

# Damage Assessment Methodology

## *An Overview*

# Purpose

To provide disaster managers with comprehensive, standardized information on the **impact of a hazard**.

Information can be used to set priorities and make management for decisions relating to response to a disaster **and to the initial steps leading to recovery.**

# Damage Assessment

- **It is an information-gathering and decision-making process**
- **It should be undertaken in any situation in which the life or well being of persons is being threatened by a disaster event**
- **It enables immediate needs to be identified and analyzed, and thereby saves lives, minimizes injuries, damages and losses.**

# Purpose of DA study

- DA is undertaken to produce appropriate and timely assessment reports in order to mount an effective and efficient response
- It should provide sound information for decision-making
- DA formats should facilitate rapid information collection and transmission
- Different stakeholders should be involved in the design of the format

# Objectives of Damage Assessment

- **Will depend on the type and intensity of the disaster**
- Minor/moderate disasters:
  - Estimate total losses (for reporting and policy purposes)
  - Help develop repair/rehabilitation procedures
- Major disasters:
  - Same objectives as for minor/moderate disasters
  - Also assess extent of damage to buildings and other structures (and its geographical distribution)

# Objectives of Damage Assessment

- **Short-Term (within a few days):**
  - To quickly identify the safe and unsafe buildings
  - To quickly estimate total damage losses (for reporting and policy purposes)
  - To quickly identify status of lifeline buildings and other structures
- **Medium-Term (within a few weeks):**
  - To assess safety status of doubtful category structures
  - To reassess and quantify damage losses
- **Long-Term (few months to years):**
  - To help develop rehabilitation/retrofitting procedures
  - To help identify deficiencies in prevalent technical knowledge and its implementation mechanisms

# Basic Philosophy of DA

- Should be based on international sound-practices
- Should consider the types of structures prevalent in Gujarat
- Should consider the technical skills likely to be available after a disaster
- Should incorporate experiences from recent disasters, particularly the 2001 earthquake and 1998 cyclone disasters

# Damage and Needs Assessment

- Situation (Damage) Assessment - **What has happened** (the effects of the disaster its magnitude and effects on society, the infrastructure and the environment)
- Needs Assessment - **What Needs to be Done** (The level and type of assistance required)



# Real Time Data

## What has happened? (damage assessment)

- Area affected
- Number of people affected
- Mortality & morbidity
- Types of injuries & illnesses
- Characteristics of affected population
- Medical, water, sanitation, nutrition
- Damage to homes & commercial buildings
- Damage to agriculture & food supply system
- Level of local response & capacities
- Level of response by NGOs & other agencies

# An Important Choice

How many reports are required:

- ✓ Flash report?
- ✓ Initial report?
- ✓ Interim reports?
- ✓ Technical reports?
- ✓ Final report?

# Assessment Process

1. Team activation / and provision of equipment
2. Briefing
3. Visual Inspections
4. Assess results and plan field surveys
5. First field surveys of impact and needs

# Assessment Process

7. Decide, plan and monitor response
8. Conduct follow-up detailed and specialist surveys
9. Debriefing
10. Lessons learnt

# Processes in DANA

1. Form assessment team/s
2. Develop Standard Operating Procedures
3. Team equipment and tools
4. Identify information users and needs
5. Design survey forms
6. Identify data collection methods
7. Standard briefing instructions
8. Collect or source baseline information
9. Training/simulation

# 1. Form assessment Teams

- **Multidisciplinary teams**
- **Volunteerism is the essence**
- **Composed of small size, during actual deployment**

## 2. Develop Standard Operating Procedures

- Team activation
- Team roles/individual roles
- Logistics, transport
- Communication
- Staff safety
- Reporting requirements

## 3. Team equipment & tools

- Prepare standard survey team equipment list
- Keep the necessary materials ready
- Orientate the team members on the use of equipments; like setting-up a tent, life jacket, and map reading etc.



## Inspection Team Equipment Checklist

- Area maps (preferably laminated)
- Water soluble markers for laminated maps
- Notebooks or pads
- Pencils/pens
- Binoculars
- Camera and spare film
- Fluids (coffee/tea)
- Rations
- Anti-motion sickness tablets
- Sick bags (for aerial inspection)
- Personal equipment (sunglasses, suitable clothing, caps)

## 4. Identify information needs & users

- Identify needs before hand to save time at the actual time of collection
- Prioritize information needs
  - ✓ Essential
  - ✓ Background
- Who will be the potential users of these information. Information may be useful for media and general public.

