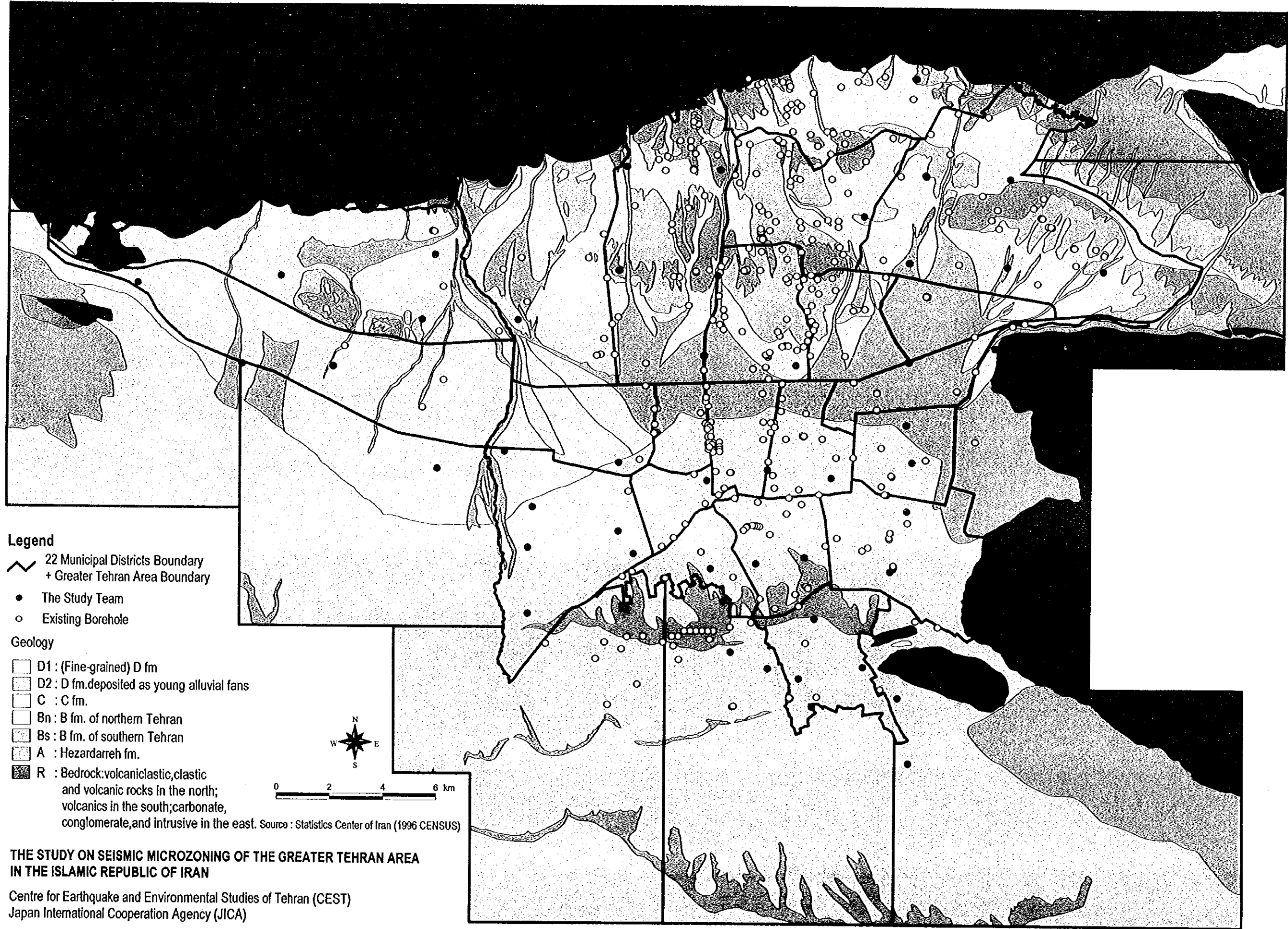# B. Earthquake Analysis

# Location Map of Boreholes



## Legend

⋀ 22 Municipal Districts Boundary
+ Greater Tehran Area Boundary

● The Study Team

○ Existing Borehole

Geology
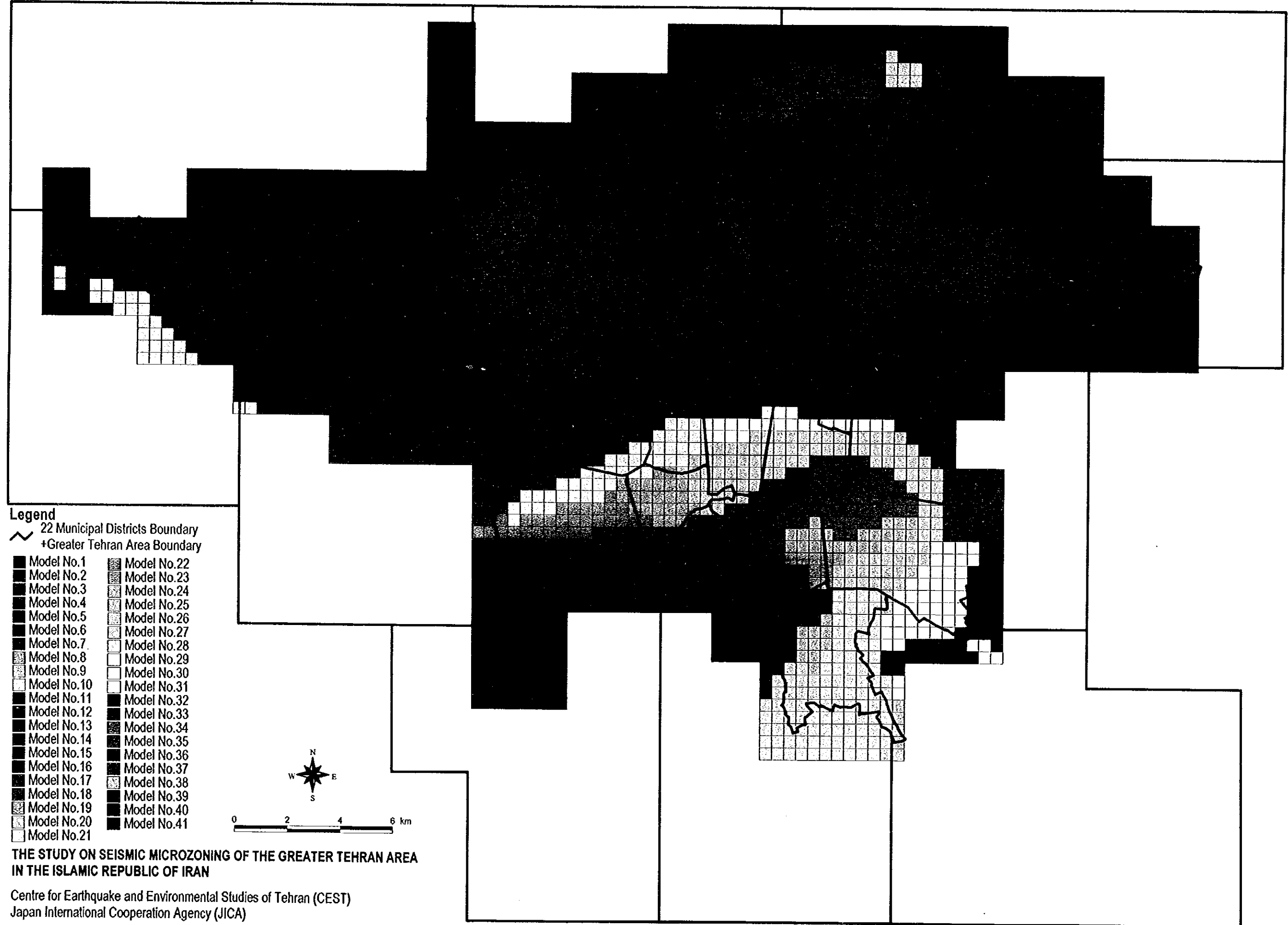
☐ D1 : (Fine-grained) D fm
▒ D2 : D fm.deposited as young alluvial fans
☐ C  : C fm.
☐ Bn : B fm. of northern Tehran
▒ Bs : B fm. of southern Tehran
▒ A  : Hezardarreh fm.
▓ R  : Bedrock:volcaniclastic,clastic
        and volcanic rocks in the north;
        volcanics in the south;carbonate,
        conglomerate,and intrusive in the east. Source : Statistics Center of Iran (1996 CENSUS)

