

# Recognition of Risk Information

## - Adaptation of J. Bertin's Orderable Matrix for social communication



**Keiichi Ishida**

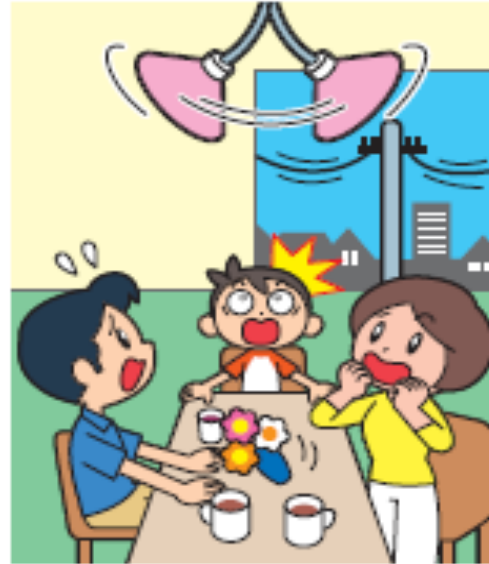
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# How strong is the earthquake?

It is normally difficult to understand for people, who never experienced earthquakes, the relations between intensity index and damages.  
But, using some illustrations:

(Source: Japan Meteorological Agency)



4

- Most people are startled.
- Hanging objects such as lamps swing significantly.
- Unstable ornaments may fall.



5 Lower



- Many people are frightened and feel the need to hold onto something stable.
- Dishes in cupboards and items on bookshelves may fall.
- Unsecured furniture may move, and unstable furniture may topple over.

# Recognition of Information by using:

**EYE**

**or**

**EAR**



The sky is blue (sunny day).  
There is a mountain (Mt. Fuji) in the back, some yellow flowers (canola flower) are in the foreground and some Trees (cherry) are in the middle..., etc.  
Tons of description writings are necessary to explain.

**Visualization is for understanding circumstance instantaneously without missing details.**

# Tokyo is the riskiest place!!!

Swiss Re

## Mind the risk

A global ranking of cities under threat from natural disasters

Most people potentially affected, aggregated for all five perils (in million)

Tokyo-Yokohama (JPN)	57.1
Manila (PHL)	34.6
Pearl-River Delta (CHN)	34.5
Osaka-Kobe (JPN)	32.1
Jakarta (IND)	27.7
Nagoya (JPN)	22.9
Kolkata (IND)	17.9
Shanghai (CHN)	16.7
Los Angeles (USA)	16.4
Tehran (IRN)	15.6

(Source: Mind the risk)

