1. Disaster management: introduction

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Content

- **Disaster management**
- Risk and vulnerability
- Risk management
- Emergency response

Many challenges in Disaster Management

It is difficult and perhaps not feasible

- To prepare for all kinds of disasters
- To predict place, scale, range, of a disaster
- To foreseen number of people affected by a disaster
- To estimate the required rescue units, authorities and specialists
- To predict the information might be needed

Disasters can have different impact …

- Small impact
  - *Fire in faculty of architecture TU Delft, 13th may 2008*
- Medium impact
  - *Airplane crash*
- Large impact
  - *Flood disaster*

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Types of Disasters

- Natural disasters – result from natural forces (flood, earthquakes, volcano activities, cyclones, hurricanes, land-slides, fire, etc.)
- Human systems failure – industrial failures, traffic accidents, human-caused destructions (terrorist attack)
- Conflict-based disasters (humanitarian)– conflicts within a nation, or external conflict directed at it (war, revolution, terrorism, civil disorder, genocide, ethnic cleansing)

Flood Disaster in the Netherlands

1st February 1953

- hurricane-force northwester wind & high spring tides
- 1800 people drowned
- 72.000 evacuated
- thousands of farm animals lost
- 150,000 hectares of land inundated

Photo: B. Th. Boot

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Natural Disasters
Katrina

1000 casualties
2.3 mil wthout power
200 $ billion damages

http://nl.wikipedia.org/wiki/New_Orleans_(stad)

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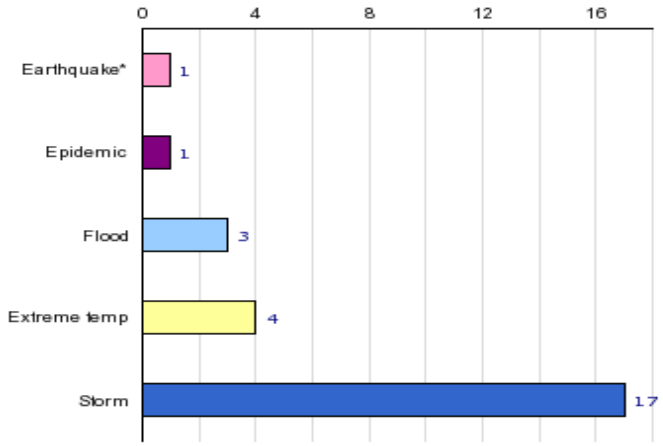
Industrial disasters

13th May, 2000, Enschede

100.000 kg explosives

- Losses: 22 dead (4 firemen), 944 without houses, 350-400 houses destroyed
- 400-500 police, 200-300 fire brigade, 120 people for identification
- Saturday 13 and Sunday 14 May: 200 military people
- 50 people Koninklijke Marechaussee
- 100 man van het Korps Nationale Reserve
- Germany sent 100 people to help
- Region Noord-Rijnland-Westfalen kept in emergency fire brigade trucks and ambulances

Disasters in Netherlands (1984-2008)



Affected People

Disaster	Date	Affected (no. of people)
Storm	1995	250,000
Flood	1993	13,000
Flood	1998	2,000
Epidemic	1999	200
Storm	1997	100
Earthquake*	1992	20
Storm	2005	1
Storm	1984	0
Storm	1985	0
Storm	1986	0

Economic Damages

Disaster	Date	Cost (US$ X 1,000)
Storm	1990	1,200,000
Storm	1995	1,180,000
Storm	2007	550,000
Flood	1998	530,000
Storm	2002	300,000
Storm	1990	180,000
Storm	1990	180,000
Extreme temp.	2005	100,000
Storm	1990	70,000
Storm	1990	60,000

Killed People

Disaster	Date	Killed (no. of people)
Extreme temp.	2006	1,000
Extreme temp.	2003	965
Storm	1990	20
Epidemic	1999	13
Storm	2007	7
Storm	2002	4
Storm	1997	2
Flood	1993	1
Storm	1995	1
Storm	1984	0

