
Unit 3: Economic Vulnerability Analysis

Time: 3 3/4 hours

Purpose

The purpose of this unit is to discuss the need to determine the economic vulnerability of a community.

Objectives

At the conclusion of this unit, participants will be able to:

- 1.** Describe the relationship between hazard vulnerability and the economic base of a community and region
- 2.** Describe key components of an economic vulnerability baseline
- 3.** Explain the differences between costs and losses
- 4.** Explain the elements of an economic vulnerability analysis
- 5.** List examples of economic analysis tools

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Total Time:	225 minutes	

Instructor Preparation

COURSE MATERIALS	EQUIPMENT
<ul style="list-style-type: none"> ♦ Facilitator Guide ♦ Course Agenda ♦ PowerPoint presentation 	<ul style="list-style-type: none"> ♦ Easel, easel pad, and markers ♦ Overhead projector and projection screen and/or computer display unit and monitor

Where Are We in the Planning Process?

2 minutes

Show Visual 3-1.

Introduce the unit and review the objectives.

Unit 3: Objectives

- ◆ Describe the relationship between hazard vulnerability and the economic base of a community and region
- ◆ Describe key components of an economic vulnerability baseline

3-1

Show visual 3-2.

Review the objectives

Unit 3: Objectives

- ◆ Explain the differences between costs and losses
- ◆ Explain the elements of an economic vulnerability analysis
- ◆ List examples of economic analysis tools

3-2

Show Visual 3-3.

Review where we are in the planning process.



An economic vulnerability analysis considers the threat and potential impact of natural hazards on the community's economic base and its infrastructure. It also assesses the potential problems that could arise because of facility interdependence and ripple effects. And finally, it seeks to identify potential leaders capable of and interested in pursuing disaster-resistant strategies to overcome the identified problems.

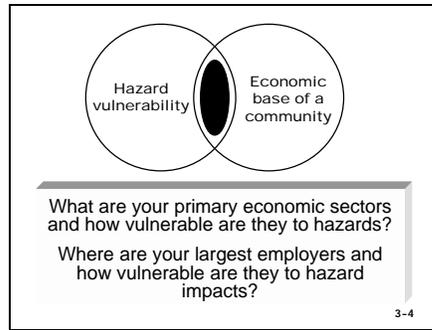
Linking Hazard Vulnerability to a Community's Economic Base

15 minutes

Relationship between a Hazard Vulnerability and the Area's Economic Base

Show Visual 3-4.

Discuss the relationship between a hazard vulnerability and the area's economic base.



Most disasters will arrive with little warning, rapidly develop and have the potential for substantial destruction. When businesses fail, the whole community struggles to recover. A widely destructive event creates disruption for the local economies. That's why it's important to identify your economic vulnerability to hazard impacts.

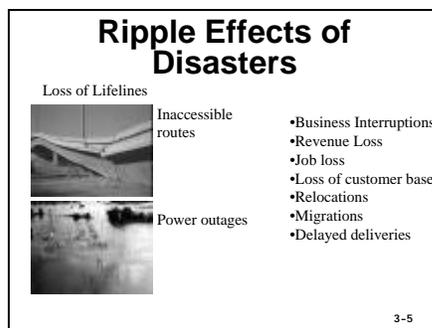
What are your primary economic sectors and how vulnerable are they to hazards?

Where are your largest employers and how vulnerable are they to hazard impacts?

Ripple Effects of Disasters

Show Visual 3-5.

Discuss the ripple effects of disasters.



Disaster events can have ripple effects that negatively impact the economy. A ripple effect occurs when an event produces spreading, pervasive, and usually unintentional effects or influences.

The interdependencies between sectors can have far-reaching effects and cross many geographical boundaries because of the disaster. The interruption of one business can launch a chain reaction by also disrupting those companies that supply it with materials or equipment and those that in turn depend on it for materials or supplies. For example, some U.S. facilities of the Boeing Company and Apple Computer, Inc. suffered production losses of up to six weeks following the January 1995 earthquake in Kobe, Japan. They could not operate without needed supplies from Kobe.

After a disaster, local economies may be affected by a loss of lifeline connections and customer base even if businesses are not directly damaged. These indirect causes include:

- ◆ *Loss of important “lifeline” connections to a community that can hamper or eliminate business activity and recovery.* Typical scenarios include the prolonged loss of major utility services such as electricity, water, or sewage disposal or the loss of a key transportation route. Communication plays an important role in many information-age businesses and even a short interruption in vital connections can be critical.

- ◆ Impact on employees reduces availability or efficiency due to personal life disruption.
- ◆ *Loss of customer base due to extensive damage and destruction of residential areas.* Relocating significant numbers of residents and their consumer dollars to another sector of town or to other communities and regions may permanently change the market share of the commercial services and establishments they left behind.

As a result of a disaster, the business community and beyond may experience any of the following:

- ◆ Lost productivity and employment
- ◆ Declining population base
- ◆ Tax revenue losses
- ◆ Lost sales revenues
- ◆ Emotional effects on victims
- ◆ Disrupted vendor supply

Show visual 3-6 (or current example)

Give examples of ripple effects of disasters, with the emphasis on the economic aspects.

Use the text examples or provide current examples.

**Cascading Impacts:
Hurricane Andrew**

- ◆ Job and revenue losses
 - Loss of 7,500 jobs at Homestead AFB
 - Loss of \$405 million in revenues
- ◆ Migration flows
 - Population losses
 - Miami-Dade, 3,969 – first since 1860
 - Population gains
 - Broward County - 80% increase
 - Palm Beach County – 45%

3-6

Show Visual 3-7.

**Cascading Impacts:
Hurricane Andrew**

- ◆ Escalating housing prices
- ◆ Household income declines
- ◆ Financial impact for homeowners
 - Increased insurance premiums
 - New home price increases – building codes

3-7

CASCADING LONG-TERM IMPACTS OF HURRICANE ANDREW IN FLORIDA

Years after Hurricane Andrew's landfall in August 1992, the long-term impacts last.

Job and Revenue Losses

- ♦ Homestead Air Force Base, partially reopened as an Air Reserve Base, still resulted in a loss of 7,500 jobs and \$405 million a year in revenues for the local economy.
- ♦ Agriculture experienced deep setbacks as a consequence of the North American Free Trade Agreement, with Mexico receiving a greater share of the vegetation market – with detrimental consequences to Homestead and Florida City.

Migration Flows

- ♦ During the first 12 months after Hurricane Andrew, Miami-Dade had a net loss in population of 3,969 – the first time it happened since 1860.
- ♦ Broward County absorbed nearly 80 percent more residents during the first 12 months after Hurricane Andrew. Between September 1992 and September 1993, 12,000 Miami-Dade residents moved to Broward, and the influx has continued yearly. Over the last decade, its population has increased 29%. This resulted in a more diverse population since 1990, with Hispanics making up 17% of the population (almost 50% increase); blacks (72% increase, representing 21% of the population)
- ♦ Palm Beach County experienced a 45% increase (2,000 families) in migration from Miami-Dade.
- ♦ Bay County had migration of 241 families; most displaced from the Homestead Air Force and moved to Tyndall Air Force Base.
- ♦ Moody Air Force Base in Georgia and Shaw Air Force Base in South Carolina had 600 families moving in from Miami-Dade.
- ♦ Others moved to Atlanta, San Antonio, Houston, the suburbs of Washington, DC and other places in central Florida.