**But, how...?**

### 1. Earthquake,



### 2. Tsunami,



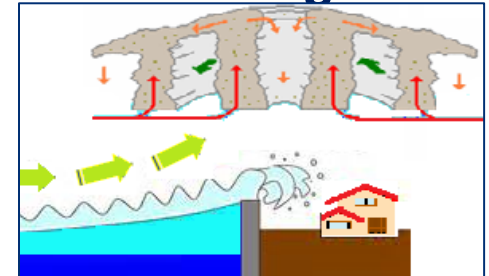
### 3. Wind storm (or Typhoon),



### 4. River flood,



### 5. Storm surge



# Detailed data for each perils for affected cities

Earthquake ranking			Storm ranking			River flood ranking			Storm surge ranking			Tsunami ranking		
Metro area	Area (km <sup>2</sup> ); People population (mn)	potentially affected(mn)	Metro area	Area (km <sup>2</sup> ); People population (mn)	potentially affected(mn)	Metro area	Area (km <sup>2</sup> ); People population (mn)	potentially affected(mn)	Metro area	Area (km <sup>2</sup> ); People population (mn)	potentially affected(mn)	Metro area	Area (km <sup>2</sup> ); People population (mn)	potentially affected(mn)
1 Tokyo-Yokohama (JPN)	16 300 37.1	29.4	1 Pearl River Delta (CHN)	20600 42.4	17.2	1 Pearl River Delta (CHN)	20600 42.4	12.0	1 Pearl River Delta (CHN)	20600 42.4	5.3	1 Tokyo-Yokohama (JPN)	16 300 37.1	2.4
2 Jakarta (IDN)	11 600 33.1	17.7	2 Tokyo-Yokohama (JPN)	16 300 37.1	14.1	2 Shanghai (CHN)	8 000 17.6	11.7	2 Osaka-Kobe (JPN)	13 500 18.6	3.0	2 Nagoya (JPN)	15 600 11.6	2.4
3 Manila (PHL)	2 900 20.9	16.8	3 Manila (PHL)	2 900 20.9	12.6	3 Kolkata (IND)	3 200 19.1	10.5	3 Mumbai (IND)	2 600 20.6	2.6	3 Osaka-Kobe (JPN)	13 500 18.6	1.8
4 Los Angeles (USA)	14 400 15.4	14.7	4 Osaka-Kobe (JPN)	13 600 18.6	7.8	4 Jakarta (IDN)	10 600 33.1	10.0	4 Tokyo-Yokohama (JPN)	16 300 37.1	2.3	4 Shantou (CHN)	5 200 10.0	0.7
5 Osaka-Kobe (JPN)	13 600 18.6	14.6	5 Taipei (TWN)	2 100 8.1	5.4	5 Delhi (IND)	5 700 21.9	8.9	5 Amsterdam-Rotterdam (NDL)	10 800 5.4	1.8	5 Kolkata (IND)	3 200 19.1	0.6
6 Tehran (IRN)	11 000 15.1	13.6	6 Shantou (CHN)	5 200 10.0	5.1	6 Tokyo-Yokohama (JPN)	16 300 37.1	8.9	6 Nagoya (JPN)	15 600 11.6	1.7	6 Dhaka (BGD)	1 800 12.9	0.4
7 Nagoya (JPN)	15 600 11.6	9.4	7 Nagoya (JPN)	15 600 11.6	4.3	7 Bangkok (THL)	3 500 9.5	7.1	7 Shanghai (CHN)	8 000 17.6	1.4	7 Izmir (TUR)	1 400 2.7	0.4
8 Lima (PER)	2 600 8.9	8.9	8 Mumbai (IND)	2 600 20.6	4.3	8 Mexico City (MEX)	4 500 19.6	6.1	8 Kolkata (IND)	3 200 19.1	1.4	8 Jiaojing (CHN)	2 700 3.1	0.3
9 Taipei (TWN)	2 100 8.1	8.0	9 Chennai (IND)	1 600 8.5	4.0	9 Cairo (EGY)	3 500 17.7	5.5	9 Ho Chi Minh (VNM)	2 000 9.1	1.3	9 Guayaquil (ECU)	900 2.4	0.3
10 Istanbul (TUR)	4 100 11.5	6.4	10 Tainan-Kaohsiung (TWN)	3 100 5.1	4.0	10 Tianjin (CHN)	2 600 5.8	5.5	10 New York-Newark (USA)	11 900 16.5	1.1	10 Chennai (IND)	1 600 8.5	0.2

## Earthquake ranking

	Area (km <sup>2</sup> );	People potentially affected (mn)
1 Tokyo-Yokohama (JPN)	16 300 37.1	29.4