Courtesy Prevention Web, http://www.preventionweb.net/

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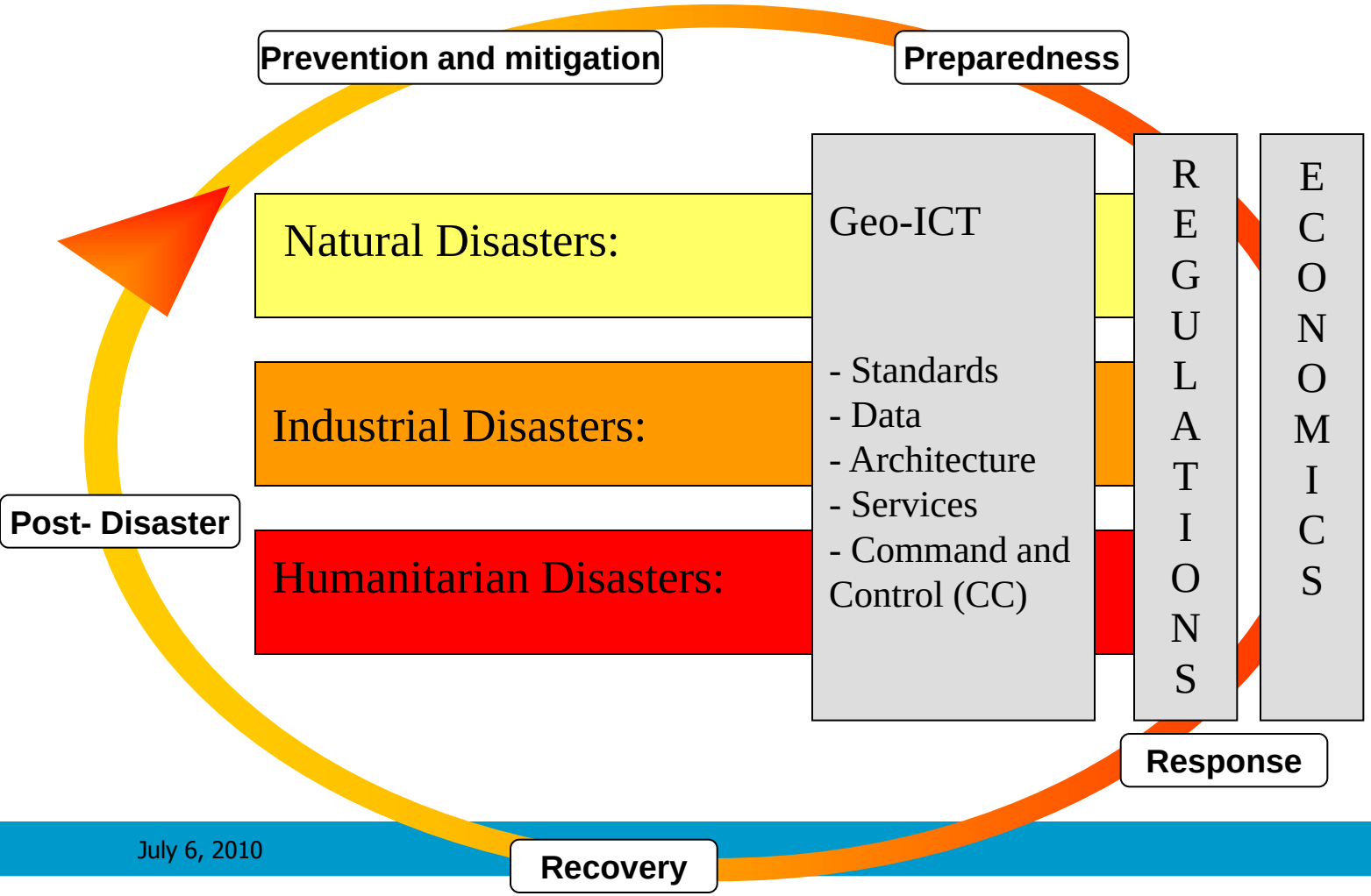
The big picture



Confronting catastrophe (A GIS handbook), R.W Greene, ESRI Press, 2002

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Attention of many politicians

EC7th FW *EC* plans in the risk area

- **ICT for sustainable growth: Disaster Risk Reduction, Emergency Management, R&TD (53M€);**
- **Natural Hazard Programme 2007 (13M€);**

Unsustainable trends, risk exposures to pollution/disasters, energy resources increasing green gases…

Generic solutions, validation, risk reduction, emergency management, interoperability of ICT-based solutions, vulnerability…

Content

Photo: Michael Kevany (Plangraphics Inc.)

- Disaster management
- **Risk and vulnerability**
- Risk management
- Emergency response

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What is risk?

