

Presentation Outline

- Overview of Seismic Vulnerability of Buildings
- RADIUS-a Simplified tool for Seismic Damage Estimation (Overview)

Overview of a RA-Tool

- Simple Damage Estimation Software -

The screenshot shows the main window of the RADIUS Program. At the top, the title bar reads 'RADIUS Program for Earthquake Damage Assessment'. Below the title bar, there is a paragraph of text describing the tool. Further down, another paragraph provides a disclaimer about the tool's simplified methodologies. At the bottom, there are two buttons: 'Start Using the Program' and 'Read Instructions'. The background of the window is a grayscale image of a city street with buildings and a grid overlay.

RADIUS Program for Earthquake Damage Assessment

This is a simple-to-use earthquake damage estimation tool. It has been developed under the support of UN-INDR to promote worldwide activities for reduction of seismic disasters in urban areas, particularly in developing countries. The program aims to raise awareness and understanding of earthquake disasters and methodology of damage estimation in the earthquake prone areas.

Since the program was developed with simplified methodologies, pursuing speed and ease-to-use, its functions and accuracy are limited. User should be careful not to use the results for any exact engineering analyses, especially a site-specific earthquake analysis. For any detailed analyses, user may only proceed with the advice of experts in the respective fields.

[Start Using the Program](#)

[Read Instructions](#)

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Ref. GeoHazards International

Seismic Vulnerability Assessment	Seismic Damage Estimation
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RADIUS
(Risk Assessment Tools for Diagnosis of Urban Areas
against Seismic Disasters)

RADIUS

Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters

Methodologies	Stakeholders			Motivation to Community	Accuracy	Resource Required	Possibility of use in developing countries
	Professionals	Authorities	Community				
RADIUS	M	H	M	H	M	L	YES
GIS GRID	H	L	L	L	M-H	H	YES
SLARIM	H	M	L	L	H	H	YES
COMMUNITY WATCHING	L	M	H	H	L	L	YES
HAZUS	H	L	L	L	H	H	YES

H: High, M: Medium, L: Low, S: Simple, C: Complex

Software Purposes

- To facilitate preliminary estimation of earthquake damage in developing countries
- To be used by city administrators and general public
- To raise awareness of earthquake risk



Software Characteristics

Goal: To make it as useful and accessible as possible

- Widely available platform (runs on MS-Excel)
- Simple, user-friendly
- NOT a GIS(Geographic Information System) type of program
 - GIS can only be utilized to show the spatial distribution of the risk