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0    2    4    6 km

**B-2**

## Model Ground for Seismic Analysis



**Legend**

∿ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

- Model No.1
- Model No.2
- Model No.3
- Model No.4
- Model No.5
- Model No.6
- Model No.7
- Model No.8
- Model No.9
- Model No.10
- Model No.11
- Model No.12
- Model No.13
- Model No.14
- Model No.15
- Model No.16
- Model No.17
- Model No.18
- Model No.19
- Model No.20
- Model No.21
- Model No.22
- Model No.23
- Model No.24
- Model No.25
- Model No.26
- Model No.27
- Model No.28
- Model No.29
- Model No.30
- Model No.31
- Model No.32
- Model No.33
- Model No.34
- Model No.35
- Model No.36
- Model No.37
- Model No.38
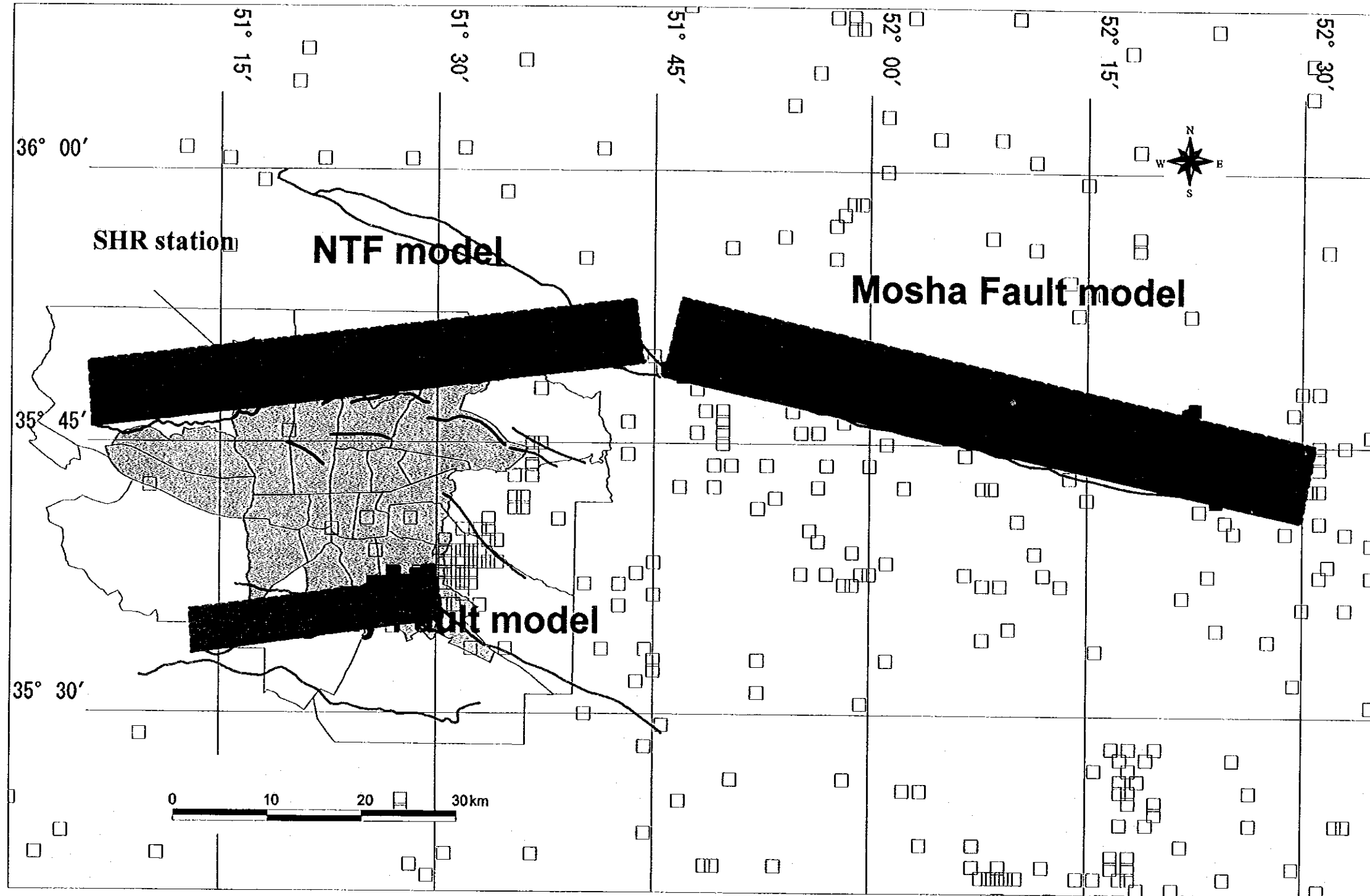- Model No.39
- Model No.40
- Model No.41

0  2  4  6 km

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## Source Fault Model for Scenario earthquake



SHR station

NTF model

Mosha Fault model

...ault model

51° 15'  51° 30'  51° 45'  52° 00'  52° 15'  52° 30'

36° 00'

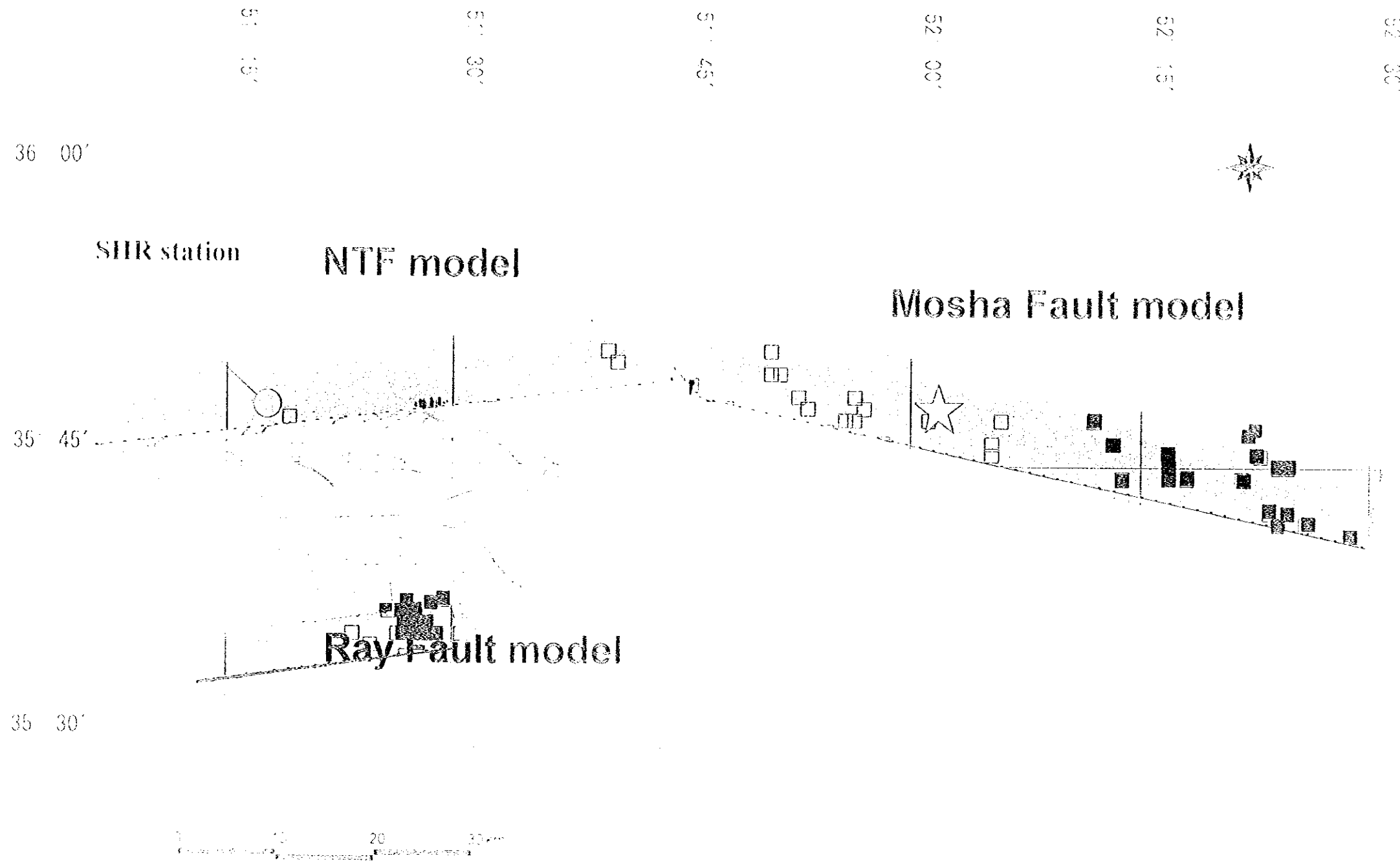35° 45'