- Hazard - refers to the events or phenomena that may cause harm to aspects of things that human beings value.
- Vulnerability - susceptibility to suffer damage from a particular disaster hazard
- Risk - function of a hazard and the vulnerability of a society.

More definitions

Risk components			Definition
Risk	Hazard		A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.
	Vulnerability	Exposure	The proneness to being affected by a particular hazard.
		Resistance capacity	The capacity to carry out activities with the aim to reduce hazards or the ability of a system to persist or prevent hazardous events, such as water defences to resist high water levels.
		Adaptive capacity	Capacity of a society to adapt and adjust to uncertain future developments and hazards.
		Coping capacity	Capacity to respond in the (immediate) aftermath of an event.
		Recovery capacity	The capacity to return back to the normal situation, before the disaster took place.
	Processes		Physical and social processes that may affect hazards and vulnerability such as climate change or urbanization.

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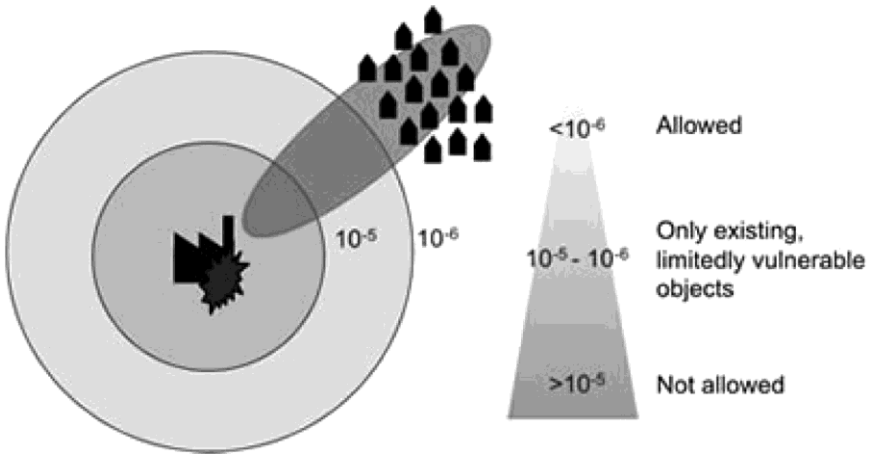
Types of risk (in NL)



Jongejan, Jonkman and Maaskant, 2010, Potential use of individual and societal risk criteria within the Dutch
flood safety policy (part 1): Basic principles

- Individual Risk (IR) at a given location
- Societal Risk (SR) for an establishment

- IR is the statistical probability that a person who is permanently present at a certain location in the vicinity of a hazardous activity will be killed as a consequence of an accident within that activity (e.g. IR for housing, hospitals, schools and the like may not exceed one in a million per year)

- SR is defined as the statistical probability that in an accident more than a certain number of people may be killed

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General considerations on different approaches: effects-based & risk-based evaluation (Claudia Basta)

Given a scenario, the 'appropriate safety distance' can be evaluated adopting:

EFFECTS-BASED APPROACH:

the compatible localization of plants/targets is based on the evaluation of 2 variables: effects and vulnerability

$$C = f(e, T_v)$$

-pros: lees complex analysis
-cons: the tolerability is not based on frequencies: land scarcity is less preserved

RISK-BASED APPROACH:

the compatible localization of plants/targets is based on the evaluation of 3 variables: effects, probability, vulnerability

$$C = f(P, e, T_v)$$

-pro: tolerability is based on frequencies: the scarcity of land is better preserved
-cons:more complex analysis is required.

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Policy developments

1976: a massive release of dioxin in Seveso (3300 wild animals found dead)

1982: 1st Seveso Directive addressing the matter of the CONTROL of major settlements with dangerous substances

1984: a toxic cloud of methyl-isocyanine in Bhopal (India) kills more than 3000 people in the surroundings of the plant

