

Session No. 4

Course Title: Social Dimensions of Disaster, 2nd edition

Session 4: Overview of Hazards and Disasters in the U.S.A.

1 hr.

Objectives:

- 4.1 Describe the annual hazard losses within the U.S.A.
- 4.2 Explain key variations in the hazard distributions among the 50 states
- 4.3 Identify the estimated losses from eight types of hazard events
- 4.4 Identify ten major natural disaster events
- 4.5 Differentiate among three measures of disaster intensity
- 4.6 Identify four major technological disasters
- 4.7 Identify three major conflict based disasters
- 4.8 Differentiate among four types of disaster impacts
- 4.9 Illustrate three issues in the measurement of disaster losses.

Scope:

In this session students will be introduced to the full range of hazards and disasters within the U.S.A. Key variations among the states, estimated national losses, and examples of natural, technological, and conflict based disaster events will be examined. Types of disaster impacts and some of the problems in measuring disaster losses will conclude the session.

Readings:

Student Reading:

Mileti, Dennis S. 1999. *Disasters By Design: A Reassessment of Natural Hazards in the United States*. Washington, D.C.: Joseph Henry Press. (Chapter 3 only; “Losses, Costs, and Impacts,” pp. 65-104).

Professor Reading:

Mileti, Dennis S. 1999. *Disasters By Design: A Reassessment of Natural Hazards in the United States*. Washington, D.C.: Joseph Henry Press. (Chapters 2 and 4 only; “Scenarios of Sustainable Hazards Mitigation” and “The Inactive Structure of Hazard”).

Background References:

Federal Emergency Management Agency. 1997. *MultiHazard Identification and Risk Analysis*. Washington, D.C.: Mitigation Directorate, Federal Emergency Management Agency.

White, Gilbert F. and J. Eugene Haas. 1975. *Assessment of Research on Natural Hazards*. Cambridge, Massachusetts: MIT Press.

General Requirements:

Student Handouts (4-1 through 4-4 appended).

Overheads (4-1 through 4-5 appended).

See individual requirements for each objective.

Objective 4.1 Describe the annual hazard losses within the U.S.A.

Requirements:

Start this session with the student exercise; proceed with lecture material specified below.

Use Overheads 4-1 and 4-2.

Remarks:

- I. Introduction.
 - A. Remind students of exercise procedures.
 1. **Divide** class into four groups.
 2. **Appoint** student roles for each group.
 - a. Chair.

b. Reporter.

c. Timer.

3. **Announce** time limit: 5 minutes.

B. **Display** Overhead 4-1; “Workshop Tasks”.

C. **Review** tasks.

1. Group 1 – What is the annual hazard loss within the U.S.A. according to Mileti?
2. Group 2 – What are three key variations in the distributions of hazards among the 50 states?
3. Group 3 – According to Mileti, there are several types of disaster impacts; specify three and provide two illustrations of each.
4. Group 4 – What are three issues or problems in the measurement of hazard losses?

D. **Start** discussion.

E. **Stop** discussion.

F. **Display** Overhead 4-2; “Session Overview.”

1. Briefly review the topics.
2. This session will cover numerous topics.
3. Message is “big picture,” not statistical detail
4. Mileti (1999) chapter and Student Handouts will be future resources for detail.

II. Annual hazard losses.

A. **Explain context** of Mileti (1999) book.

1. First national assessment by White and Haas (1975).
2. Mileti **coordinated** over 100 researchers.
- 3.. Study time period: January 1, 1975 – December 31, 1994.

B. Group 1 report (2 minutes)

C. **Elaborate** as necessary with examples from assigned reading, pp. 66-69.

1. **Deaths** from natural hazards: 24,000 people (January 1, 1975 through December 31, 1994).
2. **Weekly average**: 24 deaths.
3. **Injuries**: approximately 96,000 (96 per week).
4. **Financial**: between \$230 billion and \$1 trillion (1994 dollars).

Supplemental Considerations:

The idea of this exercise and review of these numbers is to stimulate student awareness of the **current difficulties** in assessing the actual extent of loss resulting from disaster. Also, they should obtain a rough idea of current **estimates**. Finally, the implicit message is, how can a social problem **be identified** if no one knows the extent of loss? This theme should be raised in different ways throughout the session.

