effects studies and handbooks as well as on the basis of commonsense logical relationships to social well-being concepts. They are by no means the only indicators possible to use to measure the social well-being factors, and the OSE analyst should exercise judgment and creativity in finding additional indicators of social well-being concepts.<sup>25</sup>

#### 1.1 Using OSE Indicators

We use OSE indicators to help provide greater understanding about the social well-being conditions in the present, in the future without-project condition, and under future with-project conditions. The basic process for accomplishing this operation is shown in Box 14. But what of the last step shown in the box – imputing meaning to values of indicator variables and their changes? How can this be accomplished? In general, there are three ways:

- **Comparisons.** Draw inferences and conclusions through comparisons with other areas. What does the indicator variable's state or change resemble? By drawing on such comparisons the meaning and implications of the indicator can be discerned. For example, the meaning of a community population growth rate of six percent per year can be suggested by a comparative analysis of population growth rates of the state and other communities. Such an analysis might conclude that an

#### Box 14. Using OSE Indicators to Measure Social Factors

- Link OSE indicator variables to the Social Factor concept.
- Measure and describe variables in past and current conditions.
- Forecast changes in variables in future without- and future with-project conditions.
- Impute meaning to changes in variables with regard to the Social Factor (positive/negative change?; big change/little change?; important/unimportant?; etc.).

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<sup>25</sup> The process of linking indicators to concepts is known as *operationalizing a concept*. Valid indicators of a concept should possess *face validity*, i.e., they should have some quality of reasonableness; additionally, they should be consistent with the body of thought about the concept that can be found in the research and practice; and finally, they should point in the same direction as other indicators of the same concept. For a detailed discussion of the process of operationalization and measurement of indicators see Babbie 1979.

annual population growth rate exceeds the state average rate and that communities experiencing such growth rates also exhibit signs of overheated economies, housing shortages, and strains on community services.

- **Standards.** Refer to meanings associated with values of indicators that are based on long periods of data collection and experience. An example might be meanings associated with various values of the unemployment rate. An unemployment rate of ten percent has a fairly unambiguous interpretation – economic times are tough and the economy is very likely stagnant or in decline. Unfortunately there are few social indicators that have sufficient conceptual clarity or a lengthy enough track record of data and experience to have standard meanings associated with their values. Nevertheless, where particular interpretations of the meaning of value have been or are emerging, it is possible to impute meaning to indicators on this basis.
- **Subjective Valuations of Stakeholders.** “Beauty is in the eye of the beholder” is an example of deriving meaning through a process of subjective interpretation of data. The OSE analyst can help stakeholders interpret values of social indicators that have been developed, perhaps pointing out appropriate comparison data and any relevant standards to help interpret the data. However, and ultimately, the stakeholders must decide the implications of indicators for their interpretation.

## **1.2 Indicators of Social Well-being Factors**

The tables below present indicators of the social well-being factors discussed in this handbook. The indicators are presented in tables arranged by the social factor of interest. Each table contains an overview of the social well-being factor and the kinds of questions that the indicators will help answer. Indicators sometimes have subindicators shown, which provide more detail. Sources of information for indicators are also provided.

**Table II-1. Basic Social Statistics**

**Basic Social Statistics:** These indicators are used to portray basic information about the social life and processes of the area under study. The development and use of these basic social characteristics is also presented in [Appendix A](#) “Performing a Social Profile”

**Key Questions:**

1. Who lives in the area?
2. How do residents make a living?
3. How can the area’s housing stock be described?
4. What are patterns of wealth and poverty?
5. How educated are area residents?

<b>Basic Social Statistics: Indicators</b>	<b>Sources of Information</b>
Population	Census Quick Facts: <a href="http://quickfacts.census.gov/qfd/index.html">http://quickfacts.census.gov/qfd/index.html</a> Census Profiles: <a href="http://censtats.census.gov/cgi-bin/pct/pctProfile.pl">http://censtats.census.gov/cgi-bin/pct/pctProfile.pl</a> American Fact Finder: <a href="http://factfinder.census.gov/home/saff/main.html?_lang=en">http://factfinder.census.gov/home/saff/main.html?_lang=en</a>
Total population	
Population % change	
Population projections	State Department of Finance and Planning; Local comprehensive plan;
Race and Ethnicity	
Racial /ethnic breakdown	
Age	
Median age	
% 65 and above	
% 18 and under	
Education	
% HS grads (age 25+)	
% College grads (age 25 +)	
Employment and Industry	
Major industries	
Unemployment rate	
Income and Poverty Status	
Median Household income	
Persons below poverty %	
Housing Mix and Value	
Housing units	
Homeownership rate	
Housing units in multiunit structures %	
Median value of owner occupied housing units	

**Table II-2. Social Vulnerability and Resiliency Indicators**

**Social Vulnerability and Resiliency** can be combined into indices and/or overlain with measures of physical vulnerability (flood zones, storm surge zones, etc.) and information on road networks and evacuation routes to create a place vulnerability analysis (See [Appendix D](#), Martin County Case Study).

**Key Questions Being Addressed:**

Are any groups differentially exposed to hazards or impacts from hazards under future without- and future with-project conditions?

<b>Indicator</b>	<b>Sources of Information</b>
Vulnerability	Census information (see above). Also, see NOAA Risk Vulnerability Tool: <a href="http://www.csc.noaa.gov/rvat">http://www.csc.noaa.gov/rvat</a>
Vulnerability	
Proportion of population >= 65	
Proportion of population <18	
Proportion of population in poverty status	
Proportion of minority residents	
# of mobile homes	
Mean house value	
Proportion of female head of households	
Disability status (persons with disabilities)	
#s and locations of “special use facilities” – nursing homes, hospitals, schools, day care centers	Consulting telephone directories; “Google Map”
Resiliency (See Economic Vitality and Social Connectedness)	

**Table II-3. Social Connectedness Indicators**

**Social Connectedness** refers to patterns of social networks within which individuals interact and that provide meaning and structure to life. Communities having a robust civic infrastructure composed of many and diverse opportunities for connectedness are likely to be more satisfying to individuals and more economically and socially progressive and resilient.

**Key Question:**

What is the structure of community leadership?

What is the community’s vision for the future?

What are the structure and function of community voluntary organizations?

How are community interpersonal networks, leadership, visions for the future, and relationships among voluntary organizations likely to be affected by future without- and future with-project conditions?

<b>Indicator</b>	<b>Sources of Information</b>
Citizen descriptions or ratings of the community as a good place to live, friendliness, effectiveness, etc.	Community surveys conducted as part of comprehensive plan process, Chamber of Commerce surveys, etc.
# of civic and community organizations/ numbers of members	Library and online searches
Community vision and outlook for the future	Community comprehensive plan, interviews
Community improvements underway	Community comprehensive plan, community capital improvements plan
% of voters casting ballots in the last local election	City/County Clerk’s Office
Number of citizens attending open municipal government meetings in the past year	City/County Clerk’s Office
Views of quality of life in the community	Community surveys conducted as part of comprehensive plan process, Chamber of Commerce surveys, etc.
Views on equity and diversity in the community	Surveys conducted by City/County Human Services Office

**Table II-4. Economic Vitality Indicators**

**Economic Vitality** refers to the capacity of the economy to provide a good standard of living for residents now and into the future.

**Key Questions:**

What is the economic base of the community?

What is the trajectory of economic development (growing, stagnant, declining)?

How are jobs, incomes, employment opportunities, and population growth of communities likely to differ in future without- and future with-project conditions?

<b>Indicator</b>	<b>Sources of Information</b>
Employment by industry	Bureau of Economic Analysis: <a href="http://www.bea.gov/region/data.htm">http://www.bea.gov/region/data.htm</a> Total full- and part-time employment by industry. Table CA25N. <a href="http://bea.gov/region/reis/action.cfm">http://bea.gov/region/reis/action.cfm</a> County Business Patterns <a href="http://www.census.gov/epcd/cbp/view/cbpview.html">http://www.census.gov/epcd/cbp/view/cbpview.html</a>
Top ten employers	Chamber of Commerce, State Department of Commerce
Wages (ranking)	Bureau of Economic Analysis, Table CA-34
Average annual cost of living	Consumer Price Index, Bureau of Labor Statistics <a href="http://www.bls.gov/cpi/">http://www.bls.gov/cpi/</a>
Average number of hours worked per week	Current Employment Statistics, Bureau of Labor Statistics
Number of homes sold in past year; annual percentage change	Local Realtors Association
Percentage of businesses locally owned	Chamber of Commerce
Unemployment rate	Bureau of Labor Statistics

**Table II-5. Leisure and Recreation Indicators**

**Leisure and Recreation** refer to amount of time available to spend in leisure and the opportunities to spend leisure time in preferred recreational pursuits.

**Key Question:**

How are leisure and recreational opportunities affected by future without- and future with-project conditions?

<b>Indicator</b>	<b>Sources of Information</b>
Favorite pastimes	Recreational surveys conducted by university departments or state government agencies
Hours spent in recreation/leisure activities	As above
Average distance traveled to recreational areas	As above
Inventory of local recreational areas, sizes, features	Library and online research
# of visitor days by season spent at recreational areas	Facility records
Local/ nonlocal visitation at recreation sites	Facility records
#/extent of restrictions on use of recreational facilities from advisories, alerts, or weather-related closures	Facility records

**Table II-6. Participation Indicators**

**Participation** refers to the ability to interact with others to influence social outcomes.

**Key Question:**

Are opportunities for all affected groups' participation provided for in all phases of the planning process?

<b>Indicator</b>	<b>Sources of Information</b>
Voter turnout	City/County Clerk
# of special citizens commissions established to address local issues	City/County government
Planning Process Participation	
Access of public to planning documents and information	Planning team self assessment, verification with stakeholders
Ability of all stakeholders to actively participate in each stage of the planning process	Planning team self assessment, verification with stakeholders
Ability of stakeholders to influence planning outcomes	Planning team self assessment, verification with stakeholders
Planning process provides regular opportunities to share information with stakeholders	Planning team self assessment, verification with stakeholders

**Table II-7. Identity Indicators**

**Identity** refers to a community's core values, traditions, and other sources of pride that help define it as distinct from other communities.

**Key Question:**

How are communities' sense of cultural security and identity affected by future without- and future with-project conditions?

<b>Indicator</b>	<b>Sources of Information</b>
Core values	Descriptions obtained from interviews or consultation with knowledgeable third parties
Key traditions	Descriptions obtained from interviews or consultation with knowledgeable third parties
Language	Descriptions of importance obtained from interviews or consultation with knowledgeable third parties
Sources of group pride and honor	Descriptions obtained from interviews or consultation with knowledgeable third parties

**Table II-8. Health and Safety Indicators**

**Health and Safety** refers to perceptions of personal and group safety and freedom from risks associated with natural and social hazards.

**Key Questions:**

How safe do residents feel themselves to be?

How satisfied are residents with official efforts to protect them from the hazard?

What risks and benefits to human health and safety are associated with future without- and future with-project conditions?

<b>Indicator</b>	<b>Sources of Information</b>
Accident rates per vehicle ton miles	
Exposure to hazards	
Loss of life associated with hazard	

## 2. Key Tools

This section describes key tools to collect and use OSE information in the planning process. Table II-9 repeats the OSE questions presented from Part I for each step of the planning process and shows those tools which have the greatest utility in addressing the questions. Following the table, each of the tools is summarized in the sections below. Finally Table II-3, which completes this section, summarizes the primary uses, strengths, weaknesses, expense, and level of expertise needed to use the tools.



Table II-9. Common Tools for Addressing Key OSE Questions

Planning Step	OSE Questions	Historical Analysis	Social Profiling	Independent Studies and Projections	Workshops	Stakeholder ID Methods	Interviews	Surveys	Secondary Data Collection	Focus Groups	Delphi Panels	Content Analysis	Charrettes	Shared Vision Methods	Quality of Life Indices
1	What is the history and historical development of the local and regional area?	X	X				X		X						
	– What is the history of the water resources situation?	X					X		X						
	What groups have economic, cultural, and other “stakes” in the situation?		X			X	X					X			
	– How do stakeholders define the problems, needs, opportunities, and constraints? What are their priorities? What kinds of effects are they interested in achieving/ in avoiding?				X		X	X				X			
	What are the dynamics of social life in the local and regional area?						X								
1	– How is the social landscape configured – what basic “social statistics” can be used to describe the population and portray quality of life factors?	X	X												
	– What groups are especially vulnerable?	X	X		X		X								X
	– What is the structure and functioning of the civic infrastructure?				X		X								X
2	How are social conditions currently being affected by the water resources situation?		X	X	X		X	X			X			X	X
	What are social conditions likely to be in the future in the absence of a water resources intervention?			X	X		X		X		X				
3	What should the future look like with regard to social conditions of concern?				X		X		X	X			X	X	

**PART II – CATALOGUE OF OTHER SOCIAL EFFECTS ASSESSMENT TOOLS AND VARIABLES**

Planning Step	OSE Questions	Historical Analysis	Social Profiling	Independent Studies and Projections	Workshops	Stakeholder ID Methods	Interviews	Surveys	Secondary Data Collection	Focus Groups	Delphi Panels	Content Analysis	Charrettes	Shared Vision Methods	Quality of Life Indices
	<ul style="list-style-type: none"> <li>- What needs to be changed? What needs to be preserved or improved?</li> <li>▪ What are the most important future social conditions that need to be achieved? Why?</li> <li>▪ What kinds of measures are needed to achieve these social conditions?                             <ul style="list-style-type: none"> <li>- Why is (are) the measure(s) preferred? What are key underlying interests?</li> </ul> </li> </ul>				X		X			X			X		X
4 – 6	<ul style="list-style-type: none"> <li>▪ What are plans' social effects in terms of magnitude, location, timing and duration?</li> <li>▪ What risks are associated with each plan?</li> <li>▪ How adequate are plans with respect to completeness, effectiveness, efficiency, and acceptability?</li> </ul>			X	X		X		X		X		X	X	
				X		X			X		X		X		

## 2.1 Historical Analysis

A good preliminary step to build greater understanding of a study area or of water resources issues is to consult histories that have focused on these topics. Historical treatments of an area's development can often be found in comprehensive plans for the area or in histories prepared by local historical societies. Similarly, there are many good comprehensive treatments of the history of water resources development (e.g. Rogers 1993; Reisner 1986), as well as histories of specific water issues such as flooding (e.g., Barry 1998).

## 2.2 Social Profiling

A social profile is an analysis of basic community social conditions. Generally, a profile assembles basic demographic data obtained from census and local planning documents and may also present the results of interviews conducted with community leaders. The purpose of a social profile is to provide a basic level of understanding about the social dynamics and structure of an area. The more focused treatment of planning issues relating to OSE considerations in future without-project and future with-project conditions builds off the social profile. Table II-4 in Section II.2 (OSE Indicators), above, presents much of the data that would be assembled for a social profile. Additionally, [Appendix A](#) provides more detail on constructing a social profile.

## 2.3 Independent Studies and Projections

While it is possible for the OSE analyst to develop projections of demographic variables such as population, income, and employment, it is much more advisable to use projections prepared by official government sources. In some cases there may be several projections from official sources and they may not agree. The analyst should array such projections, discuss their methods and purposes, and then specify the reasons for the choice of projection used. Similarly, it is possible that there may be an official projection for a larger area encompassing the study area. In such cases it is advisable for the analyst to begin with this projection and then carefully lay out a rationale for arriving at the smaller area projection. The use of the shift-share methodology can be especially helpful for deriving smaller area projections from projections of larger areas (Knudsen 2000).

## 2.4 Workshops

The term *workshop* refers to a small group meeting, led by a facilitator, convened to achieve a specific purpose. The facilitator attends to the process of the meeting, helping participants stay focused on the meeting objective, and employs structured problem-solving processes to help participants work through their issues of concern. Workshops are often used in planning to bring stakeholders together to identify issues of concern, to identify possible ways that a water resources problem could be addressed, and to evaluate alternatives. Workshops function best when they have 8–15 participants. Larger groups can be broken down into workgroups, which can perform tasks in the small-group workshop environment and then reconvene into the larger group to report and discuss their activities. This “large group – small group

– large group” format is only one of many variations for workshops. The design and conduct of workshops is a skill that requires knowledge of group dynamics, structured problem-solving techniques, and experience gained from actual practice. Workshops are so basic to all aspects of planning that the OSE analyst should become proficient in their design and use. The Corps PROSPECT “Public Involvement in Planning and Teaming” course provides extensive training in workshops. Additionally, more information on workshops design and facilitation can be found in Creighton et al. 1982; and Creighton forthcoming.

A *visioning workshop* is a particular type of workshop focused on developing preferred visions of the future. Participants would likely be invited to participate based on particular interests or points of view they represent. Facilitators would likely lead the group in exercises to describe what the future should look like and then focus more explicitly on key themes that are present in visions. Work would then generally be devoted to comparing, contrasting, and integrating visions; applying the vision to particular issue areas; and identifying action steps needed to make the preferred future vision a reality.

## **2.5 Stakeholder Identification Methods**

Stakeholders are those individuals and groups that have a stake in the outcome of a planning process. Stakeholders can be identified on the basis of their “interests” in water resources issues (Creighton, 2005 49). Table II-10 shows a list of common interest factors that may provide individuals or groups with a stake in encroachment management. The table also gives examples of the types of stakeholders that might correspond to each interest factor. When identifying stakeholders, it is always advisable to find the opinion leaders or influentials (see Box 15).

Three interrelated methods can be used to identify who might be appropriate to include in each box of the table. The first approach identifies those stakeholders that are obvious to include based on their correspondence to the interest factor, e.g., a local planning or the local Realtors Association. The second method uses already identified stakeholders as a source to identify additional stakeholders. Once an initial list of stakeholders has been identified, personal interviews can be conducted with representatives of the stakeholder

### **Box 15. Finding the “Opinion Leaders”**

Within any group, some individuals’ opinions and views carry more weight than others. Finding these opinion leaders within stakeholder organizations can be accomplished by asking who is generally consulted before important decisions are made. Generally, the same names will appear over and over as people within the organization are asked. By focusing on cultivating and building relationships with the organization’s opinion leaders, a much more effective and impactful communication process about issues will take place.

groups to talk about perceptions of the current situation and future challenges and opportunities. During interviews it is desirable to add to the stakeholder list by asking stakeholders who else would have an interest in the water resources issue. The third approach uses analysis to identify stakeholders. It might also be useful to review past decisions that relate to the water resources issue, review letters to the editor in local papers, and review news articles about water resources-related issues to identify groups and individuals that have been active. The process of stakeholder identification is constant, not just something

that is done at the beginning of the planning process. A stakeholder database organized by categories (e.g. elected officials, agencies, community groups, media, etc.) should be developed and kept up to date.

**Table II-10. Stakeholder Interest Factors and Illustrative Stakeholders**

<b>Interest Factor</b>	<b>Illustrative Stakeholders</b>
<b>Proximity:</b> Individuals and groups located near to the water resources problem or where solutions might be located	Businesses, homeowners, churches, homeowners associations
<b>Economics:</b> Individuals and groups who could receive some economic benefit or loss as a result of changes associated with the water resources problem or solutions	<ul style="list-style-type: none"> <li>▪ Chambers of Commerce, Boards of Realtors, Home Builders Associations, economic development commissions, professional associations, trade groups, financial institutions, etc.</li> <li>▪ News media, editorial boards</li> </ul>
<b>Use of Land or Resources:</b> Individuals and groups whose use of land or other resources might be positively or negatively affected by the water resources problem or solutions	<ul style="list-style-type: none"> <li>▪ Recreation organizations, conservation organizations</li> <li>▪ Federal and state land management agencies</li> </ul>
<b>Values:</b> Individuals or groups with strong beliefs about the way resources should be managed	Smart Growth advocate groups, conservator organizations, property rights groups
<b>Mandate:</b> Agencies or organizations having planning and regulatory authority over water resources and related land resources	<ul style="list-style-type: none"> <li>▪ Local government: elected officials, planning and zoning departments, economic development authorities, school boards, water and sewer authorities, transportation planning authorities</li> <li>▪ Regional transportation-planning committees/authorities, councils of governments</li> <li>▪ State legislative committees with water resources and land use responsibilities, offices of state senators and representatives, offices and departments in state government with water resources and land use responsibilities</li> <li>▪ Federal elected leaders representing the area, federal committees with authorizing or appropriations responsibilities</li> <li>▪ Federal agencies with water and land management responsibilities</li> </ul>

## 2.6 Interviews

Interviews are a “guided conversation” for the purpose of collecting information. The interviewer generally asks one or two relatively unstructured questions to begin the conversation with the interviewee, and then lets the process take over to obtain more information. Such guided conversations can yield valuable information about stakeholder views, values, priorities, preferences, etc. Additionally, the interview process can often develop and strengthen relationships that can have relevance in the planning process. Interviews can be face-to-face or can be conducted telephonically. Generally, it is preferable to conduct an interview in person so that the interviewer can make use of nonverbal cues to help guide the interview.

### ***Principles of Good Interviewing***

1. State the purpose of the interview – i.e., why you want to take up some of the interviewee’s valuable time.
2. Tell the interviewee how the information is being used and how information obtained will be reported. Generally, the information obtained will be reported in a nonattribution fashion, and also in summaries of collected information.
3. Have a list of topics you want to have the interviewee address, and as the interview proceeds guide the interviewee to those topics with open-ended questions.
4. Practice empathetic listening when interviewing. If a personal interview, make good eye contact, and show interest in what is being said with your body language and voice inflection. Be polite and do not argue with an interviewee no matter how much you may disagree with their viewpoint.
5. Ask follow-up questions to probe about areas you need more information on. You may also ask a “devil’s advocate” question to challenge something the interviewee has said, to obtain more information or justification for their position.
6. Take quick notes while the interviewee speaks – just enough to remind you of what was said. Then at the conclusion of the interview, and no later than the same evening, make a full transcript of the interview using those notes.
7. Thank the interviewee for their time and emphasize again how important their information is.