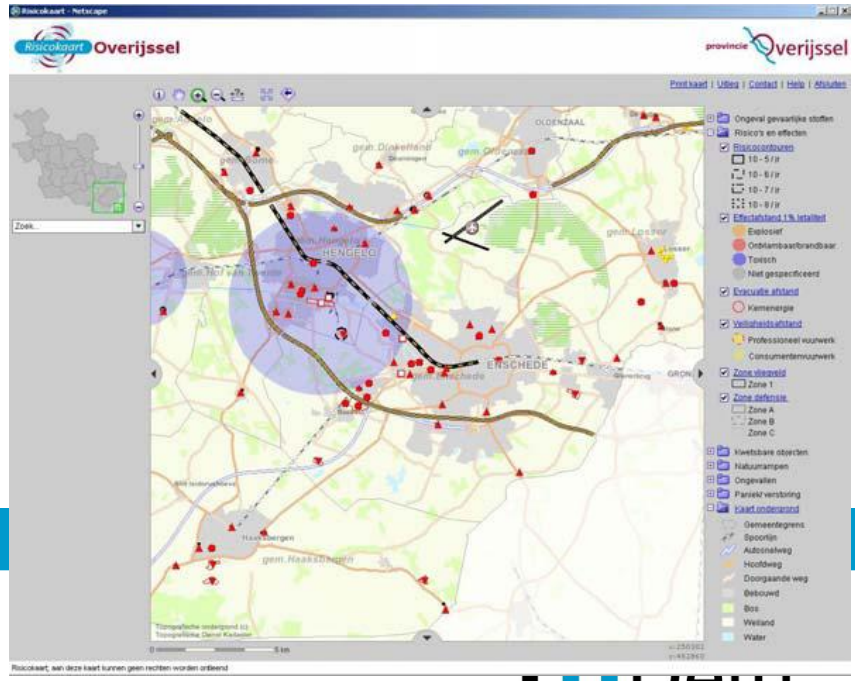
1996: 2nd Seveso Directive stressing the need of PREVENTING accidents and requiring the definition of *OPPORTUNE* SAFETY DISTANCES

2003: 1st amendment to the Directive – LONG TERM POLICIES

2004/ 2006: the EU Union adopts common GUIDELINES defining the principles for land use planning in risky areas.

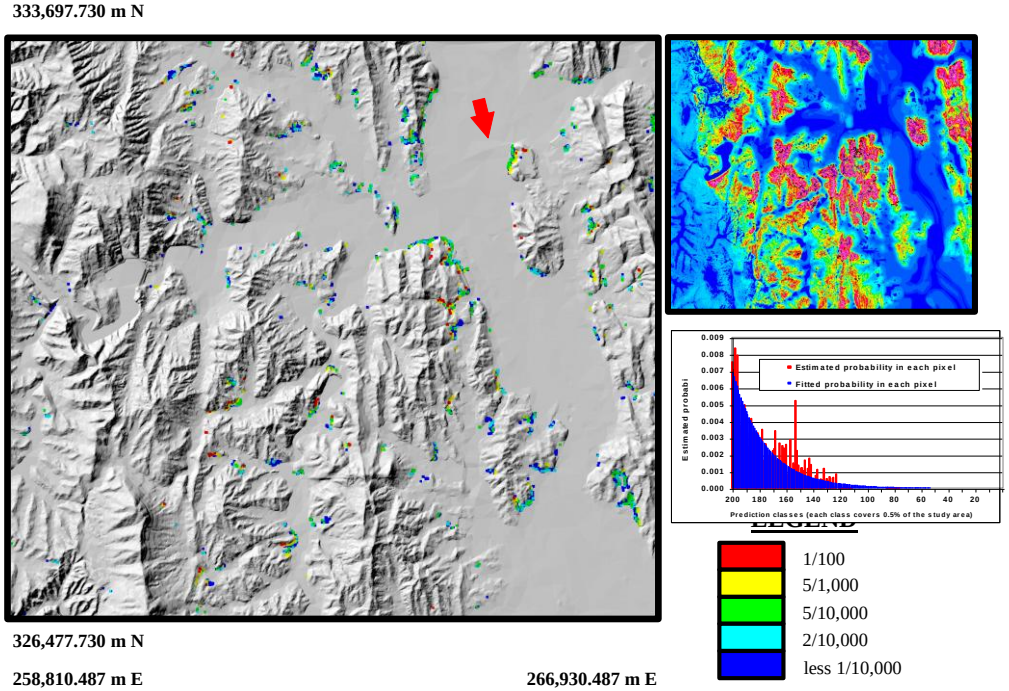
Risk maps (Seweco II Directive)