Objective 4.2 Explain key variations in the hazard distributions among the 50 states.

Requirements:

None

Remarks:

- I. Exercise Report.
 - A. Group 1 report (2 minutes).
 - B. Highlight Mileti (1999) discussion, i.e., “Hazard Losses By State” (pp. 94-96).
- II. Elaboration.
 - A. **Highlight**, as necessary, these patterns (Mileti, 1999, pp. 95-96).
 - B. **Southern states** are most hazard prone (frequency and dollar loss) (p. 95).
 - C. **Most** hazardous state: Texas.

- D. Also **high** hazard: Florida, Georgia and Ohio.
- E. **Least** hazardous: Vermont, Delaware, Rhode Island.
- F. **Multi-hazard** measure revealed: one half of all states are low hazard.
- G. **Refer** students to Figure 3.3 (assigned reading, p. 96).
 - 1. High hazard: Florida, Texas, and California.
 - 2. Medium hazard: southern mid-west; southeast; and lower section of New England, e.g., Pennsylvania and New York.

Supplemental Considerations:

Depending on the course context, this section may be **brief or expanded** considerably. Typically, however, these patterns may best be **related** to the broader issue of “**claims-making**” **difficulties** especially in geographic regions that are lower risk.

Objective 4.3 Identify the estimated losses from eight types of hazard events.

Requirements:

Overhead 4-3.

Remarks:

- I. Introduction.
 - A. **Highlight** “disasters” vs. “hazard event”.
 - 1. Mileti (1999) uses these terms **interchangeably**.
 - 2. At times Mileti refers to “hazard losses.” This refers to **actual events**, like numerous hail storms.
 - 3. **Remind** students of definitions from prior session.
 - a. Hazard is a **potential**.
 - b. Disaster is an **event**.
 - c. **Hazard loss** reflects actual events.

d. **Example:** hail is one hazard (potential) that threatens most of the U.S.A.

B. **Display** Overhead 4-3; “17 Types of Hazard”.

1. Mileti’s (1999) research documented **loss estimates** for each of these.
2. Mileti (1999), reflecting an **environmental perspective**, divided the 17 types of hazard into **two categories**.
 - a. **Climatological**, e.g., drought and dust storm, extreme cold.
 - b. **Geophysical**, e.g., earthquakes.
3. Disaster researchers have tended to emphasize **extreme events**, like damaging earthquakes, **not aggregated hazard losses** resulting from expansive soils, frost, etc.
4. Differences in **policy perspectives**:
 - a. Looking at **extreme events** often results in an emphasis on **response** and preparedness.
 - b. Focusing more broadly on **environmental hazards** results in policy initiatives emphasizing **mitigation**.

C. Briefly **review** the loss data for **several** of the 17 hazards; **emphasize** student use of Mileti’s chapter (1999) as a future resource.

D. **Summaries** below were **adapted** from Mileti 1999, pp. 69-89.

E. **All data** refer to the 20 year study period, i.e., 1975-1994.

II. Drought and dust storm.

A. **Deaths:** 26.

B. **Injuries:** 151.

C. **Property loss:**

1. Drought: estimates vary between \$600 million and \$6 billion.
2. Dust storm: between \$2 and \$22 million.
3. Crop loss: \$7.6 to \$76 billion.

- III. Earthquake.
 - A. **Deaths:** 174 or more (based only on worst cases).
 - B. **Injuries:** 14,147.
 - C. **Property loss:** \$38.6 billion.

- IV. Extreme Cold.
 - A. **Deaths:** 271.
 - B. **Injuries:** 522.
 - C. **Property loss:** 1989 only – between \$700 million to \$7 billion.

- V. Flood.
 - A. **Deaths:** between 1,600 to 2,310.
 - B. **Injuries:** not reported.
 - C. **Property loss:** between \$19.6 and \$196 billion.

- VI. Fog.
 - A. **Deaths:** 29 (**inconsistent** with data from National Highway Traffic Safety Administration which reported 6,804 deaths in “fog-related” traffic accidents from 1982 to 1991).
 - B. **Injuries:** 249 (1987 to 1994 only).
 - C. **Property loss:** \$2.2 to \$22 million.