Input Data

Program uses commonly available city information

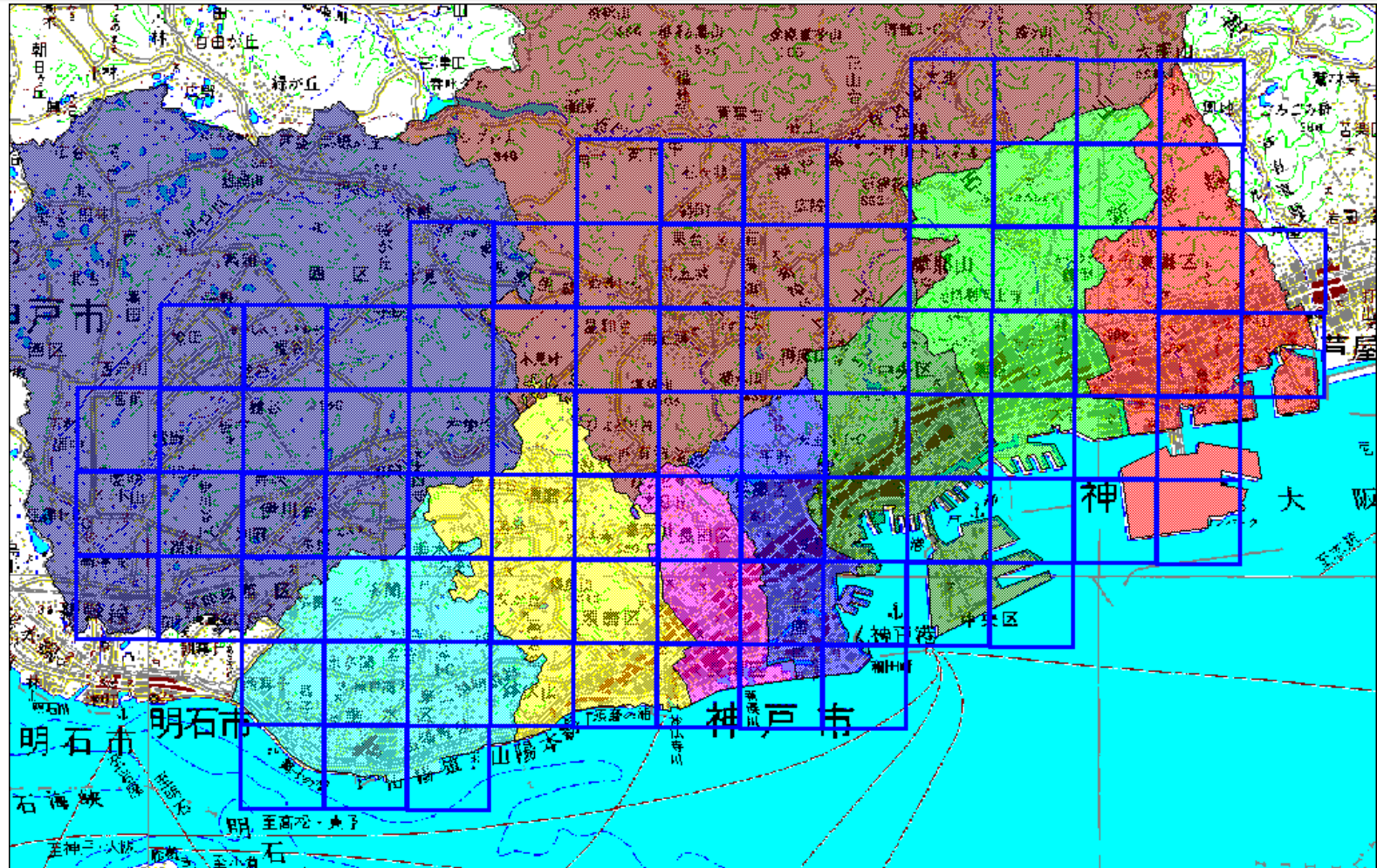
- Shape of target region (entered as a grid)
- Population and its distribution
- Building Inventory and its distribution
- Ground Characteristics (Soil conditions)
- Lifelines information
- Choice of Scenario Earthquake and its parameters

Output

- Ground Shaking Distribution (PGA or MMI Intensity)
- Building damage
- Lifelines damage
- Human Impact (number of deaths and injuries)
- Summary Tables and Thematic Maps showing the results