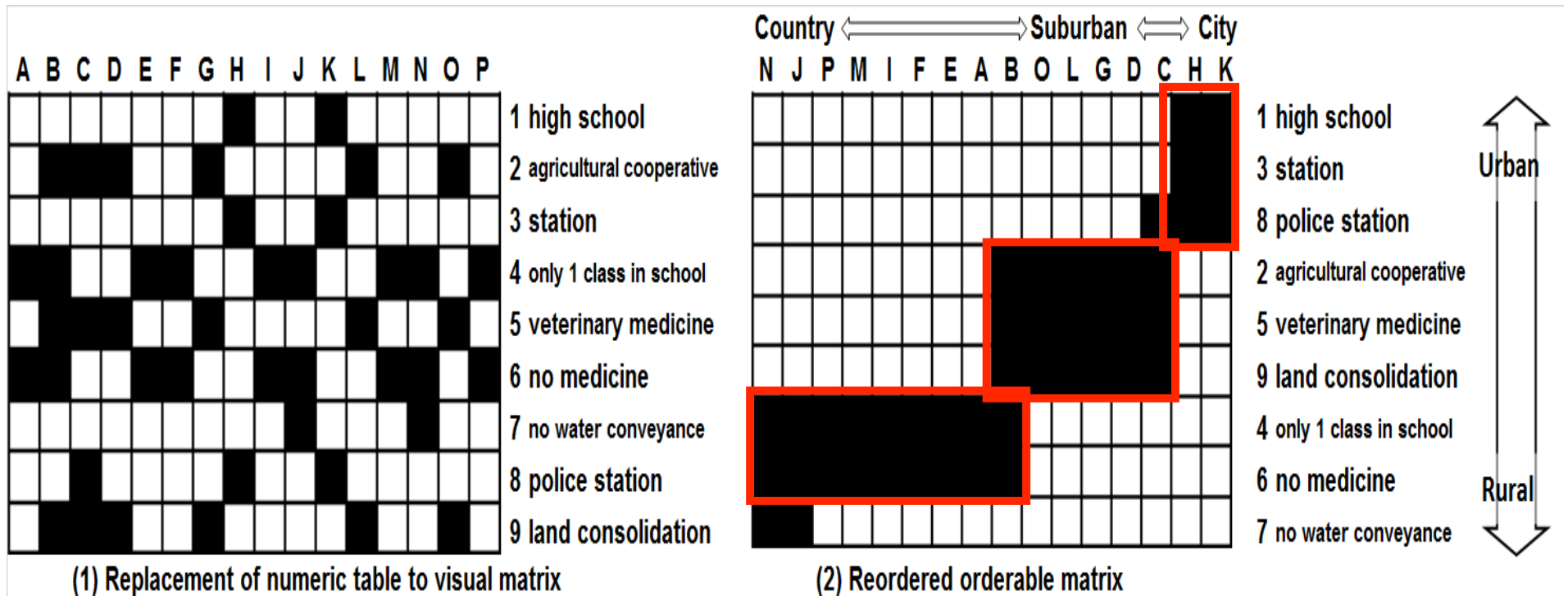
population (mn)

**Obviously, 79.2% of population is affected by a large earthquake event in Tokyo**

(Source: Mind the risk)

# Data recognition by visualization

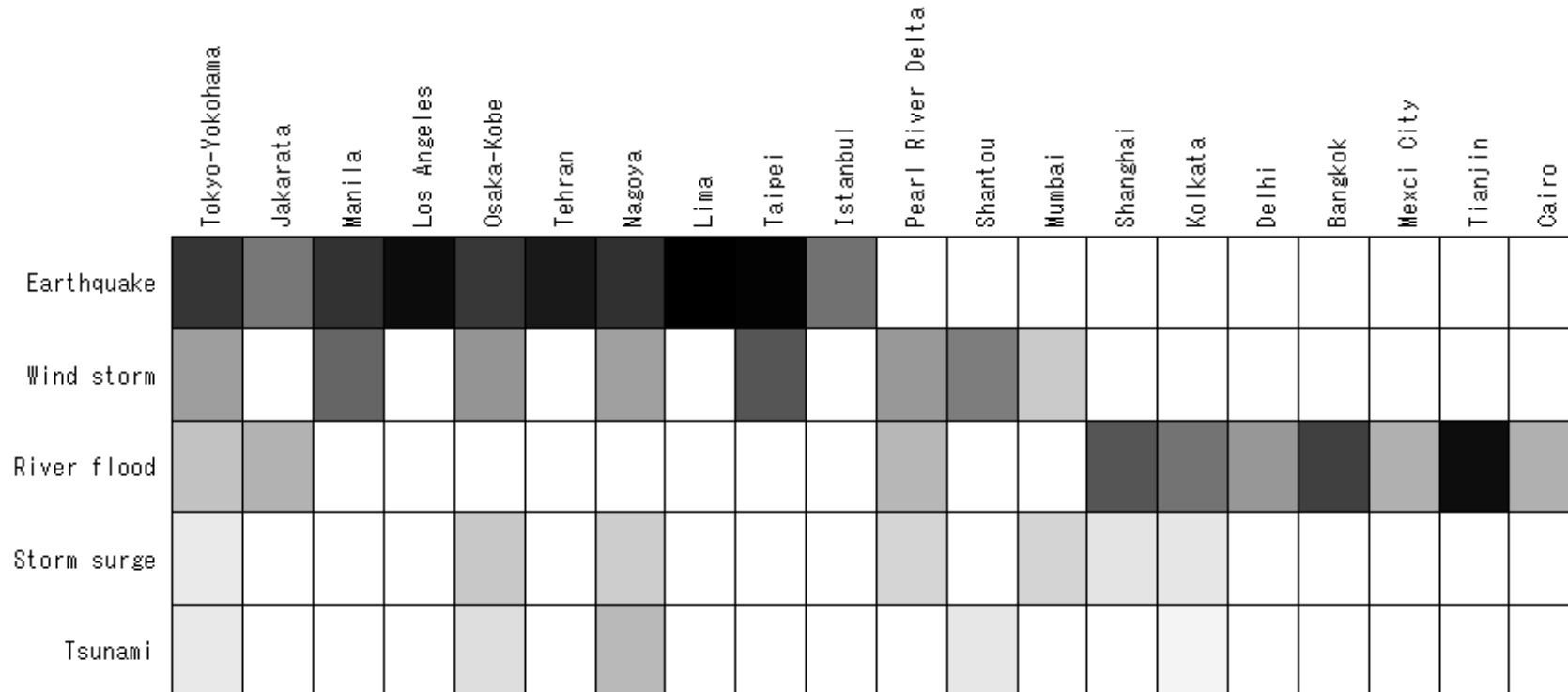
## An example of Bertin's Orderable Matrix



