Seismic Geotechnical Hazard Zonation Of Geological Factors

Maja Oštrić, dipl.ing.geol

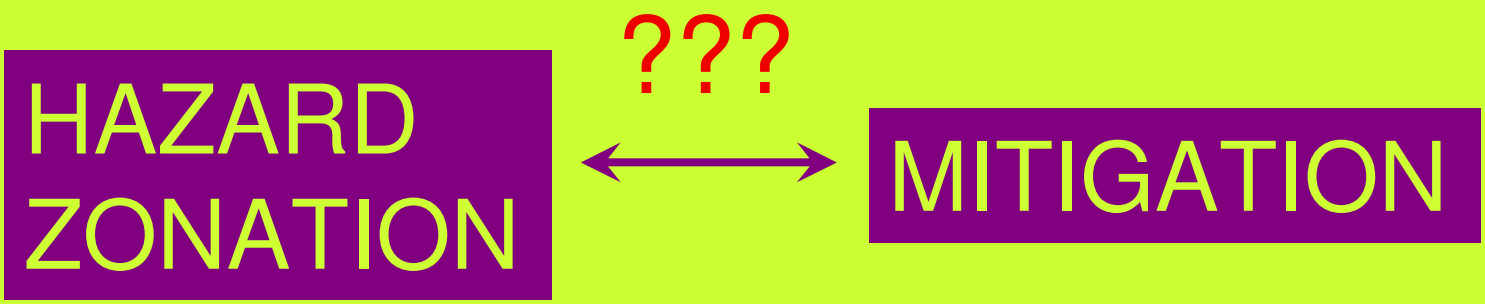
Dubrovnik, March 3rd-4th 2008

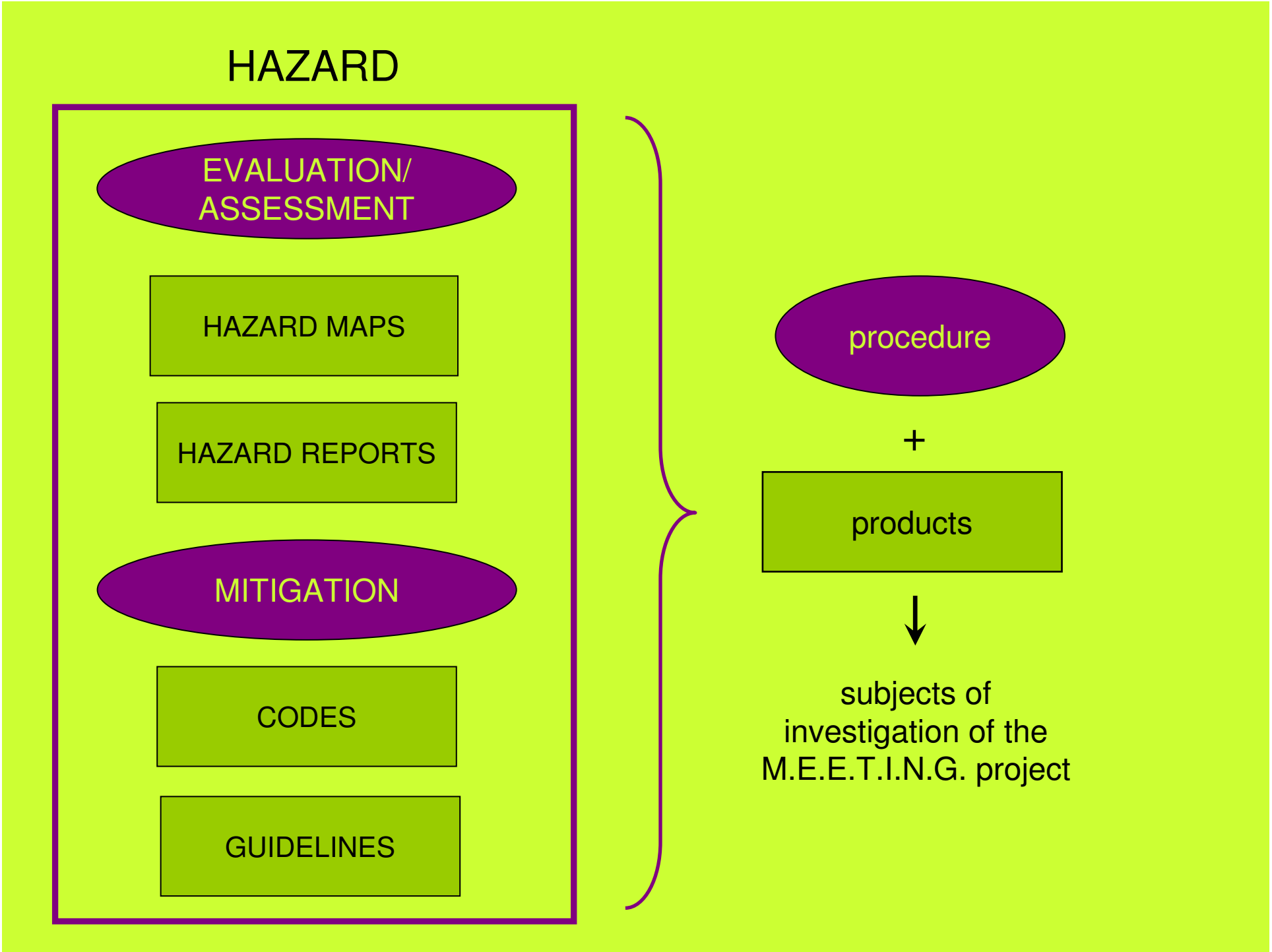
SUBJECT OF THE INVESTIGATION?