Example of Data Input Process

- Shape of target region input as a grid

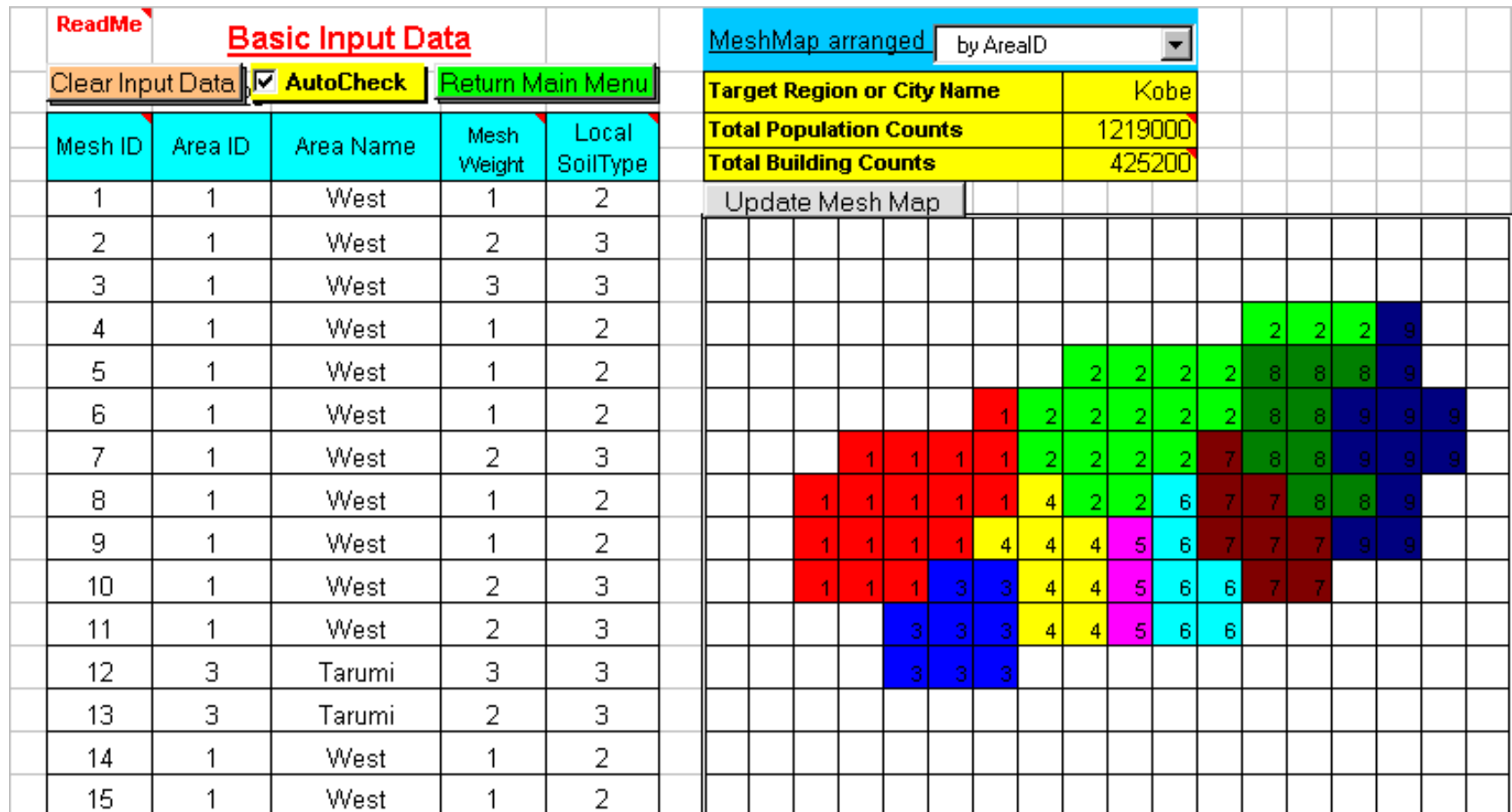


Example of Data Input Process

- Specify the City Area using Excel Mesh
- Input Total Population and Building Counts