Tremendous Housing Market and Escalating Prices

- ♦ New housing developments were exploding and housing prices were escalating, with housing prices doubling in many situations.

Household Income Declines

- ♦ Between 1990 and 2000, the median incomes declined from 15% in Leisure City to 41% in Naranja, Florida.

Greater Financial Impact for Homeowners

- ♦ Costs for new homes have increased over \$20,000 because of new and improved building codes.
- ♦ Insurance premiums have gone up 100%, but coverage has decreased.

CASCADING LONG-TERM IMPACTS OF HURRICANE ANDREW IN FLORIDA

Sources

- ♦ "Recalling the nightmare".
www.miami.com/mld/miamiherald/news/special_packages/andrew/3886314.htm
- ♦ "Lives uprooted, many fled"
www.miami.com/mld/miamiherald/news/special_packages/andrew/3891712.htm
- ♦ "After Andrew, displaced families found oasis in Broward:"
www.miami.com/mld/miamiherald/news/special_packages/andrew/3904760.htm
- ♦ "Storm's grip on S. Dade still powerful"
www.miami.com/mld/miamiherald/news/special_packages/andrew/3898016.htm
- ♦ "10 years later, Hurricane Andrew upgraded to Category 5"
www.sun-sentinel.com/templates/misc/printstory.jsp?slug=sfl%2Dscane22aug22
- ♦ "Are we prepared for the next Andrew?"
www.miami.com/mld/miamiherald/news/special_packages/andrew/3927667.htm
- ♦ "What if Andrew hit today?"
www.sun-sentinel.com/templates/misc/printstory.jsp?slug=sfl%2Dsandrew24aug24
- ♦ "Hurricane Andrew left legacy of higher housing"
www.sun-sentinel.com/templates/misc/printstory.jsp?slug=sfl%2Dsbuildaug20

SOME BUSINESS VULNERABILITIES

Destroyed or Damaged Computers, Networks, Servers, Office Equipment

Unsecured office equipment, computer monitors, computer servers, and terminals can be destroyed or thrown about. Employees can be hit by falling equipment. Businesses experience lost productivity while broken equipment is repaired or new equipment is required. Downtime due to nonfunctioning servers is also common.

Failed Communications Systems

Telephone systems can become overloaded quickly, including cellular phone systems. Consider backups, such as two-way paging systems to ensure that you can request needed emergency services; digital paging systems may not work consistently. Test backup systems; even emergency radio systems may not work because of lack of air space and unavailable frequencies. Consider having alternate providers for toll-free and fax services. Businesses can suffer a severe loss when their service is out for an extended time period.

Inaccessible Transportation Routes

Businesses need alternate routes if access is blocked to their location. They can suffer losses when their revenue stream is dependent on getting vehicles, packages, and/or employees to and from their location. For example, if an airfield is closed, then an airfreight-dependent business will need an alternate location or shipping arrangement. It needs to plan for contingencies if access is blocked or limited due to inaccessible bridges, roads, etc.

Business Disruptions

Businesses need to consider alternate operations in case of a disaster. If the facility does not have a backup, then business will cease or they will lose market share to a competitor.

Destroyed or Uninhabitable Buildings

Buildings may be destroyed if they have not been retrofitted or built to withstand the elements. Businesses without alternate plans for leasing space or obtaining another facility will experience an extended period of business disruption – and subsequent loss of revenues.

Loss of Valuable Records and Inventory

Most businesses keep on-site records and files (both hard copy and electronic) that are essential to normal operations. Some businesses also store raw materials and product inventory. The loss of essential records, files, and other materials during a disaster is commonplace. To reduce vulnerability, businesses should determine which records, files, and materials are most important; consider their vulnerability to damage during different types of disasters (such as floods, hurricanes, and earthquakes); and take steps to protect them.

Example 1

A private office building is severely damaged. The direct costs will be the costs incurred to restore the building to pre-disaster state. During the period that the restoration is undertaken, individuals normally employed in the building will be unemployed (or underemployed), output will be reduced, and the local tax base will be altered. This is just for one building – losses are greater for many buildings.

Example 2

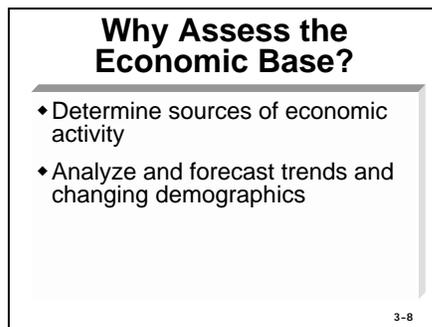
Failed computer systems can wreak havoc on suppliers, customers, business partners and other third parties. Customers may not be able to pay their invoices on time, thereby sabotaging accounts receivable. Suppliers don't deliver raw materials as scheduled, bringing production to a halt. Failures within just a few organizations can ripple through entire industries – and potentially the whole economy.

Building an Economic Baseline

10 minutes

Show Visual 3-8.

Review the reasons for assessing the economic base.



Before you begin the economic vulnerability analysis, you need to have an idea of what the existing economic base is.

Where flat growth or downturns existed in the economy before a disaster, even a temporary loss of business revenues can be irreversibly detrimental. In communities and regions where economic activity was steadily increasing, and the contributing factors are still in place, then the likelihood of recovery is greater. That's why it is essential to recognize trends in economic activity prior to a disaster.

There are several measures for economic activity, but employment and income are the most commonly used in actual case studies.

Division of an area's economic forces into basic and non-basic categories can provide valuable information for concerned citizens. For example, how much of the area's basic employment is tied to one industry or firm?

"Base studies" identify the area's primary sources of employment and earnings. In some communities, small industries may be identified as major supporters of service or locally oriented employment. Some firms produce primarily for the export market. For example, in rural counties, most of the agricultural production and manufacturing output are probably sold outside the producing county.

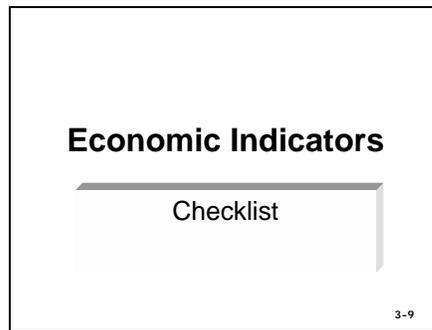
Computing and monitoring the economic base of a city, county, or region can be a useful tool for local business and government leaders in determining the sources of basic economic activity in their area. A changing base may signal other kinds of changes well in advance so that decision-makers may respond earlier than would be possible otherwise.