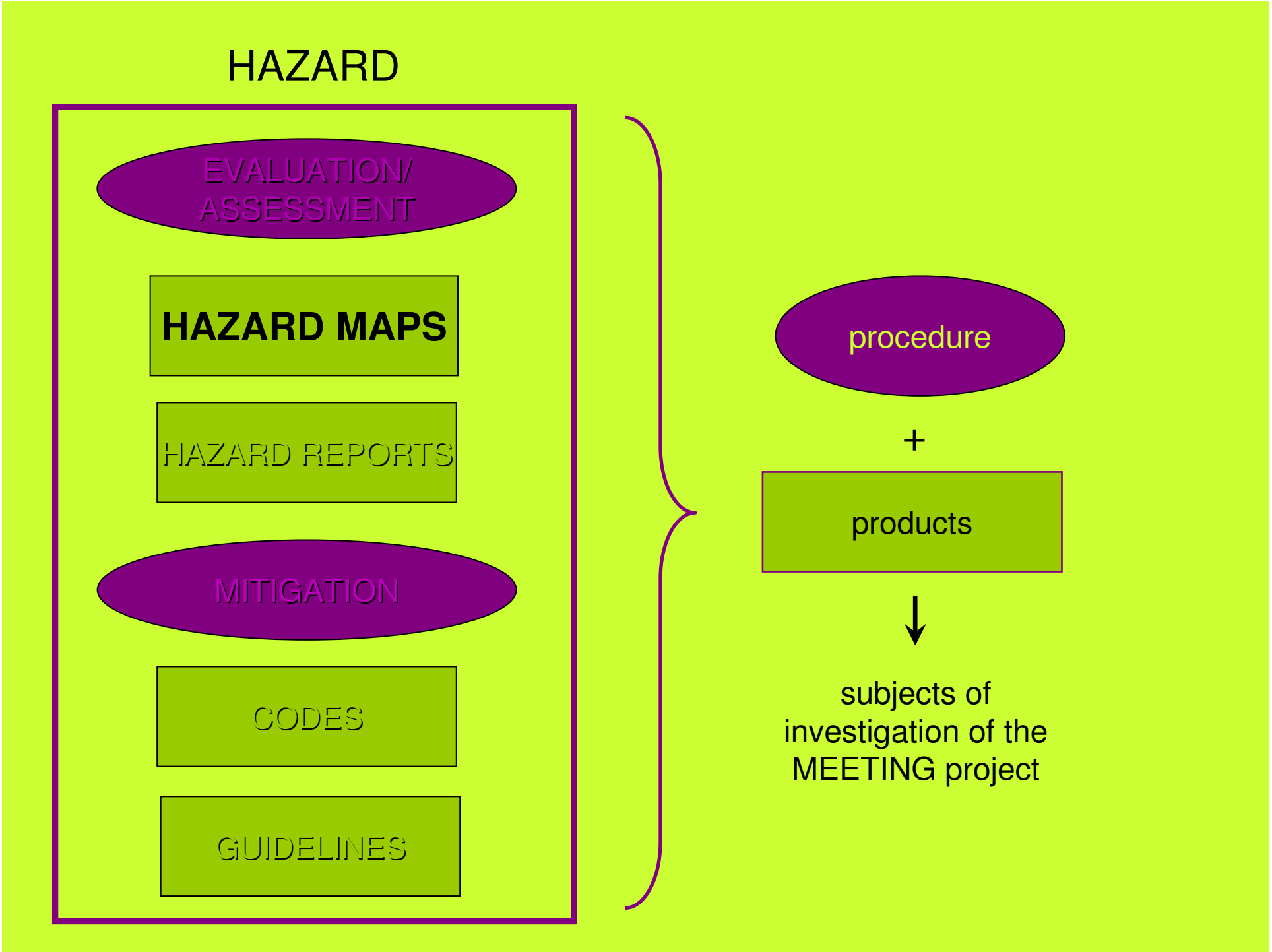
Geological Factors In Seismic Geotechnical Hazard Zonation

Subject of the investigation in the context of M.E.E.T.I.N.G. Project

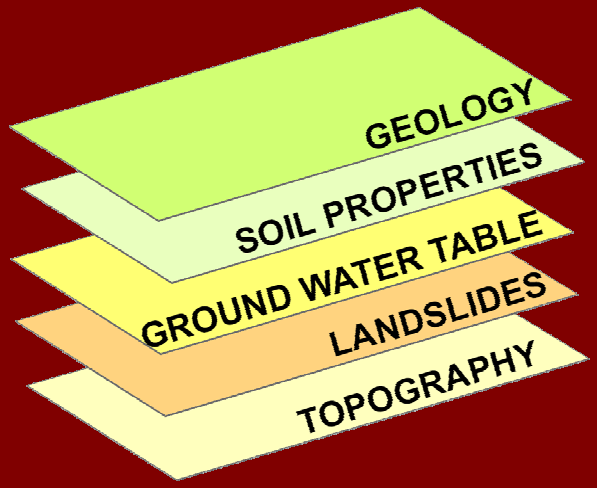
(Mitigation of The Earthquake Effects in Towns and Industrial Regional Districts)