- VII. Hail.
 - A. **Deaths:** 19.
 - B. **Injuries:** 598.
 - C. **Property loss:** between \$2.6 and \$26 billion.

- VIII. Heat.
 - A. **Deaths:** 674.

- B. **Injuries:** not reported (296 in Georgia during 1986).
 - C. **Property loss:** between \$1.8 and \$18 billion.
- IX. Hurricane and Tropical Storm.
 - A. **Deaths:** 196.
 - B. **Injuries:** 4,632.
 - C. **Property loss:** between \$11 and \$111 billion.
- X. Ice, Sleet and Snow.
 - A. **Deaths:** 863.
 - B. **Injuries:** 5,292.
 - C. **Property loss:** between \$4.8 and \$48 billion.
- XI. Landslide, Subsidence, and Expansive Soils.
 - A. **Deaths:** 3.
 - B. **Injuries:** 2.
 - C. **Property loss:** between \$11 and \$110 million.
- XII. Lightning.
 - A. **Deaths:** 1,444.
 - B. **Injuries:** 6,158.
 - C. **Property loss:** between \$41 and \$4.1 billion.
- XIII. Snow Avalanche.
 - A. **Deaths:** 340 (based on FEMA estimate of 17 deaths annually).
 - B. **Injuries:** not reported.
 - C. **Property loss:** between \$100,000 to \$1 million.
- XIV. Tornado.

- A. **Deaths:** 1,090 (*Storm Data*).
 - B. **Injuries:** 23,507 (*Storm Data*).
 - C. **Property loss:** between \$5.8 and \$58 billion.
- XV. Tsunami (tidal wave).
- A. **Deaths:** none reported during 20 year study period.
 - B. **Injuries:** none reported.
 - C. **Property loss:** none reported.
 - D. On average, the Hawaiian Islands experience one annually; a major one hits every seven years.
- XVI. Volcano.
- A. **Deaths:** 60 (eruption of Mount St. Helens in Washington State; May 1980).
 - B. **Injuries:** not reported.
 - C. **Property loss:** \$1.5 billion (Mount St. Helens).
- XVII. Wildfire.
- A. **Deaths:** 10.
 - B. **Injuries:** 182.
 - C. **Property loss:** between \$13.7 and \$137 million.
- XVIII. Wind.
- A. **Deaths:** 649.
 - B. **Injuries:** 6,670.
 - C. **Property loss:** between \$5.8 and \$58 billion.

Supplemental Considerations:

Mileti's data provide students with one type of **broad overview** of the hazards confronting policy makers. This segment of the session should reveal to them the

inadequacies in current data bases, however. Emphasize the difficulties in **focusing public attention** on disaster as a social problem with such poor quality data.

Objective 4.4 Identify ten major natural disasters.

Requirements:

Student handout 4-1.

Remarks:

- I. Introduction.
 - A. **Distribute** Student Handout 4-1 “Major U.S.A. Disaster Events”.
 - B. Student **resource**, not a memorization exercise.
 - C. **Review** the Handout briefly (as noted below).
- II. Earthquakes.
 - A. **Most violent** in U.S.A. history: New Madrid, Missouri.
 1. Seven states at risk.
 - a. Illinois.
 - b. Indiana.
 - c. Tennessee.
 - d. Kentucky.
 - e. Arkansas.
 - f. Mississippi.
 - g. Missouri.
 2. During last quake, Memphis was a military post.
 3. Population at **risk** today exceeds 12 million.
 4. Numerous **natural gas pipelines**, e.g., Pittsburgh, Philadelphia, New York.