35° 30'

0  10  20  30 km

■ Source Fault Model (solid line indicates upper limb)

□ ■ Epicenter for observed earthquake (1996-1999)

★ Applied Earthquake for Systhesis of Seismic Waveform

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| Source Fault Parameters | Ray Fault model | NTF model | Mosha Fault model |
|---|---|---|---|
| Length (km) | 26 | 58 | 68 |
| Width (km) | 16 | 27 | 30 |
| Moment Magnitude (Mw) | 6.7 | 7.2 | 7.2 |
| Origin  N (degree) | 35.8255 | 35.6815 | 35.5876 |
| E (degree) | 51.7392 | 52.4955 | 51.5061 |
| Azimuth (degree, clockwise from north) | 263 | 263 | 283 |
| Dip Angle (degree) | 75 | 75 | 75 |
| Depth of upper limb (km) | 5 | 0 | 0 |

# Source Fault Model for Scenario earthquake



SHR station

NTF model

Mosha Fault model

Ray Fault model

36 00'

35 45'

35 30'

Shade in Fault Model Surface indicates upper limb

Epicenter of observed earthquake 1996-1999

Applied Earthquake for Synthesis of Seismic Waveform

| Source Fault Parameters | Ray Fault model | NTF model | Mosha Fault model |
|---|---|---|---|
| Length (km) | 26 | 58 | 68 |
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| Azimuth (degree, clockwise from north) | 263 | 263 | 283 |
| Dip Angle (degree) | 75 | 75 | 75 |
| Depth of upper limb (km) | 5 | 0 | 0 |

# Peak Ground Acceleration Distribution Map ( Ray Fault model )



## Legend

⋀ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

⌐⌐⌐ Earthquake source fault model
(solid line indicates
upper limb of the fault plane)

Acceleration (gal)

■ 500 - 600
▨ 400 - 500
□ 300 - 400
▦ 200 - 300
■ 100 - 200
■ 1 - 100

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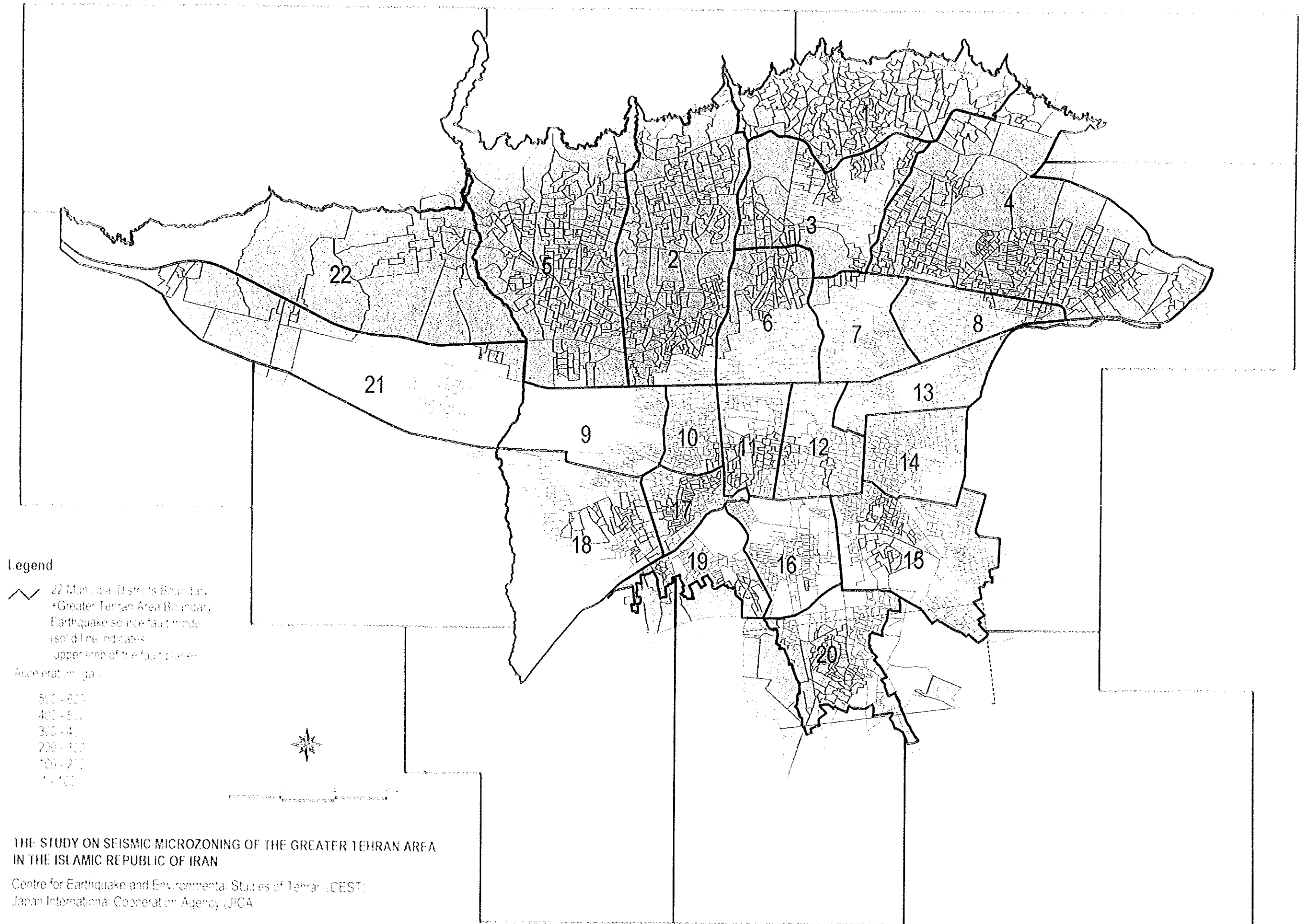
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# Peak Ground Acceleration Distribution Map ( Ray Fault model )



Legend

22 Municipal Districts Boundary
+Greater Tehran Area Boundary
Earthquake source fault model
(solid line indicates
upper limit of the fault plane)

Acceleration (gal)

500 - 600
400 - 500
300 - 400
200 - 300
100 - 200
0 - 100

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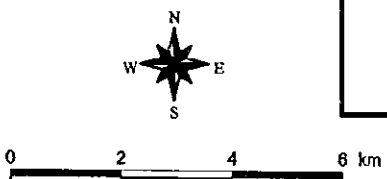Japan International Cooperation Agency (JICA)