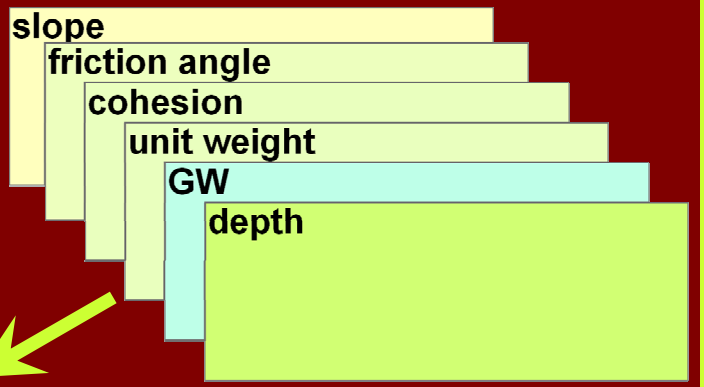

HAZARD
EVALUATION/
ASSESSMENT
HAZARD MAPS
HAZARD REPORTS
MITIGATION
CODES
GUIDELINES
procedure
+
products
subjects of
investigation of the
M.E.E.T.I.N.G. project


HAZARD
EVALUATION/
ASSESSMENT
HAZARD MAPS
HAZARD REPORTS
MITIGATION
CODES
GUIDELINES
procedure
+
products
subjects of
investigation of the
MEETING project