## **2.7 Surveys**

Surveys are standardized sets of questions posed for others to answer. Survey questions are sometimes asked in face-to-face situations or via telephone. In these circumstances the researcher completes the survey form as the respondent answers the questions posed by the researcher. In other cases a questionnaire is provided to respondents with written instructions for the respondent to follow. Upon completion the respondent returns the form to the researcher. Standardized surveys are a widely used way to elicit information from stakeholders. They provide a way of obtaining a snapshot of views, attitudes, priorities, evaluations, etc. at one moment in time. Because of their apparent ability to provide information about a wide range of public governance issues, they can be overused and become a burden on the public. The Office of Management and Budget (OMB), following the wishes of Congress, has issued stringent rules restricting the ability of government agencies to use standardized surveys. However, the Corps of Engineers has obtained a clearance from OMB to employ questionnaires for the collection of planning data. The rules governing the use of OMB-approved questions are contained in ER 1165-2-503 (31 Oct 07). There are 71 surveys in eight topic areas (customer satisfaction, environment, flood damage reduction, navigation, operations, public participation, and recreation management and planning). The surveys and instructions for their use are located at the following website: <http://www.iwr.usace.army.mil/inside/products/pub/surveys.cfm>. An illustration of the kinds of questions contained in the surveys is provided in Box 16.

**Box 16. Illustrative OMB-Approved Questions**

**PUBLIC PARTICIPATION – FLOOD DAMAGE REDUCTION**

1. How serious a threat is flooding on the (Project) River to the economic well-being of this part of the state?

Not at All Serious	Slightly Serious	Somewhat Serious	Quite Serious	Extremely Serious
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2. How seriously are people’s lives and safety threatened by floods on the (Project Area)?

Not at All Serious	Slightly Serious	Somewhat Serious	Quite Serious	Extremely Serious
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3. Should people living or farming in flood-prone areas expect to be flooded?

They Should Not Expect Any Risk	They Should Expect a Slight Risk	They Should Expect Somewhat of a Risk	Should Expect a Serious Risk	They Should Expect a Very Serious Risk
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4. How serious a problem are floods that affect only agricultural land?

Not at All Serious	Slightly Serious	Somewhat Serious	Quite Serious	Extremely Serious
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The OSE analyst may want to consider using some of the approved questions to survey stakeholders. However, the analyst should consider the time required for Corps approval, the technical difficulties of drawing a valid sample, and the value of the information obtained relative to the time and effort needed to obtain it versus other, less cumbersome means that might be available. Should the analyst conclude that a survey is the best approach for gathering needed data, they should give careful thought to obtaining the assistance of a qualified survey research expert.

It is also advisable to do a thorough literature review and web search to find out if surveys have already been done by other government agencies or by university survey research organizations that touch on your topic of interest. While such surveys may not be exactly applicable, they may yield sufficient information to eliminate the need to go through the time, expense, and aggravation of an in-house survey.

**2.8 Secondary Data Collection and Analysis**

*Secondary data* are data that have been collected by someone else for another purpose (Cnossen 1997). Such data can be an economical and efficient source of information relevant to your study (Babbie 1979). As research questions are formulated, the analyst should try to identify other potential sources of information and studies that have been conducted that address the questions. For example, a university or emergency management agency may have conducted a survey of residents after a flood. Such surveys can provide important information and might substitute for the expense and administrative burden of

conducting your own survey. Likely sources of secondary information include universities (including master's theses), local government reports and planning documents, trade journal articles, and technical reports and studies. The best way of finding such information is to consult experts in the topic areas.

Since secondary data have been collected by someone else for another purpose, you should be extra careful in evaluating the quality of the data. Attention should be paid to who has collected the data for what purpose. For example, data presented by an organization with a particular point of view to promote is likely to be more suspect than survey data presented in a peer-reviewed scholarly journal. Similarly, in using secondary data look for broad patterns of agreement among several sources. It is likely that greater confidence can be placed in data that is similar to other findings.

## **2.9 Focus Groups**

In focus groups a selected group of persons representing particular viewpoints or stakeholder groups is invited to participate in a controlled discussion. While somewhat similar to workshops, focus groups differ in that specific individuals or groups are selected to participate and specific questions are discussed, usually in a controlled order. Focus groups are identified in OMB Paperwork Reduction Act guidance restricting the use of questionnaires and surveys to no more than 10 persons without OMB approval, so in practice, focus groups should be limited to no more than nine persons without OMB clearance. The primary benefit of focus groups over questionnaires completed privately is thought to be that groups can discuss questions and reach conclusions that may be different from what would be obtained without the benefit of group discussion. For more information on focus groups see Marshall and Rossman 1999.

## **2.10 Delphi Panels/Expert Panels**

The Delphi method<sup>26</sup> is a technique for eliciting judgments from experts, typically by mail or email. It was originally developed by the RAND Corporation to produce technology forecasts. While often used as a forecasting tool, the Delphi method can be used to elicit group judgments on almost any topic. A Delphi panel is typically composed of five to 12 persons selected for their knowledge and expertise in the topic area. Panel members do not meet together as a group and may not even know the identity of other panelists. During the panel sessions, each person's input is kept anonymous so as to avoid undue influence based on reputation and also to permit members to change positions without loss of face.

A typical Delphi process has three rounds:

**Round 1** consists of posing the question and obtaining initial estimates. Panel members receive background information about the issue and are asked to provide a response to the Delphi question

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<sup>26</sup> Resources: *The Delphi Method: Techniques and Applications* (Linstone and Turoff 1975) <http://www.is.njit.edu/pubs/delphibook/>. This is a free downloadable book of readings about Delphi and its various applications written by recognized authorities on the use of the technique. Free Software to Support a Delphi Process: <http://armstrong.wharton.upenn.edu/delphi2/>. Provides a software platform for conducting a Delphi, including all needed forms.



together with the rationale for their response. Panel moderators aggregate responses. If a quantitative response (e.g. a forecast) is the desired product, statistical summaries of the responses (means, medians, quartiles, etc.) to describe variation will be produced. This information is then fed back to the expert panel for their consideration. In **Round 2** panelists are asked to review the results of Round 1 and revise their estimates based on the new information provided. Once again, panelists are asked to make an estimate and provide justification. Moderators again aggregate the information and feed it back to panelists with a request for any additional changes to and justifications of estimates. **Round 3** provides panelists with a final opportunity to make any changes to estimates.

In practice Delphi estimates often converge to a central tendency. The method has detractors who note that it can be biased by the way questions are posed and by the choice of experts. However, studies have also shown that the method has generated forecasts superior to those obtained by other methods.

## 2.11 Content Analysis

Content analysis is a structured method to systematically record the content of written material into meaningful categories of information that can then be analyzed using basic descriptive statistics and cross tabulations (Creighton and Dunning 1982). Here is an example: Assume that the OSE analyst is interested in identifying stakeholder characterizations of water resources problems and needs and the relative importance of issues over time. The analyst would first select the document frame for analysis. Let us assume that the frame would consist of letters to the editor in local newspapers for the preceding three years. The analyst would first skim the letters to develop a general feel for the type of issues being raised. Next, the analyst would create a detailed codebook which assigns codes to stakeholders, issues raised, intensity of feeling expressed<sup>27</sup>, as well as other pertinent information such as date of issue, geographic areas mentioned, etc. (See Box 17.) The analyst would then systematically go through the letters to the editor and record information, using the appropriate codes, into a spreadsheet<sup>28</sup>. When the data have

### Box 17. Example Code Book Entries

#### Stakeholder Codes

- 01 – Environmental preservation interest
- 02 – Business interest
- 03 – Homeowner

#### Issues

- 01 – Condition of levees
- 02 – Emergency management planning
- 03 – Back flow inundation
- 04 – Condition of closure structures

#### Intensity of Feeling Expressed

- 01 – Very emotional
- 02 – Facts-only presentation
- 03 – Both facts and values laden language

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<sup>27</sup> Qualitative variables such as intensity of feeling can be measured if the codebook provides indicators of what variable values mean – e.g. the presence of “value-laden” language or other expressions of emotion would be coded one way versus a simple recitation of facts or data.

<sup>28</sup> Researchers often have multiple persons perform the same coding and compare their results to ensure that the coding scheme is reliable – i.e. different people assign the code values the same way. Percent of coder agreement can be computed as a rough measure of intercoder reliability; however, more sophisticated measures are also available in standard statistical software packages such as the Statistical Package for the Social Sciences (for more information see <http://www.temple.edu/sct/mmc/reliability/#How%20should%20researchers%20calculate%20intercoder%20reliability%20What%20software%20is%20available>).

been encoded, the analyst can perform analyses to answer questions such as “What are the most frequently mentioned issues of concern?” “How do issues of concern vary by stakeholder group?” and “How have frequency, type, and intensity of issues varied over time?”

## **2.12 Charrettes**

A charrette is an extended and intense collaborative planning session – sometimes lasting for a week or longer – in which a team of planners and designers interacts with stakeholders to develop a preferred solution to a problem. The charrette process is often used in urban planning where planners bring together citizens, developers, local officials, and others to develop designs for town centers or residential areas. A successful charrette promotes stakeholder ownership of results and provides a greater chance for implementation without legal challenges or other project delays (Lennertz and Lutzenhiser 2006).

The charrette process is marked by several periods of public interaction to define needs, review and discuss results prepared by the planning and design team, and ultimately to review and decide whether to endorse the final design prepared by the team. In between the public interaction periods, the planning and design team incorporates the information provided by the public into the emerging design. Prior to the charrette, the planning and design team will have assembled and processed massive amounts of technical data and will have shaped the overall contours of the project so that interaction with stakeholders during the charrette period is focused and productive.

## **2.13 Shared Vision Methods**

Shared vision planning is a collaborative planning process that aims to facilitate a common understanding of a natural resource system and provide a consensus-based forum for stakeholders representing different interests to identify tradeoffs and new management options (Shared Vision Webpage: <http://www.svp.iwr.usace.army.mil/>). A computer simulation model is developed to characterize important hydrologic processes as well as economic and biological considerations. Planners create “interest satisfaction curves” plotting a relationship between key hydrologic variation and other factors of interest such as economic impacts and biological changes. While to date little has been done to address social well-being factors in shared vision models, it is quite possible to develop such inputs provided a qualitative or quantitative relationship of the social factor to hydrologic drivers can be described. For example, the relationship between flood stage and economic loss can be mapped as a function with little difficulty. Similarly, it may be possible to relate flood-stage damage to social factors such as vulnerability and social connectedness through discussions with stakeholders or analysis of survey data. A demonstration of the shared vision planning and modeling approach can be found at <http://www.svp.iwr.usace.army.mil/methods.cfm>.

## **2.14 Quality of Life Indices**

Quality of Life (QOL) focuses on the extent to which objective human needs are fulfilled in relation to personal or group perceptions of well-being (USACE, forthcoming, p. 3). QOL is measured using

**PART II – CATALOGUE OF OTHER SOCIAL EFFECTS ASSESSMENT TOOLS AND VARIABLES**

indicators having some logical relationship to important social well-being concepts (see Dunning and Durden 2007). QOL indicators are generally grouped into *indices* – i.e., a collection of indicators that, taken together, provide information on a more general dimension of well-being. The forthcoming IWR report referenced above profiles ten QOL indices that may have relevance for use in describing current and future QOL conditions.<sup>29</sup> Benefits of using standard indices are that they generally have gone through a validation phase and are also likely to provide comparison data and findings that may aid in the interpretation of results.

**2.15 Summary of Tools**

Table II-11 summarizes each of the tools described in this section identifying primary uses, strengths and weaknesses, resource requirements, and level of expertise required for use.

**Table II-11. Summary of OSE Tools**

<b>Tool</b>	<b>Primary Use</b>	<b>Strengths</b>	<b>Weakness</b>	<b>Resource Requirements</b>	<b>Level of Expertise Required</b>
Historical Analysis	Background understanding of the history of an area and water resources issues	Provides greater depth of understanding	May provide incomplete or biased picture	Modest, requiring access to source of content	General
Social Profiling	Providing basic information about social conditions	Provides a base for further, more focused OSE analysis	Assuming that basic information is all that is required for an OSE analysis	Generally modest, requiring access to census and local planning information	General, but familiarity with census information and sources
Independent Studies and Projections	Projections, inputs to analysis of future conditions	Independent assessments	May not be directly relevant	Modest, requiring investigation of data sources	General
Workshops	Obtaining stakeholder input on all aspects of planning process	Builds credibility and ownership in planning process	Can be staff intensive	Moderate to extensive staff time to design and run workshops	Trained facilitators helpful in designing and running workshops

<sup>29</sup> The indices profiled in the report are: Baltimore’s Vital Signs; Boston Indicators Project; Genuine Progress Indicator – Burlington Legacy Project; Hennepin County Community Indicators; King County Benchmarks; Minnesota Milestones; Oregon Benchmarks; Social Well-being of Vermonters; European Union Health Indicators; The Economist Intelligence Unit Quality of Life Index. See Appendix B for web addresses of these indices.

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<b>Tool</b>	<b>Primary Use</b>	<b>Strengths</b>	<b>Weakness</b>	<b>Resource Requirements</b>	<b>Level of Expertise Required</b>
Stakeholder Identification Methods	Identifying stakeholders	Ensures greater participation and input of views into planning process	Must be continually updated	Moderate staff time to assemble and maintain stakeholder data base	General knowledge
Interviews	Obtaining stakeholder input on all aspects of planning process	Possible to obtain in-depth information and information that may not be shared in public forums	<ul style="list-style-type: none"> <li>▪ Time consuming to conduct</li> <li>▪ Activity not visible to public so does not substitute for public forums</li> </ul>	Moderate staff time to schedule and conduct interviews	General knowledge plus some background in good communication techniques
Surveys	Assessing public attitudes	Can produce quantitative assessments	Static measurement of one moment in time	Extensive, requiring OMB and/or Corps approval	Require expert assistance to design and conduct
Secondary Data Collection	Assembling data about social conditions and stakeholder views	Economical	Data obtained may not be directly relevant	Modest, requiring access to source of content	General
Focus Groups	Obtaining targeted stakeholder information and opinions	Can provide insights about views of particular stakeholder groups	Not viewed as a substitute for more participatory forums	May come under OMB restrictions	Trained facilitators required
Delphi/Expert Panels	Forecasts, estimates based on expert judgment	<ul style="list-style-type: none"> <li>▪ Expert judgments</li> <li>▪ Forecasts not influenced by personality issues</li> </ul>	Dependent on breadth and quality of experts involved	Requires extensive staff time to assemble and run panel and analyze results	Expert assistance in running the panel required
Content Analysis	Analysis of issues	Provides analytical data using without contacting public	Generally limited in perspective to past	Modest, requiring access to source of content	General, but familiarity with coding procedures required
Charrettes	Development of planning alternatives	<ul style="list-style-type: none"> <li>▪ Encourage high level of participation</li> <li>▪ Focused energy creates enthusiasm and ownership in alternatives</li> </ul>	Extensive preparation involved	Requires extensive staff preparation	Expert assistance in design and conduct is required

**PART II – CATALOGUE OF OTHER SOCIAL EFFECTS ASSESSMENT TOOLS  
AND VARIABLES**

<b>Tool</b>	<b>Primary Use</b>	<b>Strengths</b>	<b>Weakness</b>	<b>Resource Requirements</b>	<b>Level of Expertise Required</b>
Shared Vision Models	Creating integrated plans reflecting multiple objectives	Stakeholders help build and run, thereby creating understanding and ownership in model outputs	May seem abstract and technical	Requires extensive staff preparation	Requires expert assistance to design and conduct
Quality of Life Indices	Describing social conditions and enabling comparisons with established QOL benchmarks	Established indices provide ability for comparison and benchmarking	May not be directly relevant	Generally modest, requiring access to census information	General, but requires familiarity with census information and sources



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## Appendix A—Performing a Social Profile





## Appendix A—Performing a Social Profile

As noted in Part II, Section 1.11, a social profile provides a foundational analysis of basic community social conditions. Generally, a profile assembles basic demographic data obtained from census and local planning documents, and may also present the results of interviews conducted with community leaders. As presented in Table II-4 from Part II, Section II.2 the social profile should address the following sorts of questions:

1. Who lives in the area?
2. How do residents make a living?
3. What are the patterns of wealth and poverty?
4. How can the area's housing stock be described?

The intent of the profile is to provide a basic understanding about social conditions and dynamics in the study area off of which more focused project-related OSE analyses should build. A basic way of providing understanding is to employ comparisons of the study area profiled social conditions with a larger area in which the study area is contained (e.g. a county, a region, or a state).

(OSE Indicators) presents the kinds of questions that the social profile should address and much of the data that would be assembled for a social profile.

### Preparing the Social Profile – Step 1: Identify the Study Area

In most cases the study area will have already been defined. For some studies, the study area may constitute a small area within a county. In such a case the study area social profile may need to be assembled by combining information from census tracts. In such a case it is likely that basic census data will be restricted to what was provided in the latest decennial census. Such data may sometimes be augmented by consulting local planning documents and records. For example, parcel-level data can often be obtained in county tax records, which can show patterns of ownership and real estate activity. Such information can supplement census population figures.

### Step 2: Assemble the Profile

The tables below provide a template for assembling basic socio-economic profile data oriented around the questions enumerated above. The tables are not meant to be prescriptive; rather the OSE analyst should use them as a guide for collecting basic data and should add to or modify them to suit the specifics of the situation. Data sources are also provided.

## Who Lives in the Study Area?

The OSE analyst needs to provide a clear picture of who lives in the study area:

- What is the total population of the study area? How does it break down by age, race, household size, urban/rural split, and education levels?
- How has the population grown in comparison to another relevant area (i.e. county, region, state)? How is the area projected to grow in the future; in comparison to the comparison area?

**Table A-1. Study Area and [Comparison Area] Population Trends**

Population	1990	2000	2005	Percent Change 2000–2005	Projected	
					2010	2030
Study Area						
Comparison Area						

Data Sources:

Census Quick Facts: <http://quickfacts.census.gov/qfd/index.html>

Census Profiles: <http://censtats.census.gov/cgi-bin/pct/pctProfile.pl>

American Fact Finder: [http://factfinder.census.gov/home/saff/main.html?\\_lang=en](http://factfinder.census.gov/home/saff/main.html?_lang=en)

US Census 2000, Summary File 1 (12/15/06), Summary File 3 (**Note: Provides small area data – tract and block level**)

[http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?\\_lang=en&\\_sse=on&\\_content=sp4\\_decennial\\_sf1.html&\\_title=Summary+File+1+\(SF+1\)](http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?_lang=en&_sse=on&_content=sp4_decennial_sf1.html&_title=Summary+File+1+(SF+1))

[http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?\\_pageId=sp4\\_decennial\\_sf3](http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?_pageId=sp4_decennial_sf3)

State Department of Finance and Planning (for projected population)

**Table A-2. Selected Population Characteristics**

	Study Area	Comparison Area
Population		
Median Age		
% 65 and above		
% 18 and under		
Racial Distribution		
%White		
%Black		
% Asian		
% Other <sup>(1)</sup>		
Hispanic or Latino (of any race)		
Education Levels		
% HS grads (age 25+)		
% College grads (age 25+)		

<sup>(1)</sup> Other includes individuals who identified themselves by more than one race

Data Sources:

Census Quick Facts: <http://quickfacts.census.gov/qfd/index.html>

Census Profiles: <http://censtats.census.gov/cgi-bin/pct/pctProfile.pl>

American Fact Finder: [http://factfinder.census.gov/home/saff/main.html?\\_lang=en](http://factfinder.census.gov/home/saff/main.html?_lang=en)

State Department of Finance and Planning

## How Do Residents Make a Living?

- How do people make a living in the study area?
- What’s driving the study area economy (industry mix, top employers)?

**Table A-3. Study Area Employment by Industry (Year)**

	Study Area		Comparison Area	
	Number Employed	%	Number Employed	%
Farm employment				
Forestry, fishing, related activities, mining, and other <sup>(1)</sup>				
Construction				
Manufacturing				
Wholesale trade				
Retail trade				
Transportation, warehousing, and utilities				
Information				

**APPENDICES**

	Study Area		Comparison Area	
Financial activities, including real estate				
Professional and business services, including mgt., administration, and waste services				
Educational, health, and social services				
Leisure and hospitality				
Other services, except public administration				
Government and government enterprises				
Federal				
State and local				
<b>Total Employment</b>				

<sup>(1)</sup> "Other" consists of the number of jobs held by U.S. residents employed by international organizations and foreign embassies and consulates in the United States.

Source: (2006, US Department of Commerce) Bureau of Economic Accounts, Regional Economic Accounts, Total full- and part-time employment by industry. Table CA25N. (<http://bea.gov/regional/reis/action.cfm>)

County Business Patterns (<http://www.census.gov/epcd/cbp/view/cbpview.html>)

US Economic Census, Summary Statistics NAICS (<http://bhs.econ.census.gov/econhelp/resources/>)

**Table A-4. Top Ten Employers**

Employer's Name	Industry	Number of Employees

Source: Local Chamber of Commerce  
 State Department of Commerce  
 City/County Business or Economic Alliances

## What Are Patterns of Wealth and Poverty in the Study Area?

- What are the Study Area's income, unemployment, and poverty statistics?