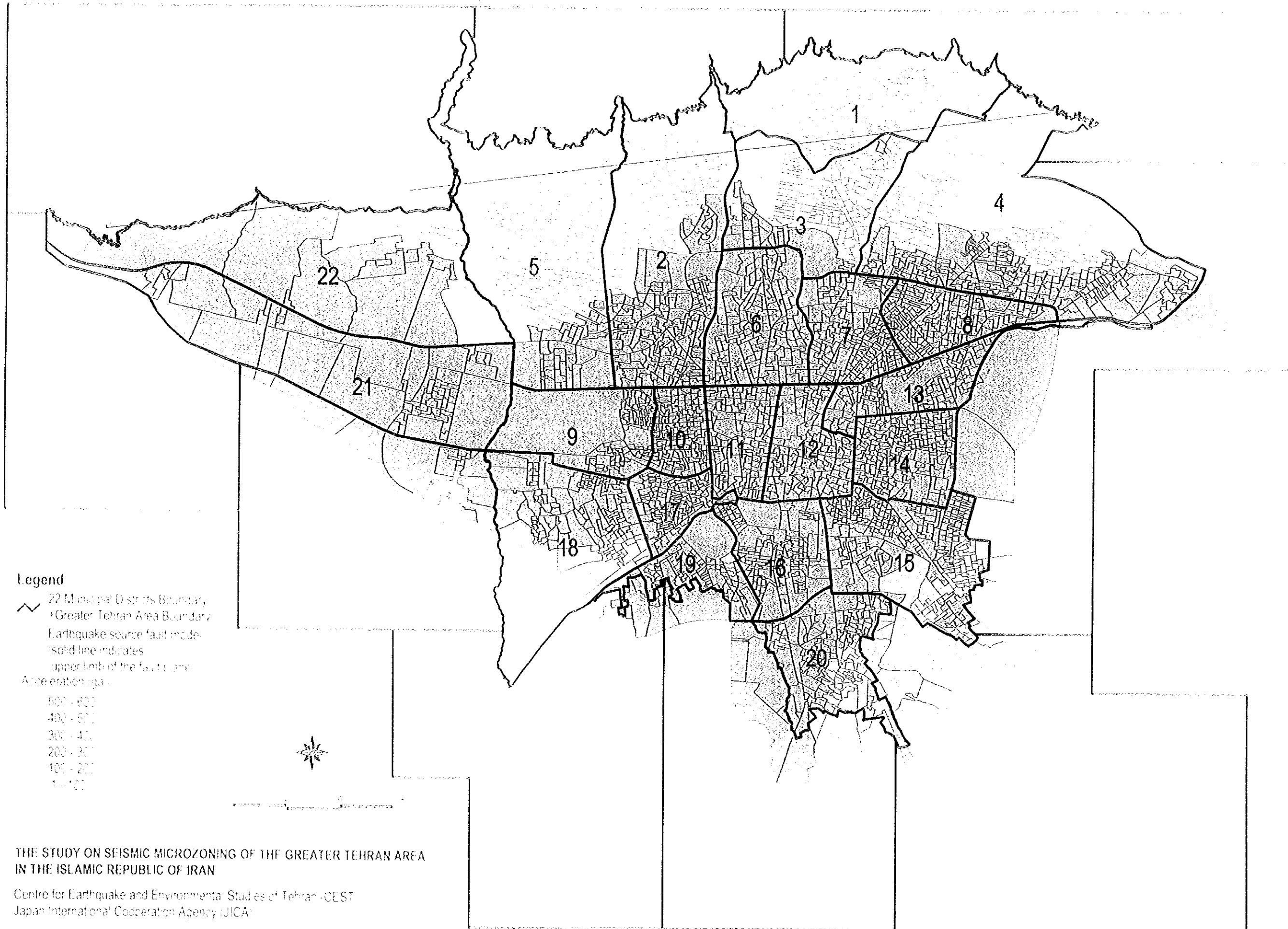# Peak Ground Acceleration Distribution Map (NTF model)

**Legend**

∿ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

⬚ Earthquake source fault model
(solid line indicates
upper limb of the fault plane)

Acceleration (gal)

◼ 500 - 600
▨ 400 - 500
▢ 300 - 400
◼ 200 - 300
▨ 100 - 200
▨ 1 - 100

0   2   4   6 km

N
W  E
S

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# Peak Ground Acceleration Distribution Map (NTF model)



Legend

22 Municipal Districts Boundary
Greater Tehran Area Boundary
Earthquake source fault model
(solid line indicates
upper limit of the fault plane)
Acceleration (gal)

600 - 800
400 - 600
300 - 400
200 - 300
100 - 200
1 - 100

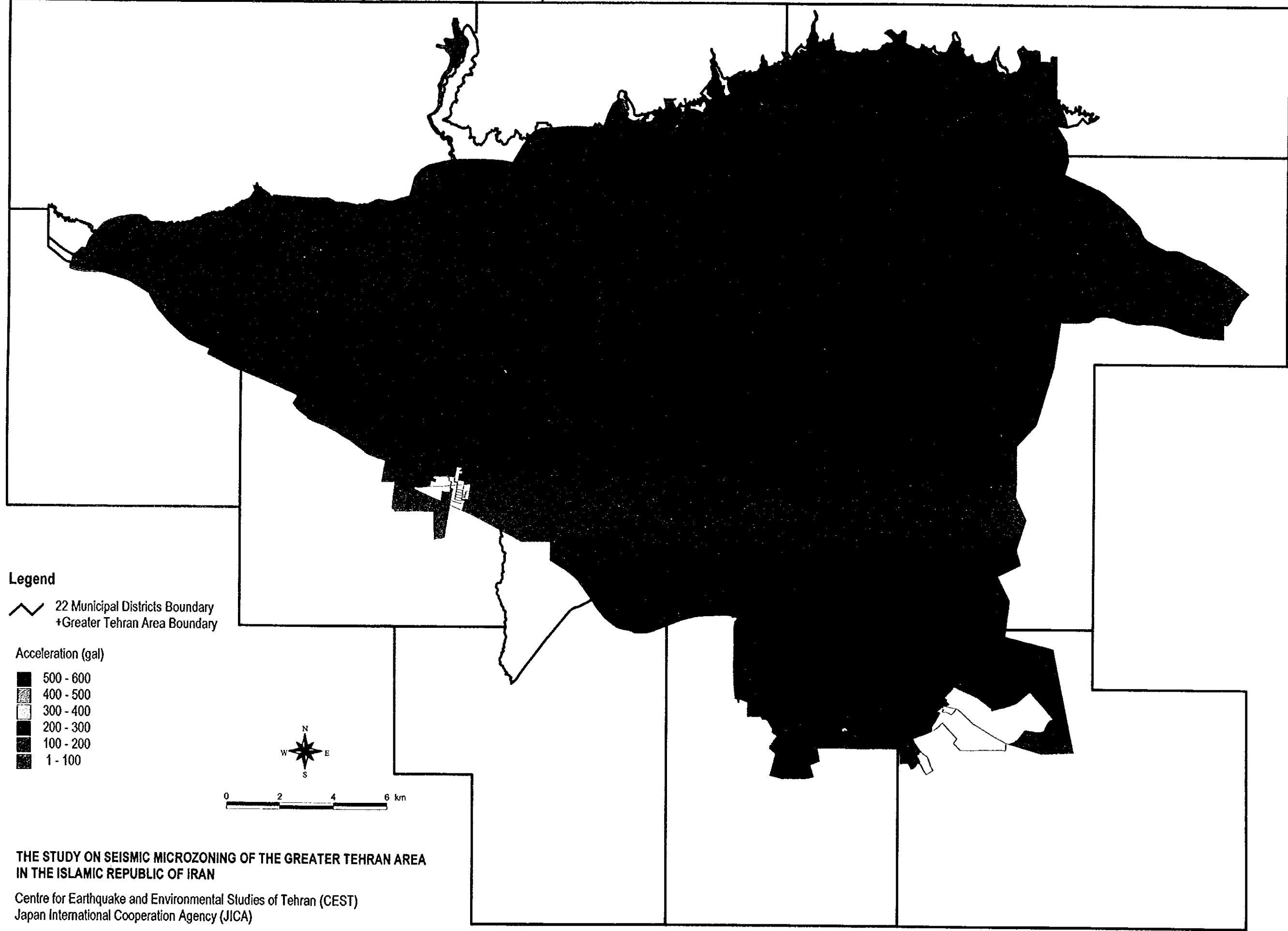THE STUDY ON SEISMIC MICROZONING OF THE GREATER TEHRAN AREA
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# Peak Ground Acceleration Distribution Map (Mosha Fault model)
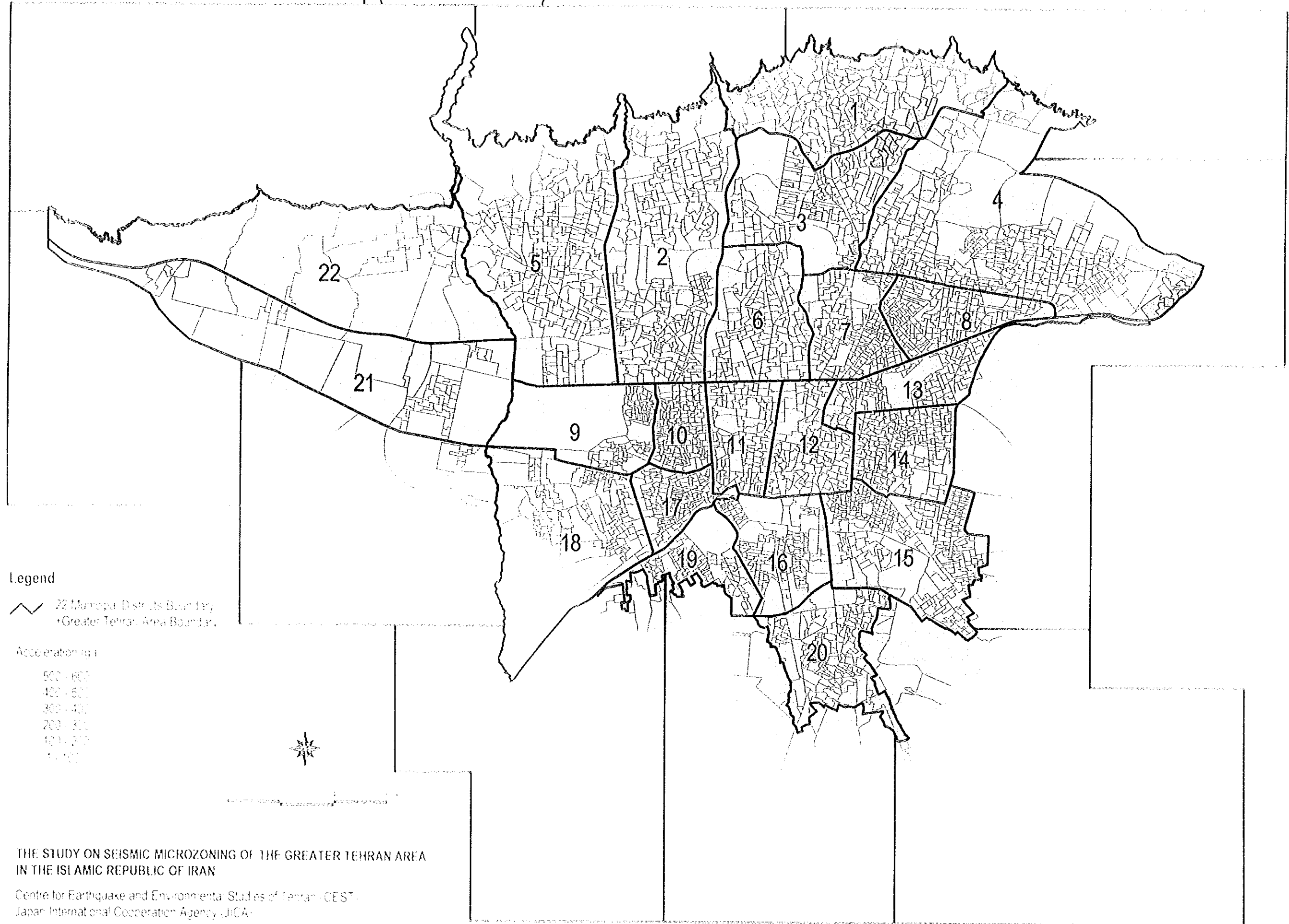