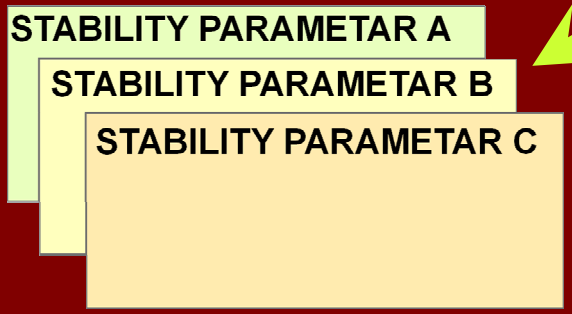
INPUT DATA



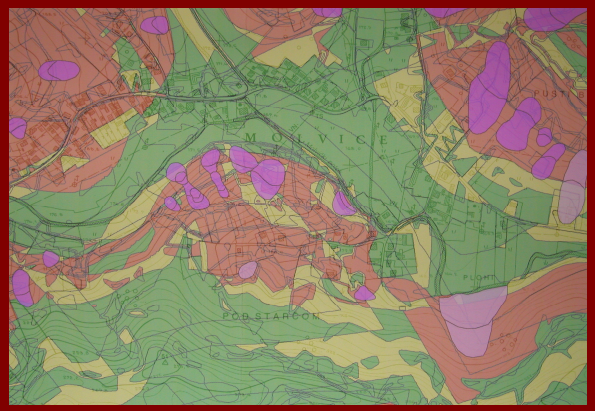
RELATIVE FACTOR IMPORTANCE



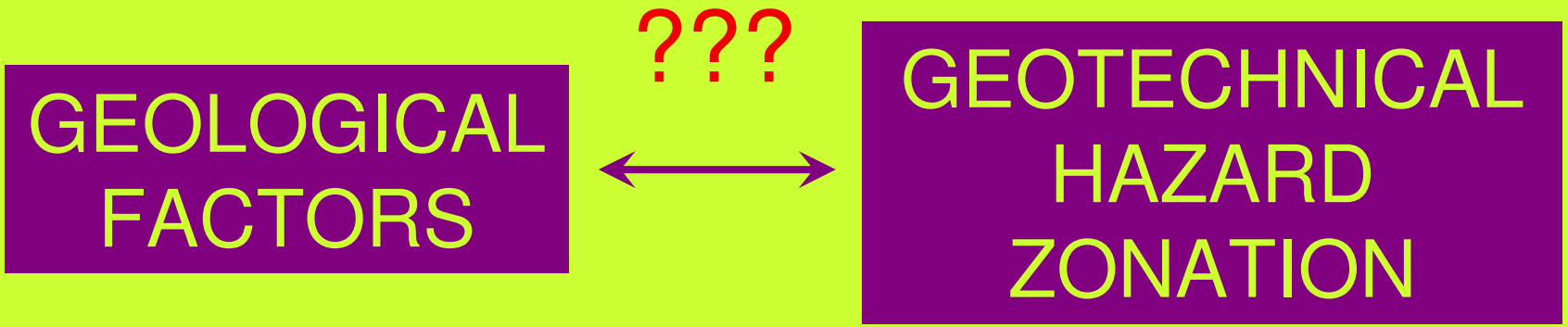
OVERLAY



CLASSIFICATION OF QUANTITATIVE HAZARD

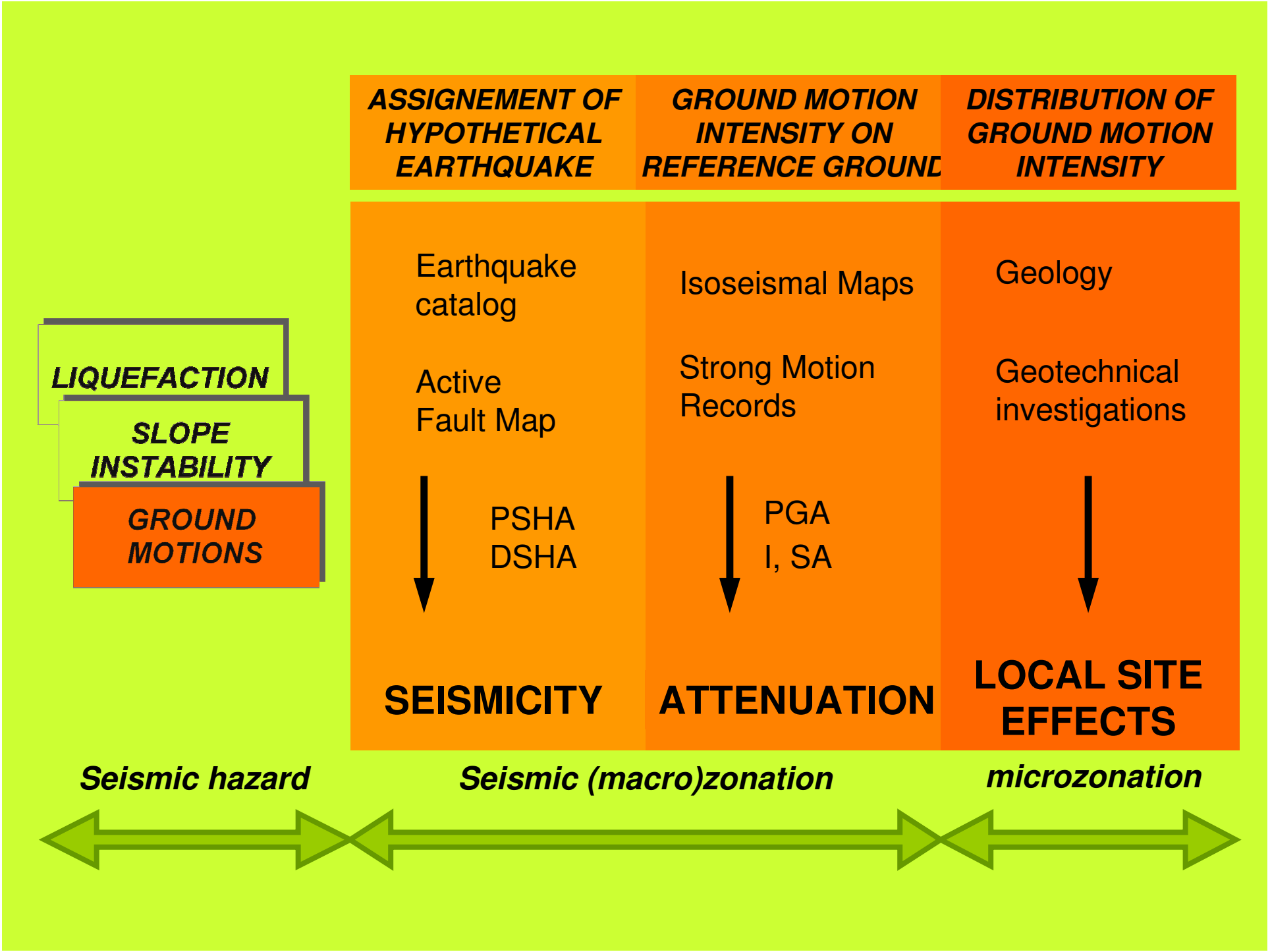


HAZARD ZONATION

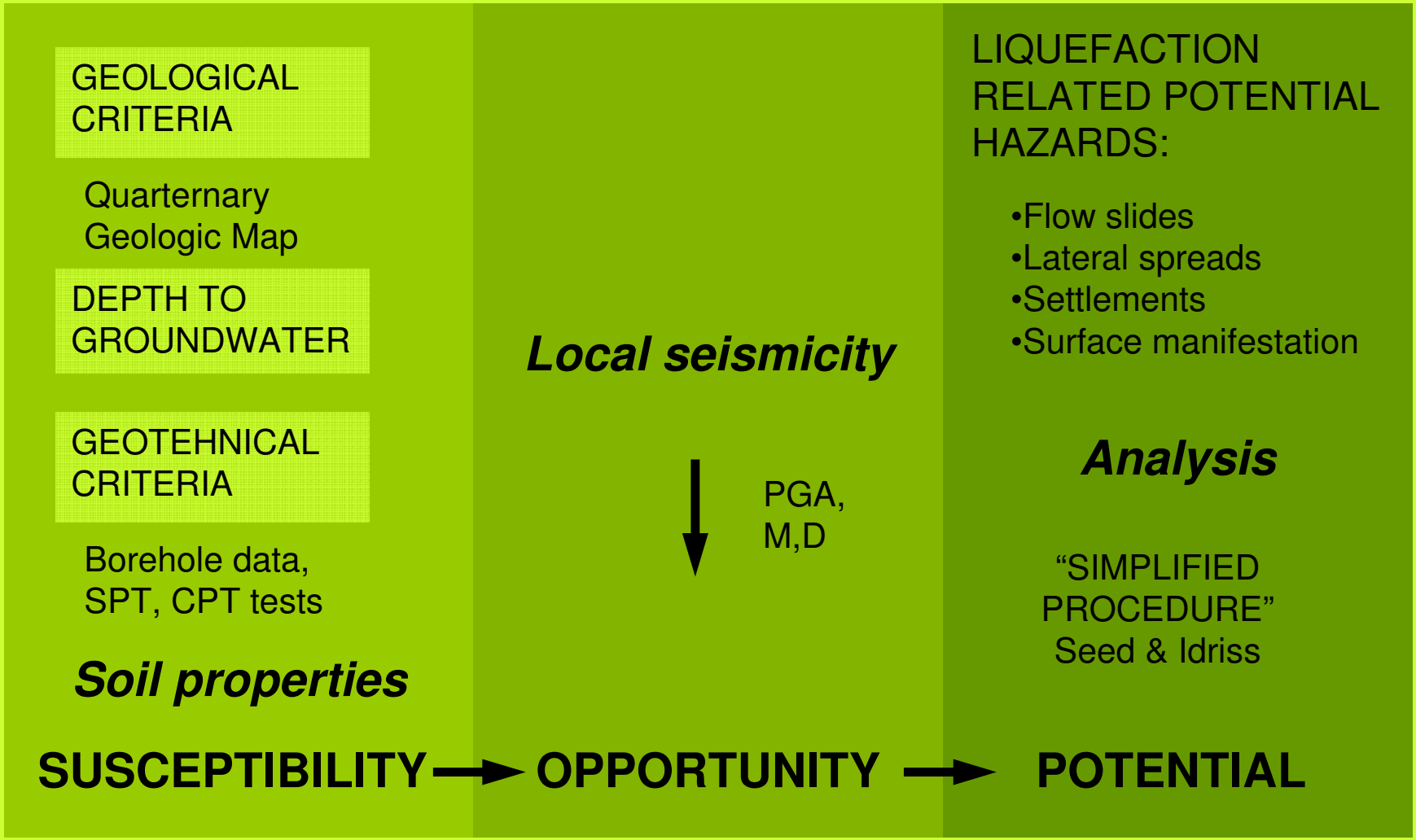


GEOLOGICAL FACTORS IN SEISMIC GEOTECHNICAL ZONATION?

answer to that question requires additional explanations


ASSIGNEMENT OF HYPOTHETICAL EARTHQUAKE
GROUND MOTION INTENSITY ON REFERENCE GROUND
DISTRIBUTION OF GROUND MOTION INTENSITY
LIQUEFACTION
SLOPE INSTABILITY
GROUND MOTIONS
Earthquake catalog
Active Fault Map
PSHA
DSHA
Isoseismal Maps
Strong Motion Records
PGA
I, SA
Geology
Geotechnical investigations
SEISMICITY
ATTENUATION
LOCAL SITE EFFECTS
Seismic hazard
Seismic (macro)zonation
microzonation

LIQUEFACTION



GEOLOGICAL FACTORS

- **Macrozonation** (tectonic, structural data)
- **Microzonation** (geologic units)
- **Scale** of Hazard Map - quality and quantity of data
- **Seismic hazard**: ground motion, liquefaction, slope instabilities