- Risk locations
- Vulnerable objects
- Contours of effect

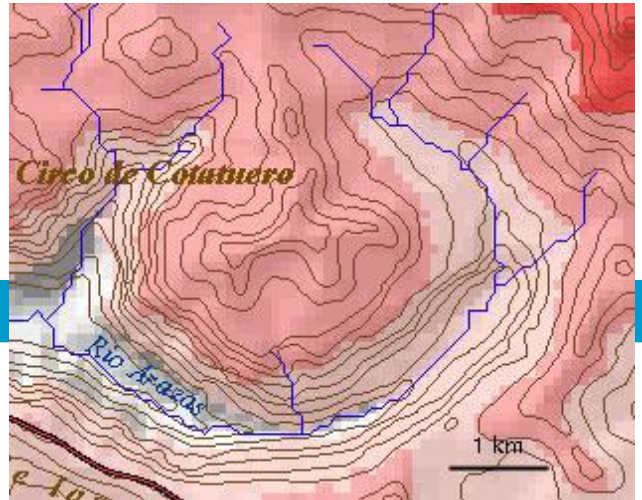


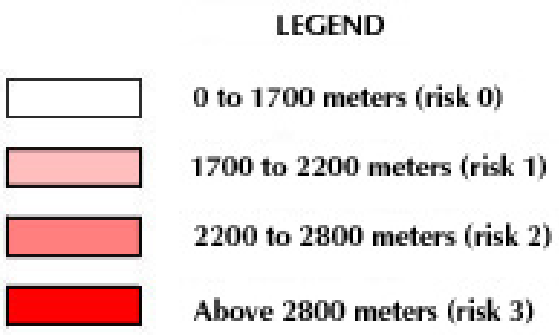
www.risicokaart.nl

Risk maps – (landslides, avelanches)



- No legal force for mapping
- No standartised approach





Pictures by Andrea Fabbri

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- Emergency response

What is Risk Management?

= Urban and regional development?

'

- Goal: *Urban planning must make the city healthier, bigger and nicer….'*
- Many different actors
- Different phases (*Vision Plan, Land use & zoning plan, Master plan, Urban plans, Specialization urban plan, Architectonic quality plan*)
- Communicate information and create knowledge

Key Elements in Risk Management

- Time is not critical
- Planning is not only for protecting humans & property damages. There are commercial and political aspects
- Decisions are made in a long-term process often involving various specialist, offering alternative solutions and pursuing acceptance from stakeholders
- Technology is not vulnerable. Many advanced (physical) models can be run
- Many actors are also GI experts

Actors in RM (e.g. flood, the Netherlands)

Activities	Key actors involved
Identification of flood risks	Ministry of Transport, Public Works and Water management, provinces, water boards
Evaluation and assessment of flood risks	Ministry of Transport, Public Works and Water management, Ministry of Housing and the Environment provinces, municipalities, water boards, emergency services, non-governmental stakeholders
Choice and implementation of risk reduction measures and instruments	Ministry of Transport, Public Works and Water management, Ministry of Housing and the Environment, provinces, municipalities, water boards, emergency services, non-governmental stakeholders
Monitoring and maintenance of the acceptable risks	Ministry of Transport, Public Works and Water management, water boards.

Actors in RM

- Urban planners, housing organisations
- Architects
- Civil Engineers
- Transportation engineers
- Risk managers in e.g. natural disasters
- ....

Content

Photo: Michael Kevany (Plangraphics Inc.)

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- **Emergency response**

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What is Emergency Management?

- Goal: *Organization, procedures, & resources employed to prevent, minimize & respond to emergency conditions in an area*
- Many different actors (but the first responders are known)
- Different phases: *Preparation, Early warning, Response, Relief*
- Exchange information and create situational awareness

Key Elements in Emergency

- Time is extremely critical
- Saving human lives & minimizing property damage are the purposes
- Decisions are made on the spot with information available
- Technology is vulnerable to the impacts of the emergency
- The users are not GI experts

Actors in ER (e.g. flood, Netherlands)

Activities	Key operational actors
Containment and control of the flood and its effects	Regional fire department; Rijkswaterstaat; Royal Dutch Water Life Saving Association (KNBRD), Royal Netherlands Sea Rescue Institution (KNRM). Military National Reserve.
Medical assistance	(Para)medical services (GHOR); Red Cross (SIGMA teams)
Public order and traffic management	Police department
Taking care of the population	Municipality

Actors in ER

- Fire Brigade
- Police
- Paramedics, ambulance
- Local, regional, national governments
- Civil protection
- ...

Conclusions

- DM is complex process
- RM and ER are quite different
  - actors, procedures, time constraints, way of working
  - Information is overlapping
- Towards integrated systems for multi-disaster management