**Legend**

⋀⋁ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

Acceleration (gal)

■ 500 - 600
▨ 400 - 500
□ 300 - 400
■ 200 - 300
▨ 100 - 200
▨ 1 - 100
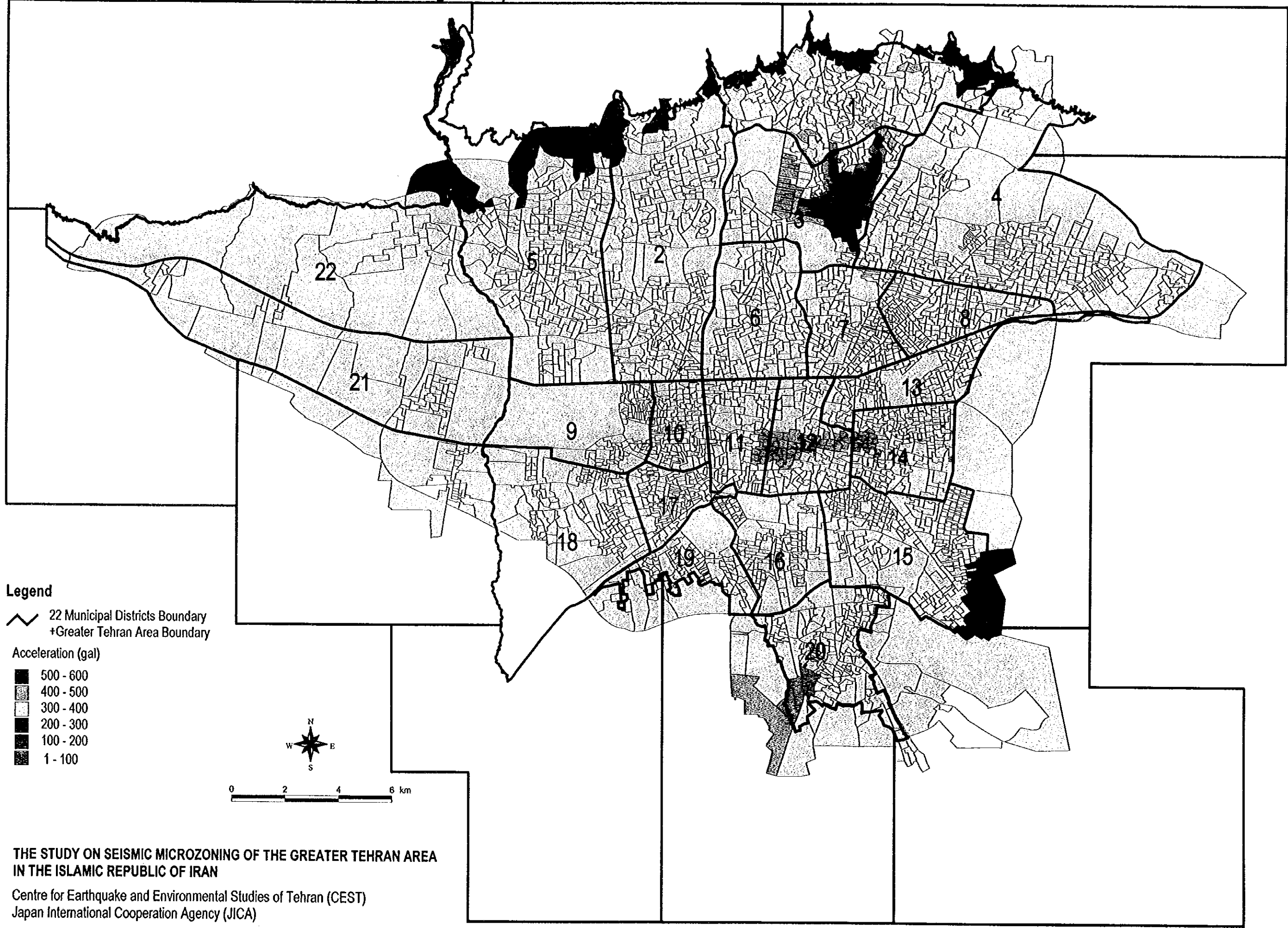
N
W ✴ E
S

0    2    4    6 km

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# Peak Ground Acceleration Distribution Map (Mosha Fault model)



Legend

22 Municipal Districts Boundary
Greater Tehran Area Boundary

Acceleration (gal)