# Adaptation of data to Bertin's matrix

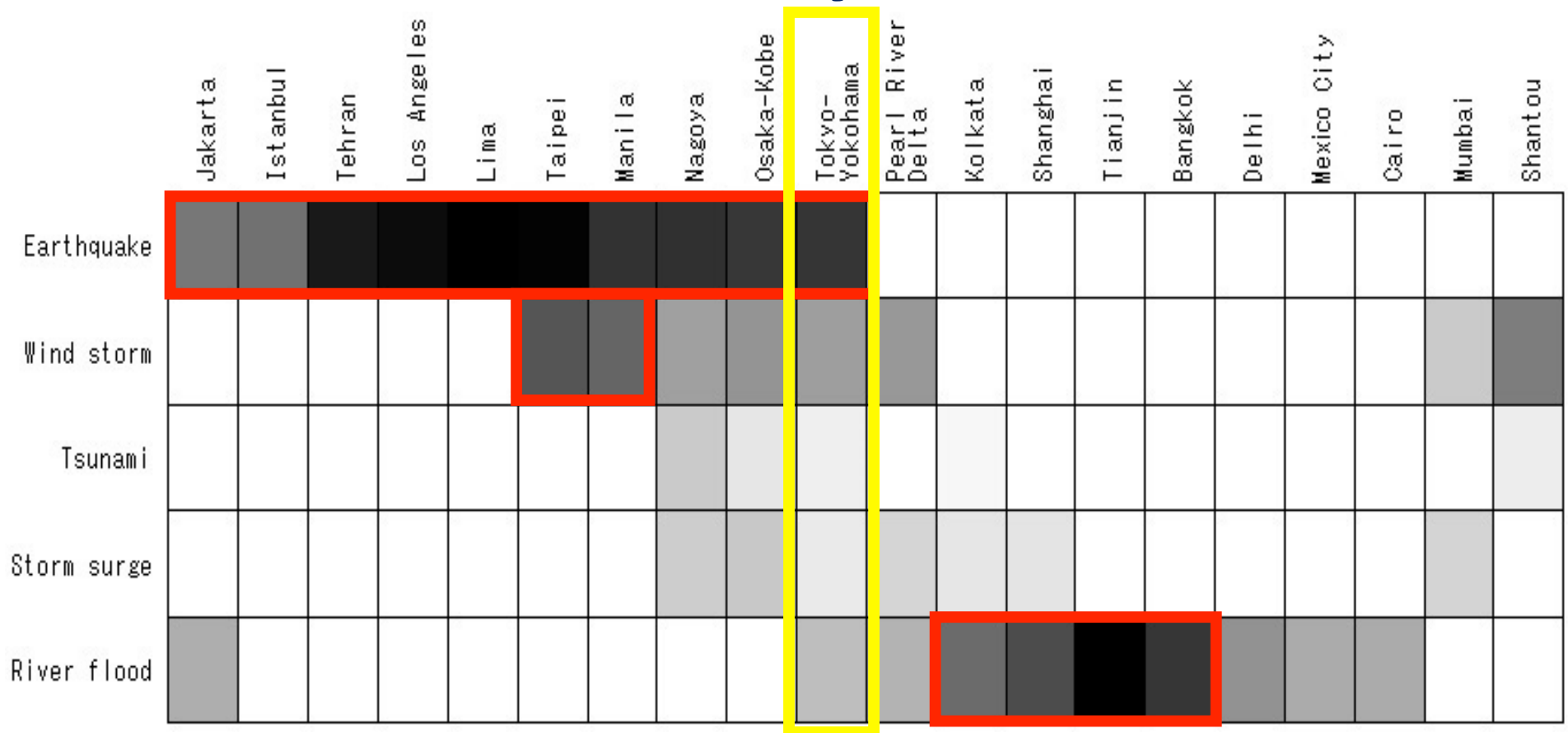
Earthquake ranking			Storm ranking			River flood ranking			Storm surge ranking			Tsunami ranking		
Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)
1 Tokyo-Yokohama (JPN)	16 300 37.1	29.4	1 Pearl River Delta (CHN)	20 600 42.4	17.2	1 Pearl River Delta (CHN)	20 600 42.4	12.0	1 Pearl River Delta (CHN)	20 600 42.4	5.3	1 Tokyo-Yokohama (JPN)	16 300 37.1	2.4
2 Jakarta (IDN)	11 600 33.1	17.7	2 Tokyo-Yokohama (JPN)	16 300 37.1	14.1	2 Shanghai (CHN)	8 000 17.6	11.7	2 Osaka-Kobe (JPN)	13 500 18.6	3.0	2 Nagoya (JPN)	15 600 11.6	2.4
3 Manila (PHL)	2 900 20.9	16.8	3 Manila (PHL)	2 900 20.9	12.6	3 Kolkata (IND)	3 200 19.1	10.5	3 Mumbai (IND)	2 600 20.6	2.6	3 Osaka-Kobe (JPN)	13 500 18.6	1.8
4 Los Angeles (USA)	14 400 15.4	14.7	4 Osaka-Kobe (JPN)	13 600 18.6	7.8	4 Jakarta (IDN)	10 600 33.1	10.0	4 Tokyo-Yokohama (JPN)	16 300 37.1	2.3	4 Shantou (CHN)	5 200 10.0	0.7