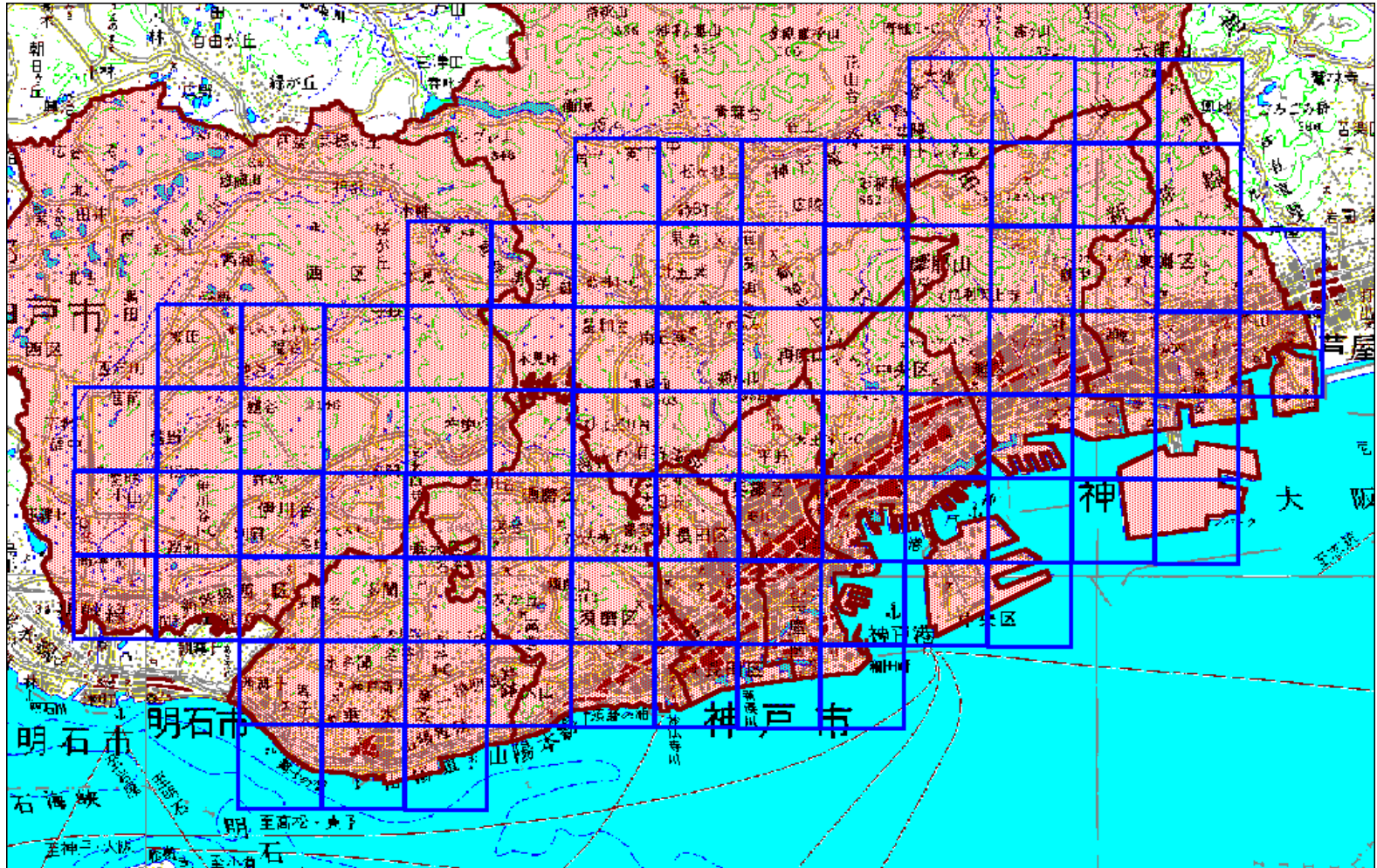
[illegible]

- Input Area ID and Area Name



Example of Data Input Process

Specify the Mesh Weight (building, population distribution)



Example of Data Input Process

- Input Mesh Weight to distribute the building and population count

ReadMe

Basic Input Data

Clear Input Data

☒ AutoCheck

Return Main Menu

Mesh ID	Area ID	Area Name	Mesh Weight	Local SoilType
1	1	West	1	2
2	1	West	2	3
3	1	West	3	3
4	1	West	1	2
5	1	West	1	2
6	1	West	1	2
7	1	West	2	3
8	1	West	1	2
9	1	West	1	2
10	1	West	2	3
11	1	West	2	3
12	3	Tarumi	3	3
13	3	Tarumi	2	3
14	1	West	1	2
15	1	West	1	2