500 - 600
400 - 500
300 - 400
200 - 300
100 - 200
- 100

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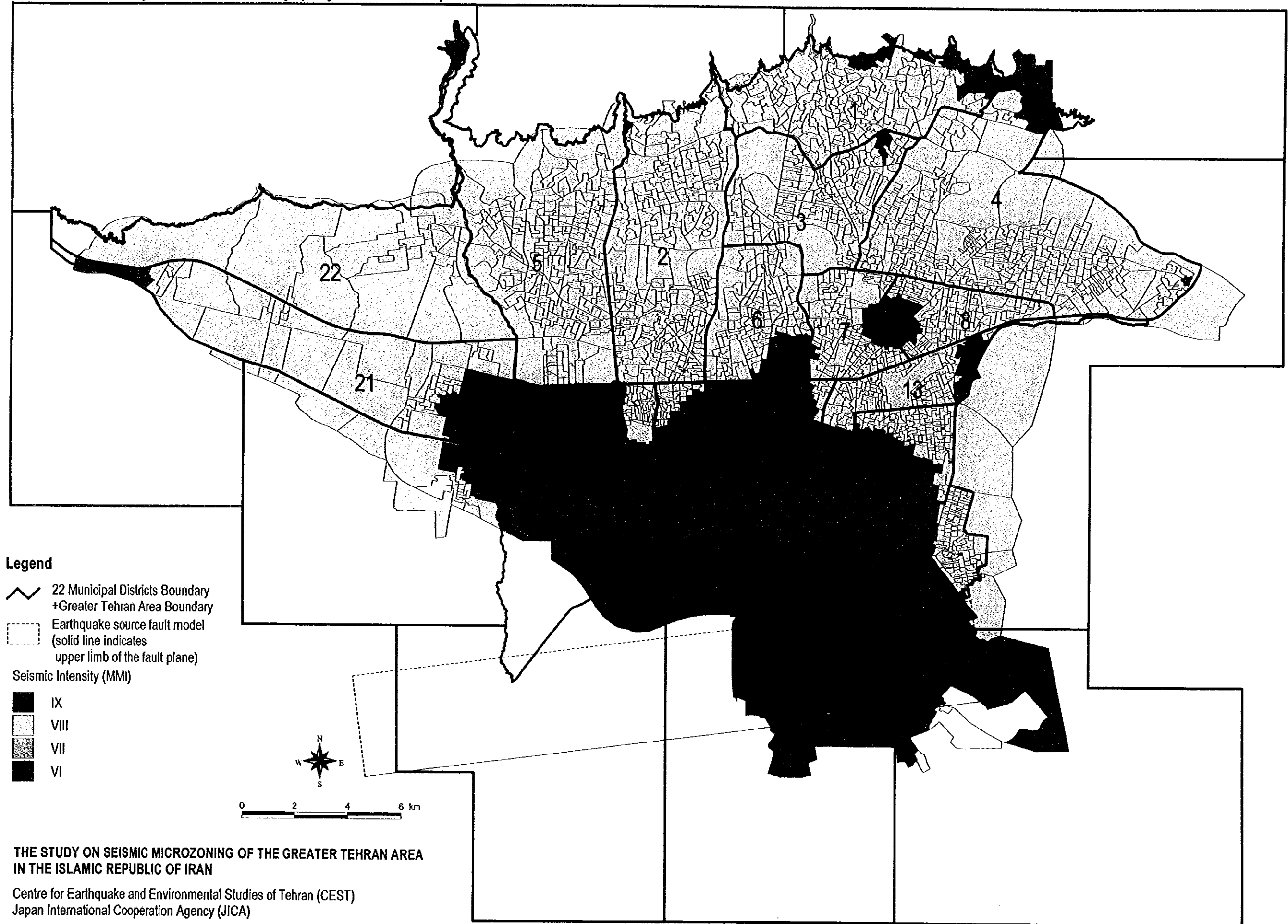Japan International Cooperation Agency (JICA)

# Peak Ground Acceleration Distribution Map (Floating model)



## Legend

⋀⋁ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

Acceleration (gal)

■ 500 - 600
▨ 400 - 500
□ 300 - 400
■ 200 - 300
▨ 100 - 200
▨ 1 - 100

N
W E
S

0   2   4   6 km

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# Seismic Intensity Distribution Map (Ray Fault model)



**Legend**

⋀⋁ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

┌┄┐ Earthquake source fault model
└┄┘ (solid line indicates
upper limb of the fault plane)

Seismic Intensity (MMI)

▮ IX
▯ VIII
▨ VII
▮ VI

N
W ✶ E
S

0    2    4    6 km

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# Seismic Intensity Distribution Map (Ray Fault model)



Legend

22 Municipal Districts Boundary,
*Greater Tehran Area Boundary,
Earthquake source fault model
solid line indicates
upper limit of the fault plane

Seismic Intensity (MMI)

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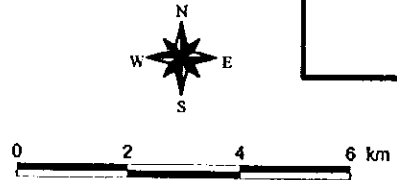
# Seismic Intensity Distribution Map (NTF model)



**Legend**

⋀⋁ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

⌐¬ Earthquake source fault model
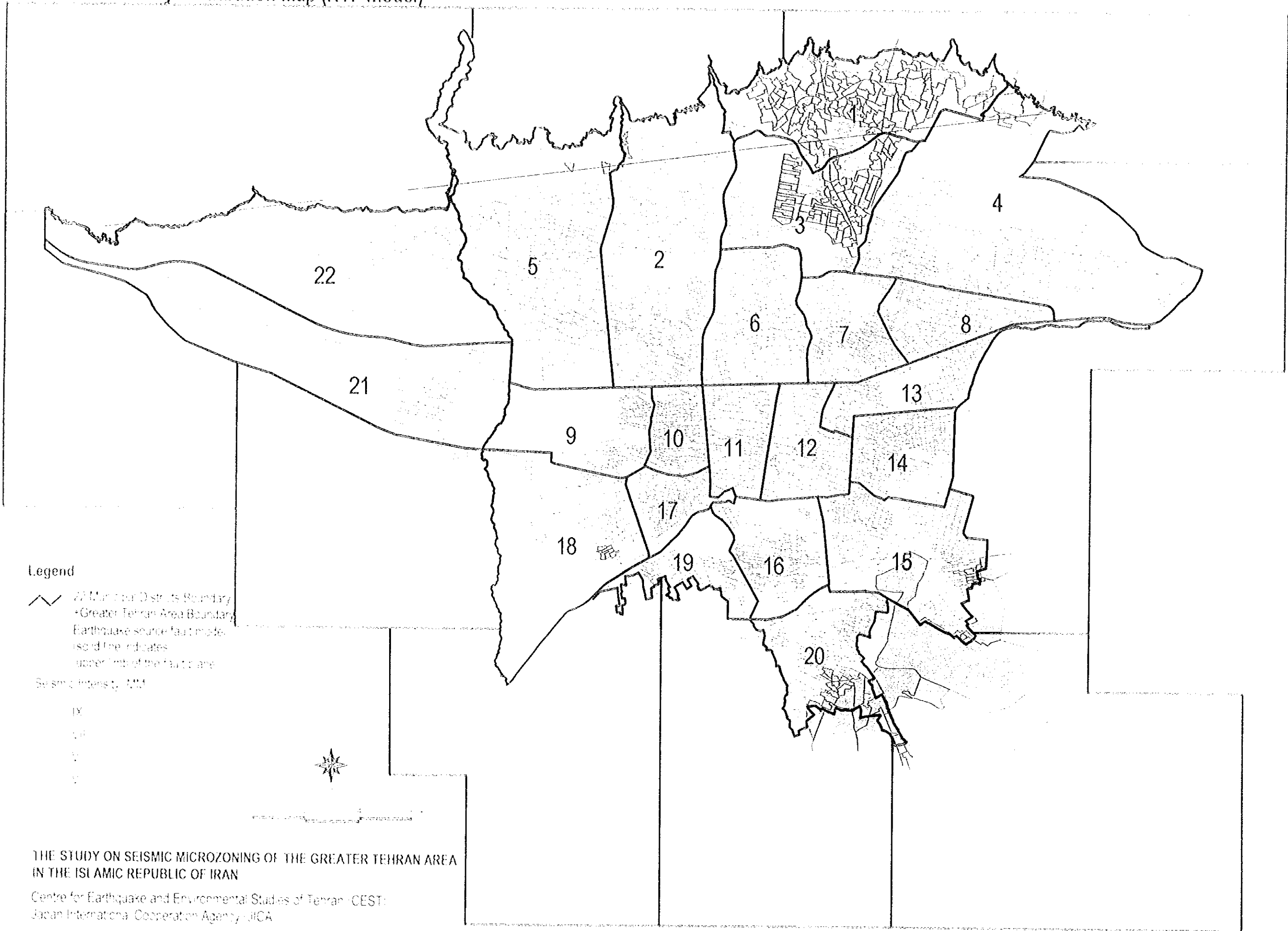(solid line indicates
upper limb of the fault plane)

Seismic Intensity (MMI)