THEORETICALY

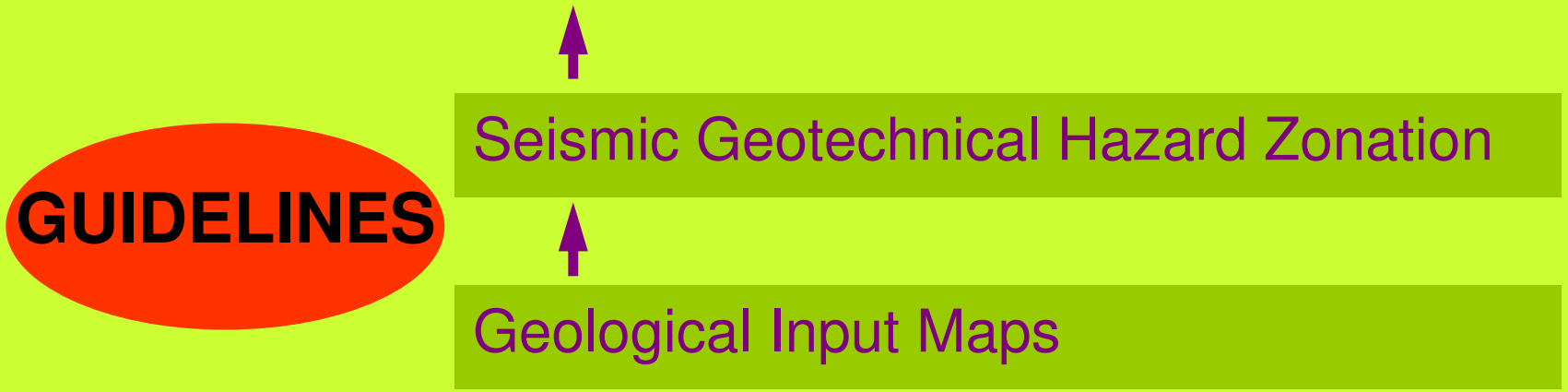
very complex issue

PRACTICALY

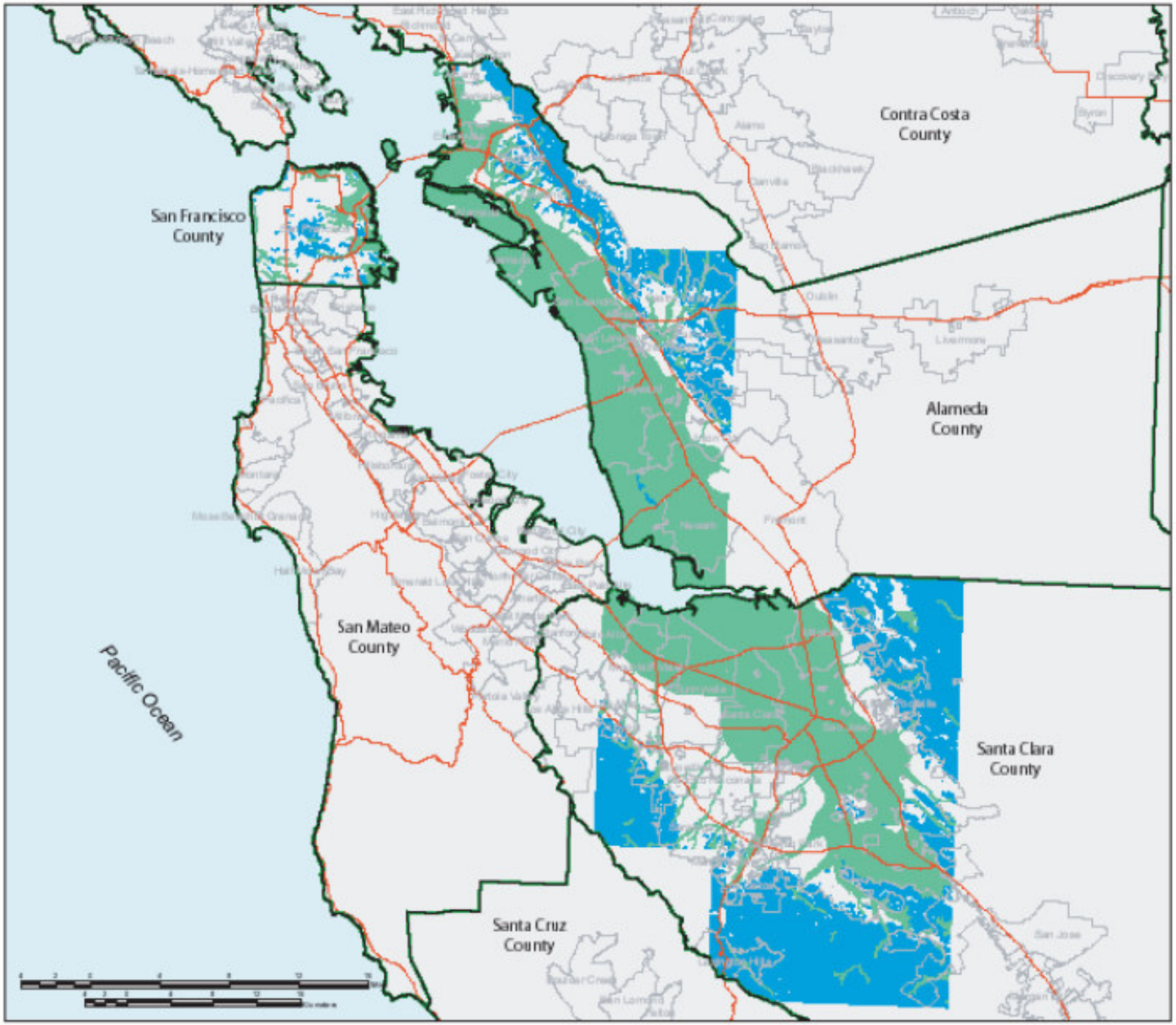
EUROCODE 8 implementation

National Annexes

Croatian seismic codes



California, USA



Seismic Hazard Zonation of Northern California
October 2003

MAP EXPLANATION

Zones of Required Investigation

Liquefaction

Earthquake-Induced Landslides

DEPARTMENT OF CONSERVATION
CALIFORNIA GEOLOGICAL SURVEY
SEISMIC HAZARDS MAPPING PROGRAM
801 K STREET, MS 12-31
SACRAMENTO, CA 95814
916 324-7299
GMW.CONSRV.CA.GOV

SEISMIC HAZARD MAPPING ACT

Purpose:

reduce threat to public health and safety

minimize loss of life and property

identification and mitigationof seismic hazard

GUIDELINES FOR EVALUATING AND MITIGATING SEISMIC HAZARDS IN CALIFORNIA

SPECIAL PUBLICATION 117, 1992;
REVISED SPECIAL PUBLICATION 118, 2004

investors/owners
engineers
state/county/city agencies

Recommended procedures for implementation of SP 117, Guidelines for Analyzing and Mitigating

Landslide Hazards

SCEC, 2002

Liquefaction in California

SCEC, 1999

Historic records,
field observations
computer- mapping technology

Seismic Hazard Zone Map

areas where site investigations are required to determined the need for mitigation of potential liquefaction and/or earthquake induced landslide ground displacements

Maps that show

ZONES OF REQUIRED INVESTIGATION

Land Use Planning

Construction

Historic records,
field observations
computer- mapping technology

Seismic Hazard Zone Map

areas where site investigations are required to determined the need for mitigation of potential liquefaction and/or earthquake induced landslide ground displacements