Economic Indicators: What They Are and How We Find Them

20 minutes

Show Visual 3-9.

Ask participants to take a few minutes and read over the economic indicators checklist.



What Is An Economic Indicator

Discuss how participants can use economic indicators to determine the economic base of their community.

Use the Hurricane Floyd Economic Impact Assessments (Section 3: Pre-Disaster Economy) in the Toolkit for either North Carolina or Virginia to illustrate how the economic indicators were gathered and analyzed.

Economic indicators help you to understand the workings of a local economy by providing statistical data about various dimensions of economic activity and well-being.

These indicators can be helpful in assessing the impact of a potential disaster on the community's economic base. For instance, if a community depends totally on raising cattle, a foreign animal disease, such as foot and mouth disease, would have a huge impact on that community's economic base. The outbreak of the same disease in a community in which only 10% of the economic base is based on agriculture and 90% is from manufacturing would be vastly different.

The following table identifies some of the typical economic indicators used to assess the local community's economic viability and growth.

ECONOMIC INDICATORS

Employment indicators

- ◆ Workforce size (public and private sectors)
 - Agriculture
 - Mining
 - Construction
 - Manufacturing
 - Utilities
 - Wholesale trade
 - Retail
 - Financial Services
 - Other Services
 - Transportation
 - Shipping
- ◆ Sales volume by type of businesses
- ◆ Employment by type of businesses
- ◆ Unemployment figures
- ◆ Claims for unemployment compensation
- ◆ Wage indicators, per capita income
- ◆ Available workforce data

Public Finance Indicators

- ◆ Municipal/county/state tax revenues
- ◆ Building permits
- ◆ Public expenditures
- ◆ Conventions (scheduled/canceled)
- ◆ Tourism (number, amount spent)
- ◆ Alcohol sales receipts/taxes collected
- ◆ City/county sales tax

Population Demographics

- ◆ Trends
- ◆ Net migration (in/out)

Commerce

- ◆ Crop production
- ◆ Fishing harvests
- ◆ Port tonnage
- ◆ Railroad operating revenues
- ◆ Logging revenues
- ◆ Hotel/motel vacancy rates; revenues
- ◆ Business license applications/cancellations
- ◆ Business failure rates (especially those of restaurants, gas stations)
- ◆ Customs duties

Housing

- ◆ Number of single-family and multifamily units under construction
- ◆ Building permit/construction start information for commercial, industrial, demolished units, etc.
- ◆ Total assessed value of residential housing, increase/decrease in property values
- ◆ Shifts to mixed use

Real Estate and Financial Institutions

- ◆ Residential real estate values
- ◆ Commercial real estate values
- ◆ Farm real estate values
- ◆ Undeveloped land values
- ◆ Mortgage defaults
- ◆ New loan requests
- ◆ Small business loan requests
- ◆ Personal loan defaults

Other

- ◆ E-commerce
- ◆ Ecotourism
- ◆ School lunch fees
- ◆ Hospitality services

1. In group discussion:

Ask participants to add additional indicators from their experience.

List on easel pad.

2. Ask for experiences from group.

3. Ask if any economic bases have been lost or permanently destroyed due to disaster.

Data Sources

Information for economic indicators can be obtained from a variety of sources such as the following:

- ◆ U.S. Census Bureau
- ◆ Bureau of Labor Statistics
- ◆ Bureau of Economic Analysis
- ◆ State Employment Commission
- ◆ Commissioners of the Revenue
- ◆ State and local economic development offices
- ◆ Various city and county departments

Ask for additional resources. Write on easel pad.

Differentiating between Costs and Losses

30 minutes

Definitions of Costs and Losses

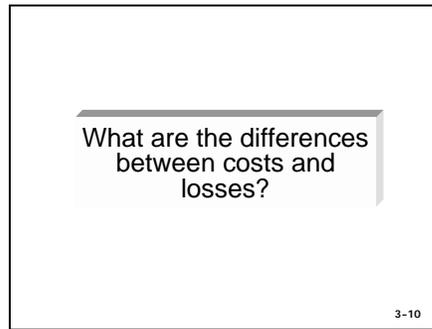
Show Visual 3-10.

1. Emphasize how different sectors have different definitions or meanings for the terms costs and losses.

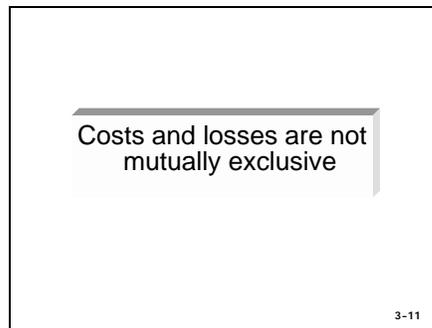
Ask participants the following question:

From your perspective, what are the differences between costs and losses?

Record their responses on the easel pad.



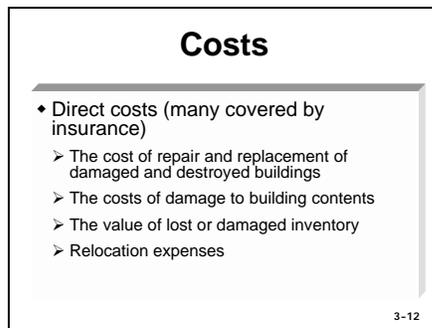
Show Visual 3-11.



When you are conducting an economic vulnerability analysis, understanding the differences and relationships between costs and losses is important. It is important to understand that the two are not mutually exclusive. Different professions bring particular meaning to the terms.

2. Discuss with participants what is meant by "costs."

Show Visual 3-12.

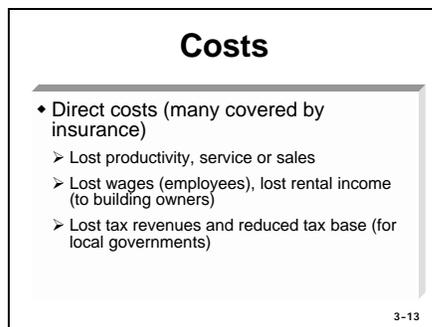


The costs of a disaster are generally those disaster economic impacts suffered by individuals, businesses, or communities for which some measure or dollar value can be assigned.

Direct costs most identified with the disaster include:

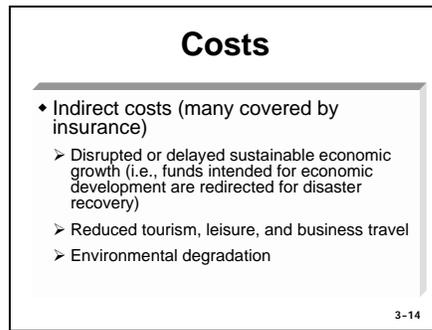
- ◆ The cost of repair and replacement of damaged and destroyed buildings
- ◆ The costs of damage to building contents
- ◆ The value of lost or damaged inventory
- ◆ Relocation expenses

Show Visual 3-13.