MeshMap arranged by Mesh Weight

Target Region or City Name

Kobe

Total Population Counts

1219000

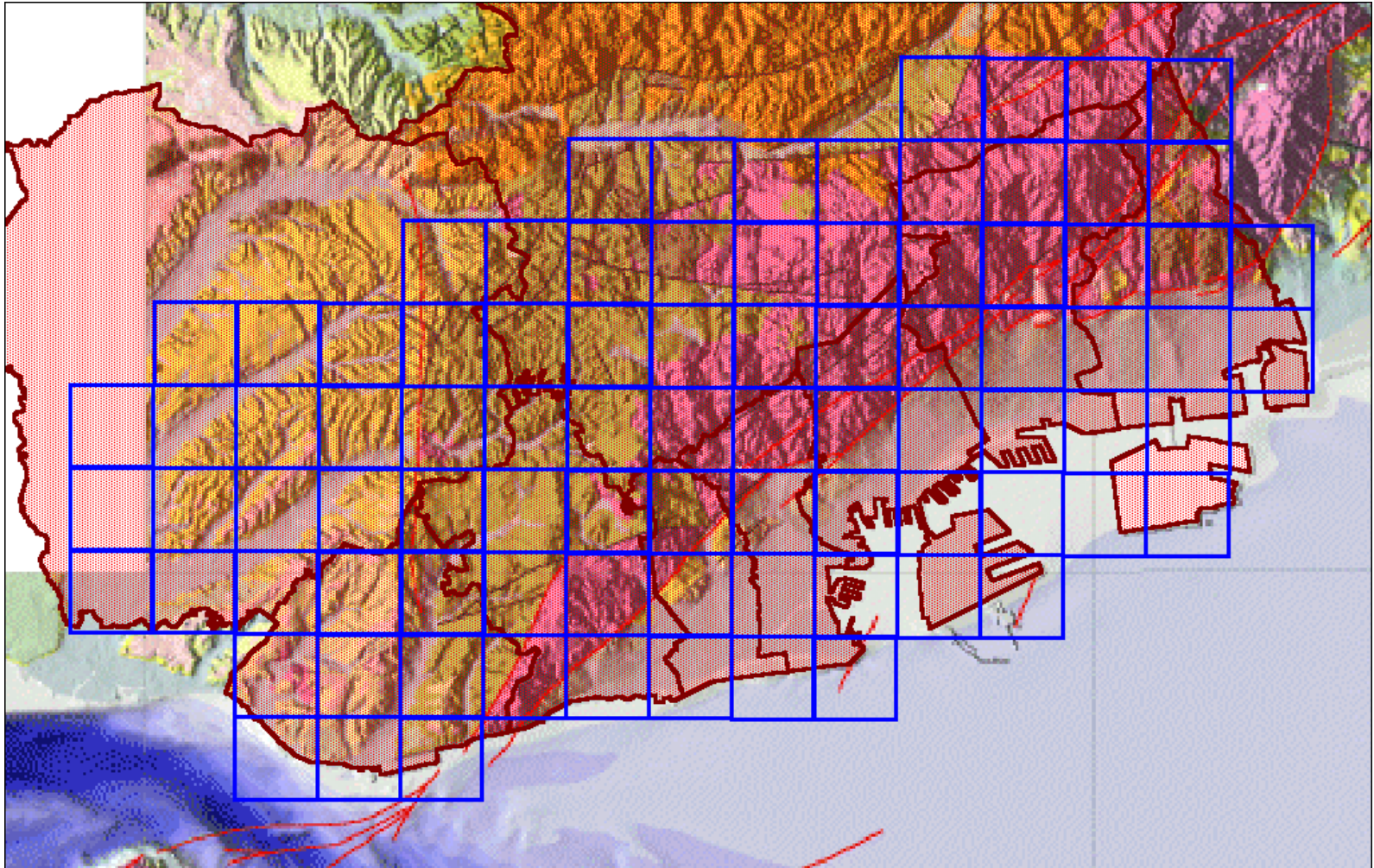
Total Building Counts

425200

Update Mesh Map

Example of Data Input Process

- Specify Ground Characteristics (Soil conditions)