**Table A-5. Study Area Unemployment, Poverty, and Personal Income**

	Unemployment Rate		Per Capita Personal Income			Median Household Income	Percent of Individuals Living Below Poverty
	2000	2005	2005	State Rank <sup>(1)</sup>	1994-2004 Av. Annual Growth Rate	Year	Year
Study Area							
Comparison Area							
State							

<sup>(1)</sup> County-level data

*Data Sources:*

Bureau of Labor Statistics, *Local Area Unemployment Statistics* (<http://www.bls.gov/la/home/htm>); or see <http://data.bls.gov/cgi-bin/dsrv>

Bureau of Economic Analysis, *BEARFACTS, Regional Economic Accounts* (<http://www.bea.gov/regional/bearfacts/>)

CA Dept of Social Services, *Research and Development Division: "What are the Sources of Poverty Data?"* June, 5, 2003  
[www.dss.cahwnet.gov/research/res/pdf/Povertysource.pdf](http://www.dss.cahwnet.gov/research/res/pdf/Povertysource.pdf)

*Unemployment:* US Department of Labor, Bureau of Labor Statistics, *Local Area Unemployment Statistics*. Data are annual averages, not seasonally adjusted. <http://data.bls.gov/cgi-bin/dsrv> (10/26/06); and national household data averages (<http://www.bls.gov/cps>)

*Per Capita Personal Income:* BEA *Regional Economic Accounts (BEARFACTS 1994-2004)*, <http://www.bea.gov/bea/regional/bearfacts/> (12/07/06)

*Poverty:* US Census, *State and County QuickFacts* (<http://quickfacts.census.gov>) (4/27/07)

*Median household income:* US Census. 2005 *American Community Survey* (<http://factfinder.census.gov>) (10/26/07)

## How Can the Study Area Housing Be Described?

**Table A-6. Housing Characteristics for Study Area (Year)**

	Study Area	Comparison Area
Total Housing Units		
% Owner Occupied		
% Renter Occupied		
% Vacant		
% Urban		
% Rural		
% Lacking Complete Plumbing Facilities		
Average Household Size		
Median Value of Owner-occupied housing		

Sources: US Census. 2005 American Community Survey (<http://www.census.gov/acs/www/> )

American Fact Finder:

US Census 2000, Summary File 1 (12/15/06), Summary File 3 (**Note: Provides small area data – tract and block level**)

[http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?\\_lang=en&\\_sse=on&\\_content=sp4\\_decennial\\_sf1.html&\\_title=Summary+File+1+\(SF+1\)](http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?_lang=en&_sse=on&_content=sp4_decennial_sf1.html&_title=Summary+File+1+(SF+1))

[http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?\\_pagelid=sp4\\_decennial\\_sf3](http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?_pagelid=sp4_decennial_sf3)

### Step 3: Analyze the Data

As presented above, the analyst should make use of comparisons with other areas to help draw conclusions from the data assembled, comparing and contrasting statistics in the tables.

### Step 4: Report Findings

The social profile should be brief. Striving to communicate a basic level of detail to permit understanding of the social conditions in the study area in four or five pages would be a good goal. The analyst should present the key findings in short, declarative sentences if possible (see Section 5.7 in Part I).

### Additional Social Profiling Resources

University of Illinois, Department of Natural Resources and Environmental Science. 2006. A Step-by-Step Guide to Conducting a Social Profile for Watershed Planning. (<http://www.watershedplanning.uiuc.edu/index.html>).

Bright, A., K. Cordell, A. Hoover, and M. Tarrant. A Human Dimensions Framework: Guidelines for Conducting Social Assessments. U.S. Department of Agriculture, Forest Service. General Technical Report SRS-65. (<http://www.treesearch.fs.fed.us/pubs/5501>).

Guseman, P. and K. Dietrich. 1978. Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning. U.S. Army Corps of Engineers, Waterways Experiment Station, Miscellaneous Paper Y-78-2. Vicksburg, MS.

Natural Resources Conservation Service, Social Science Team:

(<http://www.ssi.nrcs.usda.gov/publications/>)

Sanders, I. 1960. "The Community Social Profile." American Sociological Review 60(1). Feb.





## Appendix B—Online Resources



## Appendix B—Online Resources

This appendix identifies websites providing general resources for OSE analysis.

**Natural Resources Conservation Service (NRCS) Social Science Team:**

(<http://www.ssi.nrcs.usda.gov/index.html>). The website of the NRCS Social Sciences Team provides access to many social science publications and interactive tools focused on conservation planning.

**National Oceanographic and Atmospheric Administration (NOAA) Human Dimensions Website:**

(<http://www.hd.gov/HDdotGov/index.jsp>). A web portal for human dimensions information and tools.

**NOAA, Coastal Services Center, Social Science Applications:**

([http://maps.csc.noaa.gov/socialscience\\_2/](http://maps.csc.noaa.gov/socialscience_2/)). The site is designed to help coastal managers and staff members learn about different applications of social science in coastal management. It provides links to social science components of ongoing and completed projects at or through the NOAA Coastal Services Center, and contains a section of tools, methods, and training opportunities as well as general information resources.

**World Bank, Social Development Group:**

(<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEVELOPMENT/0,,contentMDK:20617103~menuPK:199464~pagePK:148956~piPK:216618~theSitePK:244363,00.html>). The Social Development Group has four thematic teams that work on Community Driven Development & Social Capital, Social Analysis and Policy, Participation and Civic Engagement & Social Accountability, and Conflict Prevention and Reconstruction.

**University of South Carolina, Hazards and Vulnerability Research Institute:**

(<http://www.cas.sc.edu/geog/hvri/>). The Hazards and Vulnerability Research Institute (HVRI) is an interdisciplinary research and graduate and undergraduate training center focused on the development of theory, data, metrics, methods, applications, and spatial analytical models for understanding the field of hazard vulnerability science. The website provides access to the Institute's Social Vulnerability Index (SoVI) which measures the social vulnerability of U.S. counties to environmental hazards. The index synthesizes 42 socioeconomic and built environment variables, which the research literature suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards. The data were culled from national data sources, primarily those from the United States Census Bureau.

**FEMA Hazards US (Hazus) Models:** The flood loss estimation methodology

([http://www.fema.gov/plan/prevent/hazus/hz\\_flood.shtm](http://www.fema.gov/plan/prevent/hazus/hz_flood.shtm)), consists of flood hazard analysis and flood loss estimation analysis. The flood hazard analysis module uses characteristics such as frequency, discharge, and ground elevation to estimate flood depth, flood elevation, and flow velocity. The flood loss estimation module calculates physical damage and economic loss from the results of the hazard analysis.

The HAZUS-MH Hurricane Model ([http://www.fema.gov/plan/prevent/hazus/hz\\_wind.shtm](http://www.fema.gov/plan/prevent/hazus/hz_wind.shtm)) allows users to estimate the economic and social losses from hurricane winds.

### **Quality of Life Indices:**

Baltimore's Vital Signs: <http://www.ubalt.edu/bnia/indicators/index.html>

Boston Indicators Project: <http://www.bostonindicators.org/IndicatorsProject/>

Genuine Progress Indicator – Burlington Legacy Project:  
<http://www.whatcomcounts.org/whatcom/modules.php?op=modload&name=NS-Indicator&file=index>

Hennepin County Community Indicators:  
<http://www.co.hennepin.mn.us/portal/site/HCInternet/menuitem.3f94db53874f9b6f68ce1e10b1466498/?vgnextoid=d132a17675602110VgnVCM1000000f094689RCRD>

King County Benchmarks: <http://www.metrokc.gov/budget/benchmrk/>

Minnesota Milestones: <http://www.mnplan.state.mn.us/mm/>

Oregon Benchmarks: <http://www.oregon.gov/DAS/OPB/obm.shtml>

Social Well-Being of Vermonters:  
<http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=1277>

European Union Social Indicators: [http://www.social-science-geis.de/en/social\\_monitoring/social\\_indicators/Data/EUSI/index.htm](http://www.social-science-geis.de/en/social_monitoring/social_indicators/Data/EUSI/index.htm)

The Economist Intelligence Unit Quality of Life Index:  
[http://www.economist.com/media/pdf/QUALITY\\_OF\\_LIFE.pdf](http://www.economist.com/media/pdf/QUALITY_OF_LIFE.pdf)

## Appendix C—Trauma Benefit Method



## Appendix C—Trauma Benefit Method

Provided in this handbook is a hyperlink to a description of the “Trauma Benefit Method” (TBM) excerpted from an IWR report prepared in 1980 for the Huntington District and later published as an IWR Report (85-R-4): *Human Costs Assessment – The Impacts of Flooding and Nonstructural Solutions: Tugs Fork Valley, West Virginia & Kentucky*. The methodology, principally developed by Drs. David Allee and Barbara Osgood of Cornell University under the direction of Dr. George Antle of IWR, developed quantitative estimates of personal and social trauma from devastating floods experienced by residents of Tug Fork Valley West Virginia and Kentucky. Trauma experienced was measured using social surveys and linked to American Medical Association diagnoses of levels of impairment produced by various levels of trauma. The levels of impairment were then linked to Veterans Administration payments for degree of impairment from trauma. Generalizing survey results of trauma experienced to the valley population that had experienced flooding, “trauma benefits” of over \$90 million were computed. As noted in the handbook, the method, while analytically defensible, never proceeded to the stage of acceptance as a key benefit computation approach. Recognizing that the time may be right for a reexamination and further refinement of the method, it is offered in this appendix: <http://www.iwr.usace.army.mil/inside/products/pub/iwrreports/85-R-4.pdf>





## Appendix D—Martin County, Florida, Case Study



## **Appendix D—Martin County, Florida, Case Study: Part II, Social Vulnerability Index**



# MARTIN COUNTY, FLORIDA SOCIAL EFFECTS ASSESSMENT CASE STUDY PART I

July 2008

Note: This case study is presented in two parts. Part I consists of an analysis of Martin County social conditions exploring the question of how the Martin County Shore Protection Project (SPP) affected social conditions during and after Hurricanes Frances and Jeanne in 2004. Part II of the case study is a demonstration of the application of the Social Vulnerability Index (SoVI) and its use in performing a place vulnerability

Views, opinion and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision unless so designated by other official documentation.

# MARTIN COUNTY, FLORIDA SOCIAL EFFECTS ASSESSMENT CASE STUDY PART I

by

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U.S. Army Corps of Engineers  
Institute for Water Resources  
Casey Building  
7701 Telegraph Road  
Alexandria, VA 22315

July 2008





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## 1. Introduction

The Shore Protection Assessment (SPA), funded as part of the emergency funding for repair of shore protection projects (SPP), assesses how existing Federal SPP's performed during 2004 when four hurricanes made landfall in the southeastern United States, and identifies "lessons learned" that can improve shore protection designs and performance in the future. This case study examines the social effects experiences in Martin County, Florida, associated with Hurricanes Frances and Jeanne.

## 2. Background

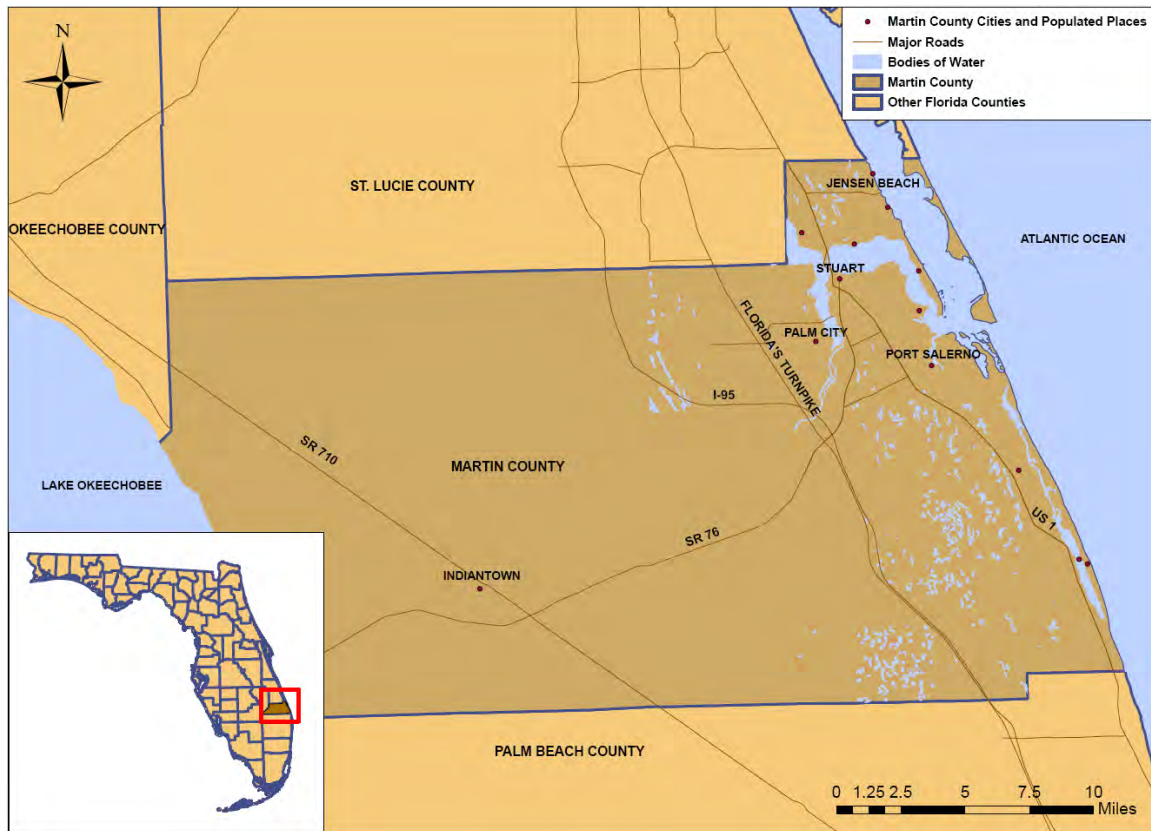
Hurricanes are among Nature's most powerful and destructive forces. They primarily affect coastal areas through winds, storm surge, rainfall, and sediment transport. The impact of hurricanes on people, their possessions, and their communities can be devastating, producing large economic losses, property destruction, loss of life, and personal trauma and suffering. Yet despite the inherent risks posed by hurricanes, people are drawn to coastal areas and are settling or building second homes at a rapid pace. The populations of coastal areas along the 18 eastern and Gulf Coast states grew more rapidly than the United States as a whole between 1980 and 1993, increasing to 36.1 million in 1993 (Heinz Center 2000, p. 45). As population and development have increased, so also have economic damages from coastal storms<sup>30</sup>. And as damages have mounted, so have demands for shore protection projects (see, for example, ASBPA 2006). These projects are designed so that sand from the shorelines provides protection from hurricanes and other storm events in order to reduce damages produced by storm surge and sediment transport from such storms.

Martin County, Florida, is bounded by the Atlantic Ocean on the east, Palm Beach County to the south, Lake Okeechobee to the west, and St. Lucie County to the north.

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<sup>30</sup> The pattern of steadily increasing decadal damages from hurricanes is well documented and shown in Pielke and Landsea (1998). These authors go on to show that most of the increase in damages is explained by increases in population densities and property values in coastal areas.

Exhibit 1. Martin County, FL

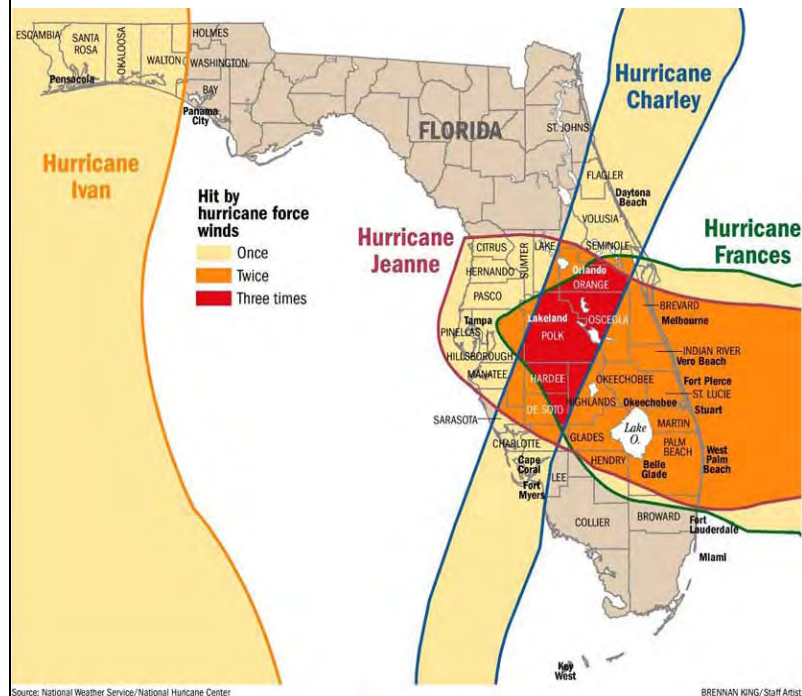


Data Source: Florida Geographic Data Library 2008.

Map created by Marstel-Day, LLC

The county had the dubious distinction of serving as the place of landfall for two major hurricanes in 2004 (Exhibit 2) within less than one month’s time, with a strong northeaster between them (Kent 2007). Hurricane Frances came ashore as a Category 2 hurricane on 5 September 2004 on Hutchinson Island just east of the St. Lucie inlet and proceeded in a west-northwest direction. The storm produced surges of six feet above mean sea level in tidal areas and rainfall in excess of ten inches over large portions of central and northern Florida. Just three weeks later, on 26 September, hurricane Jeanne made landfall in almost the same location as a Category 3 hurricane and followed a path almost identical to that of hurricane Frances. Once again, estimated storm surges of six feet occurred in tidal areas, and rainfall amounts approached eight inches. (USACE 2007).

Exhibit 2 . Paths of the 2004 Hurricanes



Source: National Weather Service/National Hurricane Center

The Martin County Shore Protection Project (SPP) is located along four miles of beaches on Hutchinson Island just north of the location of the landfall of hurricanes Frances and Jeanne. Protection to recreational facilities and upland development is provided via beach nourishment measures, as opposed to seawalls or groins. The project maintains a 35-foot-wide beach with a maximum elevation of 9.1 feet mean low water (MLW) and a beach dune with a 20-foot width. The project required the placement of 1.3 million cubic yards of material and calls for renourishment at approximately 11-year intervals (USACE 2007).

### 3. Social Effects Assessment

The population in the hazard or impact area is defined as the population at risk (IPET Volume VII). The social effects assessment considers how the SPP affected social conditions for this population, using data presented in a social profile. The intent of the profile is to provide a basic understanding about social conditions and dynamics in the study area prior to and after the 2004 hurricanes.

### 3.1 Objectives

The objectives of the social effects assessment are to explore how the SPP affected social conditions. Did the project provide protection for people's property, institutions, communities, and culture? Did it have any unintended social consequences – either positive or negative – on people and communities? By understanding how the SPP affected social conditions, we can potentially improve SPP designs of the future.

### 3.2 Approach

The approach used in this assessment is the presentation of a social profile to provide a foundational analysis of basic community social conditions. Socio-economic data was collected for Martin County as well as for neighboring St. Lucie County to provide a focused comparison for a jurisdiction facing the same hurricane events but lacking an SPP. Additionally; personal interviews were conducted with a number of Martin County government officials, as well as officials from the Martin County Chamber of Commerce.

The social assessment explores the following questions:

**1. How did the disaster experience of populations in areas protected by the project differ from those of populations in areas that did not have protection?** The expectation is that the SPP reduces vulnerability and that residents and the community protected by the SPP experienced fewer negative social effects than did those who lived in comparable areas that did not have an SPP.

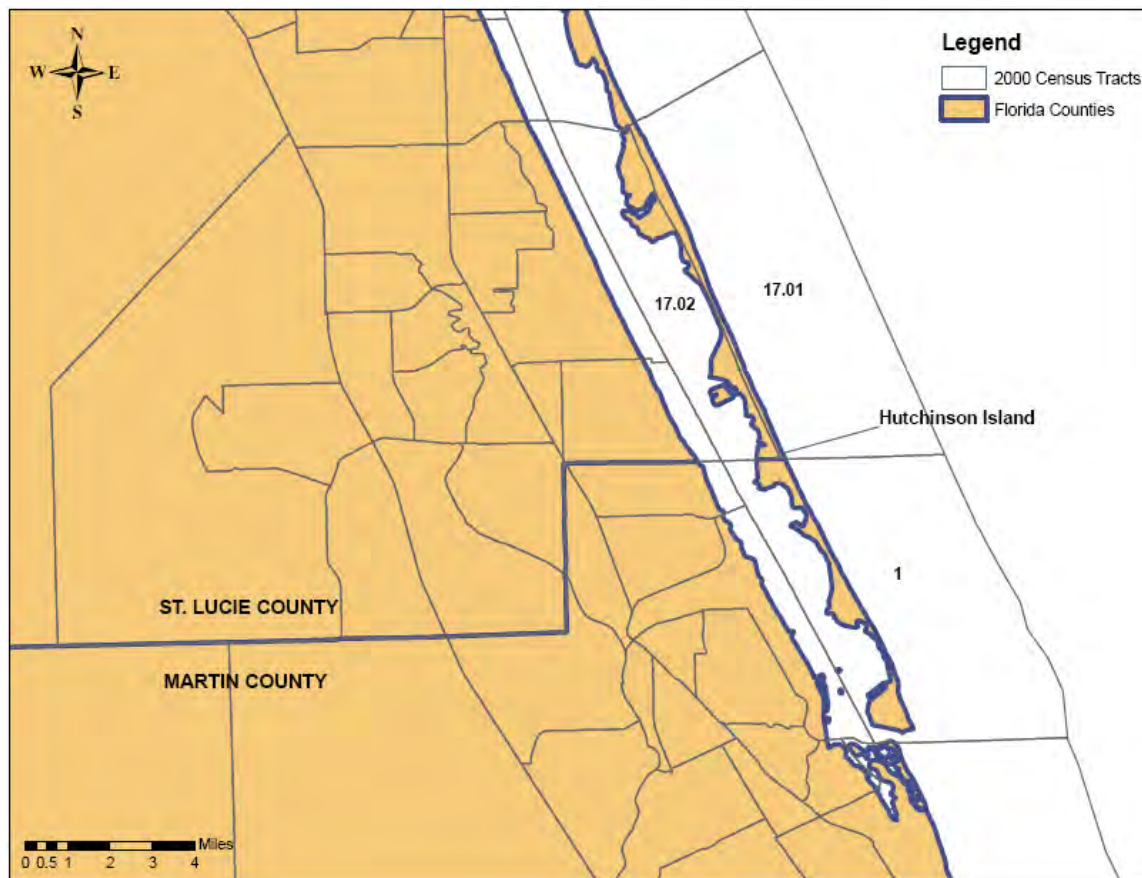
**2. How quickly and completely did the population and communities impacted by the hurricanes recover from the events? How did the period of recovery in communities with the SPP differ from those in comparable areas without protection?** The expectation is that protected communities will have recovered from the events more quickly than did communities without protection.

If the SP projects were doing their job, it can be supposed that negative social effects associated with hurricanes and coastal storms would have been reduced. That is, we would expect there to have been fewer instances of personal loss, family stress, social disruption, and fewer negative impacts on communities than there would have been if the SPP had not been in place. To test this hypothesis, the case study compares Martin County and the SPP area with St. Lucie County to the north. The county is similar to Martin County in many demographic variables but had no SPP.