- ◆ Lost productivity, service or sales
- ◆ Lost wages (employees), lost rental income (to building owners)
- ◆ Lost tax revenues and reduced tax base (for local governments)

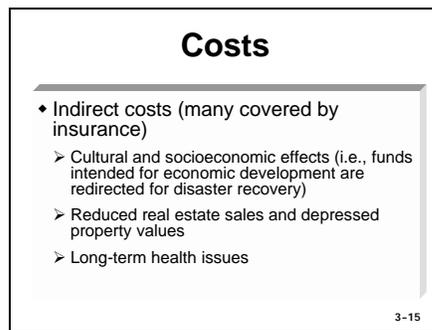
Show Visual 3-14.



Indirect costs may involve both short- and long-term economic consequences and are generally harder to measure. Nevertheless, indirect costs can have significant impact on individuals, businesses, and communities. Indirect costs include:

- ◆ Disrupted or delayed sustainable economic growth (i.e., funds intended for economic development are redirected for disaster recovery)
- ◆ Reduced tourism, leisure, and business travel
- ◆ Environmental degradation

Show Visual 3-15.



- ◆ Cultural and socioeconomic effects (i.e., movement of population)
- ◆ Reduced real estate sales and depressed property values
- ◆ Long-term health issues

3. Discuss with participants what is meant by “losses.”

Show Visual 3-16.



Losses

- ◆ Not recoverable
- ◆ Any cost, either direct or indirect, that is not compensated in some way
- ◆ Constitute the more deeply-felt economic impacts
- ◆ Losses associated with indirect impacts of a disaster can lead to business failures many months after a disaster

3-16

4. Ask them to read 2 examples.

Losses are costs that are not recoverable. Individuals, businesses, and communities may be eligible to receive compensation for some of the costs of a disaster. Compensation or partial compensation may be in the form of insurance payments, direct cash grants, favorable loans, or charitable goods and services. Any cost, either direct or indirect, that is not compensated in some way, however, is a loss.

Economic losses resulting from a disaster constitute the more deeply felt economic impacts that, due to their very nature, are more difficult to overcome and take longer to recover from. A business may receive partial compensation for its lost building and inventory. However, its uncompensated losses may be too severe for the business to financially continue. Losses associated with indirect impacts of a disaster can lead to business failures many months after a disaster.

Show Visual 3-17.

Relate the concepts of losses to the World Trade Center or Grand Forks examples or use another recent example.

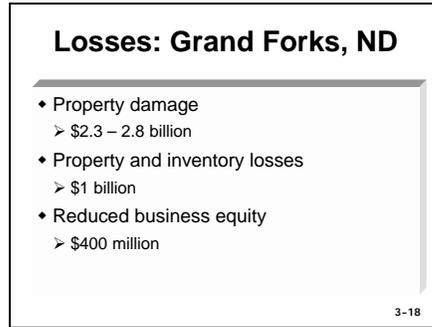


World Trade Center: Costs and Losses

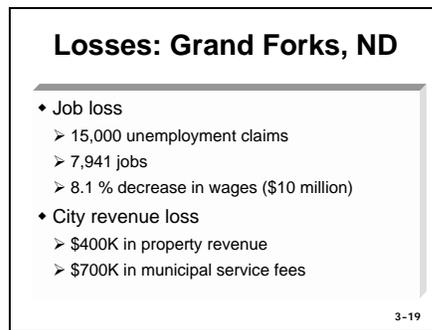
- ◆ Lost employee income and business profits
 - > \$48 billion
 - > 73,900 layoffs
- ◆ Spending reductions
- ◆ Reduced tax revenues
- ◆ Delays to travelers and commuters
- ◆ Capital costs
 - > \$30 billion
- ◆ Cleanup and emergency management costs
 - > \$14 billion

3-17

Show Visual 3-18.



Show Visual 3-19.



5. Ask participants to provide examples from their community of “losses.”

(Do not spend time on costs – this is more widely understood.)

Ask if they can distinguish the losses in their timeframes (immediate, short-term, long-term).

WORLD TRADE CENTER ATTACK: DIRECT AND INDIRECT COSTS	
Direct Costs	<ul style="list-style-type: none"> ◆ Human lives ◆ Property Loss <ul style="list-style-type: none"> – Buildings – Business fixtures – Computer equipment – Phone and power utilities – Subway stations – Planes – Vehicles ◆ Costs to respond to the emergency, remove debris, stabilize buildings and clean up ◆ Health effects, injuries, and emotional distress ◆ Costs to provide temporary living assistance
Indirect Costs	<ul style="list-style-type: none"> ◆ Lost employee income and business profits associated with firms closed or cut back, temporarily or permanently, because office space and infrastructure were destroyed or damaged ◆ Lost employee income and business profits associated with other firms that depended on those that closed or cut back ◆ Spending reductions from other income losses triggered by the firms that closed or cut back ◆ Fiscal impacts such as reduced tax revenues ◆ Delays to travelers and commuters ◆ The Fiscal Policy Institute estimated \$21 billion in indirect losses and 73,900 layoffs in the 4th quarter of 2001. ◆ The New York State Assembly Ways and Means study estimated that of the 125,300 jobs lost in New York in the 4th quarter of 2001, 80 percent resulted from the attacks. It estimated that the attacks would generate about \$27 billion in indirect losses through 2002. <p>Source: GAO-02-700R: Impact of Terrorist Attacks on the World Trade Center</p>

WORLD TRADE CENTER ATTACK: ESTIMATION OF COSTS	
Capital Costs (approximately \$30 billion)	<ul style="list-style-type: none"> ◆ Destroyed buildings (\$6.4 billion) ◆ Damaged buildings (\$2.2 billion) ◆ Infrastructure (\$4.5 billion) ◆ Technology and fixtures (\$6.6 billion) ◆ Human capital (\$10.0 billion)
Cleanup and Emergency Management Costs (approximately \$14 billion)	<ul style="list-style-type: none"> ◆ Debris removal (\$6.0 billion) ◆ Security (\$5.0 billion) ◆ Health (\$2.7 billion—medical costs and leaves of absences for injuries, disabilities, bereavement, traumatic stress, and litigation) ◆ Other (\$0.7 billion—victim assistance and support services, burial costs, aid to educational facilities and miscellaneous agencies)
Losses Resulting from Changes in Employment and Productivity (9/11/01 –12/31/03) \$39 billion	<ul style="list-style-type: none"> ◆ Near-term impact on employment and productivity (9/11/01 – 12/31/01) ◆ Medium to longer term pattern of recovery (1/1/02 – 12/31/03)
TOTAL \$83 billion	Source: New York City Partnership and Chamber of Commerce

FLOODS- GRAND FORKS, NORTH DAKOTA

Economic Costs and Losses

Evacuation of Grand Forks, ND, meant the closing of most Grand Fork businesses, which represented 34,013 wage and salary jobs. 15,000 workers filed unemployment claims.