5 Osaka-Kobe (JPN)	13 600 18.6	14.6	5 Taipei (TWN)	2 100 8.1	5.4	5 Delhi (IND)	5 700 21.9	8.9	5 Amsterdam-Rotterdam (NDL)	10 800 5.4	1.8	5 Kolkata (IND)	3 200 19.1	0.6
6 Tehran (IRN)	11 000 15.1	13.6	6 Shantou (CHN)	5 200 10.0	5.1	6 Tokyo-Yokohama (JPN)	16 300 37.1	8.9	6 Nagoya (JPN)	15 600 11.6	1.7	6 Dhaka (BGD)	1 800 12.9	0.4
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8 Lima (PER)	2 600 8.9	8.9	8 Mumbai (IND)	2 600 20.6	4.3	8 Mexico City (MEX)	4 500 19.6	6.1	8 Kolkata (IND)	3 200 19.1	1.4	8 Jiaojing (CHN)	2 700 3.1	0.3
9 Taipei (TWN)	2 100 8.1	8.0	9 Chennai (IND)	1 600 8.5	4.0	9 Cairo (EGY)	3 500 17.7	5.5	9 Ho Chi Minh (VNM)	2 000 9.1	1.3	9 Guayaquil (ECU)	900 2.4	0.3
10 Istanbul (TUR)	4 100 11.5	6.4	10 Tainan-Kaohsiung (TWN)	3 100 5.1	4.0	10 Tianjin (CHN)	2 600 5.8	5.5	10 New York-Newark (USA)	11 900 16.5	1.1	10 Chennai (IND)	1 600 8.5	0.2