5. Detailed case study, see Drabek et al. 1983, pp. 61-92.
- B. Note **impact measures** (R, i.e., Richter magnitude scale); next section of this session.
- III. Floods.
- A. 1993, **most costly** in U.S.A. history.
- B. Many **exacerbated** by dam failures, e.g., Johnston, Pennsylvania (1989; 2,209 deaths) (see Student Handout; “Major U.S.A. Technological Disasters and Emergencies”, Section IV; “Dam Failures”).
- C. **Most costly** U.S.A. hazard events overall.
- IV. Hurricanes.
- A. **Loss increase** annually due to coastal development.
- B. 1900, Galveston, Texas; **highest death toll** in U.S.A. history.
- C. 1992, Hurricane Andrew, **most costly** in U.S.A. history.
- V. Tornadoes.
- A. 1925; “Tri-state tornado”; 689 deaths, **largest number** in U.S.A. history.
- B. 1999; City of Moore, Oklahoma, numerous other communities in Oklahoma County and Wichita, Kansas area; over **1,500 buildings destroyed** (FEMA, 1999).
- VI. Tsunamis.
- A. **None** reported in Mileti data base.
- B. 1964; resulting from **Alaskan earthquake**; Valdez, Alaska and Crescent City, California; 122 deaths.
- VII. Wildfires.
- A. 2000 and 2002 wildfires; **drought** related.
- B. **Population invasions** of forest areas has increased hazard.

Supplemental Considerations:

The Student Handout provides a **key resource** for future papers and analyses. Students should identify **two or three events** among several of the disaster types for future reference in workshop exercises. Each of these disasters **illustrate** the “non-routine” quality described by Kreps and Drabek (1996), i.e., short term, intense community focus.

Objective 4.5 Differentiate among three measures of disaster intensity.

Requirements:

Student Handout 4-2.

Remarks:

- I. Introduction.
 - A. **Distribute** Student Handout 4-2; “Four Measures of Disaster Intensity.”
 - B. **Identify** this as a student resource.
 - C. Four measures listed are **used commonly** and **reported** by media outlets frequently.
- II. Richter Magnitude Scale.
 - A. **Common** indicator of earthquake **magnitude**.
 - B. **Logarithmic** basis results in marked increases across small number change.
 - C. **Example:** R6 is 31 times greater than R5.
 - D. Northridge California quake was R6.7 (1994).
 - E. Loma Prieta quake in San Francisco Bay area was R7.1 (1989).
- III. Modified Mercalli Intensity Scale.
 - A. **Used occasionally** by media to **compare** damage levels.
 - B. **Review** a few of the levels listed.
- IV. Saffir/Simpson Damage Potential Scale.
 - A. **Frequently used** to communicate hurricane threat.

- B. **Five categories** are used reflecting variations in:
 - 1. Wind speed.
 - 2. Surge height.
 - 3. Damage potential.
- C. Hurricane Andrew (1992) was a Category 5 hurricane.
- V. Fujita Tornado Scale.
 - A. **Commonly used** measure for tornado intensity.
 - B. **Usually reported** by media **after** damage survey estimates are completed.
 - C. Scale varies across **six** categories listed.
 - D. Tornado damage in the City of **Moore, Oklahoma** in May, 1999, reflected **Category 5** level.
 - E. **Highlight** relative frequency of tornadoes of differing intensities (Section IV.D. of Handout 4-2).

Supplemental Considerations:

Depending on professor interest and course context, this section may be **very brief**. The message is that these four measures are **reported frequently** and students may use Handout 4-2 as a **future resource** for interpretation.

Objective 4.6 Identify four major technological disasters.

Requirements:

Student Handout 4-3.

Remarks:

- I. Introduction.
 - A. While noted, Mileti (1999) discussed **technological** hazards only **minimally** (pp. 89-90 and 92-94).
 - B. **Toxic Release Inventory (TRI)**.

1. Started in 1987.
2. Documents toxic releases from industrial sources.
3. More than 22,000 TRI facilities.

C. **Transportation** incidents:

1. Transportation related hazardous materials spills estimated at 1,000 incidents per year (Mileti 1999, p. 89).
2. Transportation included highway, rail, air, and water.

D. **National Priority List (NPL)**.

1. 1,270 remediation sites.
2. Former industrial sites that pose community health hazard.
3. Superfund legislation enacted in 1980 provides financial support for clean-ups.

II. Seven Types of Technological Disasters and Emergencies.

A. **Distribute** Student Handout 4-3; “Major U.S.A. Technological Disasters and Emergencies.”

1. Students should use as a **resource**.
2. Briefly review the **five categories** and highlight one or two examples of each.

B. **Shipwrecks** and related explosions.

1. Mont Blanc collision with a Belgian relief ship.
 - a. Not included on Handout, occurred near docks of Halifax, Nova Scotia, Canada.
 - b. Discussed in Session No. 3.
 - c. Date: December 6, 1917.
 - d. Case study by Samuel Henry Prince.
 - e. First **social science study** of disaster.