Maps that show

ZONES OF REQUIRED INVESTIGATION

Land Use Planning

Construction

Seismic Hazard Zone Map

Seismic Hazard Zone Report

Potential Seismic Hazard

SITE- INVESTIGATION REPORT

SCREENING INVESTIGATIONS

available data

clearly demonstrate
absence of potential hazard

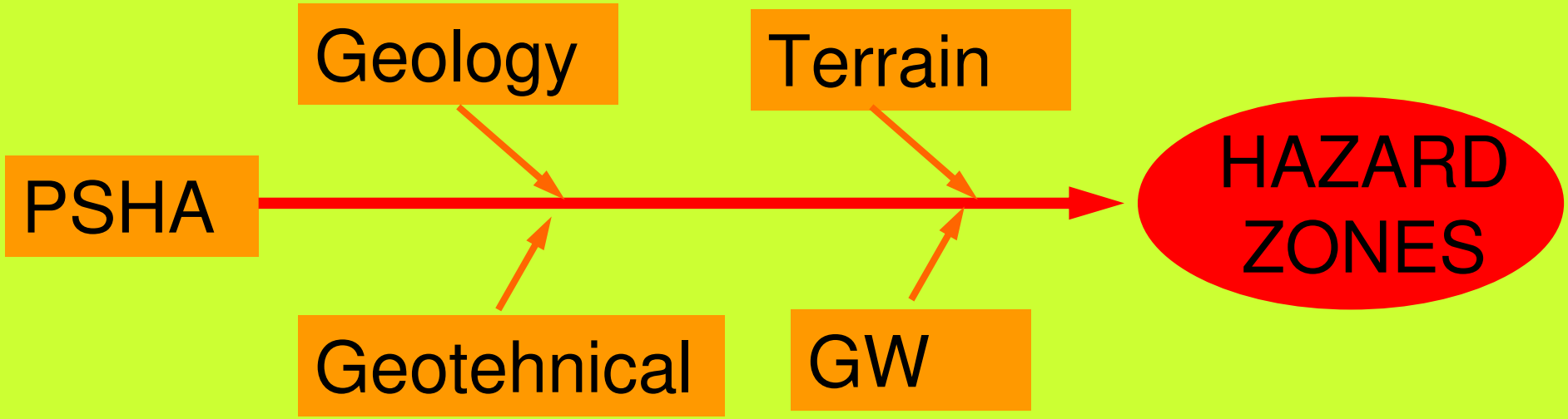
QUANTITAIVE EVALUATION

Analysis

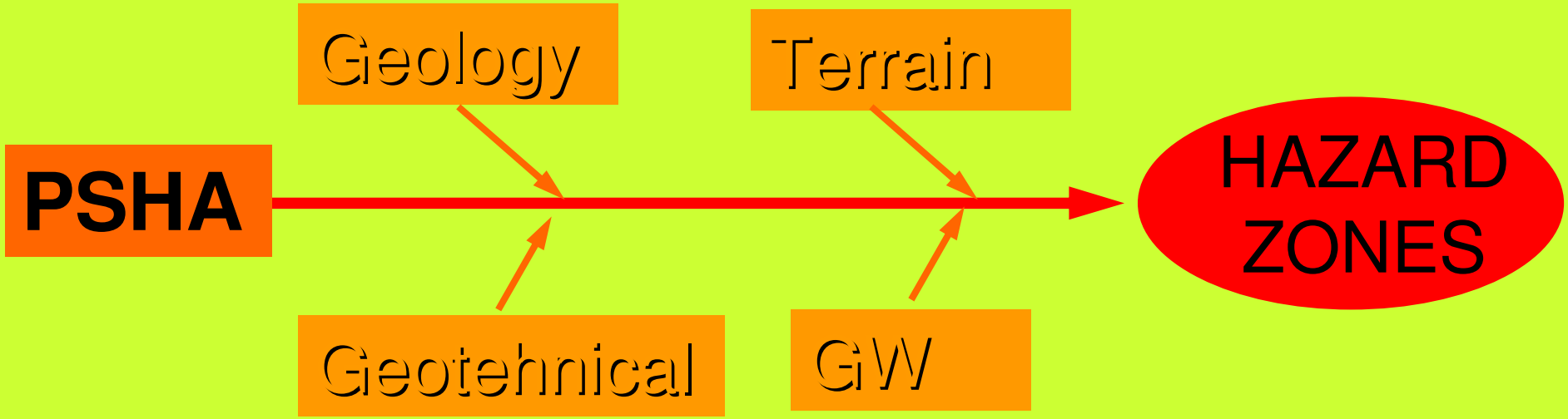
- Liquefaction
- Landslides

Seismic Hazard Zone Act

DATA REQUIREMENTS FOR SEISMIC ZONATION!



DATA REQUIREMENTS FOR SEISMIC ZONATION!



Seismic Code

Seismic Code 31/81, 49/82,29/83,20/88, 52/90)

Seismic Map SFRJ, 1987

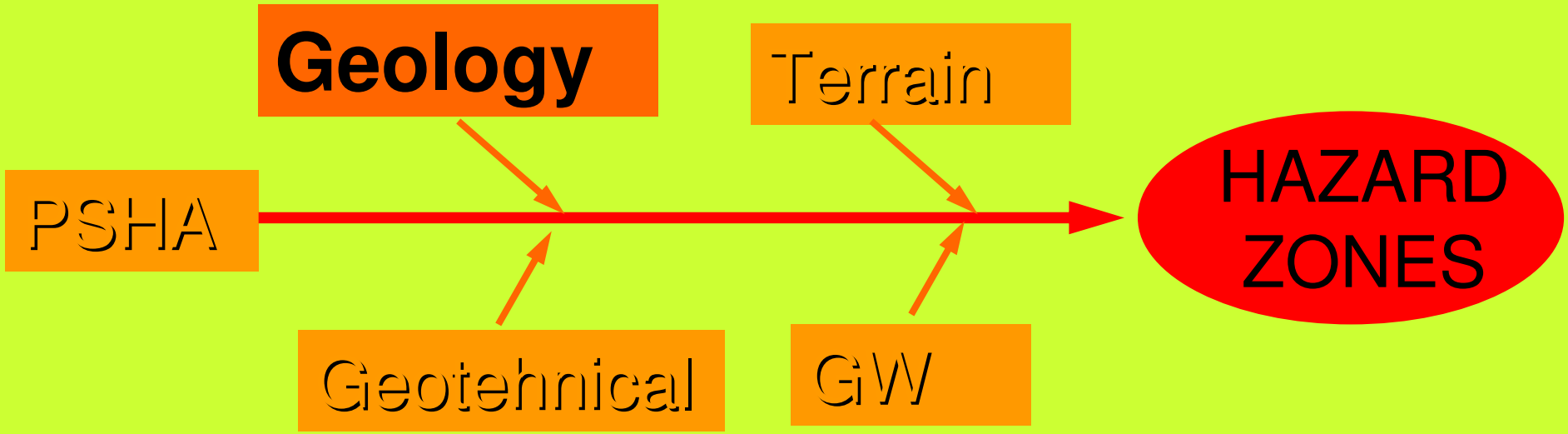
Seismic Intensities, for category II,

500 yr return period

EC8

PGA,ground type A
475 YRS

DATA REQUIREMENTS FOR SEISMIC ZONATION!