## 5. Design survey forms

- Various kinds of reports are needed - technical, official, confidential and those for public release through the media for effective response
- Common format to be developed and used
- Designed by multiple users related to assessment and response
- Design in consultation with specialists in each sector
- Clear
- Easy to complete

## 6. Data collection methods

- ✓ Informal reports
- ✓ Visual inspections
- ✓ Interviews with key informants
- ✓ Special interviews

# Aerial Photography

Damage assessment  
Islamabad Pakistan



ITC, Enschede The Netherlands 2000-2001

Before Earthquake

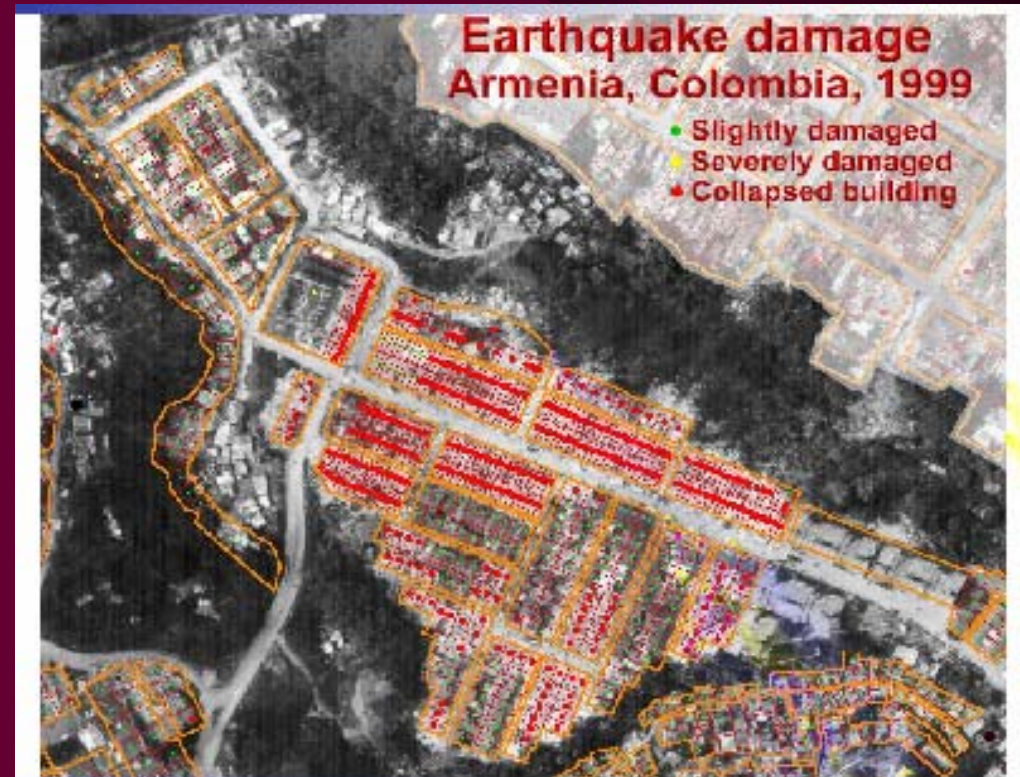


After Earthquake



# Aerial Photography

Natural Hazard Maps prepared with the help of APs



## 7. Standard briefing instructions

- Prepare standard briefing instructions to before sending a survey mission.
- The Team is likely to include people who do not have regular contact with emergency or disaster management organization, or who may be inexperienced in carrying out surveys.

# Standard briefing instructions (cont)

The instructions should briefly outline.

- Purpose of the survey
- Team organization
- Team equipment
- Areas to be surveyed
- Information sectors to be covered
- Standard terms and their meanings
- Techniques for obtaining information
- Reporting requirements



## 8. Collect the Baseline information

- Comparison of survey with Baseline information is valuable for response and recovery plans.
- Specialist government agencies keep baseline information.
- NGOs should include contacts of relevant agencies through which baseline information can be obtained.

# Baseline Data

- Area maps and plans
- Census and statistics agencies
- National, state and local government Maps
- Statistics
- Plans
- Lists of agency staff
- Government resources
- Community capacities

# Baseline Data

- Contact numbers for agencies, donors, superiors, embassies, media, specialized technical experts
- Baseline data should be up-dated from time to time, so that it is relevant and reliable when needed

## 9. Simulations/training

The teams must be given training on following aspects:

- Use of survey forms
- Reporting requirements and process
- Living in the field
- Use of equipment and tools
- Personal safety
- Simulations to enhance learning;
- Team wide debriefing on lessons learnt at the end of each mission;

# Context of Damage Assessment

- Primary focus is on condition of physical assets:
  - Buildings (Residential, Office, Commercial, Lifeline etc.)
  - Roads and Bridges
  - Water supply and sanitation structures
  - Dams and other irrigation structures
  - Industrial facilities (including power plants)
  - Ports and other coastal structures
  - Electrical and Communications system structures

# Primary Focus for DA

- Structures which are owned by multiple agencies of the government
  - Structures that may require government funds for repairs or rehabilitation (including private buildings)
  - Structures that affect a large number of people
- 
- Buildings
  - Bridges
  - Tanks and storage reservoirs (UGSR, GSR & ESR)

# Secondary Focus for DA

- Structures owned or operated by specialised agencies
- Very complex structures that require high-level technical skills for assessment

- Complex industrial facilities
- Port and harbour structures
- Petrochemical infrastructure
- Dams
- Roads