## 4. Social Profile

In this section, socioeconomic data is provided for Martin County and is compared with data for St. Lucie County and the state of Florida. In addition, the census tract of Martin County protected by the SPP (census tract 1) is compared to the census tracts in St. Lucie, along the same island (census tracts 17.01 and 17.02) but not protected by the SPP. Exhibit 3 shows the locations of these census tracts along Hutchinson Island. This area of St. Lucie is currently trying to obtain its own SPP and is currently in the feasibility stage (Personal Communication Kathy Fitzpatrick 2007).

Exhibit 3. Hutchinson Island Census Tracts



Data Source: Florida Geographic Data Library

Map created by Marstel-Day, LLC



## 4.1 Population

From 1990 to 2000, the state of Florida experienced the third highest population increase in the United States. Despite slower increases thus far in the following decade, Florida continues to experience one of the highest population increases in the country (EDR 2007). Both Martin and St. Lucie Counties experienced a higher percentage of growth than the state of Florida from 1990 to 2000, as shown in Exhibit 4. However, since that time, Martin County has proactively worked to slow growth in accordance with the wishes of residents. Some county residents would like to stop growth all together, though most favor slow growth (Martin County Development Patterns Study 2007). Through this effort, Martin County has experienced slower growth than its neighbors. Martin County's percent of population change from 2000 to 2006 fell below the state average and was significantly lower than that of St. Lucie County.

Exhibit 4. Population Change in Martin and St. Lucie Counties and the State of Florida

Geographic Area	Population				
	1990	2000	% change 1990-2000	2006	% change 2000-2006
Martin County	100,900	126,731	25.6%	139,393	10.0
St. Lucie County	150,171	192,695	28.3	252,724	31.2
Florida	12,938,071	15,982,824	23.5	18,089,888	13.2

Source: U.S. Census 2008.

In addition to the total percent of population change from 2000 to 2006, the evidence of slow growth is apparent in the average annual percent of population increase for Martin County. As shown in Exhibit 5, it was lower than that of the state and Palm Beach County to the south and significantly lower than St. Lucie County to the north.

Exhibit 5. Annual County Population Increase

Average Annual Percent Population Increase by County 2000–2006			
Palm Beach	Martin	St. Lucie	Florida
2.2%	2.0%	5.1%	2.1%

Source: Population Technical Bulletin, Martin County Board of County Commissioners, Growth Management Department, May 2007.

The trend for slow growth in Martin County is expected to continue, as shown in Exhibit 6. The projected percent of population change from 2010 to 2015 is lower in Martin County than in the state as a whole or St. Lucie County.

Exhibit 6. Projected Population

Geographic Area	Projected Population			
	2010	% change 2006–2010	2015	% change 2010–2015
Martin County	154,100	10.6	167,000	8.4
St. Lucie County	298,800	18.2	346,200	15.9
Florida	19,974,200	10.4	21,831,500	9.3

Source: U.S. Census 2008.

Martin County comprises twenty-four census tracts (U.S. Census List of Census Tracts 2008). The SPP is located in census tract 1, which contains slightly less than 2 percent of the County population. St. Lucie County contains thirty-six census tracts. St. Lucie’s portion of Hutchinson Island occupies two of them, census tracts 17.01 and 17.02. The three census tracts on Hutchinson Island all have similar total populations, as shown in Exhibit 7.

**Exhibit 7. Census Tract Population**

<b>Geographic Area</b>	<b>Total Population (2000)</b>	<b>% of County Population</b>
Martin County Census Tract 1	2,501	1.97
Martin County	126,731	
St. Lucie Census County Tract 17.01	2,412	1.25
St. Lucie Census County Tract 17.02	2,434	1.26
St. Lucie County	192,695	

Source: U.S. Census 2008.

## **4.2 Age**

Both Martin and St. Lucie Counties have older populations than the state of Florida, as shown in Exhibit 8, with Martin County having an older population than St. Lucie. However, both counties experienced a decline in median age from 2000 to 2006 as well as a decline in the percentage of their population of 65 years of age and above. While the state of Florida also saw a decline in the percentage of population 65 and above from 2000 to 2006, the median age increased in the same period.

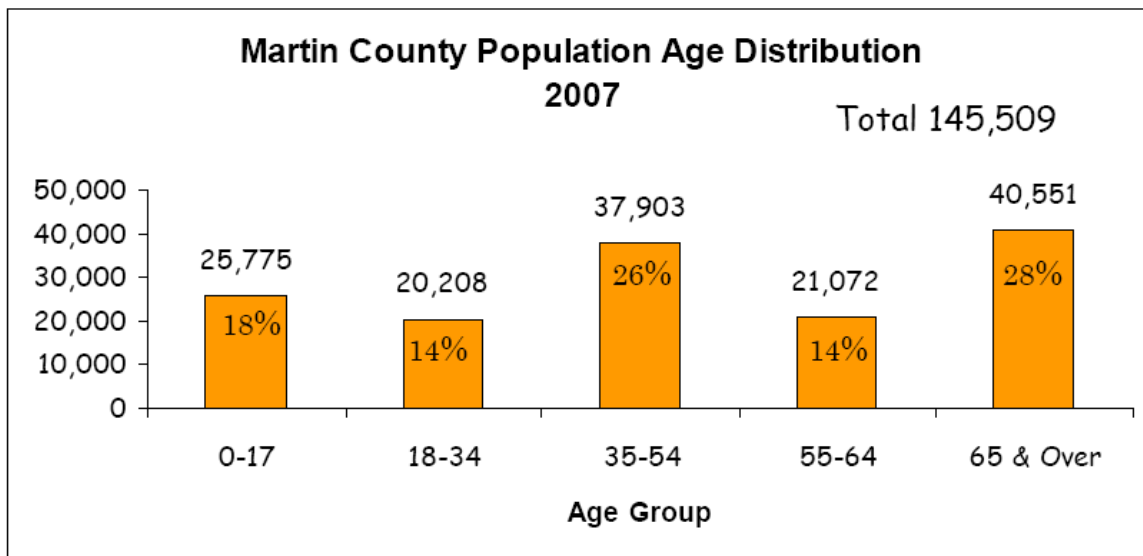
Exhibit 8. Population Age

Geographic Area	Median Age		% 65 and above	
	2000	2006	2000	2006
Martin County	47.3	46.4	28.2	26.2
St. Lucie County	42.0	40.7	22.7	19.7
Florida	38.7	39.8	17.6	16.8

Source: U.S. Census 2008.

Exhibit 9 shows the population of Martin County broken down by age group. The largest age group is 65 and over, and the smallest is 18–34.

Exhibit 9. Age Distribution



Source: Martin County Population Technical Bulletin and Bureau of Economic and Business Research 2007.

Exhibit 10 reveals that the census tracts of Hutchinson Island have a significantly older population than the rest of their respective counties. The census tract of Martin County on Hutchinson Island has somewhat of a younger population compared to the tracts in St. Lucie (65.4 years vs. 67.8 and 70.2 years).

**Exhibit 10. Census Tract Population Age**

<b>Geographic Area</b>	<b>Median Age (2000)</b>	<b>% 65 and above (2000)</b>
Martin County Census Tract 1	65.4	51.3
Martin County	47.3	28.2
St. Lucie Census County Tract 17.01	67.8	58.5
St. Lucie Census County Tract 17.02	70.2	64.4
St. Lucie County	42.0	22.7

Source: U.S. Census 2008.

### **4.3 Racial Breakdown**

The populations of Martin and St. Lucie Counties have a higher White percentage than the state, as seen in Exhibit 11. Between 2000 and 2006, the state and both counties experienced increases in their minority population percentages. For all three, the greatest percent increase was in their Hispanic/Latino populations.

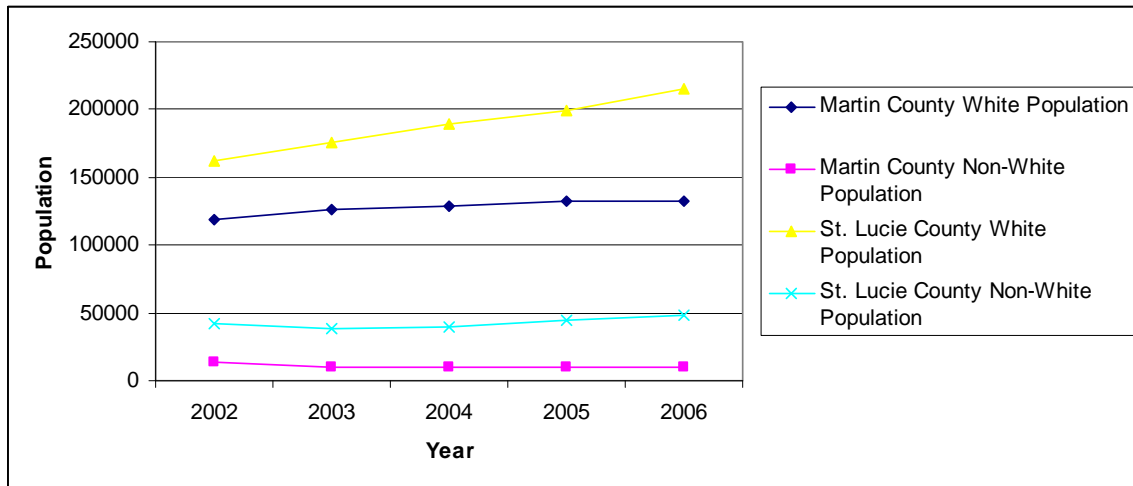
Exhibit 11. Population by Race

Geographic Area	% White		% Black		% Other		% Hispanic/Latino Origin	
	2000	2006	2000	2006	2000	2006	2000	2006
Martin County	89.9	88.4	5.3	6.2	4.8	5.4	7.5	9.4
St. Lucie County	79.1	76.8	15.4	16.7	5.5	6.5	8.2	14.1
Florida	78.0	76.1	14.6	15.4	7.4	8.5	16.8	20.1

Source: U.S. Census 2008.

Though St. Lucie County has a higher percentage minority population, Exhibit 12 reveals that its white population grew noticeably more steadily than its minority population between 2000 and 2006. Though both experienced growth, the minority population declined in 2003 and 2004 before its net increase between 2000 and 2006. The slow growth rate sought by Martin County residents is evidenced in its population growth over this time period. Similar to St. Lucie County, the minority population of Martin County declined in 2003 and 2004 from its 2002 numbers. However, by 2006 it had not yet regained a minority population equal to its 2002 numbers.

Exhibit 12. Population by Race, 2002–2006



	2002	2003	2004	2005	2006
Martin County White Population	118,385	125,806	129,007	131,867	132,702
Martin County Non-white Population	13,612	9,474	9,322	10,004	10,157
St. Lucie County White Population	162,538	175,839	188,785	198,699	214,884
St. Lucie County Non-white Population	41,574	37,775	39,695	44,362	48,435

Source: Florida Department of Health, Population Reports 2002–2006.

The census tracts of Hutchinson Island have much smaller minority populations than those of the counties. Exhibit 13 shows that all three census tracts have a nearly 99 percent white population while Martin County and St. Lucie County as a whole have white populations of 89.9 percent and 79.1 percent, respectively. For all three census tracts, the largest minority group is Hispanic/Latino.

Exhibit 13. Census Tract Population by Race

<b>Geographic Area</b>	<b>% White (2000)</b>	<b>% Black (2000)</b>	<b>% Other (2000)</b>	<b>% Hispanic/Latino Origin (2000)</b>
Martin County Census Tract 1	99.1	0.2	0.7	1.4
Martin County	89.9	5.3	4.8	7.5
St. Lucie County Census Tract 17.01	98.9	0.9	0.5	1.4
St. Lucie County Census Tract 17.02	99.0	0.0	1.0	0.4
St. Lucie County	79.1	15.4	5.5	8.2

Source: U.S. Census 2008.

#### 4.4 Civic infrastructure

Civic infrastructure can be an important factor in the recovery time from a disaster. Networks and organizations can often provide support and assistance to residents quickly after a disaster. While social organization may be difficult to measure, certain proxy indicators provide insight into the level of social involvement in the community. Voting records are one indicator, as those most likely to vote are those with the highest stakes in society, including older individuals, homeowners, married couples, people with higher education, higher incomes, and good jobs (Jamieson et al. 2002).

Exhibit 14 shows that approximately 84 percent of the Martin County voting age population consisted of registered voters in 2000 (86,499 out of 103,108). St. Lucie was similar, with 85 percent (84,666 out of 99,567). Both Counties were above the national average of 70 percent in 2000. Though being registered to vote does not necessarily indicate participation in an election, historically it has been shown that, for the most part, those registered to vote actually vote (Jamieson et al. 2002). Regarding political party



affiliation, in 2000 Martin County was predominantly Republican while St. Lucie was more evenly split between Republicans and Democrats.

Exhibit 14. County Voting Statistics for the Census and Elections of 2000

<b>Geographic Area</b>	<b>Voting Age Population</b>	<b>Total Registered Voters</b>	<b>Republican Registered Voters</b>	<b>Democrat Registered Voters</b>
Martin County	103,108	86,499	48,042	23,238
St. Lucie County	99,567	84,666	35,626	30,555

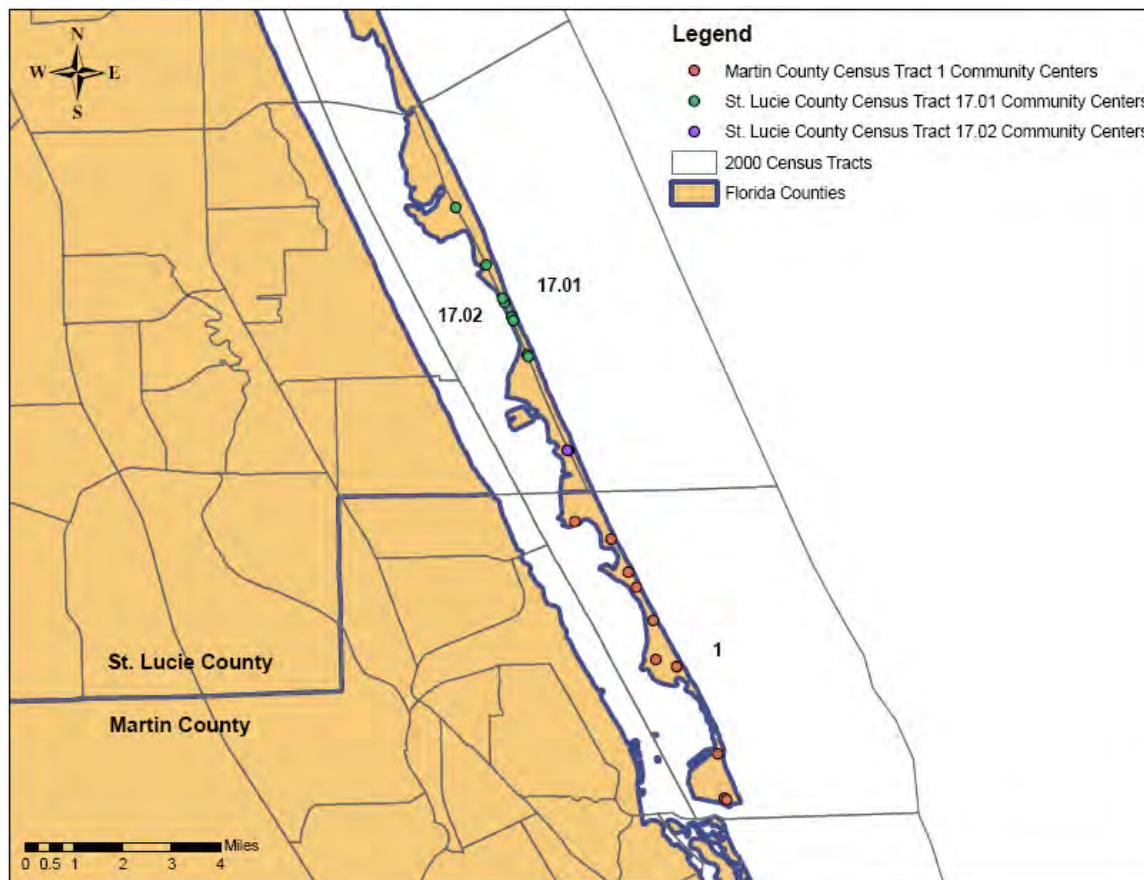
Source: Florida Senate, District by County Statistics 2008.

#### 4.4.1 Community Centers

The presence of community centers and social service centers is one aspect of civic infrastructure that can be measured directly. Exhibit 15 shows the community centers within the three census tracts of Hutchinson Island. Community centers in the two counties include the American Legion, soccer clubs, women’s clubs, and boys and girls clubs, as well as homeowners associations and condominium associations. Martin County has 143 community centers and Martin County census tract 1 has 11 community centers. St. Lucie County has 112 community centers. St. Lucie County census tract 17.01 has eight community centers and tract 17.02 has two. Both Martin County tract 1 and St. Lucie tract 17.01 have higher densities of civic associations than their populations might suggest. That is, both tracts have from 1.2 to roughly 2 percent of their counties’ population but account for over 7 percent of their counties’ civic associations. St. Lucie County tract 17.02 civic association density is just slightly more than its share of the county population (1.8 percent of civic associations versus 1.26 percent of county population). Social services include private schools, day care centers, counseling centers, and job training centers. Martin County has 255 social service centers, while St. Lucie County has 280 social service centers. There is one social service center on Hutchinson Island, a Lutheran School within census tract 1

of Martin County, while St. Lucie tracts 17.01 and 17.02 have no social service centers. In both counties, the highest concentration of these centers is in the eastern portion of the county.

Exhibit 15. Hutchinson Island Community Centers



Data Source: FGDL (2008)

Map created by Marstel-Day, LLC.

#### 4.4.2 Crime

Crime is another indicator of civic infrastructure. The National Neighborhood Indicators Project and its partners use crime, as well as births, deaths, health status, educational performance, public assistance, and property conditions, to assess neighborhood conditions (NNIP 2007). Exhibit 16 provides crime statistics. Martin and St. Lucie Counties experienced a lower crime rate than the state but more admissions to prison when standardized for population size.

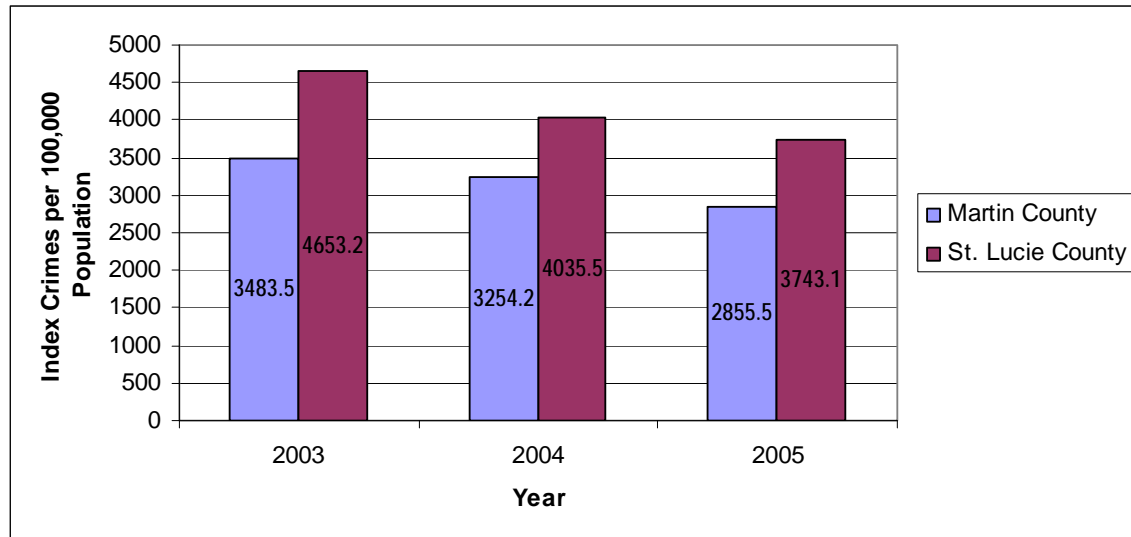
Exhibit 16. Crime Rate and Prison Admissions

<b>Geographic Area</b>	<b>Crime Rate, 2006 (index crimes per 100,000 population)</b>	<b>Admissions to prison FY 2005-06</b>	<b>Admissions to prison per 100,000 population</b>
Martin County	3,152.6	425	297.9
St. Lucie County	3,822.4	705	271.9
Florida	4,632.0	35,098	191.3

Source: Florida Legislature, Office of Economic and Demographic Research 2007.

Exhibit 17 compares the crime rates in Martin and St. Lucie Counties in the years surrounding the 2004 hurricanes. Though both counties experienced a declining total crime rate each year between 2003 and 2005, the rates of change between the counties somewhat differ. Between 2003 and 2004, Martin County experienced a 6.6 percent decrease in crime rate. The following year, the rate fell more drastically, 12.3 percent. St. Lucie County experienced a smaller decline of 7.2 percent between 2004 and 2005 (that is, after the hurricane) than between 2003 and 2004, when the rate fell by 13.3 percent. However, given that both counties experienced a decline over the three years, it appears that the hurricanes of 2004 were not associated with an increase in the crime rate.

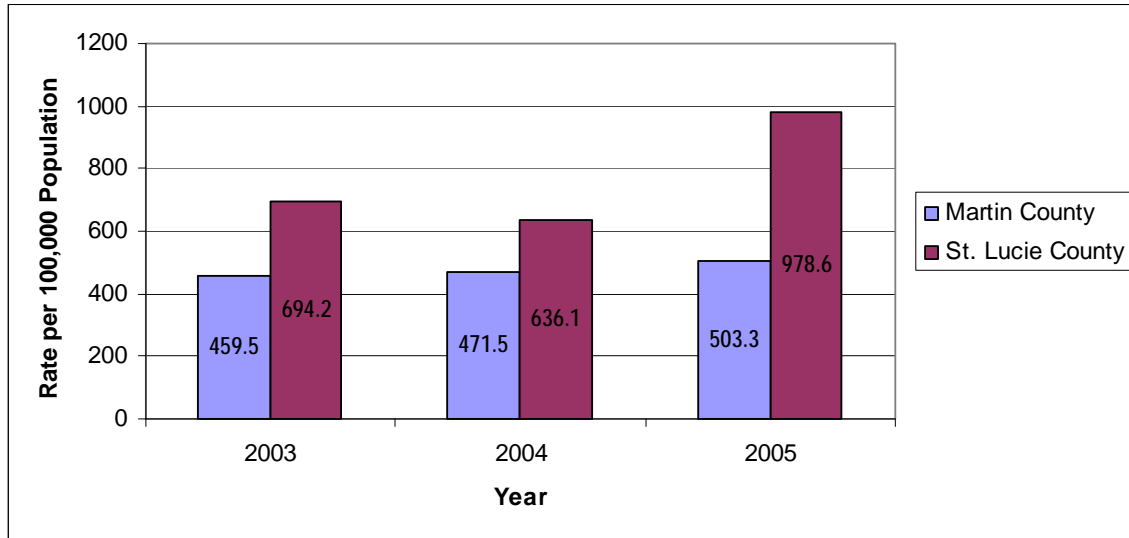
Exhibit 17. Total Index Crime Rate 2003–2005



Source: Florida Department of Law Enforcement, Data and Statistics 2008.