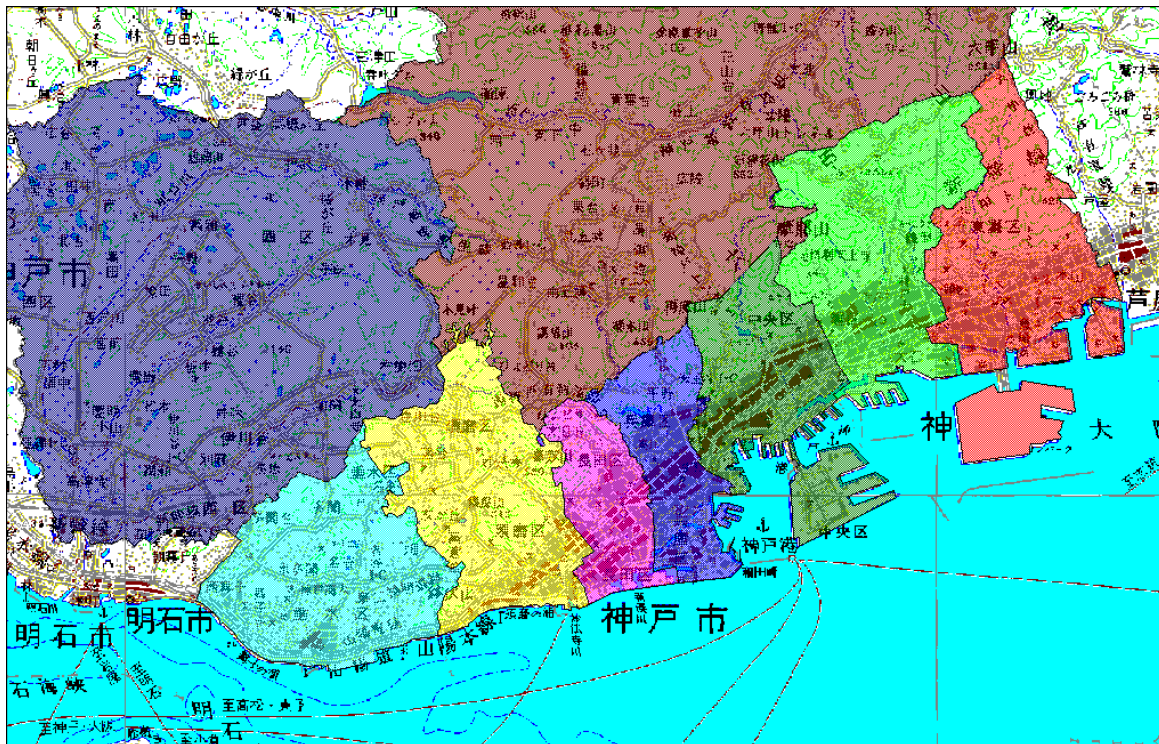


■ Input Local Soil Characteristics

Overview of Simple Damage Estimation Software

Example of Data Input Process

- Specify Building Inventory by Area
- Percentage of 10 Building Classes in each Area



Building Classes Explanation

RES1---	Informal construction - mainly slums, row housing etc. made from unfired bricks, mud mortar, loosely tied walls and roofs.
RES2---	URM-RC composite construction - sub-standard construction, not complying with the local code provisions. Height up to 3 stories. URM is Un-Reinforced Masonry and RC is Reinforced Concrete building
RES3---	URM-RC composite construction - old, deteriorated construction, not complying with the latest code provisions. Height 4 - 6 stories.
RES4---	Engineered RC construction - newly constructed multi-storied buildings, for residential and commercial purposes.
EDU1---	School buildings, up to 2 stories. usually percentage should be very small
EDU2---	School buildings, greater than 2 stories. usually percentage should be very small
MED1---	Low to medium rise hospitals usually percentage should be very small
MED2---	High rise hospitals usually percentage should be very small
COM---	Shopping Centers
IND-----	Industrial facilities, both low and high risk

Example of Data Input Process

- Input Building Inventory by Area
- Buildings and Population are distributed by Mesh Weight

Inventory by Area												
Read Me First		Clear Input Data		<input checked="" type="checkbox"/> AutoCheck		Return Main Menu						
Area ID	Area Name	RES1 (%)	RES2 (%)	RES3 (%)	RES4 (%)	EDU1 (%)	EDU2 (%)	MED1 (%)	MED2 (%)	COM (%)	IND (%)	Sum (%)
1	West	3	18	36	28	7	4	1	1	1	1	100
2	North	5	17	43	20	8	3	1	1	1	1	100
3	Tarumi	3	15	36	31	7	4	1	1	1	1	100
4	Suma	4	14	35	30	8	5	1	1	1	1	100
5	Nagata	10	20	40	14	9	3	1	1	1	1	100
6	Hyogo	7	18	28	33	3	7	1	1	1	1	100
7	Center	2	7	19	51	2	15	1	1	1	1	100
8	Nada	6	22	30	25	7	6	1	1	1	1	100
9	East Nada	5	18	35	25	7	6	1	1	1	1	100

Example of Data Input Process

- Specify and Enter Scenario Earthquake

Read Me First

Scenario Earthquake Information

Scenario

☒ Historical Earthquake ☐ User Defined Earthquake

Earthquake Information

Choose Scenario Earthquake

Kobe Earthquake

Earthquake Manitude

7.2

Earthquake Depth (km)

1

EQ Occurance Time (hrs)

5.46

Attenuation Equation

Choose Attenuation Equation

Fukushima & Tanaka -

Reference

Enter Reference MeshID No.