- ◆ Property damage in the region reached \$2.3 to \$2.8 billion.
- ◆ Two billion dollars in damage in Grand Forks/East Grand Forks, representing 12 percent of North Dakota's Gross State Product
- ◆ Estimated \$1 billion in property and inventory losses to commercial and industrial property.
- ◆ Reduced business equity exceeded \$400 million, wiping out equity in many companies, plus loss of personal net worth from uninsured home losses.
- ◆ One thousand seven hundred thirty-nine businesses with less than 100 employees of which 86 percent suffered property damage and/or business interruption. In East Grand Forks, total employment down 10.7 percent (7,941 jobs) and wages down 8.1 percent (\$10 million).
- ◆ In North Dakota, Altru Health Systems realized a \$12.8 million operating loss during the three weeks it was shut down. Part of this loss was due to payments to employees who were not working.
- ◆ East Grand Forks, ND, lost more than \$400,000 in property tax revenue and \$700,000 in revenue in fees for municipal services, including electricity and water that were not used during the flood.

Source: Grand Forks Chamber of Commerce. Greater Grand Forks: A Solid Past. A Strong Future. A Place to Call Home. Grand Forks, North Dakota.

Critical Infrastructure in the Community

10 minutes

Show Visual 3-20.

Identify the critical infrastructures in a community.



Conducting an analysis of critical infrastructure in the community is another consideration in determining the vulnerability of a community.

Executive Order 13010, signed by President Clinton in 1996, emphasized eight critical infrastructures whose services are so vital that their incapacity or destruction would have a debilitating impact on the defense or economic security of the United States. These critical infrastructures are identified in the table.

CRITICAL INFRASTRUCTURES	
Electrical Power	A critical infrastructure characterized by generation stations, transmission and distribution networks that create and supply electricity to end-users so that end-users achieve and maintain nominal functionality, including the transportation and storage of fuel essential to that system.
Gas and Oil Production, Storage and Delivery	A critical infrastructure characterized by the production and holding facilities for natural gas, crude and refined petroleum, petroleum-derived fuels, and the refining and processing facilities for these fuels.

CRITICAL INFRASTRUCTURES	
Telecommunications	<p>A critical infrastructure characterized by computing and telecommunications equipment, software, processes, and people that support the:</p> <ul style="list-style-type: none"> ◆ processing, storage, and transmission of data and information; ◆ processes and people that convert data into information and information into knowledge; and ◆ data and information themselves.
Banking and Finance	<p>A critical infrastructure characterized by entities, such as retail and commercial organizations, investment institutions, exchange boards, trading houses, and reserve systems, and associated operational organizations, government operations, and support activities, that are involved in all manner of monetary transactions, including its storage for saving purposes, its investment for income purposes, its exchange for payment purposes, and its disbursement in the form of loan and other financial instruments.</p>
Water Supply Systems	<p>A critical infrastructure characterized by the source of water, reservoirs and holding facilities, aqueducts and other transport systems, the filtration, cleaning and treatment systems, the pipeline, the cooling systems, and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater, and firefighting.</p>
Transportation	<p>A critical infrastructure characterized by the physical distribution system critical to supporting the national security and economic well-being of this nation, including aviation; the national airspace system; airlines and aircraft; and airports; roads and highways, trucking and personal vehicles and intelligent transportation systems; waterborne commerce; ports and waterways and the vessels operating thereon; mass transit, both rail and bus; pipelines, including natural gas, petroleum, and other hazardous material; freight and long haul passenger rail; and delivery services.</p>
Emergency Services	<p>A critical infrastructure characterized by medical, police, fire, and rescue systems and personnel that are called upon when an individual or community is responding to emergencies. These services are typically provided at the local level (county or metropolitan area). In addition, state and federal response plans define emergency support functions to assist in response and recovery. In PDD-63, this infrastructure is further divided into Public Health Services, Emergency Law Enforcement, and Emergency Fire Services.</p>
Government Operations	<p>Sufficient capabilities at the federal, state and local levels of government are required to meet the needs for essential services to the public.</p>

Ask participants to think about utilities and transportation routes in their community and how those types of infrastructure will be affected by a disaster.

In doing a critical infrastructure analysis, it's important to complete a critical facilities inventory and conduct a vulnerability assessment on all critical facilities.

Show Visual 3-21.

Briefly review example from World Trade Center.



World Trade Center: Infrastructure Impact

- ◆ Communications and Utilities
 - Verizon: Loss of switching station and major network equipment
 - \$1.9 billion in damages
 - Con Edison: power substation losses
 - Merchant credit card processing problems

3-21

Show Visual 3-22.



World Trade Center: Infrastructure Impact

- ◆ Transportation
 - 10 subway stations closed
 - Handled 40% commuters
 - Traffic restrictions
 - 500K commuters displaced
 - Costs
 - \$1 billion to rebuild PATH
 - \$1 billion to rebuild tunnels
 - Street repairs

3-22

Tell participants you are going to explore the economic impact of disasters in-depth through the use of a case study.

INFRASTRUCTURES IMPACTED BY THE WORLD TRADE CENTER TERRORIST ATTACK: NYC

Communications and Utilities

Verizon, the local telecommunications provider, sustained \$1.9 billion in damages, including the loss of a switching station and major network equipment. Con Edison lost two substations, and its local distribution system was badly damaged. Much of Manhattan relied for a while on a combination of emergency generators and other temporary solutions. Some businesses experienced problems accepting credit cards or communicating with suppliers because of communications problems or damages.

Transportation Routes

The immediate area lost commuter services on PATH and subway lines. During the first month after the attack, ten subway stations that handled about 40% of downtown's commuters were closed. This has resulted in much longer commutes as well as severe crowding on subways and commuter rail lines. Traffic in the immediate area was restricted, which limited foot traffic and deliveries. Over half a million commuters who travel to lower Manhattan were displaced. It will cost more than \$1 billion to rebuild collapsed tunnels, and more than \$1 billion to rebuild the PATH train station, which served the World Trade Center. The damaged streets around the area will also need to be repaired.

Source: Working Together to Accelerate New York's Recovery: Economic Impact Analysis of the September 11th Attack on New York City (New York City Partnership and Chamber of Commerce, November, 2001)

Case Studies of Disasters and Economic Impact

25 minutes

Show Visuals 3-23 and 3-24.

Use recent case studies to illustrate key concepts about disasters and their economic impact.

You can refer to the World Trade Center case study (visuals 3-23 and 3-24) or the Hurricane Floyd Economic Impact Assessments (Section 4: Post-Disaster Economy) in the Toolkit for either North Carolina (visuals 3-25 and 3-26) or Virginia (visual 3-27).