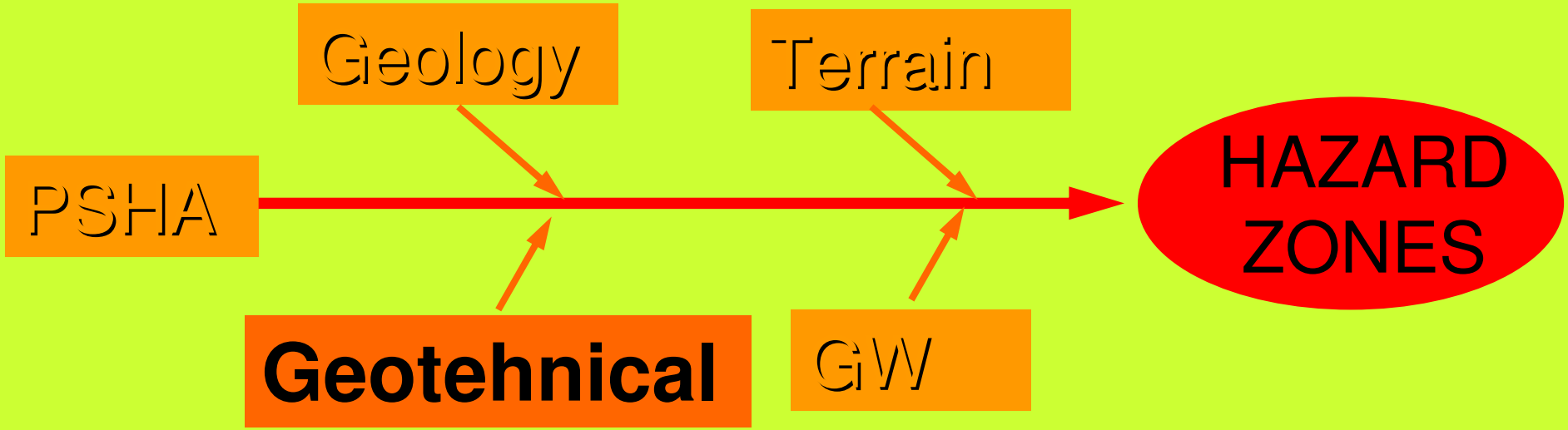
OGK 1 : 100 000

bedrock

surficial deposits,

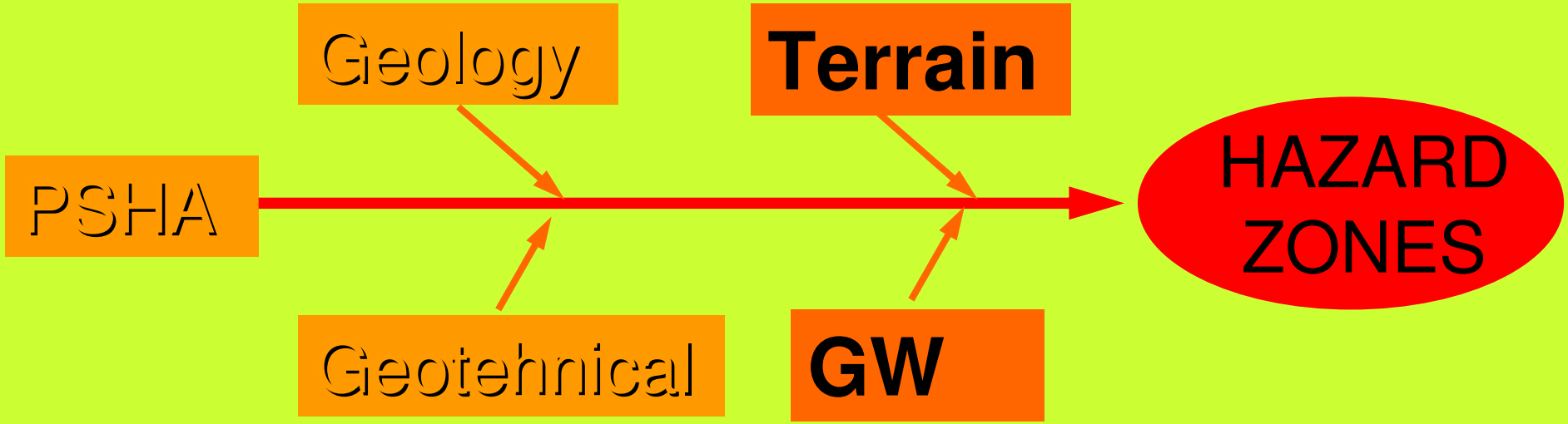
3D-depth

DATA REQUIREMENTS FOR SEISMIC ZONATION!



no geotehnical data base!

DATA REQUIREMENTS FOR SEISMIC ZONATION!



topographic data exist; DTM 1 : 5 000

data on groundwater levels for Zagreb are available Hydrogeological data base

SEISMIC MICROZONATION

Urban areas of:
- Rijeka 1974
- Dubrovnik 1983
- Zagreb 1988

Pravilnika o tehničkim normativima za izgradnju objekata visokogradnje u seizmičkim područjima (Službeni list SFRJ 31/81, 49/82, 29/83).

Same methodology used Medvedev (1977)

Ground motions	✓
Liquefaction	-
Landslides	-

Thank you
for Your attention !