■ IX
□ VIII
■ VII
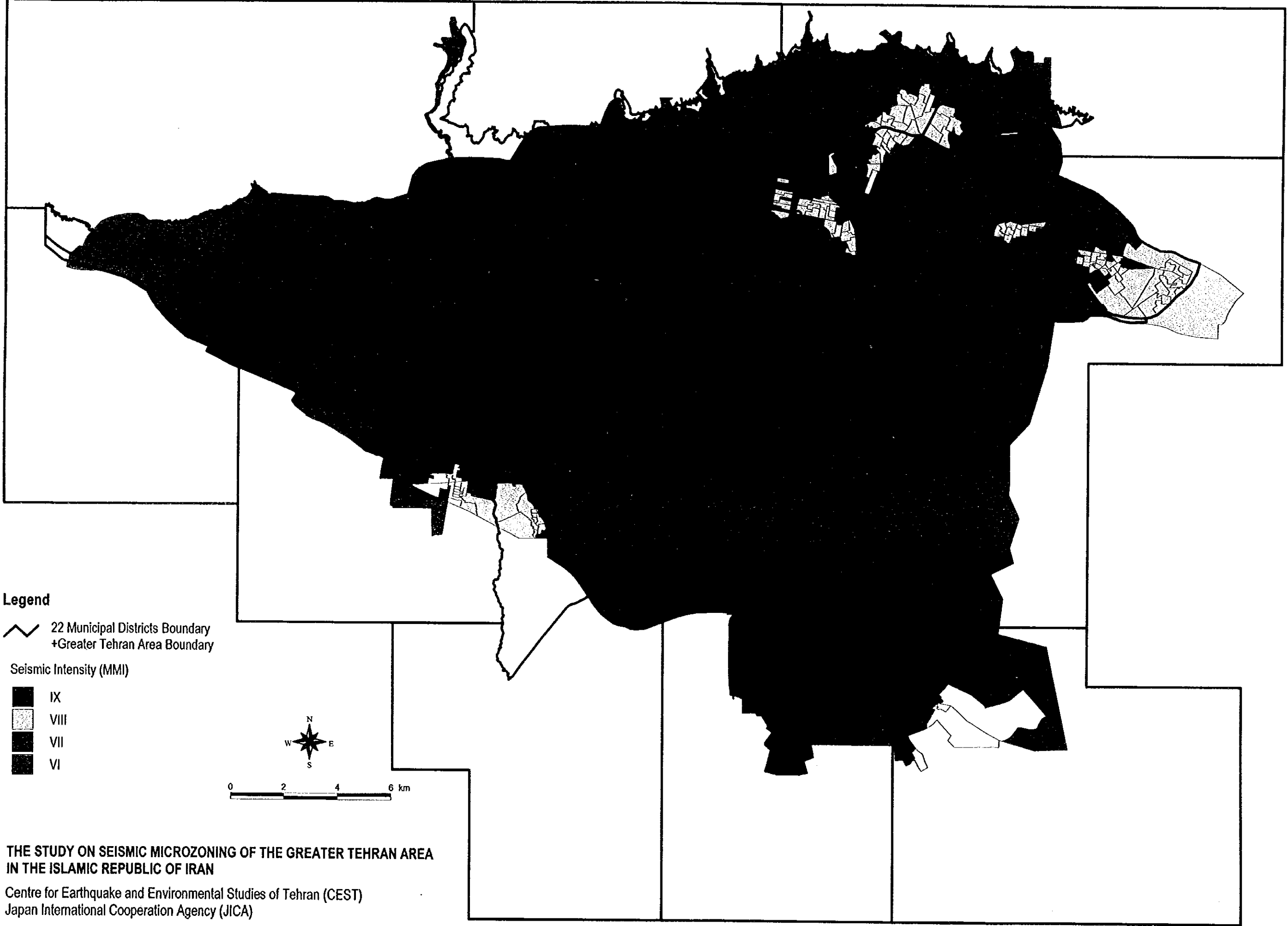▓ VI

N
W＋E
S

0    2    4    6 km

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# Seismic Intensity Distribution Map (NTF model)



Legend

∿∿ 22 Municipal District Boundary
+Greater Tehran Area Boundary
Earthquake source fault model
solid line indicates
upper limit of the fault plane

Seismic Intensity MM

IX

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# Seismic Intensity Distribution Map (Mosha Fault model)



**Legend**

⋀⋁ 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

Seismic Intensity (MMI)

▮ IX
▨ VIII
▮ VII
▨ VI

N
W   E
S

0   2   4   6 km

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# Seismic Intensity Distribution Map (Mosha Fault model)



Legend

22 Municipal Districts Boundary,
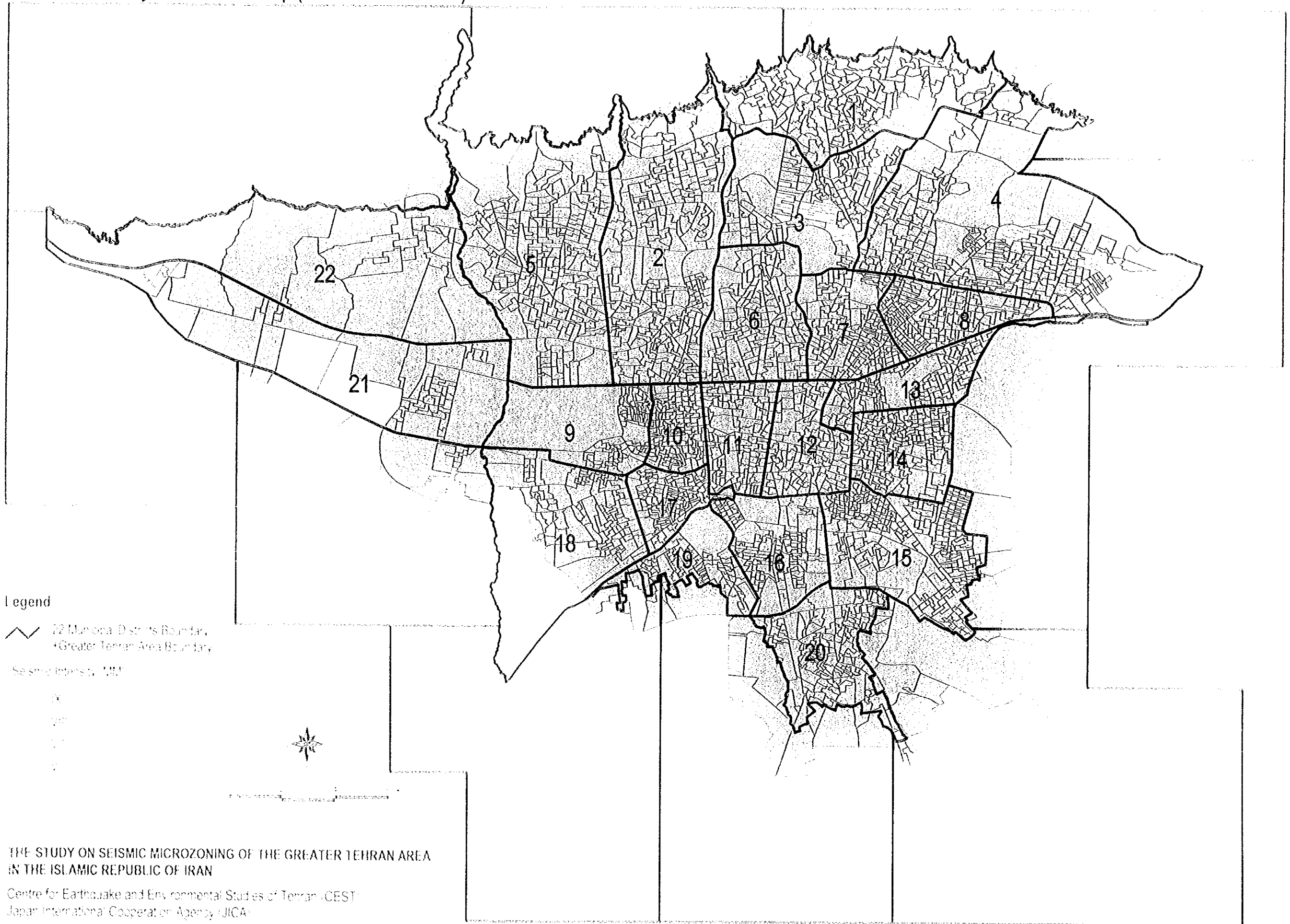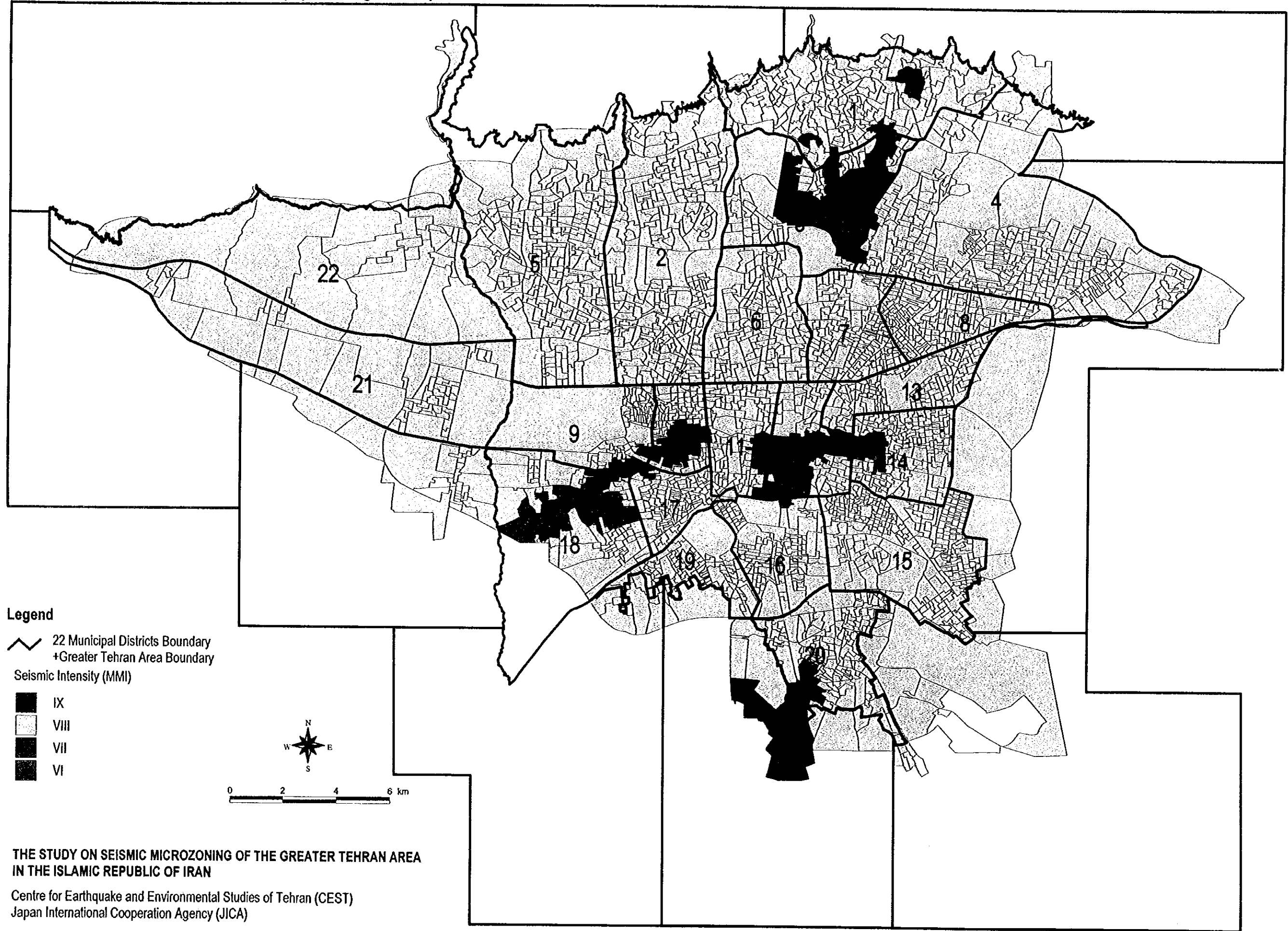+Greater Tehran Area Boundary,