2. Titanic (1919; 1,503 deaths).
3. USS Cole (2000; 17 deaths).
 - a. Terrorist caused.
 - b. Like the air crashes during the 9-11 attacks, this event may be cross-listed in various summary reports.

C. Airplane crashes.

1. Egypt Air.
 - a. Date: 1999.
 - b. Deaths: 217.
 - c. Location: departed New York and crashed near Nantucket Island.
 - d. Emergency management issue: international passengers.
2. American and three United planes.
 - a. Date: 2001.
 - b. Location: World Trade Center, Pentagon and field near Shanksville, Pennsylvania.
 - c. Terrorist attacks.
 - d. Like the USS Cole incident, the 9-11 attacks are cross-listed as airplane crashes in various summary reports.

D. Railroad wrecks.

1. Woodbridge, New Jersey.
 - a. **Deaths:** 84.
 - b. Date: 1951.
2. Mobile, Alabama.
 - a. **Deaths:** 47.

b. Date: 1993.

E. Structural fires and explosions.

1. Chicago, Illinois.

a. **Deaths:** 602.

b. Date: 1903.

c. **Significance:** largest fire caused death toll in U.S.A. history; Iroquois Theater Fire.

2. Boston, Massachusetts.

a. **Deaths:** 491.

b. Date: 1942.

c. **Significance:** impact on fire regulations; Cocoanut Grove Club.

F. Dam failures.

1. Johnstown, Pennsylvania.

a. **Deaths:** 2,209.

b. Date: 1889.

c. **Significance:** highest death toll in U.S.A. history.

2. Buffalo Creek, West Virginia.

a. **Deaths:** 125.

b. Date: 1972.

c. **Significance:** mental health impacts studies extensively; will be reviewed later in course.

G. Hazardous materials incidents.

1. Highway accidents accounted for 82% of total during 1983 through 1990.

2. **More recent study** – 81% of total were highway related, i.e., 5,517 of 6,774 reported in 1997 (FEMA 1997, p. 274).

H. **Radiological materials incidents.**

1. Three Mile Island (TMI).
 - a. Date: 1979.
 - b. Location: Middletown, Pennsylvania.
 - c. Nuclear reactor experienced **loss of coolant** and partial core meltdown.
 - d. Incident triggered **extensive evacuations**, especially pregnant women and children.
2. Chernobyl.
 - a. Date: 1986.
 - b. Location: 62 miles south of Kiev, Ukraine.
 - c. **Significance:** worst reactor incident to date anywhere in world.

Supplemental Considerations:

The key purpose of this section is to expand student awareness of the **risks** that emergency managers confront that stem from **technological** sources. By using Student Handout 4-3 as a **resource**, this message can be communicated quickly. Students should be encouraged to use this **resource** in future class activities and assignments.

Objective 3.7 Identify three major conflict based disasters.

Requirements:

Student Handout 4-4.

Remarks:

- I. Introduction.
 - A. **Distribute** Student Handout 4-4; “Selected Conflict Disasters and Emergencies.”

- B. **Highlight** the absence of these events in Mileti's (1999) review.
 - C. **Emphasize** that the Handout should be used as a **resource** in future work.
 - D. Briefly **review** two examples of each type listed.
- II. Terrorist Attacks.
- A. **1920 Bombing.**
 - 1. Location: New York City, New York.
 - 2. **Deaths:** 35.
 - 3. Cause: crime never solved; Bolshevist or anarchist group suspected.
 - B. **1995 Bombing.**
 - 1. Location: Oklahoma City, Oklahoma.
 - 2. **Deaths:** 168.
 - 3. Cause: Alfred P. Murrah Federal Building was bombed; Timothy McVey found guilty and executed; Terry Nichols remains in prison awaiting outcome of appeals.
- III. Civil Disorder.
- A. **1919 Riots.**
 - 1. Location: Chicago, Illinois.
 - 2. **Deaths:** 38.
 - 3. Cause: racial clash at beach triggered five days of riots.
 - B. **1992 Riots.**
 - 1. Location: Los Angeles, California.
 - 2. **Deaths:** 58.
 - 3. Cause: black resident, Rodney King, allegedly beaten by white police officers; videotape of incident released to media; upon the acquittal of the officers, riots followed.