Although the total crime rate appears to have been unaffected by the hurricanes in either county, it is also important to assess the specific crimes that may be more likely to be influenced by disasters. For example, domestic violence may be expected to increase when disasters increase stress on families. Exhibit 18 examines the domestic crime rate each year from 2003 through 2005 for Martin and St. Lucie Counties. The most notable change is in the domestic violence rate change for St. Lucie County between 2004 and 2005, i.e., in the year immediately following the hurricanes, when the rate increased nearly 54 percent. Martin County's domestic violence rate also increased in that time period, but the increase was significantly smaller, 6.7 percent. According to this indicator, the population of Martin County may have experienced less stress than the population of neighboring St. Lucie County.

Exhibit 18. Domestic Violence Rates 2003–2005

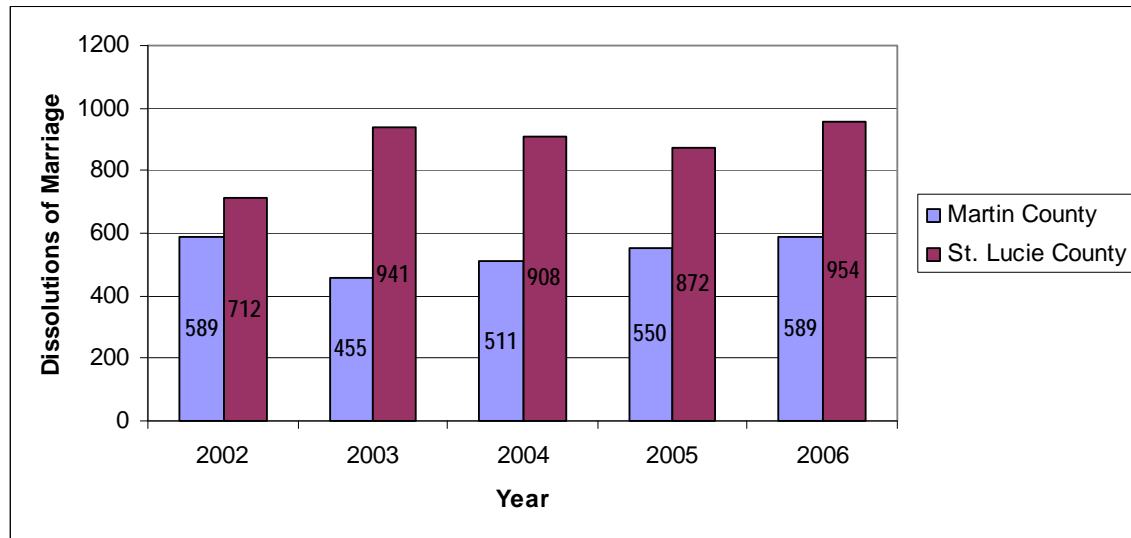


Source: Florida Department of Law Enforcement, Data and Statistics 2008.

Another potential indicator of personal stress is the number of dissolutions of marriage. Exhibit 19 provides dissolutions of marriage statistics for Martin and St. Lucie Counties for 2002 through 2006. Overall, there does not appear to be a clear trend and the 2004 hurricane year does not seem to have had a significant impact.<sup>31</sup>

<sup>31</sup> The only notable numbers are during September 2004, the month the hurricanes hit, when the number of dissolutions of marriage in both counties dropped significantly.

Exhibit 19. Dissolutions of Marriage 2002–2006



Source: Florida Department of Health, Florida Vital Statistics Annual Reports 2002–2006.

## 4.5 Housing Characteristics

Housing characteristics for Martin and St. Lucie Counties and the state of Florida are presented in Exhibit 20. Though all three jurisdictions increased their number of housing units between 2000 and 2006, the increases were not uniform. St. Lucie County's increase from 91,262 to 125,519 housing units translates to a 37.5 percent increase. Martin County and Florida experienced much slower increases of 14.4 percent and 16.8 percent, respectively. The increases in housing units do not necessarily indicate changes in homeownership rates. Despite its increase in housing units, St. Lucie County experienced a decline in homeownership rate between 2000 and 2006. Martin County and Florida experienced increases in homeownership rates during the same period. St. Lucie County also differs from Martin County and Florida in regard to the number of housing units in multiunit structures. The percentage of such housing increased in St. Lucie while decreasing in Martin County and Florida. This indicates that Martin County has more of a trend toward single-family housing than does St. Lucie County. Also shown in Exhibit 20, the median value of housing units more than doubled within both counties and the state.

Exhibit 20. Housing Characteristics, 2000 and 2006

Geographic Area	Housing Units		Homeownership Rate (%)		Housing Units in Multiunit Structures (%)		Median Value of Owner-Occupied Housing Units	
	2000	2006	2000	2006	2000	2006	2000	2006
Martin County	65,471	74,921	79.8	80.4	29.1	27.4	152,400	307,800
St. Lucie County	91,262	125,519	78.0	77.5	20.3	22.0	86,100	226,900
Florida	7,302,947	8,531,860	70.1	70.3	29.9	29.8	105,500	230,600

Source: U.S. Census 2008.

The median values of housing units are higher in the census tracts on the island than their county averages, as shown in Exhibit 21. In addition, the homeownership rate is much higher in these census tracts than in their counties. In Martin County census tract 1 and St. Lucie census tract 17.01, the percentages of housing units in multiunit structures are significantly higher than in their respective counties. Of particular note is census tract 17.01, where over 97 percent of housing units are in multiunit structures, reflecting the presence of condominiums along the beach. St. Lucie County census tract 17.02 is noticeably lower in multiunit structures than both counties and the other census tracts on Hutchinson Island. Only 4.5 percent of housing units in this tract are in multiunit structures (Exhibit 21).

Exhibit 21. Housing Characteristics by Census Tract

<b>Geographic Area</b>	<b>Housing Units</b>	<b>Homeownership Rate</b>	<b>% Housing Units in Multiunit Structures</b>	<b>Median Value of Owner-Occupied Housing Units</b>
Martin County Census Tract 1	3,150	92.6	77.4	163,400
Martin County	65,471	79.8	29.1	152,400
St. Lucie County Census Tract 17.01	3,074	87.9	97.3	271,900
St. Lucie County Census Tract 17.02	2,815	93.6	4.5	115,100
St. Lucie County	91,262	78.0	20.3	86,100

Source: U.S. Census 2008.

## 2.16 4.6 Education

Martin County has a higher percentage of high school and college graduates than the state of Florida, while St. Lucie County has a lower percentage of both compared to the state, as seen in Exhibit 22. However, St. Lucie County also experienced the highest increase of percentage of high school and college graduates between 2000 and 2006.



Exhibit 22. Education Attainment 2000 and 2006

Geographic Area	Percent High School Graduates (age 25+)		Percent College Graduates (age 25+)	
	2000	2006	2000	2006
Martin County	85.3	88.6	26.3	29.0
St. Lucie County	77.7	83.5	15.1	18.7
Florida	79.9	84.5	22.3	25.3

Source: U.S. Census 2008.

## 2.17 4.7 Economic Activity

Martin and St. Lucie Counties and the state of Florida all had increases in their median household income between 2000 and 2006, as shown in Exhibit 23. Martin County's median household income was higher than the two other jurisdictions in both 2000 and 2006. Martin County also had a lower percentage of persons below the poverty line in 2000 and 2006. In that time, Martin and St. Lucie Counties experienced a decrease in the percentage of persons below the poverty line, while Florida as a whole experienced a slight increase.

Exhibit 23. Median Household Income and Poverty, 2000 and 2006

Geographic Area	Median Household Income (\$)		Persons Below Poverty (%)	
	2000	2006	2000	2006
Martin County	44,083	50,939	8.8	7.0
St. Lucie County	36,363	44,974	13.4	12.6
Florida	38,819	45,495	12.5	12.6

Source: U.S. Census 2008.

Compared to the rest of Martin County, census tract 1 had a much higher median household income in 2000 as well as a much lower poverty rate. In St. Lucie County, census tracts 17.01 and 17.02 had lower poverty rates than the county as a whole. Despite its lower poverty rate, census tract 17.02 had a slightly lower median household income than the state (Exhibit 24).

Exhibit 24. Median Household Income and Poverty by Census Tract

<b>Geographic Area</b>	<b>Median Household Income (\$) (2000)</b>	<b>Persons Below Poverty (%) (2000)</b>
Martin County Census Tract 1	69,539	4.8
Martin County	44,083	8.8
St. Lucie Census County Tract 17.01	55,238	3.4
St. Lucie Census County Tract 17.02	35,396	5.5
St. Lucie County	36,363	12.6

Source: U.S. Census 2008.

#### **4.7.1. Bankruptcy Filings**

Bankruptcy filings may serve as an indicator of economic difficulties caused by the hurricanes. A study published by the Nevada Law Journal found that bankruptcy filing rates appear to increase for affected areas within twelve to thirty-six months following a major hurricane (Lawless 2005). Total bankruptcy filings declined for all three jurisdictions between 2000 and 2006, though the rate of filings per 1,000 persons increased for both St. Lucie County and Florida. (See Exhibit 25.) St. Lucie County experienced a 33.5 percent decline in bankruptcy filings between 2000 and 2006. Martin County was close behind, with a decline of 30.0 percent. Florida's decline in bankruptcy filings was just over 17 percent.

Exhibit 25. Bankruptcy Filings and Rates

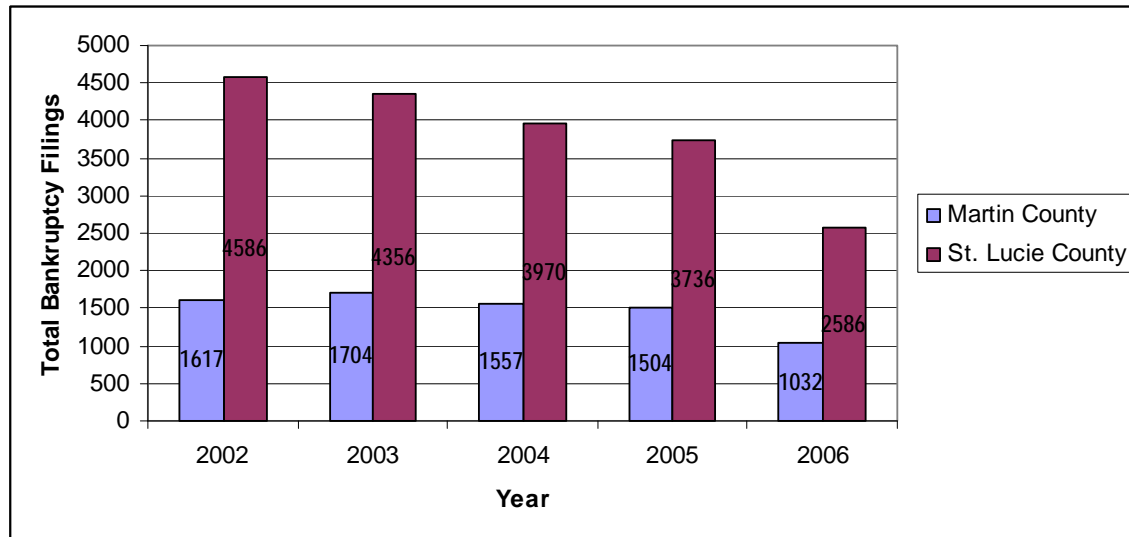
Geographic Area	Total Bankruptcy Filings		Rate of Filings per 1,000 persons	
	2000	2006	2000	2005*
Martin County	1,474	1,032	2.9	2.7
St. Lucie County	3,891	2,586	2.7	3.8
Florida	294,520	244,051	4.6	5.2

\* 2006 data not available

Source: RAND Florida 2007.

Comparing data for 2004 with data from the surrounding years results in no noticeable impact from the storms, as seen in Exhibit 26. St. Lucie had a downward trend in the number of bankruptcy filings between 2002 and 2006, without any yearly exceptions. Martin County also had a generally declining trend in the number of filings with the exception of 2003, which saw an increase compared to the previous year.

Exhibit 26. Yearly Bankruptcy Filings



Source: RAND Florida 2007.

#### 4.7.2 Tourism

A potential indicator for economic recovery is revenue from tourism taxes. Exhibit 27 shows the collected tourist-related taxes in Martin and St. Lucie Counties from 2002 through 2007. (Martin County did not begin collecting the tourism tax until 2003.) It is important to note that, due to the difference in tax rates between the counties, the revenue and percentages should not be compared. However, within each county, they provide insight into tourism trends. It appears that following the year of Hurricanes Jeanne and Francis, tourism continued to increase in both counties, though not by as much as in previous years. After that, however, tourism appears to have slowed considerably. Martin County experienced a decline in revenue in 2006 and 2007 and St. Lucie County experienced a very small increase in 2006 but a decline in 2007. Given the apparent lag time between the hurricanes and the slowdown in tourism, it is difficult to determine if the hurricanes were responsible or broader issues of economic slowing were in play. In any case, Martin County did not appear to fare better than St. Lucie.

Exhibit 27. Tourism-Related Tax Revenue

Tax Year*	Martin County Bed Tax** (2%)		St. Lucie County Tourist Development Tax (5%)	
	Total Collected	% Change from Previous Year	Total Collected	% Change from Previous Year
2002	-	-	1,600,352.31	-
2003	511,465 (10 months)	-	1,875,070.07	17.2
2004	629,085	23.0	2,434,258.41	29.8
2005	692,175	10.0	2,757,380.24	13.3
2006	668,563	(3.4)	2,761,724.28	0.2
2007	615,861	(7.9)	2,567,238.95	(7.0)

\* The tax year for St. Lucie County begins in October of the previous year and ends in September of the current year.

\*\* Martin County began collecting tourism-related tax in 2002-2003.

Source: Andreassi (2008) and Personal communication St. Lucie County Tax Collector's Office (2008)

### 4.7.3 Labor Force

The labor force as a percentage of the population over the age of seventeen is smallest in Martin County, though rising, while it is declining in St. Lucie County and the state. (See Exhibit 28.) In St. Lucie County, the percentage is also lower than that of the state. The unemployment rate is higher in St. Lucie County than in Martin County. Comparing the 2000 and 2006 unemployment rate does not reveal any lingering effects on employment from the hurricanes.

Exhibit 28. Labor Force and Unemployment

Geographic Area	Labor Force as Percent of Population Aged 18 and Older (%)			Unemployment Rate (%)		
	1990	2000	2006	1990	2000	2006
Martin County	54.9	54.4	55.5	7.7	4.2	3.4
St. Lucie County	62.9	58.2	58.2	13.2	5.7	4.2
Florida	64.4	63.4	63.0	6.3	3.8	3.3

Source: EDR Martin County Profile (2007) and EDR St. Lucie County Profile (2007)

**4.7.4 Cost of Living**

Exhibit 29 presents the cost of living in Martin and St. Lucie Counties relative to the cost of living for Florida as a whole. Overall, the cost of living in Martin County is a little lower than the state, while St. Lucie County has a slightly higher cost of living. This holds true for nearly all categories included in the total with the exception of personal goods and services, where Martin County is slightly higher than the state and St. Lucie is slightly lower.

Exhibit 29. Cost of Living

Price Level Index (2005)		
Florida State Average = 100		
	Martin County	St. Lucie County
Total	98.11	100.66
Food	98.81	101.01
Housing	96.94	101.47
Medical Care	96.81	107.28
Personal Goods and Services	100.44	98.75
Transportation	98.71	97.57

Source: Enterprise Florida, Martin County and St. Lucie County profiles 2008.



### 4.7.5 Major Industries

For Martin and St. Lucie Counties and the state of Florida, the trade, transportation, and utilities industries account for more than twenty percent of employment, as shown in Exhibit 30. The education and health services sector employs the next largest group. The third largest employment sector varies by location. In Martin County, it is leisure and hospitality and in St. Lucie it is construction. For Florida, the third largest employment sector is professional and business services. Other sectors vary in their rank by location.

Exhibit 30. Employment by Industry, 2006

	<b>Martin County</b>	<b>Saint Lucie</b>	<b>Florida</b>
Average Annual Employment	60,500	70,280	7,952,023
Natural Resources & Mining	N/D	3.2%	1.2%
Construction	11.9%	10.4%	8.0%
Manufacturing	5.0%	4.9%	5.1%
Trade, Transportation, and Utilities	22.5%	20.3%	20.8%
Information	1.8%	0.9%	2.1%

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Financial Activities	5.3%	6.0%	6.9%
Professional & Business Services	11.1%	9.7%	17.0%
Education & Health Services	14.6%	12.2%	18.4%
Leisure & Hospitality	12.8%	8.8%	11.4%
Other Services	4.6%	2.8%	3.1%
Public Administration	4.7%	7.8%	5.8%
Unclassified	0.0%	0.0%	0.1%

Source: Enterprise Florida, Martin County and St. Lucie County profiles 2008.

As would be expected given the top industries in Martin County, the top two employers in Martin County are a health system and a the school district. Exhibit 31 lists the top ten employers in Martin County and the number of people employed by each. After the two largest employers, a majority of the top ten employers are part of the retail trade.

Exhibit 31. Martin County Major Private-Sector Employers

<b>Private-Sector Employer</b>	<b>Number of Employers</b>
Martin Memorial Health Systems	2,497
Martin County School District	2,456
Publix Supermarkets	1,168
Armellini Express Lines	684
Home Depot	400
Winn Dixie	382
Lowes Home Improvement	335
Vought Aircraft	300
TurboCombustor Technology	294
First National Bank	272

Source: Enterprise Florida 2008.

Overall, Martin and St. Lucie counties have similar populations and civic infrastructures. Their economies are similar as well, though with some variation, particularly in income.

### **3. 5. Social Resiliency**

The SPP is estimated to have avoided \$11.3 million in damages during the 2004 hurricane season (Kent 2007). It also provided for a quick response to the hurricanes with little bureaucracy, because all permits and studies were already in place. One of the benefits Martin County government personnel attributed to the SPP was that the county could focus on other needs, including public infrastructure (Personal communication 2007). Martin County had \$57 million of public infrastructure damage that it could attend to instead of spending time and money obtaining authority and permits necessary for replenishing the beach. Officials point to the absence of commission meetings and public outcry about beach nourishment issues as proof of it not being a concern.

The SPP also appears to have reduced the social effects of the storms. According to Heinz, et al, the disaster resiliency of a community “revolves around the ability of all residents to afford secure housing” (Heinz 2002). A smaller percentage of Martin County residents were forced to move from their homes in the 2004 hurricane season than in many of the surrounding counties, as shown in Exhibit 32. In St. Lucie County, for example, 22.2 percent of respondents to a University of Florida survey reported that they were forced to move, compared to 17.5 percent in Martin County (Smith and McCarty 2006).

Exhibit 32. Percent of Respondents Forced to Move Out of Home by at Least One Hurricane

<b>PLACE</b>	<b>Forced to Move</b>	<b>Not Forced to Move</b>
Brevard	16.5	83.5

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Charlotte	32.2	67.8
De Soto	32.9	67.1
Escambia	25.3	74.7
Hardee	32.3	67.7
Highlands	22.4	77.6
Indian River	24.6	75.4
	17.5	82.5
Okeechobee	25.8	74.2
Osceola	20.8	79.2
Polk	17.0	83.0
St. Lucie	22.2	77.8

Santa Rosa	23.5	76.5
Region	21.2	78.8
Florida	9.5	90.5

Source: Smith and McCarty 2006.

In addition, Martin County had the highest percentage of respondents to the UFL survey who had returned to their homes compared to surrounding counties, the region, and the state, as shown in Exhibit 33. Despite similar demographics, 81.0 percent of St. Lucie respondents had returned to their homes at the time of the UFL survey, while 93.0 percent of Martin County residents had returned.

Exhibit 34 shows that Martin County also experienced a relatively high percentage of residents who quickly returned to their homes following the hurricanes. This is particularly important because getting people back into their homes more quickly enables them to open their windows and clear out any wet debris before it ruins their homes and increases their insurance claims (Personal communication, Kathy Fitzpatrick 2007). Nearly 78 percent of residents in Martin County who moved due to the hurricane were back in their homes within two weeks, while only around 60 percent of St. Lucie County residents had returned in the same period.

The duration of time before people can move back to their homes is likely to be influenced by the extent of damage to the housing units. Exhibit 35 presents the hurricane damage to housing units caused by the 2004 hurricanes. Compared to St. Lucie County, Martin County experienced a lower percentage of homes completely destroyed or severely damaged and a higher percentage of homes with minor or no damage (Smith and McCarty 2006).

Exhibit 33. Percent of Respondents Who Have Returned to Their Pre-Hurricane Homes

<b>PLACE</b>	<b>Returned</b>	<b>Have Not Returned</b>
Brevard	87.7	12.3
Charlotte	76.2	23.8
De Soto	76.7	23.3
Escambia	83.4	16.6
Hardee	76.5	23.5
Highlands	87.8	12.2
Indian River	86.6	13.4

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	93.0	7.0
Okeechobee	87.9	12.1
Osceola	86.1	13.9
Polk	89.7	10.3
	81.0	19.0
Santa Rosa	82.5	17.5
Region	82.0	18.0
Florida	88.1	11.9

Source: Smith and McCarty 2006.