58

Earthquake Epicentral distance (km)

1

Choose EQ Direction relative from Ref. Mesh

North West

OK & Return

■ Building Damage Distribution

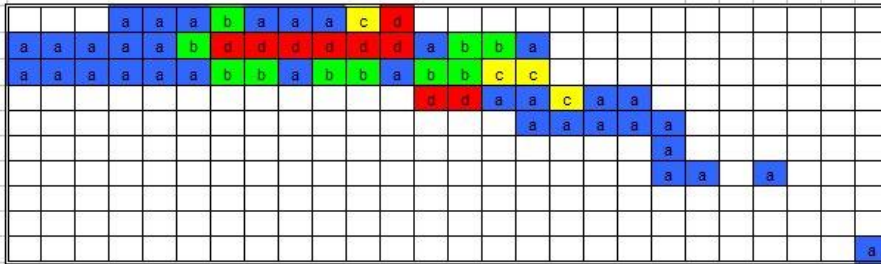
Overview of Simple Damage Estimation Software

Tool Applications

- Understanding of cities' earthquake risks
- Estimation of impact of past well-known earthquakes
- Estimation of impact of any number of possible future earthquakes
- Delineation of planning policies by decision makers
- Education and risk awareness of the public

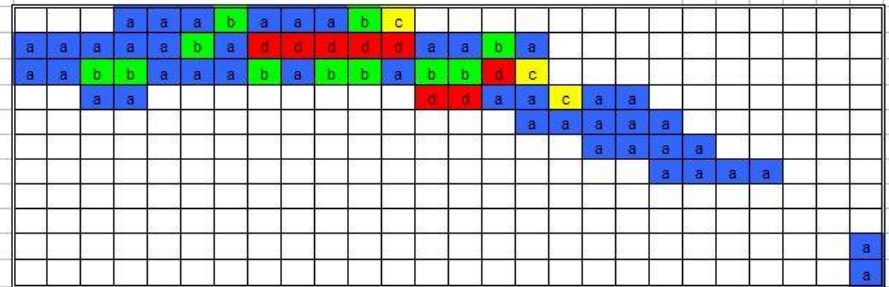
Estimating future risk...

Map Using Automatic Range (Cell characters show ColorID)



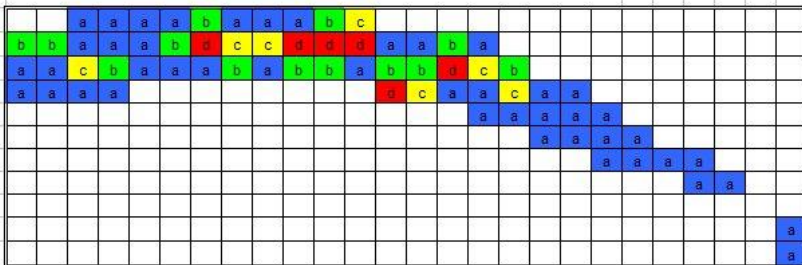
2003

Map Using Automatic Range (Cell characters show ColorID)



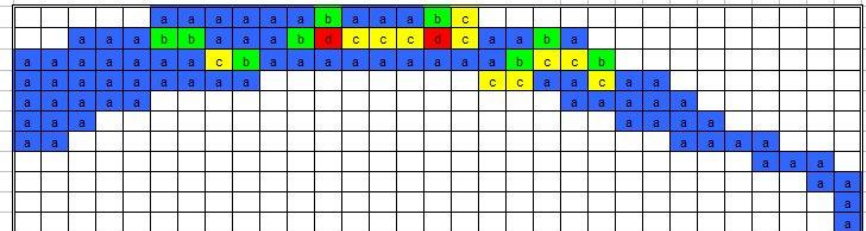
2007

Map Using Automatic Range (Cell characters show ColorID)



2012

Map Using Automatic Range (Cell characters show ColorID)



2022

A Word of Caution

- The program uses simplified methodologies to enable speedy calculations and to maintain easy-to-use features.
- The program outputs may be used for preliminary earthquake damage estimation only.
- It should not be used for a detailed and exact site-specific earthquake analysis or detailed Micro-zonation.
- Experts in the respective fields should be consulted for a precise estimation of loss values.

END



Thank you for your Attention.