Show Visual 3-25.
(Hurricane Floyd-NC)

Economic Impact: World Trade Center

- ◆ Commercial space
 - Declining demand in immediate area
 - 30% office space lost in Manhattan
 - Relocating businesses rent increases – up to 150%
- ◆ Sluggish retail sector
 - 10% reduction

3-23

Economic Impact: World Trade Center

- ◆ Restaurant revenue decrease (20 – 30%)
- ◆ Tourism decline nationwide
 - 500K job losses
 - \$12.5 billion losses in international tourism
- ◆ Job/Revenue/Losses
 - \$795 million revenue loss
 - 55,000 job losses

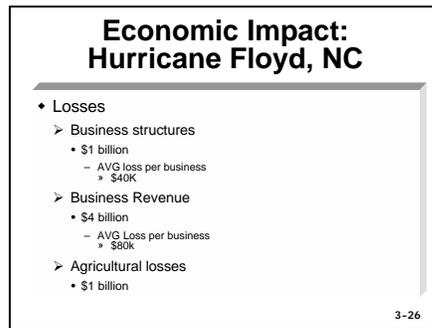
3-24

Economic Impact: Hurricane Floyd, NC

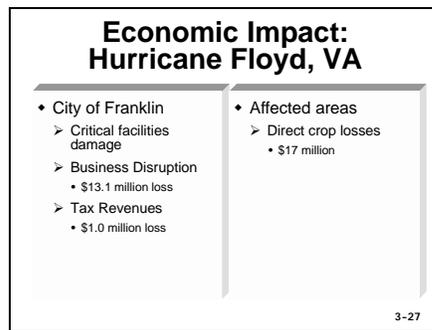
- ◆ Coastal hotels and restaurants
 - Business revenue down 40-50% (1 month)
- ◆ Infrastructure impact
 - Lost production
 - Road closures
 - Loss of water and power

3-25

Show Visual 3-26.



Show Visual 3-27.
(Hurricane Floyd-VA)



**SEISMIC RETROFITTING AVOIDS BUSINESS DISRUPTION:
ANHEUSER-BUSCH, LOS ANGELES, CA**

Mitigation saved the Anheuser-Busch facility in Los Angeles after the Northridge Earthquake. The Anheuser-Busch Engineering Department retrofitted the plant to conform to the Los Angeles seismic code – and the plant was functioning within days after the earthquake. The Anheuser-Busch business interruption cost could have exceeded \$300 million from the Northridge Earthquake had seismic strengthening been omitted. This is more than 15 times the actual cost of the brewery’s loss control program.

ECONOMIC IMPACTS OF THE WORLD TRADE CENTER TERRORIST ATTACK: NYC

Various estimates suggest that the New York City's economy will sustain a gross loss of approximately \$83 billion due to the attack, including \$30 billion in capital losses, \$14 billion in cleanup and related costs and \$39 billion in loss of economic output to the economy.

Rising Vacancy Rate for Commercial Space

Vacancy rates rose to more than 8% in the last quarter of 2001 which reflects declining demand and the availability of space after 9/11/2001. Lower Manhattan lost almost 30% of its office space after the attack. Businesses having to relocate will experience rent increases up to 150% compared to their favorable long-term leases in the World Trade Center vicinity. Many will be priced out of the market.

Displaced Tenants Moving

Approximately 75% of the dislocated firms have left Manhattan and moved to the New Jersey waterfront. The remainder went to Connecticut, Westchester, and Long Island.

Sluggish Retail Sector

For the period from September to December immediately after the attack, retail sales were 10 percent lower than the rest of the nation. This was attributed to lowered customer volume, which was also hampered by access restrictions and public commuter transportation problems, and fears about personal safety.

Restaurant Trade Revenues Decline

Revenues for restaurants declined 20 to 30%, with the steepest declines in Lower Manhattan. Approximately 30 restaurants have closed permanently, while another 37 have temporarily shut down. In mid-town New York, restaurants also suffered a 30 to 50% decline because of the decrease in tourism.

Lost Jobs

The attack was estimated to have cost the city an estimated 125,000 jobs during the last quarter of 2001. Though some jobs will return, by the end of 2003, the city will have lost 57,000 jobs permanently.

Small Business Sector

In the World Trade Center complex, 707 small businesses were destroyed or suffered extensive damage. In the 45 days immediately following the attacks, 3,400 small businesses lost a total \$795 million due to their inaccessibility in the vicinity near Ground Zero. Small businesses lost an estimated \$101 million in capital losses of destruction of inventory and depreciable assets. During the first 9 months after the attack, it was estimated that as many as 55,000 small business jobs could be lost, with the largest concentration in Lower Manhattan. A Downtown Alliance survey reported that downtown businesses were closed an average of 8 days, with average weekly losses of \$25,123.

Loss of Travel and Tourism Revenue and Jobs Nationwide

More than 500,000 job losses in travel and tourism have been attributed to the lingering effects of the terrorist attacks. Both domestic and international travel has declined considerably. According to the U.S. Conference of Mayors, loss of international tourism has cost U.S. cities more than \$12.5 billion dollars.

Source: Working Together to Accelerate New York's Recovery: Economic Impact Analysis of the September 11th Attack on New York City (New York City Partnership and Chamber of Commerce, November, 2001)

Elements of an Economic Vulnerability Analysis

20 minutes

An economic vulnerability analysis identifies economic centers where hazard risks could have major impacts on your local economy.

What an Economic Vulnerability Analysis Covers

Show Visual 3-28.

Discuss what an economic vulnerability analysis covers.

Elements: Economic Vulnerability Analysis

- ◆ Geographic
 - What can happen as a result of the business location?
- ◆ Technological
 - What could result from a process or system failure?

3-28

Geographic

What can happen as a result of the business location? Think about such things as:

- ◆ Proximity to floodplains, seismic faults, and dams
- ◆ Proximity to companies that produce, store, use, or transport hazardous materials
- ◆ Proximity to major transportation routes and airports (storage of jet fuel)
- ◆ Proximity to nuclear power plants

Technological

What could result from a process or system failure?
Possibilities include:

- ◆ Fire, explosion, hazardous materials incident
- ◆ Safety system failure
- ◆ Telecommunications failure
- ◆ Computer system failure
- ◆ Transportation accident

CASE STUDY: CHICAGO FREIGHT TUNNEL LEAK

In one of Chicago's strangest accidents, a piling driven into the Chicago river bottom caused a leak in one of Chicago's underground freight tunnels. The resulting inrush of water spread throughout much of the system's 50 miles of tunnels, flooding subbasements and disrupting utility service throughout the Loop (subway system). No significant injuries were reported, and due to the subterranean nature of the accident, spectators had little to see. Prompt response by government agencies emptied the tunnels of water and restored utility service.

Source: www.chipublic.org/004chicago/disasters/tunnel_flood.html

Show Visual 3-29.

Continue discussing what an economic vulnerability analysis covers.