Supplemental Considerations:

Many students will consider terrorist attacks as **obvious examples** of conflict disasters, especially since the 9-11 experience. These will be explored in the **next session** of this course. The message here, however, is to **broaden** their view of such events. Protests and demonstrations are important civil liberties, but such **events** can **intensify** into riots wherein property destruction occurs and the **safety** of the public is threatened.

Objective 3.8 Differentiate among four types of disaster impacts.

Requirements:

Overhead 4-4.

Remarks:

- I. Exercise Response.
 - A. Group 3 report (2 minutes).
 - B. Following this report, reflecting assigned reading, **elaborate** as necessary.
- II. Four Types of Disaster Impacts.
 - A. **Display** Overhead 4-4; “Four Types of Disaster Impacts.”
 - B. **Individual Impacts.**
 1. Loss of life.
 2. Personal injury.
 3. Injury or death to rescue personnel, e.g., firefighters during 9-11 response.
 4. “The Ripple Effect,” e.g., friends and relatives impacted by loss of victims.
 - C. **Economic Impacts.**
 1. Destruction of homes and businesses.
 2. Employment loss.
 3. Tourism loss.

4. Relocation loss.
5. Livestock.
6. Pets.
7. Crops.
8. Infrastructure, e.g., sewage treatment, library, bridges.

D. Social Impacts.

1. Family relationships.
2. Community symbols, e.g., historic landmarks.
3. Neighbor relationships.
4. Voluntary associations, e.g., school.

E. Institutional Impacts.

1. Governmental Reform.
 - a. **Example:** following the TMI incident, new national regulation was implemented for all nuclear power plants.
 - b. **Example:** following the 9-11 attacks, an Office of Homeland Security was created.
2. Mitigation Programs.
 - a. **Example:** following the 1993 midwest floods, FEMA implemented a “buyout and relocation” program (Mileti 1999, p. 93).
 - b. **Example:** following many tornadoes, local communities have implemented various mitigative programs including “tie-down” requirements for mobile homes and sheltering provisions.
3. Leadership and Political Change.
 - a. **Example:** following the Chernobyl disaster, a Ukrainian political leader gained increased popularity, which in turn,

contributed to support for the Green World Party (Mileti 1999, p. 94).

- b. **Example:** formation of an international commission on nuclear power after the Chernobyl disaster (Mileti 1999, p. 94).

Supplemental Considerations:

Beyond viewing disasters and hazards as **physical matters**, this section expands awareness of the **social dimension**. Some professors may wish to **expand** this section through application and expanded discussion. Through reference to the Student Handouts, e.g., 4-1, 4-3, and 4-4, the range of impacts could be elaborated.

Objective 4.9 Illustrative three issues in the measurement of disaster loss.

Requirements:

Overhead 4-5.

Remarks:

- I. Introduction.
 - A. Group 4 report (2 minutes).
 - B. **Elaborate** as necessary with examples.
- II. Issues.
 - A. **Display** Overhead 4-5.
 - B. **Relate** topics to Group 4 response.
 - C. **Briefly illustrate** each topic as required (see Mileti 1999, pp. 96-100).
 - 1. Assigning values to loss.
 - a. **Example:** lost memorabilia.
 - b. **Example:** destruction of historical monument.
 - 2. Measuring loss.
 - a. **Example:** assessing depreciation.

- b. **Example:** historical value.
- 3. Direct vs. indirect damage.
 - a. **Example:** unemployment because of business closure (direct).
 - b. **Example:** tourism decline following wildfire (indirect).
- 4. Interpretation of loss measures.
 - a. **Example:** use of “standardized” dollars.
 - b. **Example:** population growth vs. absolute damage loss.

Supplemental Considerations:

Although brief, this section introduces students to the **range of difficulties** in assessing disaster losses. When events are compared historically, they will be sensitive to the measurement issues. As such, their understanding is expanded of the full range of disasters and hazards that threaten the U.S.A. Equally important are the **complexities** in risk perception, policy alternatives, and other such matters that **constrain** public perceptions of disaster. Student understanding of the “**non-routine**” nature of disasters as social problems is thereby enriched.

Course Developer References:

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