Exhibit 34. Duration of Hurricane-Induced Move for People Who Have Returned to Their Pre-Hurricane Homes (Percent Distribution)

Place	<2 Weeks	2-4 Weeks	1-3 Months	3-6 Months	>6 Months
Brevard	69.6	19.0	7.6	1.3	2.5
Charlotte	29.3	26.1	12.6	21.4	10.6
De Soto	42.0	24.2	15.7	8.5	9.6
Escambia	51.6	18.3	7.6	11.9	10.6
Hardee	47.7	15.3	14.6	10.6	11.8
Highlands	81.6	5.1	4.8	3.0	5.5
Indian River	65.4	17.1	3.1	5.2	9.2
	77.9	8.4	1.4	8.2	4.1

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Okeechobee	62.9	19.4	6.0	3.0	8.7
Osceola	88.0	5.4	1.1	4.4	1.1
Polk	82.2	6.7	4.4	2.2	4.5
	59.8	15.1	8.0	11.7	5.4
Santa Rosa	44.0	17.6	8.9	10.4	19.1
Region	59.2	16.0	8.1	9.0	7.7
Florida	81.7	7.2	5.5	2.1	3.4

Source: Smith and McCarty 2006.

Exhibit 35. Extent of Hurricane Damage to Housing Units (Percent Distribution)

Place	Completely Destroyed	Major Damage	Minor Damage	No Damage
Brevard	0.6	21.4	38.3	39.7
Charlotte	6.0	43.0	32.6	18.4
De Soto	6.5	45.2	37.8	10.5
Escambia	1.7	40.7	39.1	18.5
Hardee	8.1	40.3	38.7	12.9
Highlands	1.4	24.5	44.3	29.8
Indian River	2.8	38.4	43.1	15.7
Martin	0.6	23.4	43.8	32.2
Okeechobee	5.1	33.1	39.5	22.3
Osceola	0.6	28.0	43.4	28.0
Polk	1.2	22.1	40.1	36.6
St. Lucie	1.8	36.4	40.4	21.4
Santa Rosa	2.6	34.1	38.4	24.9
Region	2.2	32.7	39.0	26.1
Florida	0.4	8.1	23.8	67.8

Source: Smith and McCarty, 2006.

### **3.1 5.1 Property Valuation and Taxes**

One of the main concerns expressed by residents and apparent in the literature is the increased valuation of homes following rebuilding. In Martin County, several persons interviewed for this case study reported that some landlords rehabilitated housing to the point that former residents were priced out of the market. Additionally, workers coming to the county to participate in rebuilding increased housing demand, contributing to price increases (Personal communication 8/6/07). Anecdotal stories portray fast increases in home valuations. For example, a two-bedroom ocean-front condo on Hutchinson Island in Martin County was purchased in 2004 for \$399,000 and was selling for \$625,000 in 2006 (Beattie 2006). (It should be noted that home prices across the United States generally inflated significantly in the same period.) A study conducted after the 2005 hurricane season appears to support the belief that home prices rise considerably in areas with protection from storms. Researchers at Florida Atlantic University analyzed the economic impact of restored beaches on residential properties in Escambia, Indian River, Lee, and Sarasota counties following the 2004 hurricane season for the Florida Department of Environmental Protection. They found that the value of single-family properties upland of restored beaches increased more than 30 percent, twice the increase in value of properties upland of beaches that had not been restored. Additionally, the value of condominium properties upland of restored beaches increased more than fifteen percent, compared to no increases in value for condominiums upland of eroded beaches (Murley 2006 and Shoreline 2006). The SPP included a quick response for beach renourishment, supporting the potential for significant home valuation increases following the hurricane.

County millage rates also provide insight into changes in home valuations. Millage is the tax rate on property expressed in mills per dollar of value of the property, i.e., one mill is equal to one dollar for each \$1,000 of a property's assessed value (see, Radnor Real Estate Taxes). As seen in Exhibit 36, millage rates in both Martin and St. Lucie Counties increased in 2004 and then declined in subsequent years. The taxing district of Martin County affected by the SPP shows a continual decrease in millage rates from 2002 through 2007, with the largest decreases occurring between 2005 and 2006 and between 2006 and 2007. Declining millage rates may indicate a higher assessed total property value. The higher the assessed value or the more property available for taxation, the lower the millage rate required to meet the County's budget. The decreased rates suggest a rise in property values and/or the presence of new construction since the hurricanes of 2004.

Exhibit 36. County Millage Rates

Year	Martin County Total County	St. Lucie County Total County	Martin County Taxing District Northern A-61 (Hutchinson Island)
2002	15.1528	20.8554	19.0208
2003	15.1210	20.6671	18.9560
2004	17.4585	24.0310	18.0092
2005	17.1158	23.4210	17.3462
2006	16.1893	22.1217	16.3257
2007	N/A	N/A	15.2917

Source: Florida Department of Revenue Property Valuations and Tax Data books 2002–2006, and Property Appraiser’s Office, Martin County 2008.

Because changes in millage rates are attributed to changes in a county’s total property value, determining the impact of new construction on tax revenue may help to suggest if decreases in millage rates are due to new construction or to changes in property valuation. Exhibit 37 shows the percent increase in taxable value of real property that is due to other than new construction. These data show a significant increase in value due to other than new construction in 2004 through 2006. The substantial increase in 2004 from the previous year in both counties likely reflects a decrease in new construction that would be expected with severe hurricanes. However, large percentage increases in 2005 and 2006 in taxable real property from other than new construction may suggest significant property value increases in this time period.

Exhibit 37. Percent Increase Due to Other Than New Construction

	Martin County	St. Lucie County
2002	5.61	6.41
2003	8.68	12.53
2004	15.00	23.19
2005	12.86	26.15
2006	17.70	32.41

Source: Florida Department of Revenue Property Valuations and Tax Data books 2002–2006.

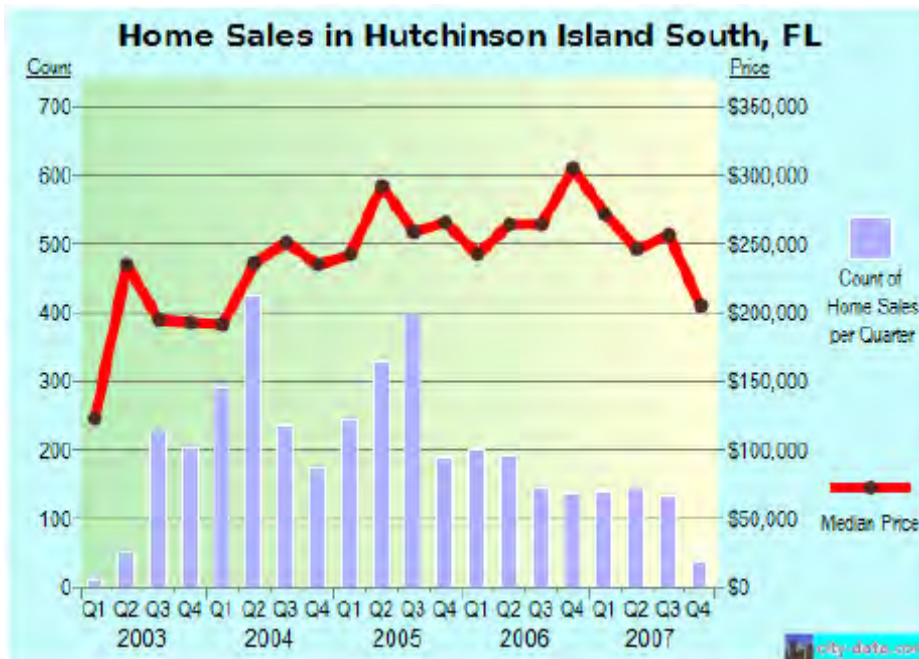
An online forum also suggests anecdotally that Floridians view Martin County as more expensive than neighboring St. Lucie. “Martin County will absolutely cost you more money than St. Lucie County in terms of purchase costs and living expenses, although their tax rate is slightly lower. That’s because their valuations are so high – they don’t have to have as high a millage rate” (City-data.com Forum 2007).

An important note regarding property taxes, however, is that they may not be equal for all residents. Florida has a dual-bracket tax system, permitting local governments to set the taxable value of properties at different levels for permanent and seasonal residents. In some cases, snowbirds pay property taxes ten times as high as nearby permanent residents. For example, in St. Lucie County, one permanent resident of Jensen Beach (near Hutchinson Island) paid \$271 a year in property taxes on a 408-square-foot mobile home built in 1984. A seasonal resident with a 420-square-foot mobile home four houses away built in 1987 paid \$3,007, though their lots are approximately the same size (Gerena-Morales 2006). This is important because more than half of the residents of South Hutchinson Island (where the Martin County

section lies) are part-time. Realtors estimate that up to half of part-time residents are from areas far north of Florida and many are retired or near retirement. The other half are generally young, successful South Floridians using their Hutchinson Island home for short vacations or winter rental properties (Beattie 2006). Florida-wide, the part-time population has an average annual income of \$63,000, compared with around \$53,000 for permanent residents. This difference is somewhat smaller than expected, given the difference in tax rates (Gerena-Morales 2006).

With increasing home valuation and corresponding taxation, there was concern that lower-income residents might be forced to sell their homes (Personal Communication 8/6/07). Exhibit 38 suggests that, though the median price of homes sold in the Martin County area of Hutchinson Island generally increased during the years following the hurricanes, there do not appear to be significant increases in turnover compared to before the hurricane. Between 2003 and 2007, the second quarter of 2004 (prior to the hurricanes) had the greatest number of home sales. Home sales did slow considerably after 2005. However, it is difficult to determine if the high turnover in 2005 was caused by the hurricane because of the high sales volume in 2004.

Exhibit 38. Home Sales



Source: City-data.com Hutchinson Island South Profile 2008.

In the near future, property tax concerns may be partially alleviated by a new amendment to the Save Our Homes tax break. The break has been in effect since 1994 and caps assessment increases at 3 percent a year for homesteaded property (Deslatte 2008). However, all other residents, including the large percentage of part-time residents on Hutchinson Island, had been without such protection and were therefore subject to substantial changes in taxes with changes in assessed property value. With the approval of Amendment 1 by Florida voters on January 28, 2008, changes are forthcoming. This amendment comprises several tax relief measures, including a cap of 10 percent for all properties not previously capped, such as rental properties, second homes, and business properties, to protect them from large tax increases (Governor Charlie Crist 2008). With limits on tax increases, property valuation concerns may be limited to rent increases on properties with improvements after hurricane damage. Since the purpose of the SPP is to reduce such damage, the SPP should reduce this impact.

**3.2 5.2 Insurance**

Hurricanes are more likely to hit Florida than any other state. Since 1990, an average of at least one hurricane struck Florida every two years, and a Category 3 or higher hurricane strikes Florida every four years, on average. Twenty-two percent of all U.S. catastrophe losses since 1980 have occurred in Florida (Insurance Information Institute (1) 2008). Exacerbating the insurance issue due to the risk of hurricanes and catastrophic loss is the value of coastal property in Florida. The value of insured coastal property in Florida is first in the nation, exceeding \$2 trillion, as shown in Exhibit 39. (Insurance Information Institute (3) 2008).

Exhibit 39. Value of Insured Coastal Properties Vulnerable to Hurricanes by State  
(\$ Billions)

State	Coastal (\$ Billion)	Total Exposure (\$ Billion)	Coastal as a percent of total coastal area in U.S.
Florida	\$1,937.4	\$2,443.5	79%

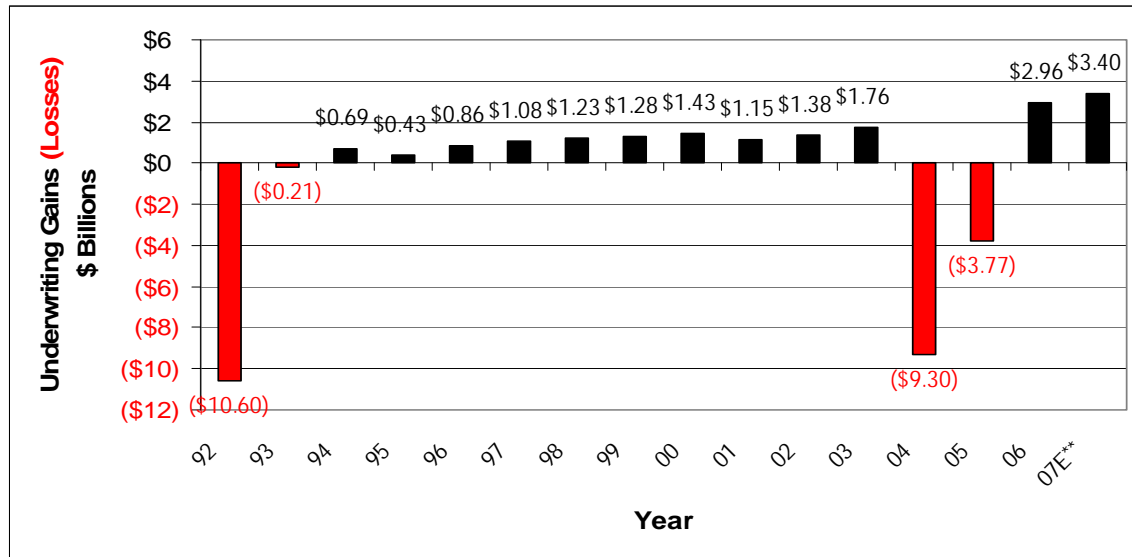


New York	1,901.6	3,123.6	61
Texas	740.0	2,895.3	26
Massachusetts	662.4	1,223.0	54
New Jersey	505.8	1,504.8	34

Source: Insurance Information Institute (3) 2008.

Hurricane Andrew in 1992 was one of the costliest hurricanes to hit the mainland United States. However, by the late 1990's Florida's property insurance market had recovered to the point where property insurance was generally available and affordable. At the same time, thousands of new homes and businesses were built along the coast as property value sharply increased. With the storms of 2004 and 2005 and their associated costs, some insurers decided to reduce their presence in Florida, either by not renewing existing policies or not accepting new policies. Property insurance coverage then became more difficult to find and to afford (Lehrer 2008). By 2006, many homeowners in coastal counties identified insurance as a top issue in the upcoming election. A resident of Satellite Beach, an area to the north of Hutchinson Island, reported that his insurance bill increased from \$1,604 to \$5,521 on a 2,000 square foot house from the end of 2005 to the end of 2006 (Reed 2006). According to a Mason-Dixon Poll survey of 625 Florida registered voters, 42 percent said their premiums have increased by more than \$1,000 since 2005. Nearly one in five had considered leaving the state because of insurance (Reed 2006). However, some insurers' groups claim that they are still operating with an overall loss. According to the Insurance Information Institute, Florida's homeowners insurers' underwriting losses in 2004 (-\$9.3 billion) and 2005 (-\$3.8 billion) resulted in a four-year cumulative loss of \$6.7 billion after accounting for subsequent hurricane-free profitable years 2006 (+\$3 billion) and 2007 (+\$3.4 billion), as shown in Exhibit 40 (Insurance Information Institute (1) 2008). In contrast, the Florida Insurance Council, a Tallahassee lobbying group, gave a different report of the insurance industry. "The state's hurricane insurance market remains strong and viable – in stark contrast to the shake-up that occurred a decade earlier [under Hurricane Andrew]." (Reed 2006).

Exhibit 40. Florida Homeowners Insurance Gains and Losses for Private Insurers\*



\* Does not include Citizens Property Insurance Corporation results.<sup>32</sup>

\*\*2007 Estimate by Insurance Information Institute based on historical loss, expense and premium data for Florida.

Source: Insurance Information Institute (2) 2008.

Experts are predicting that insurance rates will continue to rise. After two seasons in 2004 and 2005 with multiple storm hits, companies are revising their risk models to account for multiple storms in one year. Premiums are likely to rise, to reflect both this increased risk and the rising costs of reinsurance (Horvath 2006).<sup>33</sup> The cost of reinsurance has increased significantly following the 2004–2006 storm seasons (OIR (2) 2006).

<sup>32</sup> Citizens Property Insurance Corporation was created by the state of Florida to provide property insurance for those unable to obtain coverage in the private insurance market. By law, it must charge more than private insurers to ensure it is noncompetitive. Citizens levies assessments in years when losses exceed claims-paying capacity. It can also issue bonds and receive state funds. The number of Citizens policies has grown significantly from 658,085 policies in 2002 to 1.35 million by July 31, 2007 and Citizens is now the state’s second-largest insurer. In May 2007 a new law was passed allowing homeowners to purchase coverage from Citizens if the rates for a policy from a private insurer are more than 15 percent higher than for a similar Citizens policy (Insurance Information Institute August 2007 and Waddell 2006).

<sup>33</sup> Reinsurance is insurance for insurance companies. It transfers some of the risk of insurance to companies to another insurance company, the reinsurer. Reinsurance typically accounts for around seven percent of the U.S. property/casualty insurance industry premiums (Insurance Information Institute December 2007).

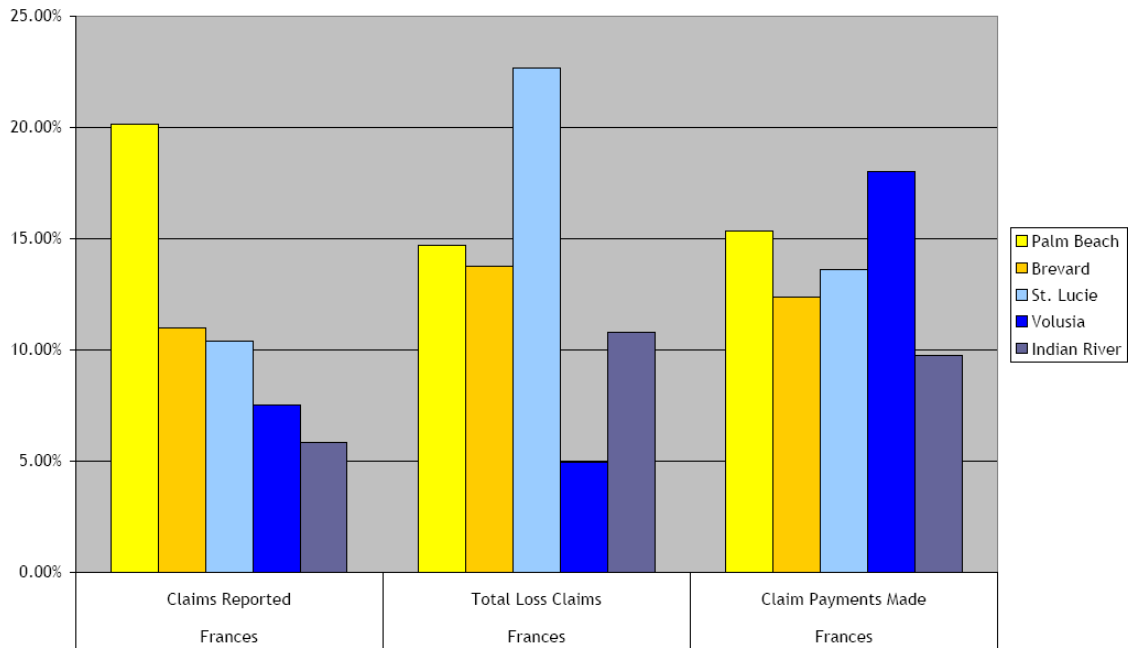
The Florida Office of Insurance Regulation (OIR) is responsible for reviewing and approving requests from insurers to modify rates to ensure they comply with Florida statutes and do not unfairly discriminate against the public with dramatic rate changes (OIR (1) 2006). Rate increase requests have been substantial following the hurricanes of 2004, as 35 insurers in Florida requested a statewide increase after the hurricane season (King 2005). One of the concerns following the hurricanes of 2004 in Martin County was the sharp increase in homeowner insurance (personal communication 2007). Nationwide, for example, asked for permission to nearly double its rates in Martin County in January 2005, representing a premium increase of 89.3 percent. In Palm Beach County, it sought a 33.1 percent increase, and in St. Lucie it sought a 9.2 percent increase (Sedore 2005). Despite permission to raise rates 21 percent, Nationwide ceased writing new property insurance policies in Florida in August 2005 (Orlando Business Journal 2005). Another insurer, United Services Automobile Association Insurance Co. (USAA), requested an average statewide increase of 40 percent for residential property insurance rates. For Martin County, USAA requested a 43.2 percent increase. Leon and Sumter counties had the lowest requested percent increase, with 36.3 percent. OIR denied the request, claiming that USAA did not provide sufficient data for its catastrophe model and loss trends and did not use a model currently accepted by the Florida Commission on Hurricane Loss Methodology (Freer 2006).<sup>34</sup> Allstate reached an agreement with OIR for a rate increase after initially being denied (Cornejo 2006).

The high percentage increases in rates requested for Martin County are somewhat surprising given where the largest losses occurred. Exhibits 41 and 42 present the top five counties' losses for Hurricanes Frances and Jeanne. Martin County is in neither of these groups. The apparent disproportionate requested increases could possibly be due to increased property values.

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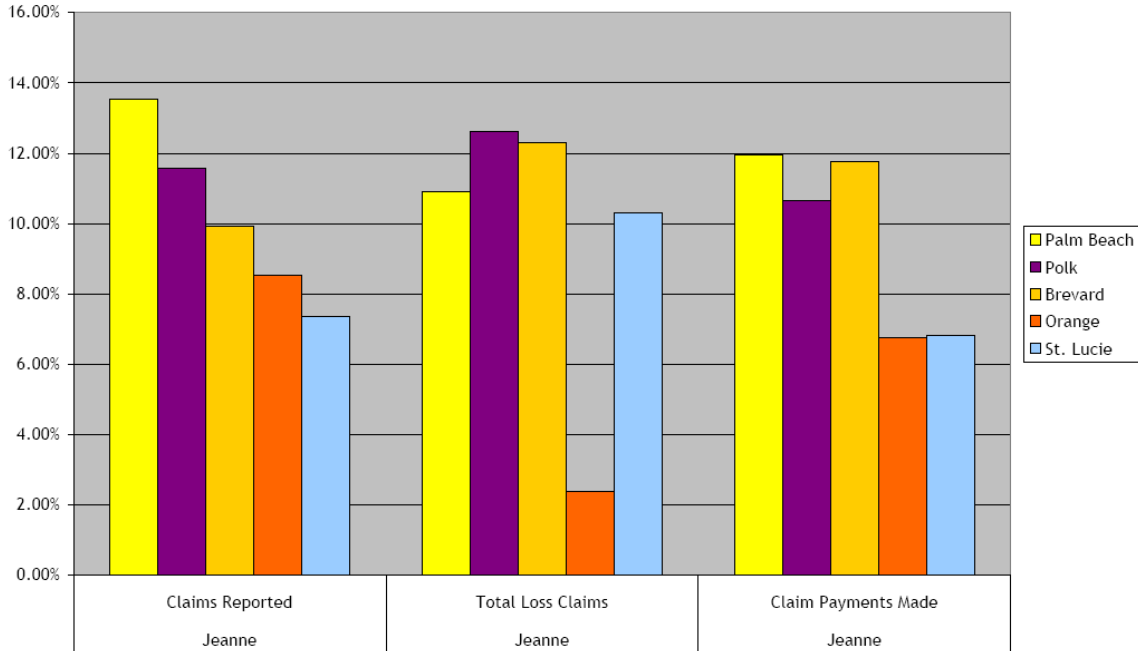
<sup>34</sup> The Florida Commission on Hurricane Loss Projection Methodology is an independent panel of experts created in 1995 by the Florida Legislature to evaluate computer models and methodologies for predicting hurricane losses. Its purpose is to determine that rates are neither excessive nor inadequate (FCHLPM 2008).