(Source: Mind the risk)



More dark cells show more importance of affected population:  
100% affected (black) > 0% or no risk (white)

# Presentation of data by Bertin's Matrix

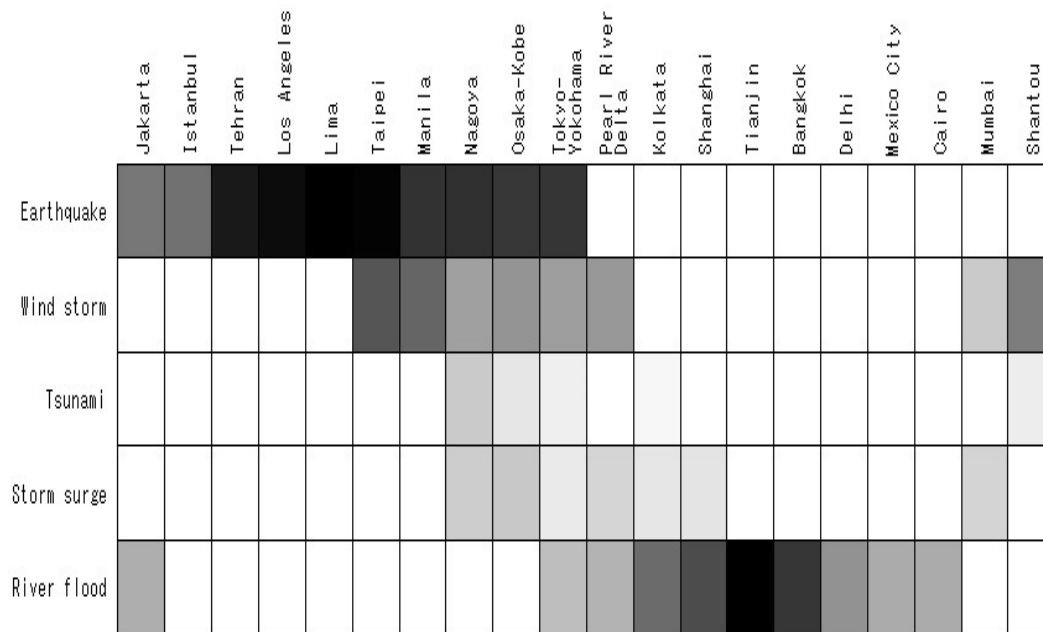


More dark cells show more importance of affected population: 100% affected (black) > 0% or no risk (white)

**People in Tokyo area could be affected all of 5 perils, then the sum of losses would be higher than the other cities.**



# Presentation of data by Bertin's Matrix



Most people potentially affected, aggregated for all five perils (in million)