Seismic Intensity, MMI

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# Seismic Intensity Distribution Map (Floating model)



### Legend

〰 22 Municipal Districts Boundary
+Greater Tehran Area Boundary

Seismic Intensity (MMI)

| | |
|---|---|
| ■ | IX |
| □ | VIII |
| ■ | VII |
| ▓ | VI |

N
W — E
S

0    2    4    6 km

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Centre for Earthquake and Environmental Studies of Tehran (CEST)
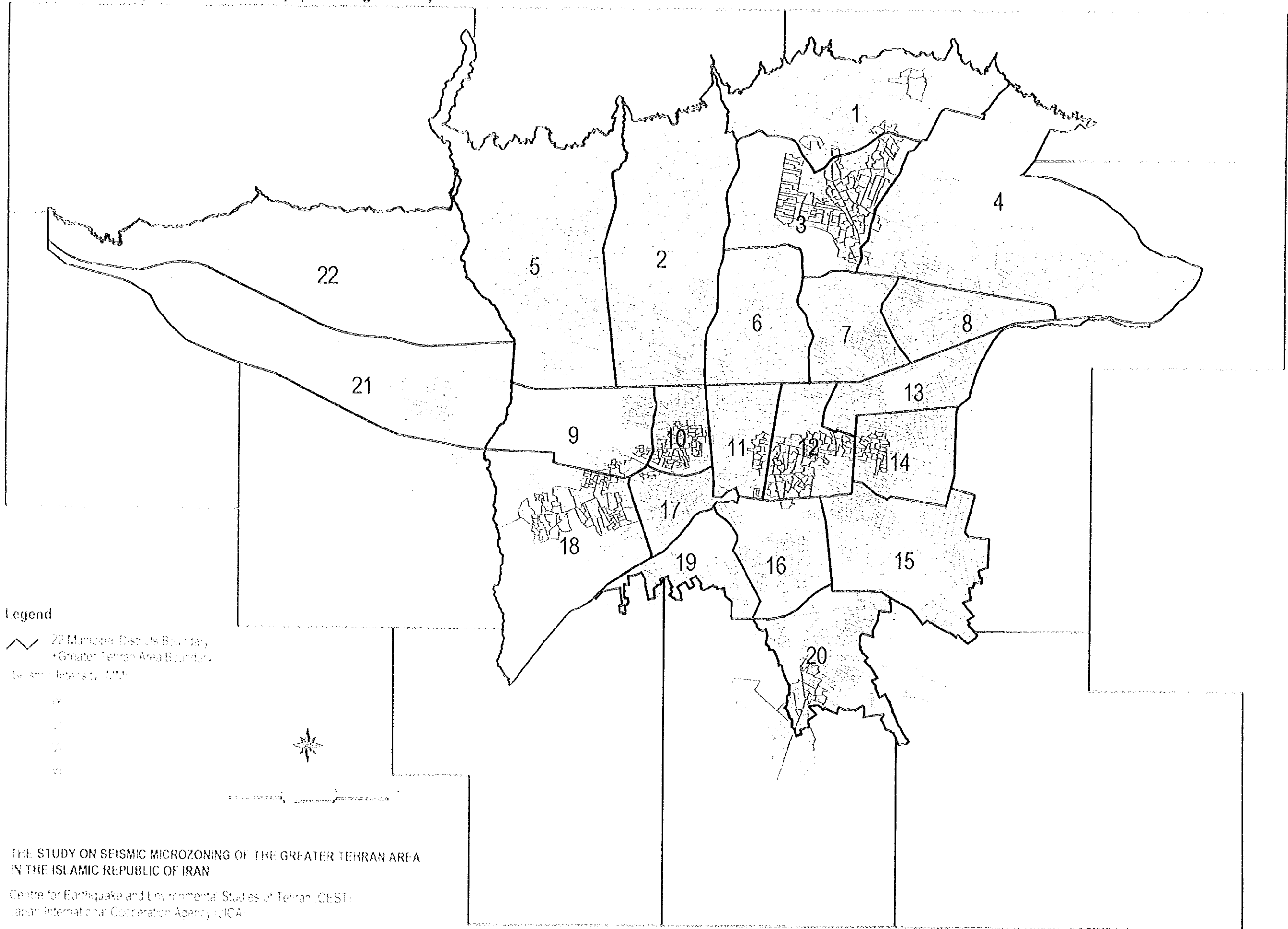Japan International Cooperation Agency (JICA)

# Seismic Intensity Distribution Map (Floating model)



Legend

22 Municipal Districts Boundary
Greater Tehran Area Boundary
Seismic Intensity (JMA)

THE STUDY ON SEISMIC MICROZONING OF THE GREATER TEHRAN AREA
IN THE ISLAMIC REPUBLIC OF IRAN

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Japan International Cooperation Agency (JICA)