Exhibit 41. Top 5 Counties of Loss Occurrence as a Percentage of Statewide Totals Reported for Hurricane Frances as of 12/31/2005



Source: OIR (3) 2006.

Exhibit 42. Top 5 Counties of Loss Occurrence as a Percentage of Statewide Totals Reported for Hurricane Jeanne as of 12/31/2005



Source: OIR (3) 2006.

Clearly, insurance is expensive because hurricane damage is expensive. As evidence for infrastructure protection from SPPs increases, SPPs could potentially be incorporated into risk models, thereby lowering the risk and lowering insurance rates.

## 4. 6. Conclusion

This case study has explored how the presence of the SPP affected social conditions in the Martin County portion of Hutchinson Island and also Martin County more generally. Two key questions were posed for exploration:

1. How did the disaster experience of populations in areas protected by the SPP differ from those of populations in areas that did not have the SPP?

2. How quickly and completely did the population and communities impacted by hurricanes recover from the events? How did the period of recovery in communities with the SPP differ from those in comparable areas but without the SPP?

While the analysis does not yield complete or definitive answers to these questions it is nevertheless possible to reach some conclusions. The presence of SPP likely affected socioeconomic conditions. Martin County and St. Lucie County have relatively similar demographics in terms of population and civic infrastructure. Regarding economic indicators, Martin County appeared slightly less vulnerable, particularly in the census tracts of Hutchinson Island. Some socioeconomic indicators following the hurricanes of 2004 suggest impacts that may be attributable to the SPP. The most significant of these appear to be social stressors and economic hardship, represented by domestic violence filings and bankruptcy rates. St. Lucie County exhibited significant increases in both of these categories following the hurricanes, while Martin County did not.

The SPP appears to have reduced damages and permitted a faster recovery. Martin County residents appear to have returned to their homes sooner and in higher numbers than residents of St. Lucie County. This may be attributable, at least in part, to the same benefits of the SPP discussed by interviewed Martin County government personnel. Having the SPP in place with authority allowed a quick response to the hurricanes with little bureaucracy, so the County could focus on other needs, including public infrastructure.

In addition to the infrastructure protection benefits of the SPP, the data suggest the SPP played a role in reducing stressors on the local population and permitting a faster, easier recovery from the storms. One note of concern is that Martin County census tract 1 did not regain its minority population. However, the decline appears to have begun before the hurricanes hit, rendering the underlying cause difficult to identify. The concerns expressed by residents and county officials about increases in property taxes and insurance rates are potential negative effects associated with shore living. Property tax concerns may be partially alleviated by the recently approved Amendment to the Save Our Homes tax break. With limits on tax increases, most homeowners should be protected from sharp tax increases caused by rising property values. The remaining vulnerability is for the rental population, which may face rent increases on properties with improvements after hurricane damage. Since the purpose of the SPP is to reduce such damage, the SPP should reduce this impact.

Insurance rates will likely continue to increase as development in coastal areas increases and damage from storms becomes more costly. With increased evidence of the infrastructure protection provided by an SPP, such protection may be included in the methodology for determining approved rate changes.

Ultimately, this could mean that the presence of an SPP will reduce insurance costs. These lowered costs, in addition to the reduced stressors resulting from the SPP, would protect lower-income residents. An SPP may have greater impact in more economically disadvantaged areas because of these suggested advantages.





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# Implementation of the Social Vulnerability Index for Martin County, Florida: Methods and Results

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**Implementation of the Social Vulnerability Index for  
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## **Social Vulnerability Defined**

Vulnerability examines those circumstances that place people and places at risk and those circumstances that enhance or reduce their ability to respond to and recover from hazards (Cutter et al. 2003). Social vulnerability describes those characteristics of the population that intervene between natural processes and the built environment to redistribute the risks and impacts. These differential social burdens of hazards help explain why the same natural event produces dramatically different impacts even within the same geographical area. The contrast in the effects of Hurricane Katrina in New Orleans in the Lower Ninth Ward versus the Lakeview District along the shores of Lake Pontchartrain is one example of how social vulnerability produces differences in impacts. With nearly the same level of flooding, the Lower Ninth Ward (a low income, African American community) most likely will take longer to recover from the disaster than the Lakeview District (middle income, largely white professional community) because of its greater underlying social vulnerability.

There is more than five decades worth of social science research chronicling the effect of disasters on people and communities. These post-event field studies document social factors that increased or decreased the impact of the disaster on the local population. However, most of these findings were drawn from surveys of the local population and the research design varied as did the questions posed. Other studies were descriptive and often anecdotal with results that were hard to generalize to other places and hazard events. Despite these limitations in the research, a common set of social indicators did emerge as contributing to vulnerability (Heinz Center 2002). For example, special needs populations (homeless, infirmed) increase the social vulnerability of communities as they are often difficult to identify let alone measure. As a consequence these groups are often left out of preparedness plans and recovery efforts. Similarly, certain age cohorts (the elderly and the very young) increase social vulnerability in communities because their mobility is limited, they are often more susceptible to harm, and they may require special care before and after a disaster. Another driving factor is socioeconomic status, which both increases and decreases social vulnerability. Wealthier communities have more property to lose, but they have the resources and insurance to absorb the losses and recovery quickly. Low-income communities have less material goods to lose, but their livelihoods are tied to them. Thus, the impact of the disaster has longer term consequences for low-income communities, because they have few resources, which in turn significantly hampers their ability to respond to and recover from the disaster. As a final example, housing stock and tenure also influence social vulnerability. Communities with a large percentage of their housing stock in manufactured housing (mobile homes) are more vulnerable than communities with more traditional housing. Similarly, rental populations are more vulnerable than homeowners because they are often transient and thus lack access to information in disasters, insurance, sheltering, and post-event housing options.

## **Significance of the Social Vulnerability Index (SoVI)**

The Social Vulnerability Index (SoVI), first developed in 2003 by Cutter et al., measures the social vulnerability of US counties to environmental hazards. The index is a comparative metric that is used to examine the differences in social vulnerability. Understanding the pre-existing or pre-event social vulnerability within a community is important for policy makers and practitioners as they try to develop disaster resilient communities. The SoVI is a particularly useful tool as it graphically illustrates the geographic variation in social vulnerability. It helps to illustrate the uneven capacity for preparedness and response and may provide a useful benchmark for allocating resources to compensate for the differential levels of social vulnerability. SoVI has been used as a component in hazard vulnerability assessments at the state and local level and as part of state hazard mitigation plans in California and South Carolina.

## **SoVI Applications**

The Social Vulnerability Index (SoVI) draws from the extensive post-disaster case studies and uses a common set of broad indicators with specific variables (Cutter et al. 2003). First applied to compare US counties using 1990 census data, SoVI has now been used to determine the vulnerability of coastal counties to erosion hazards (Boruff et al. 2005), examine the changing landscape of social vulnerability (from 1960-2000) for all US counties (Cutter and Finch, 2008), and to assess both interstate and intra-state variation in social vulnerability in 2000 (see <http://www.cas.sc.edu/geog/hrl/sovi.html>). Moving from the county to sub-county levels of geography, the SoVI methodology has been applied to characterize the pre-event vulnerability in Charleston, South Carolina; New Orleans; Los Angeles; Tampa-St. Petersburg metro area; and the San Francisco Bay Area, among others.

## **SoVI Methodology**

The SoVI consists of socioeconomic profiles of places derived from the US Census. For county-level profiles, 42 variables were used as the original input data into the principal components analysis (PCA). The exact list of variables is found in Table 1. Using a varimax rotation, these variables were reduced to 9-12 factors, which varied slightly by decade. The factors or components explain 73-78% of variance in the data, again depending on the decade in question. Following the PCA, each factor was examined to determine its influence on vulnerability: increase or decrease, or both. Adjustments were made to the component's directionality (positive, negative, absolute value) to insure that positive loadings were associated with increasing vulnerability and negative loadings with decreasing vulnerability. The factor scores were then summed to produce the overall index score for each county. The specific procedures for SoVI are found in Appendix 1.

The final SoVI scores were then mapped using categories based on standard deviations from the mean to highlight the extremes in the statistical distribution. Counties greater than one standard deviation are labeled as high vulnerability, counties less than one standard deviation are labeled as low vulnerability, with the remaining counties in the medium category. For ease in display, the maps highlight the most (top 20%) and least (bottom 20%) vulnerable counties. The 2000 SoVI (<http://www.cas.sc.edu/geog/hrl/sovi.html>) includes additional data on the national percentile ranking for the county, thus providing a statistical view of the relative vulnerability of that county. For example, the top three most vulnerable counties in Florida are Miami-Dade, Citrus, and Hernando, with SoVI scores of 8.15, 7.90, and 7.07, respectively. On the national scale these counties are in the 97.5, 97.2, and 96.4 percentile of all counties, or more simply stated, among the top four percent of the most socially vulnerable counties in the whole country.

Along with the visual representation of social vulnerability, the methodology allows the user to identify drivers of social vulnerability for each spatial unit. This is accomplished through an examination of the factor scores for each enumeration unit to see how they contribute to the overall SoVI score for that unit. For example, in Miami-Dade County, the leading indicator of social vulnerability is race and ethnicity (Hispanic), while in Citrus County it is age, ethnicity, and the rural nature of the area.

Table 1 Variables used in the construction of the Social Vulnerability Index

Variable	Description	County Scale	Sub-county Scale
QBLACK	% black population	√	√
QINDIAN	% Native American population (American Indian, Eskimo, or Aleut)	√	√
QASIAN	% Asian or Pacific Islanders population	√	√
QSPANISH	% Hispanic Persons	√	√
QKIDS	% population under 5 years old	√	√
QPOP650	% population 65 years or older	√	√
MEDAGE	Median age	√	√
QFEMALE	% Female	√	√
BRATE	Birth rate (number of births per 1000 population)	√	
QCVLUN	% of the civilian labor force unemployed	√	√
PERCAP	per capita income	√	√
PPUNIT	Average number of people per household	√	√
QRICH	% families earning more than \$15K in 1960, \$25K in 1970, \$75K in 1980, \$75K in 1990, \$100K in 2000	√	√
QPOVTY	% persons living in poverty	√	√
MDHSEVAL	Median dollar value of owner occupied housing units	√	√
QRENTER	% renter occupied housing units	√	√
MEDRENT	Median gross rent (\$) for renter occupied housing units	√	√

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<b>PHYSICN</b>	Number of physicians per 100,000 population	√	√
<b>QFRM</b>	% rural farm population	√	√
<b>QVOTE</b>	vote cast for president, % voting for leading party (1972 for 1970 and 1992 for 1990)	√	
<b>DEBTREV</b>	general local government debt to revenue ratio	√	
<b>QFHH</b>	% families with female headed households with no spouse present	√	√
<b>QMOHO</b>	% of housing units that mobile homes	√	√
<b>QED12LES</b>	% population over 25 years old with less than 12 years of education	√	√
<b>HODENT</b>	# housing units per square mile	√	√*
<b>HUPTDEN</b>	# housing permits per new residential construction per square mile	√	
<b>MAESDEN</b>	Number of Manufacturing establishments per square mile	√	
<b>EARNDEN</b>	Earnings in all industries (in \$1000) per square mile	√	
<b>COMDEVDN</b>	# commercial establishments per square mile	√	
<b>RPROPEN</b>	Value (in \$1000) of all non-residential property and farm products sold per square mile	√	
<b>QCVBRPC</b>	% civilian labor force participation	√	√
<b>QFEMLBR</b>	% female participation in civilian labor force	√	√
<b>QAGRI</b>	% employed in primary industry farming, fishing, mining, forestry	√	√
<b>QTRAN</b>	% employed in transportation, communications, and other public utilities	√	√
<b>QSERV</b>	% employment in service occupations	√	√
<b>NRRESPC</b>	Nursing home residents per capita	√	√
<b>QSSBEN</b>	Percent Social security recipients	√	√
<b>HOSPTEC</b>	Number of community hospitals per capita	√	√*

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<b>MIGRA</b>	Percent international migration	√	√
<b>QLANDFRM</b>	Land in farms as a % of total land area	√	√*
<b>QPCNGE</b>	Percent decennial population change	√	
<b>QURBAN</b>	Percent of the population living in urban areas	√	√

\*Available, but not used in tract-level analyses.



Since SoVI is a relative measure, the selection of the study region for comparison is an important consideration. For example, in downscaling SoVI to a sub-county level, comparisons can be made between census tracts or census block groups within a particular place (e.g. within a county or within a metro area), or between two places (e.g. Charleston, SC and Los Angeles, CA). Because of the lack of some of the socioeconomic variables at the sub-county level, SoVI<sub>TRACT</sub> only includes 30 of the original 42 variables found in SoVI. In addition to data unavailability, variables that showed no variance (e.g. percent urban) or those that were more indicative of the built environment (e.g. number of manufacturing establishments and value, housing density, and the number of new housing permits) were omitted. As such SoVI<sub>TRACT</sub> represents only demographic and social indicators. However, the remaining variables continue to capture the social vulnerability as understood in the original formulation. A separate built environment vulnerability index is presently under development, which will highlight those aspects of the constructed environment that increase or decrease community vulnerability.

## **Scoring Martin County**

For Martin County, two approaches were used. The first was a census tract level analysis for the county which included 24 census tracts. The second analysis used smaller geographic units, census block groups which included 66 enumeration units.

### **Tract-level**

The PCA generated a total of eight factors or components in the tract-level analysis for Martin County, which explain 89.7% of the variation in the data (Table 2). The high explanatory power suggests that these components perform very well, capturing the multi-dimensional nature of social vulnerability as well as the variability within the county. The components include age, ethnicity, low income, race, gender & unemployment, infrastructure employment, nursing home residents, physicians, and mobile homes. The spatial distribution of the social vulnerability is found in Figure 1. Four tracts stand out as having the highest levels of social vulnerability—two in the western two-thirds of the county (a largely exurban, rural area) and two in the more populated eastern section. The drivers in the western tracts are ethnicity (Hispanic) and infrastructure (transportation, communications, and public utilities) employment. In the east, the drivers are age and nursing home residents.

Table 2 Factor Construction for Martin County, Tract Level

Sign	Factor	Name	% Variance Explained	Dominant Variables	Correlation
	1	Age	20.8	QSSBEN	-.92
				QPOP65O	-.92
				MEDAGE	-.89
+	2	Ethnicity	19.0	QAGRI	.90
				QSPANISH	.80
				QINDIAN	.88
+	3	Low income	12.1	PERCAP	-.85
				QRICH	-.84
				MDHSEVAL	-.89
+	4	Race, gender & unemployed	11.4	QCVLUN	.75
				QFHH	.60
				QBLACK	.54
				MEDRENT	-.77
-	5	Infrastructure employment	8.0	QTRAN	-.89
+	6	Nursing home residents	7.4	NRRESPC	.83
				QBLACK	.68
+	7	Health care access	5.8	PHYSICN	.88
-	8	Mobile homes	5.2	QMOHO	-.76
Total Explained Variance			89.7		

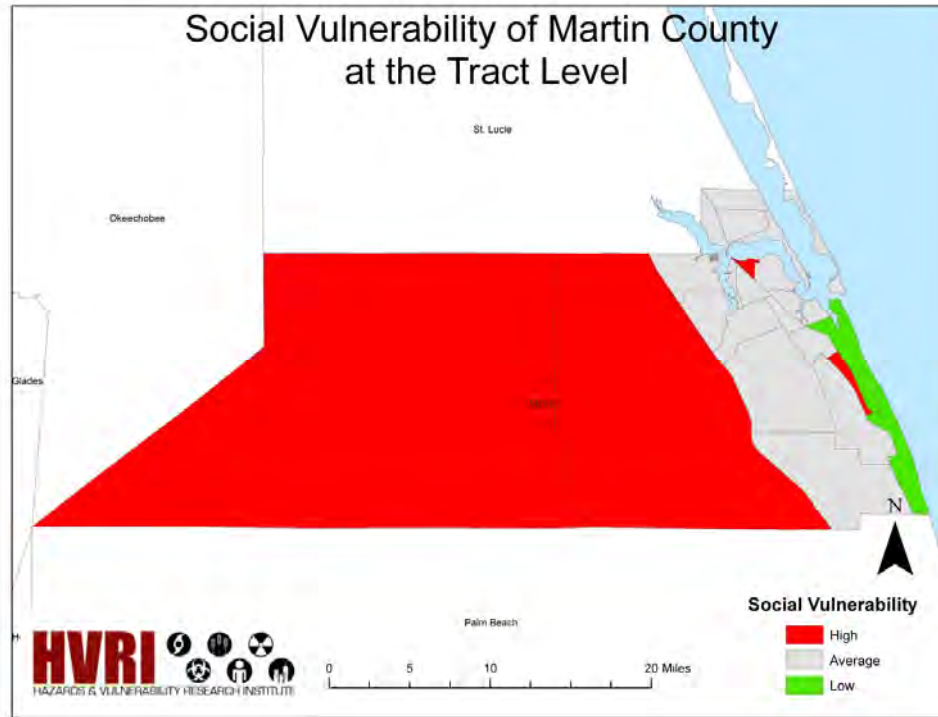


Figure 1 Social Vulnerability of Martin County at the Census Tract Level

### Block-Group Analysis

At the block-group level, the PCA produced seven components or factors, explaining 77.2% of the variance in the input data. The factors contributing to social vulnerability are nearly identical to the tract-level analysis and include: age, low income, ethnicity, race & class, urban/rural, male immigration, and nursing home residents (Table 3). As can be seen in Figure 2, there is more variation in the mapped scores than was the case with the larger enumeration units. High social vulnerability is concentrated in the western half of the county and along the I-95 and US Highway 1 corridors. Lower levels of social vulnerability are concentrated in Palm City.

Table 3 Factor Construction for Martin County, Block Group Level

Sign	Factor	Name	% Variance Explained	Dominant Variables	Correlation
	1	Age	21.0	QPOP650	-0.95
				QSSBEN	-0.94
				MEDAGE	-0.90
+	2	Low income	13.3	QRICH	-0.86
				MDHSEVAL	-0.87
+	3	Ethnicity	11.4	QINDIAN	.81
				QSPANISH	.77
+	4	Race & class	10.8	QBLACK	.88
				QPOVERTY	.65
	5	Urban/rural	8.8	QRFRM	-0.86
				QURBAN	.80
+	6	Male immigration	7.2	MIGRA	.65
				QFEMLBR	-.7
+	7	Nursing home residents	4.7	NRRESPC	.84
Total Explained Variance			77.2		

For the high vulnerability block groups in the western portion of the county (Indiantown and surrounding areas), the social vulnerability is driven by the rural, agricultural nature of this part of the county along with ethnicity (Hispanic), race (African American, Native American), and class (lower income populations) (Table 3). The tracts in the eastern section of the county are defined by male immigrants and poverty (Tracts 10, 11, 12, 18) and by age and nursing home residents (Tracts 16, 21). While the social vulnerability is high in all these tracts, there are different social characteristics producing it, a distinction that is important for emergency preparedness and response.

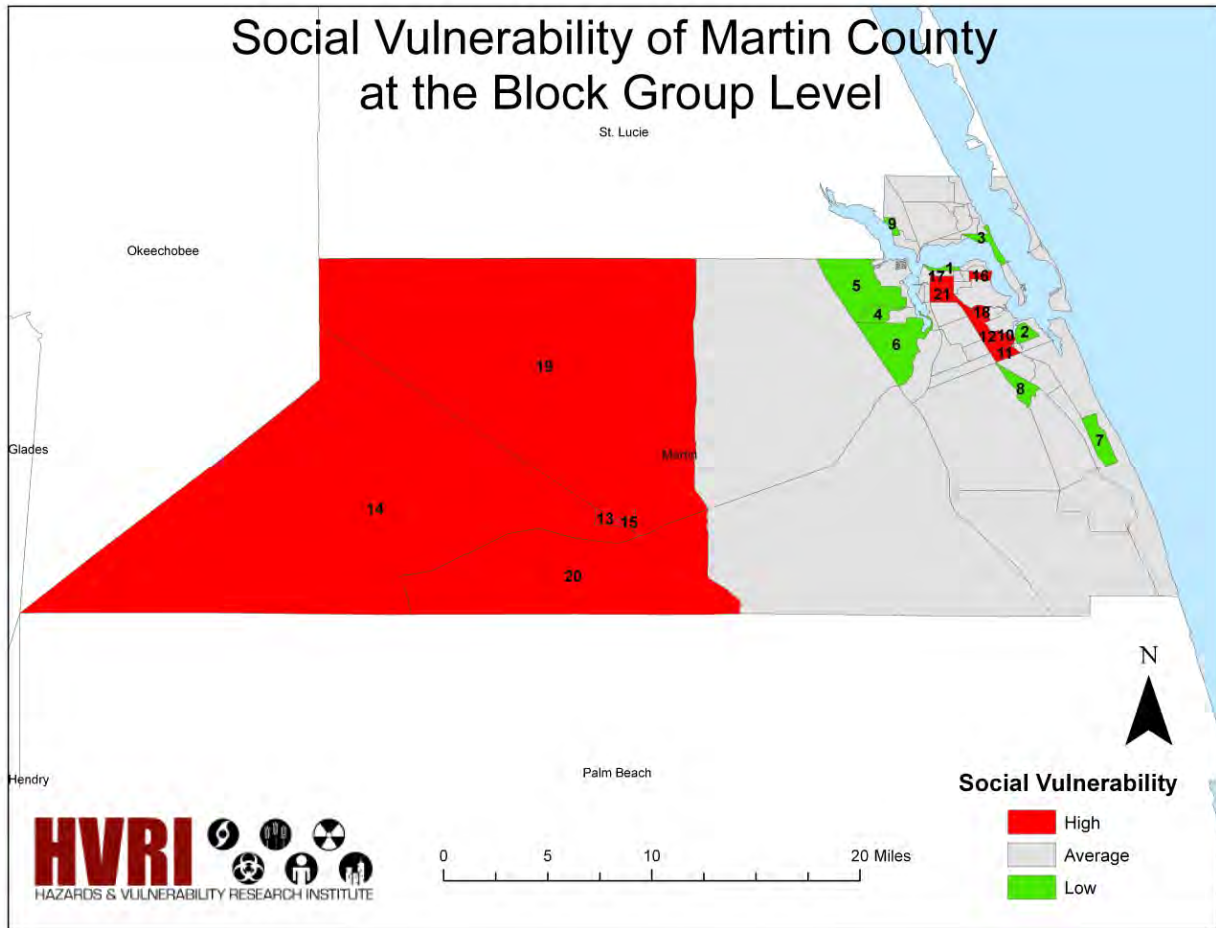


Figure 2 Social Vulnerability of Martin County at the Block Group Level

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Table 3 Factors contributing to high and low social vulnerability for Martin County census block groups depicted in Figure 2.