Elements: Economic Vulnerability Analysis

- ◆ Physical
 - > What types of emergencies could result from the design or construction of the facility?
 - > Does the physical facility enhance safety?
- ◆ Human Error
 - > What emergencies can be caused by employee error?
- ◆ Terrorism



3-29

Physical

What types of events could result from the design or construction of the facility? Does the physical facility enhance safety? Consider:

- ◆ The physical construction of the facility
- ◆ Hazardous processes or byproducts
- ◆ Facilities for storing combustibles
- ◆ Layout of equipment (HVAC, shelving, gas lines)
- ◆ Lighting
- ◆ Meeting and/or surpassing building code
- ◆ Structural and nonstructural mitigation
- ◆ Evacuation routes and exits
- ◆ Proximity of shelter areas

List on easel pad.

Human Error

What events can be caused by employee error?

Ask for significant examples from their community.

Terrorism

What acts of terrorism are likely or plausible?

Conducting an Economic Vulnerability Analysis

Show Visual 3-30.

Describe the first step in conducting an economic vulnerability analysis.

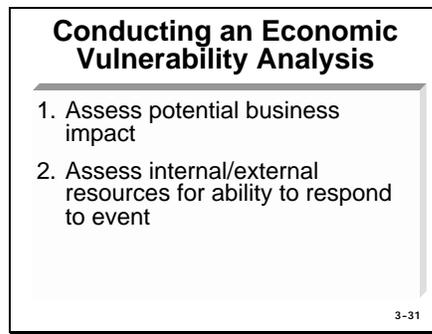


1. Assess the potential business impact of elements such as the following:

- ◆ Business interruption
- ◆ Employees unable to report to work
- ◆ Employees or customers unable to reach facility
- ◆ Imposition of fines and penalties or legal costs
- ◆ Interruption of critical supplies
- ◆ Interruption of product distribution

Show Visual 3-31.

Describe the second step in conducting an economic vulnerability analysis.



2. Assess internal/external resources for ability to respond to event

Consider each potential disaster from beginning to end and each resource that would be needed to respond. For each event ask these questions:

- ◆ Do we have the needed resources and capabilities to respond?
- ◆ Will external resources be able to respond to us for this event if we need them, or will they have other priority areas to serve?

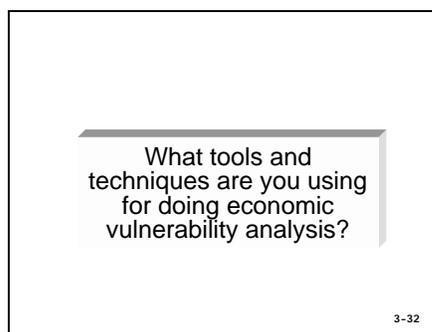
When assessing resources, remember that community emergency workers – police, paramedics, firefighters – will focus their responses where the need is greatest or they may be victims themselves and be unable to respond immediately. That means response to your facility or business community may be delayed.

Tools and Techniques for Economic Vulnerability Analysis

30 minutes

Show Visual 3-32.

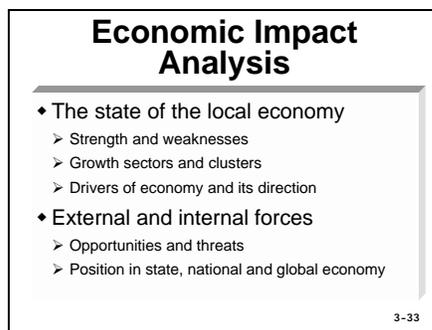
Ask participants what tools and techniques they are using in their communities for doing economic vulnerability analyses. Record their answers on an easel pad.



Economic Impact Analysis

Show Visual 3-33.

Discuss the purpose of the economic impact analysis.



The objective of the economic impact analysis (EIA) is to collect, interpret, and present data that outlines key characteristics of the area. You are essentially interested in collecting data about:

- ◆ The state of the local economy
 - What are the area's strengths and weaknesses
 - What are the growth sectors and clusters
 - What is driving the economy and where is it headed?

- ◆ External trends and forces
 - What are the opportunities and threats?
 - How is the region positioned in the state, national, and global economies?

Ideally, this information should be collected before a disaster.

Explain how FEMA/EDA conduct post-disaster EIAs.

Use the Economic Impact Assessment cases in the Toolkit to relate your key points.

Post-Disaster EIA

If the potential impact from a natural disaster is perceived to be significant, FEMA may task EDA to undertake a rapid assessment of the economic effects on businesses or agricultural activity. The objective of the assessment reports is to:

- ◆ Determine the direct and indirect economic impacts of the disaster through surveys of the affected businesses
- ◆ Develop conclusions and wide-ranging recommendations to accelerate business recovery and support the creation of sustainable, disaster-resistant business enterprises.

Show Visual 3-34.

Briefly review the steps for doing a post-disaster economic impact analysis.

Post-Disaster EIA

- ◆ Rapid assessment of economic effects on businesses
- ◆ Steps
 - Determine scope of study
 - Characterize the pre-disaster economy
 - Determine impacts of study

3-34

Step 1: Determine the scope of the study

The first step in doing an EIA is to determine the scope of the study, such as whether the study will cover the entire state, all of the communities impacted, or a sample of the communities. This decision will often be based on the resources available and the time frame required for results.

Determining which communities to study may be done through a review of the following sources:

- ◆ Preliminary Damage Assessment Reports (best available tool for assessing losses at the county and municipal level).
- ◆ Community Relations Reports (provides anecdotal data about how the data has affected communities – prepared by FEMA’s Community Relations teams)
- ◆ Recommendations from the state and local emergency management offices
- ◆ Surveys of damage to local businesses

Step 2: Characterize the pre-disaster economy

The next step involves collecting data about the pre-disaster economy of the areas under the study (State, counties, selected communities).

This involves collecting baseline data, which include a review of any of the following data:

- ◆ Industry sectors (Standard Industrial Classification system)
- ◆ Employment and productivity levels, wages and salaries (Bureau of Labor Statistics, state and local data sources)
- ◆ Demographic data (U.S. Census Bureau, state and local data sources)

Step 3: Determine the impacts of the disaster

Depending on the nature of the EIA, the study may look at only short-term, or may examine both short- and long-term effects of a disaster. This information may be collected at a community level or may be aggregated at the local and/or state level.

Short-Term (Direct) Impacts

The effects of direct impacts of a disaster may be assessed through interviews with those affected, a survey of those affected, or through data analysis of economic sources. Be sure to think “out of the box”/creatively.

An assessment of the short-term impacts may include a review of any of the following data sources:

- ◆ Losses associated with destruction of capital, including repair and replacement cost for damaged and destroyed buildings
- ◆ Estimates of clean-up costs (demolition, debris removal, medical treatment and victim assistance)
- ◆ Economic losses associated with the drops in employment, and productivity revenues such as tourism
- ◆ Tax base losses
- ◆ Relocation expenses

Examples:

- ◆ **Impact to community**
- ◆ **Image**
- ◆ **Public Relations**

The direct impacts offer a snapshot of the immediate post-disaster situation; it does not take into account the long-term effects.