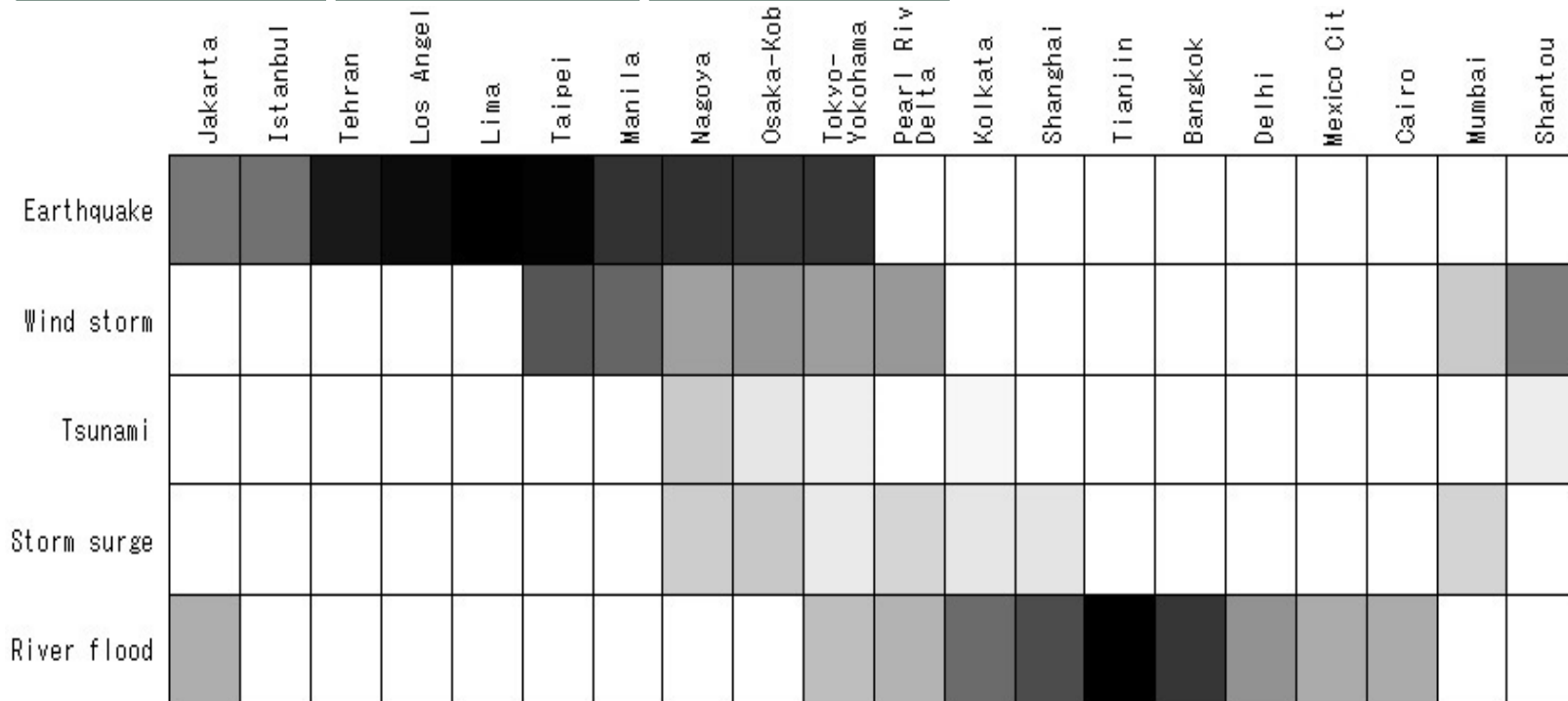
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Kolkata (IND)	17.9
Shanghai (CHN)	16.7
Los Angeles (USA)	16.4
Tehran (IRN)	15.6