ID	FIPS Code	Age	Lack of Wealth	Ethnicity	Race and Class	Urban and Rural	Male Immigrant	Nursing Home Residents	SoVI Score
<b>Low Social Vulnerability</b>									
1	120850008001	1.4125	-0.4923	-2.0191	-0.7881	0.1277	-0.1215	-0.4431	-2.3239
2	120850013026	0.6922	-0.5147	-0.7456	-0.5523	0.0017	-0.2514	-0.6728	-2.0428
3	120850005008	0.7167	-1.9529	-0.8593	-0.3648	0.2635	0.4897	-0.0019	-1.7091
4	120850006022	0.5207	0.1541	-0.2122	-0.2591	0.9575	-1.3204	-1.4312	-1.5906
5	120850006012	0.1665	-1.0795	0.0591	-0.5808	0.2750	-0.4149	0.0346	-1.5399
6	120850006024	0.5158	-0.8289	-0.9090	-0.1273	0.0608	0.5826	-0.8187	-1.5248
7	120850014061	0.4371	0.0305	-0.8323	-0.0907	0.0747	0.2025	-1.1602	-1.3384
8	120850014034	0.3347	0.0441	0.0863	-0.4111	0.0675	-0.6181	-0.8234	-1.3201
9	120850003002	1.2349	-0.4052	-0.5291	-1.4575	0.5524	-0.6469	0.0660	-1.1853
<b>High Social Vulnerability</b>									
10	120850013014	1.5240	0.8874	-0.6271	-0.5708	0.5526	1.7412	0.4269	3.9342
11	120850012002	0.5746	1.8079	-0.1085	-0.5442	0.4475	1.3414	0.5354	4.0541
12	120850012001	1.0874	0.2401	0.2490	-0.8633	1.3034	3.1599	-1.0501	4.1263
13	120850018003	0.6849	0.2024	0.1877	3.6981	0.3996	0.5651	-1.5347	4.2031
14	120850018004	0.5125	0.4093	1.9958	2.4420	0.1468	0.0424	-0.7686	4.7801
15	120850018002	1.4865	-0.5392	4.5190	0.3467	0.0332	0.3235	-0.9626	5.2071
16	120850009003	2.3668	1.0449	0.3375	0.6885	0.9923	0.3785	-0.3048	5.5037

17	120850008003	0.3777	0.3876	-0.9588	4.3745	0.3191	-2.0427	3.2587	5.7160
18	120850013011	0.8438	-0.3040	1.1380	1.8846	0.4348	2.5038	-0.6111	5.8899
19	120850018001	0.4735	0.5957	-0.9325	1.1040	5.3919	1.3712	-0.1917	7.8121
20	120850018005	1.2644	1.2866	4.3496	-1.4787	1.9798	-0.5615	0.9983	7.8383
21	120850010001	0.2152	1.0778	-0.0155	-0.2419	0.8139	2.7601	3.9979	8.6076

### Martin County Natural Hazard Loss History

Martin County has experienced significant economic losses from natural hazards. Conservatively speaking, the sum of direct losses from natural hazards from 1960-2005 totals more than \$103 million (adjusted to \$2005) (Table 4). Slightly more than a third of these losses are agricultural losses (primarily orange groves), with the remainder being direct property losses. The primary causes of the losses are hurricanes and tropical storms, although flooding, frost, and wildfires also contributed to the overall loss total.

Table 4 Losses from Natural Hazards in Martin County, 1960-2005

Hazard	Losses (\$ millions)
Coastal (flooding, wind, inundation)	11.4
Flooding	19.4
Severe summer weather	3.4
Hurricane/Tropical storms	59.6
Tornado	0.7
Wildfire	3.4
Winter weather (including frost)	5.6
TOTAL	103.5

Source: Compiled by the authors from SHELDUS 5.1 (<http://www.sheldus.org>)

## Comparing Social Vulnerability and Hazards

Flood hazards and storm surge inundation zones served as examples to demonstrate the intersection of social vulnerability with areas of high hazard potential. Flood hazard zones originate from FEMA's Q3 data, which delineate zones of differential flooding risk. The geographical representation of these zones is for planning purposes only, and is not intended for use in a regulatory environment. The 100-year and 500-year flood zones were combined to represent the total flooding potential for the county and then overlain on the map of social vulnerability at the block group level. The flood hazard itself is concentrated along the coast (in the eastern section of the county) and in the western margins of the county adjacent to Lake Okeechobee (Figure 3). It is in this area that the flood hazard intersects with a high social vulnerability community. Most of the flood hazard affects block groups with average to low levels of social vulnerability. The exception in the eastern portion of the county is in Block Group 16, a highly vulnerable area due to the low income, elderly population residing there.

A very different pattern emerges in the case of hurricane storm surge inundation. Here, the hazard is confined to the coastal and bay reaches of the county. Depending on the storm's strength, the inundation zone could be quite expansive. As was the case with flooding, most of the underlying social vulnerability is in the low to moderate or average levels. However, Block Group 10, an area of high social vulnerability is completely affected by surge inundation as is Block Group 16. Both are areas with elderly male immigrant populations that will necessitate special efforts to assist in preparing for and responding to hazards.



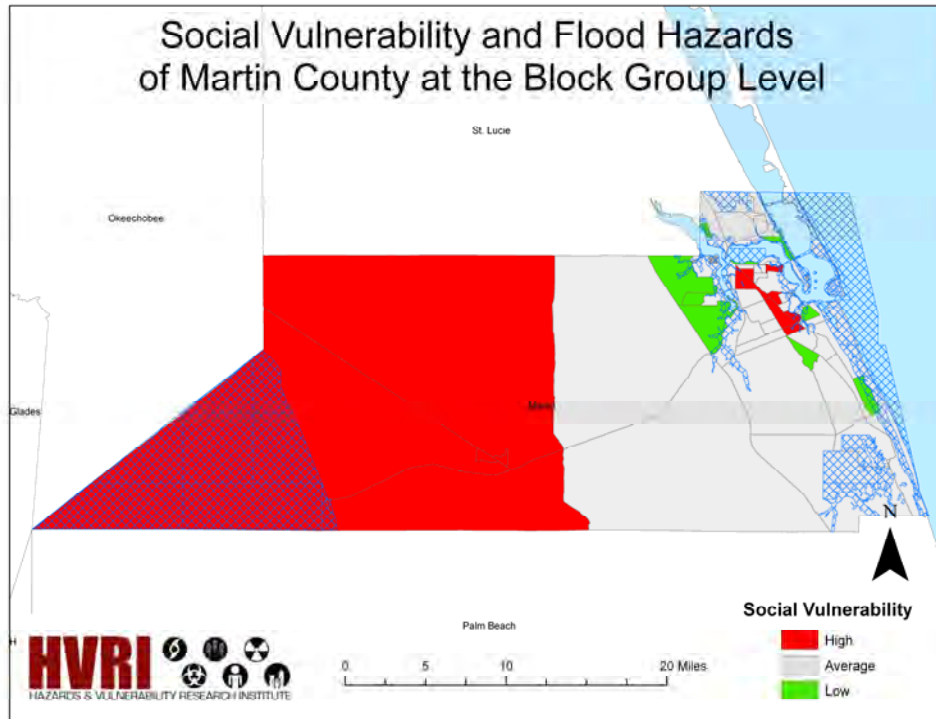


Figure 3 Flood Hazards and Social Vulnerability

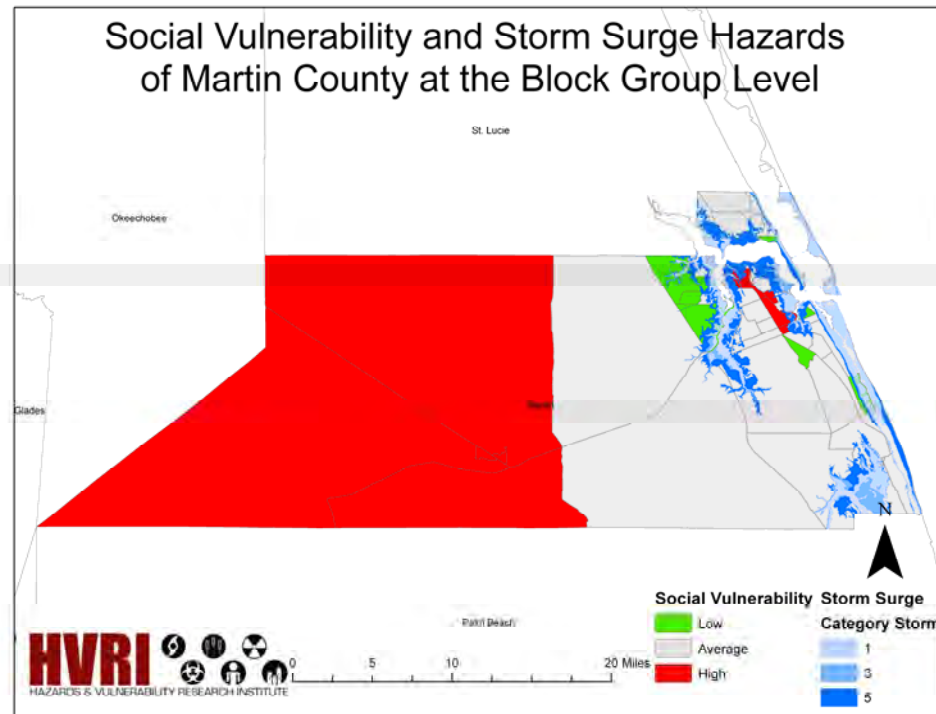


Figure 4 Social Vulnerability and Storm Surge Hazards

## Summary

The implementation of the SoVI for Martin County successfully demonstrates the spatial differences in the likely populations at risk from natural hazards. It not only graphically illustrates where the most socially vulnerable populations reside, but it also explains what is contributing to their vulnerability. This means that different preparedness and response measures may be required to selectively target areas of high social vulnerability, especially in those high hazard exposure zones such as floodplains and storm surge inundation zones. A one-size fits all strategy for preparedness, response, and mitigation ignores the realities of the very distinct social differences found in the county.

## References and Further Information

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### 2000 U.S. Coastal Counties:

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Cutter, S. L. and C. T. Emrich. 2006. "Moral Hazard, Social Catastrophe: The Changing Face of Vulnerability Along the Hurricane Coasts." *Annals of American Academy of Political and Social Science* 604: 102-112.

**SoVI Methodology applied to island nations:**

Boruff, B. J. and S. L. Cutter. 2007. "The Environmental Vulnerability of Caribbean Island Nations," *The Geographical Review* 91 (1): 24-45.

### Appendix 1 The SoVI Recipe

1. Download the requisite variables from the US Census Data Engine.
2. Standardize all variables to either percentages, per capita, or density functions (per square mile).
3. Verify accuracy by using descriptive statistics such as the minimum and maximum values. Check for missing values for the unit of analysis. If some cells have a missing value, substitute the mean value for the variable in its place. The statistical procedure will not run properly with missing values.
4. Normalize the input variables through the creation of z-scores with a mean 0 and standard deviation 1.
5. Perform the principal components analysis (PCA) using a varimax rotation and Kaiser criterion for component selection (e.g. eigenvalues greater than 1.0). The varimax rotation tends to load each variable highly on only one component.
6. Interpret the resulting components on 1) what they broadly represent and 2) how they may influence social vulnerability. This is done by examining the correlations between the variables and the components given in the loadings matrix output of the PCA to determine what characteristics are being represented, and if they have a tendency to increase or decrease social vulnerability. The goal is to have all the components aligned so that they theoretically increase social vulnerability. For example if a factor tends to show strong positive values (greater than + .50) for variables that indicate low social vulnerability, the inverse of the corresponding factor score is used (in other words, the factor score is multiplied by -1). In some cases, notably the age component, there are strong positive and negative values on individual variables (e.g. loads positively on elderly, and loads negatively on children), both that increase social vulnerability. In those instances the absolute value of the component is used. Finally, there are times when the phenomenon has a mix of loadings, but overall it shows strong positive values that indicate increasing social vulnerability then no change in directionality is required.

7. Place all the components with their adjustments into an additive model and sum to generate the overall SoVI score for the place.

8. SoVI scores are then mapped using a classification (tertile or quintile) based on standard deviations from the mean, with scores  $\geq 1$  standard deviation indicating higher levels of social vulnerability, and scores  $\leq 1$  standard deviation showing lower levels of social vulnerability.

9. The following is an example of the 2000 County SoVI illustrating the variable loadings, naming of the factor, and the sign adjustment (directionality). The SoVI score is computed for each unit of analysis (e.g. county, census tract).

<b>Sign Adjustment</b>	<b>Factor</b>	<b>Name</b>	<b>Dominant Variables</b>	<b>Correlation</b>
-	1	Socioeconomic Status	QPOVTY	-0.86
			QED12LES	-0.85
			QCVBRPC	0.81
			PERCAP	0.82
II	2	Age	MEDAGE	-0.89
			QKIDS	0.88
			QSSBEN	-0.83
			PPUNIT	0.83
			BRATE	0.80
			QPOP650	-0.80

APPENDICES

+	3	Development	COMDEVND	0.99
			MAESDEN	0.98
			EARNDEN	0.97
			HODENT	0.95
			HUPTDEN	0.89
			RPROPEN	0.74
+	4	Rural Agriculture	QLANDFRM	0.73
			NNRESPC	0.65
			QPCHCG	-0.65
			QFRFM	0.63
			HOSPTPC	0.57
			MDHSEVAL	-0.50
+	5	Race and Gender	QFEMLBR	0.84
			QFHH	0.59
			QAGRI	-0.58
			QBLACK	0.56
			QVOTE	-0.55
+	6	Race	QASIAN	0.76
+	7	New Immigrants	QINDIAN	-0.76
			MIGRA	0.53
+	8	Ethnicity	QSPANISH	0.77
+	9	Gender	QFEMALE	0.81

			QSERV	-0.58
+	10	Infrastructure Employment	QTRAN	0.85
+	11	Economic Dependence	DEBTREV	0.98

**SoVI** = +(- Factor 1) + (II Factor 2) + Factor 3 + Factor 4 + Factor 5 + Factor 6 + Factor 7 + Factor 8 + Factor 9 + Factor 10 + Factor 11





The logo for the Institute for Water Resources (IWR) features the letters 'IWR' in a large, bold, serif font. A horizontal line with a slight curve passes through the middle of the letters. To the right of the 'IWR' logo, the words 'Institute for Water Resources' are written in a smaller, sans-serif font, stacked in three lines: 'Institute for', 'Water', and 'Resources'.

*The U.S. Army Engineer Institute for Water Resources (IWR) was formed to provide forward looking analysis and research in developing planning methodologies to aid the Civil Works program. IWR is a field operating activity under the supervision of the Director for Civil Works, U.S. Army Corps of Engineers (USACE).*

*The Institute is the USACE center of expertise for integrated water resources management, focusing on planning analysis and hydrologic engineering and on the collection, management and dissemination of Civil Works and navigation information, including the nation's waterborne commerce data. It also serves as the Corps center of expertise for collaborative planning and environmental conflict resolution. The Institute supports its mission by providing:*

- *Analysis of emerging water resources trends and issues*
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- *National data management and results-oriented program and project information*
- *National and international collaboration on water resources issues*
- *Development of new risk-based decision-support methodologies and software tools*
- *Conflict resolution and public participation training and outreach*

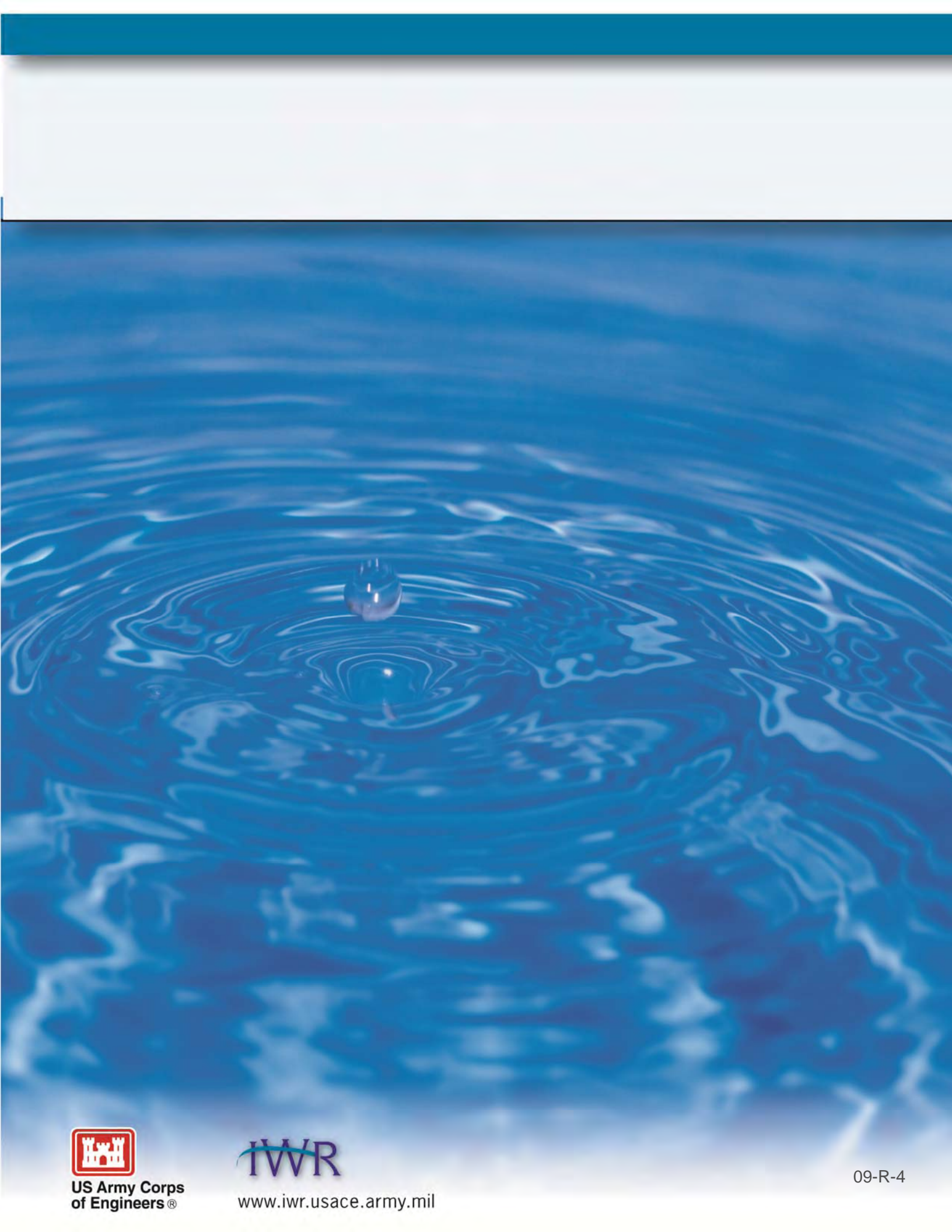
*The Institute shares its expertise in providing research and direction for future water resources challenges through its national and international partnerships.*

*The Hydrologic Engineering Center specializes in the development, documentation, training, and Partnerships application of hydrologic engineering and hydrologic models. The Navigation Data Center, and its Waterborne Commerce Statistical Center, is the Corps data collection organization for waterborne commerce, vessel characteristics, port facilities, dredging information, and information on navigation locks.*

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*IWR facilities include its National Capital Region and Navigation Data Center (NDC), both at the Humphreys Engineer Center in Alexandria, Virginia; the Hydrologic Engineering Center (HEC) in Davis, California; and the Waterborne Commerce Statistics Center (WCSC), part of NDC, located in New Orleans, Louisiana.*

*For more information, visit IWR's web site at [www.iwr.usace.army.mil](http://www.iwr.usace.army.mil), or contact IWR Director Robert Pietrowsky ([robert.a.pietrowsky@usace.army.mil](mailto:robert.a.pietrowsky@usace.army.mil), 703-428-8250), HEC Director Christopher Dunn ([christopher.n.dunn@usace.army.mil](mailto:christopher.n.dunn@usace.army.mil), 530-756-1104 x317), NDC Director David Lichy ([david.e.lichy@usace.army.mil](mailto:david.e.lichy@usace.army.mil), 703-428-9052), or WCSC Director Susan Hassett ([susan.k.hassett@usace.army.mil](mailto:susan.k.hassett@usace.army.mil), 504-862-1453). IWR's National Capital Region address: U.S. Army Engineer Institute for Water Resources, 7701 Telegraph Rd, 2nd Floor, Casey Building, Alexandria, VA 22315-3868.*



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