Long-Term (Indirect) Impacts

Indirect economic impacts are defined as the long-term economic impacts on a region that occur as a result of direct economic losses. This could include such things as a change in unemployment or sales tax revenues.

Indirect economic impacts from disasters take months, even years, to be fully identified.

Time Series Analysis

Mention how time series analysis helps in an EIA.

Time series analysis provides the basis for understanding how an economy is evolving over time, and in relation to others. It involves plotting data trends over time for one or more geographic areas or units (e.g. industries) of analysis. It may be part of an economic impact analysis.

Cross-Section Analysis

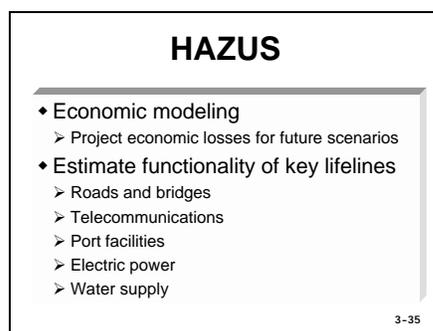
Mention how cross-sectional analysis helps in an EIA.

Cross-sectional analysis allows you to understand the structure of the economy. It examines the distribution of one variable by other variables at one point in time, such as the distribution of jobs by industry, of population by race, or income by source. It may be a part of an economic impact analysis.

HAZUS

Show Visual 3-35.

Discuss the role of HAZUS in doing an economic vulnerability analysis.



HAZUS is an important tool in economic modeling to help you forecast how an economy might behave under certain conditions. HAZUS employs national averages for losses from past events which can be used to project potential economic losses for future scenario events. HAZUS can also be used to estimate the functionality of key lifelines, including roads, bridges, telecommunications, port facilities, electric power and water supply. This type of information is important in assessing the impact of an event on businesses, suppliers, employees, and customers.

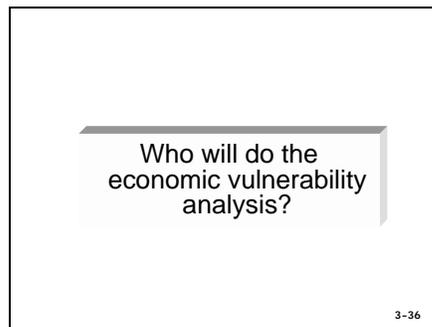
Surveys

Point out how a survey of damages to local businesses can be used as a tool in conducting an economic vulnerability analysis. Refer participants to the sample Jackson County, Oregon survey in their Toolkit or the survey used in an economic analysis in Hurricane Floyd EIA Report.

This is a simple method for surveying businesses in the local area about key variables. After a disaster, this might involve asking them questions about the extent of their losses and how they have been impacted.

Show Visual 3-36.

Pose the following question to the participants. Stress the vital role each sector plays in making the community more economically stable.



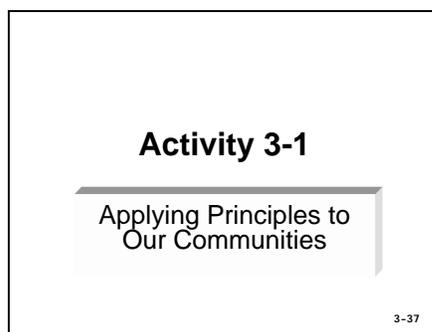
The key to the economic vulnerability analysis is having knowledgeable, capable individuals who are committed to making the community disaster-resistant and in protecting the economic base. Each community will have a wide range of leaders, with a diversity of capabilities.

Activity 3-1: Applying Principles to our Communities

60 minutes

Show Visual 3-37.

Ask participants to complete the following exercise.



During the debriefing, ask one or more of the discussion questions of the class.

Discussion Questions

- ◆ What multi-sector relationships have been most beneficial for economic disaster resistance?
- ◆ Overall, what are the tools that most communities are using for economic analysis? What are the barriers to using others?
- ◆ Where do communities as a whole stand regarding doing economic vulnerability analysis?
- ◆ How could you act as a change agent when you return to your community to ensure that resources are directed toward doing an economic vulnerability analysis?

Activity 3-1: Applying Principles to our Communities

Time

20 minutes (individual)

20 minutes (small group discussion)

20 minutes (class discussion)

Purpose

The purpose of this exercise is to assist you in better understanding the existing multi-sector relationships and their role in economic disaster resistance and in identifying the tools and techniques now being used in your community or region.

Directions

- 1.** Think about your community and answer the following questions, using the worksheet provided. If you can't answer a particular question, think about those in your community who would have that information and write it down. This can serve as an indicator of where you may need to strengthen your knowledge base about that sector or initiate a relationship with that person or entity. You will have 20 minutes to answer the questions.
- 2.** After 20 minutes, discuss your findings with your table group members. Focus your discussion on identifying successful relationships and weaknesses in various communities' efforts in doing economic vulnerability analysis.
- 3.** When the class reconvenes, you'll have an opportunity to explore these issues further.

ACTIVITY 3-1. APPLYING PRINCIPLES TO OUR COMMUNITIES

1. Does your community have a comprehensive economic development plan?
If you do not know, how can you find out?

2. Does the plan address the community's vulnerability to hazards?
If you do not know, how can you find out?

3. If you have a plan and it addresses hazards, does it address economic vulnerabilities?

4. Which groups in your community are most active in disaster critical areas, such as those related to business, economic growth, disaster management, safety, and infrastructure protection?

5. Which groups, including the ones listed in the previous question as well as any additional ones, are actively working together now for economic sustainability and disaster resistance?

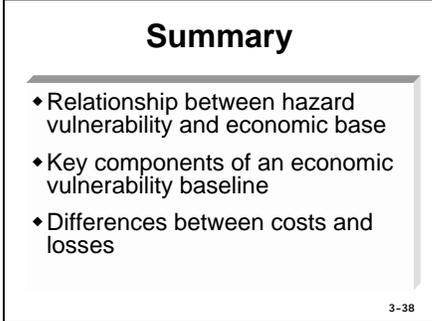
6. Describe how they are working together?

Summary

3 minutes

Show Visual 3-38.

Summarize the unit.

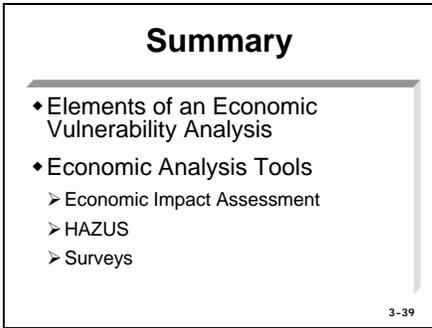


Summary

- ◆ Relationship between hazard vulnerability and economic base
- ◆ Key components of an economic vulnerability baseline
- ◆ Differences between costs and losses

3-38

Show Visual 3-39.



Summary

- ◆ Elements of an Economic Vulnerability Analysis
- ◆ Economic Analysis Tools
 - Economic Impact Assessment
 - HAZUS
 - Surveys

3-39