**adpc** Electrical generation & transmission networks, etc.

# Damage Assessment for Buildings

- Method should be dependent on building type
- Very large number of buildings are likely to be damaged in a major disaster – Method should be relatively rapid
- Structural repairs are based on technically detailed evaluation – Method should be technically rigorous
- Method should consider the variations in international “best practices”



# Approximate Equivalence Between Existing Damage Scales for Buildings

Damage Level (%)	HAZUS-99	FEMA-273	EMS-98 / MSK-64	ATC-13	ATC-20
0	No-Damage Limit State (Grade 0)				
10	Slight Damage	Immediate Occupancy	Grade 1	Slight	Green Tag
20			Grade 2	Light	
30		Damage Control			
40					
50	Moderate Damage	Life Safety	Grade 3	Moderate	Yellow Tag
60					
70					
80	Extensive Damage	Limited Safety	Grade 4	Heavy	Red Tag
90		Near Collapse			
100		Partial Collapse		Major	
	Collapse Limit State (Grade 5)				

# Approximate Equivalence Between Existing Damage Scales for Buildings

Damage Level (%)	HAZUS-99	FEMA-273	EMS-98 / MSK-64	ATC-13	ATC-20
0	No Damage Limit State				
1	<div style="border: 2px solid red; padding: 10px; text-align: center;"> <p>Intended for rapid safety assessment</p> </div>	<div style="border: 2px solid red; padding: 10px; text-align: center;"> <p>→</p> </div>	Grade 1	Slight	Green Tag
2			Grade 2	Light	
3					Grade 3
4			Grade 4	Heavy	
5					Grade 5
6			Grade 6	Major	
7					Grade 7
8			Grade 8	Major	
9					Grade 9
10			Grade 10	Major	
100	Collapse Limit State				

# Approximate Equivalence Between Existing Damage Scales for Buildings

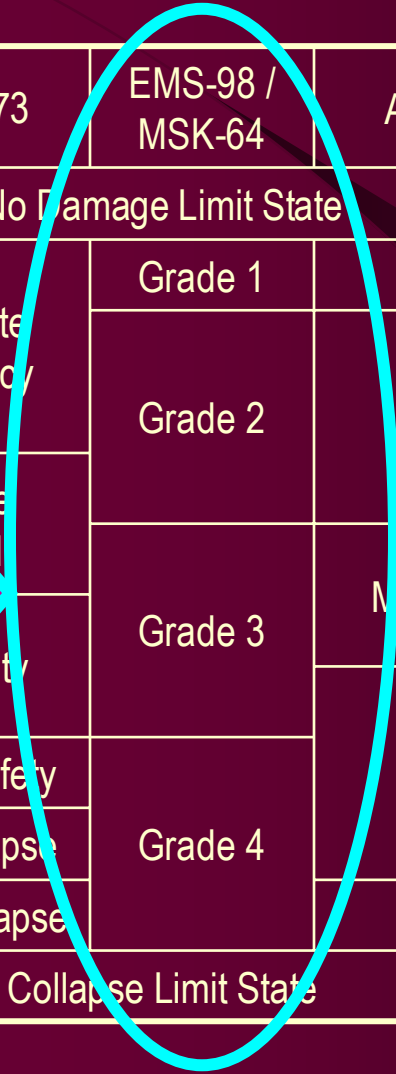
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10		Immediate Occupancy	Grade 2		
20			Life Safety	Grade 3	Major
30		Life Safety		Grade 4	
40	Moderate Damage		Life Safety	Grade 5	Major
50					
60		Extensive Damage	Limited Safety	Grade 6	Major
70	Near Collapse		Grade 7		
80				Near Collapse	Grade 8
90	Partial Collapse	Grade 9			
100			Collapse Limit State	Collapse Limit State	Major

Intended for estimating Value of damage

# Approximate Equivalence Between Existing Damage Scales for Buildings

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30	Life Safety	Grade 3	Moderate	Yellow Tag	
40	Limited Safety	Grade 4	Heavy		
50	Near Collapse		Major	Red Tag	
60	Partial Collapse	Collapse Limit State			

Intended for earthquake intensity estimation





# Proposed Procedure for Damage Assessment for Buildings

- International experience clearly shows that a single “fit-all” methodology not feasible to satisfy all short, medium and long-term objectives
- Three-step methodology has been proposed:
  - Rapid Safety Assessment
  - Detailed Safety Assessment
  - Engineering Evaluation

# Proposed Procedure for Damage Assessment for Buildings

## ■ Rapid Safety Assessment

- Required for **ALL** damaged buildings after a disaster
- Method is based on ATC-20 with suitable modifications

## ■ Detailed Safety Assessment

- Required for all doubtful buildings
- Required for all buildings being considered for compensation
- Method is based on international best practices after elimination of deficiencies in existing practice

## ■ Engineering Evaluation

- Required for buildings considered for engineered rehabilitation/retrofitting

# Damage Assessment for Bridges

- Low redundancy structures – collapse may be sudden and catastrophic
- Structural repairs are based on technically detailed evaluation – Method should be technically rigorous
- Damage assessment likely to be carried out by technical persons from the responsible line departments
- Damage assessment procedure developed based on these considerations



*Thank You*