**Certain cities affected more severe than the other cities by one perils.**

**Detailed and then important information have been compromised by modifying data to a top 10 ranking scoring.**

# Recap. Writing vs Illustrating

Earthquake ranking			Storm ranking			River flood ranking			Storm surge ranking			Tsunami ranking		
Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)	Metro area	Area (km <sup>2</sup> ): Population (mn)	People potentially affected(mn)
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2 Jakarta (IDN)	11600 33.1	17.7	2 Tokyo-Yokohama (JPN)	16300 37.1	14.1	2 Shanghai (CHN)	8000 17.6	11.7	2 Osaka-Kobe (JPN)	13500 18.6	3.0	2 Nagoya (JPN)	15600 18.6	2.4
3 Manila (PHL)	2900 20.9	16.8	3 Manila (PHL)	2900 20.9	12.6	3 Kolkata (IND)	3200 19.1	10.5	3 Mumbai (IND)	2600 20.6	2.6	3 Osaka-Kobe (JPN)	13500 18.6	1.8
4 Los Angeles (USA)	14400 15.4	14.7	4 Osaka-Kobe (JPN)	13600 18.6	7.8	4 Jakarta (IDN)	10600 33.1	10.0	4 Tokyo-Yokohama (JPN)	16300 37.1	2.3	4 Shantou (CHN)	5200 10.0	0.7
5 Osaka-Kobe (JPN)	13600 18.6	14.6	5 Taipei (TWN)	2100 8.1	5.4	5 Delhi (IND)	5700 21.9	8.9	5 Amsterdam-Rotterdam (NDL)	10800 5.4	1.8	5 Kolkata (IND)	3200 19.1	0.6
6 Tehran (IRN)	11000 15.1	13.6	6 Shantou (CHN)	5200 10.0	5.1	6 Tokyo-Yokohama (JPN)	16300 37.1	8.9	6 Nagoya (JPN)	15600 11.6	1.7	6 Dhaka (BGD)	1800 12.9	0.4
7 Nagoya (JPN)	15600 11.6	9.4	7 Nagoya (JPN)	15600 11.6	4.3	7 Bangkok (THL)	3500 9.5	7.1	7 Shanghai (CHN)	8000 17.6	1.4	7 Izmir (TUR)	1400 2.7	0.4
8 Lima (PER)	2600 8.9	8.9	8 Mumbai (IND)	2600 20.6	4.3	8 Mexico City (MEX)	4500 19.6	6.1	8 Kolkata (IND)	3200 19.1	1.4	8 Jiaojing (CHN)	2700 3.1	0.3
9 Taipei (TWN)	2100 8.1	8.0	9 Chennai (IND)	1600 8.5	4.0	9 Cairo (EGY)	3500 17.7	5.5	9 Ho Chi Minh (VNM)	2000 9.1	1.3	9 Guayaquil (ECU)	900 2.4	0.3
10 Istanbul (TUR)	4100 11.5	6.4	10 Tainan-Kaohsiung (TWN)	3100 5.1	4.0	10 Tianjin (CHN)	2600 5.8	5.5	10 New York-Newark (USA)	11900 16.5	1.1	10 Chennai (IND)	1600 8.5	0.2



# annex

	Jakarta	Istanbul	Tehran	Los Angeles	Lima	Taipei	Manila	Nagoya	Osaka-Kobe	Tokyo-Yokohama	Pearl River Delta	Kolkata	Shanghai	Tianjin	Bangkok	Delhi	Mexico City	Cairo	Mumbai	Shantou	
Earthquake	Dark Gray	Dark Gray	Black	Black	Black	Black	Dark Gray	Dark Gray	Dark Gray	Dark Gray	White	White	White	White	White	White	White	White	White	White	White
Wind storm	White	White	White	White	White	Dark Gray	Dark Gray	Dark Gray	Dark Gray	Dark Gray	Dark Gray	White	White	White	White	White	White	White	White	Light Gray	Dark Gray
Tsunami	White	White	White	White	White	White	White	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray
Storm surge	White	White	White	White	White	White	White	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray	Light Gray
River flood	Dark Gray	White	White	White	White	White	White	White	White	Light Gray	Light Gray	Dark Gray	Dark Gray	Black	Black	Dark Gray	Dark Gray	Dark Gray	White	White	White

	Jakarta	Istanbul	Tehran	Los Angeles	Lima	Taipei	Manila	Nagoya	Osaka-Kobe	Tokyo-Yokohama	Pearl River Delta	Kolkata	Shanghai	Tianjin	Bangkok	Delhi	Mexico City	Cairo	Mumbai	Shantou	
Earthquake	Orange	Orange	Black	Black	Black	Black	Red	Red	Red	Red	White	White	White	White	White	White	White	White	White	White	White
Wind storm	White	White	White	White	White	Red	Orange	Yellow	Yellow	Yellow	Yellow	White	White	White	White	White	White	White	White	Yellow	Orange
Tsunami	White	White	White	White	White	White	White	Yellow	Light Green	Light Green	White	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Storm surge	White	White	White	White	White	White	White	Yellow	Yellow	Light Green	Yellow	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Yellow	White
River flood	Yellow	White	White	White	White	White	White	White	White	Yellow	Yellow	Orange	Red	Black	Red	Yellow	Yellow	Yellow	Yellow	White	White

Colored elements catch the reader's attention.

However, in some cases, an additional information is required to explain which color represents what meaning differently with other colors.