Recognition of Risk Information - Adaptation of J. Bertin's Orderable Matrix for social communication

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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:



Most people are startled.

Hanging objects such as lamps swing significantly.

Unstable ornaments may fall.





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:EYEorEAR



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!!!

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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 <mark>(</mark> 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

Ea	orthquake rankin	g		Storm ra	anking			Riv	er flood rankir	ıg			St	orm surge rank	ng			Ts	unami ranking		
N	letro area	Area (km²); population (mn)	; People potentially affected(mn)	Metro ar	ea A po (m	rea (km²); opulation nn)	People potentiaïly affected(mn)	Met	tro area	Area (popula (mn)	km²); ation p a	People ootentiaïly ffected(mn)	Met	tro area A p (1	vrea (ki opulat mn)	m²); Pe ion pe aft	eople otentially fected(mn)	Μ	letro area de la definitación de la Alternación de la definitación de la Alternación de la definitación de la	Area (km²); population mn)	People potentially affected(mn)
1	Tokyo- Yokohama (JPN)	16300) 37.1	29.4	1 Pearl (CHN	River Delta)	20600 42.4	17.2	1	Pearl River Delt (CHN)	ta 2 4	0600 2.4	12.0	1	Pearl River Delta (CHN)	a 20 42	600 .4	5.3	1	Tokyo-Yokohama (JPN)	16 300 37.1	2.4
2	Jakarta (IDN)	11 600 33.1	17.7	2 Tokyo (JPN))-Yokohama	16 300 37.1	14.1	2	Shanghai (CHN	I) 8 1	000 7.6	11.7	2	Osaka-Kobe (JF	N) 13 18	500 .6	3.0	2	Nagoya (JPN)	15 600 11.6	2.4
3	Manila (PHL)	2 900 20.9	16.8	3 Mani	la (PHL)	2 900 20.9	12.6	3	Kolkata (IND)	3 1	200 9.1	10.5	3	Mumbai (IND)	2.6 20	000 .6	2.6	3	Osaka-Kobe (JPN	l) 13 500 18.6	1.8
4	Los Angeles (US	A) 14400 15.4	14.7	4 Osak	a-Kobe (JPN) 13 600 18.6	7.8	4	Jakarta <mark>(</mark> IDN)	1 3	0600 3.1	10.0	4	Tokyo-Yokoham (JPN)	a 16 37	300 .1	2.3	4	Shantou (CHN)	5200 10.0	0.7
5	Osaka-Kobe (JP	N) 13600 18.6	14.6	5 Taipe	i (TWN)	2 100 8.1	5.4	5	Delhi (IND)	5 2	700 1.9	8.9	5	Amsterdam- Rotterdam (NDI	10 .) 5.4	800 1	1.8	5	Kolkata (IND)	3 200 19.1	0.6
6	Tehran (IRN)	11 000 15.1	13.6	6 Shan	tou (CHN)	5 200 10.0	5.1	6	Tokyo-Yokohan (JPN)	na 1 3	6300 7.1	8.9	6	Nagoya (JPN)	15 11	600 .6	1.7	6	Dhaka (BGD)	1 800 12.9	0.4
7	Nagoya (JPN)	15600 11.6	9.4	7 Nago	ya (JPN)	15 600 11.6	4.3	7	Bangkok (THL)	3 9	500 .5	7.1	7	Shanghai (CHN	80 17)00 .6	1.4	7	lzmir (TUR)	1 400 2.7	0.4
В	Lima (PER)	2600 8.9	8.9	8 Mum	bai (IND)	2 600 20.6	4.3	8	Mexico City (M	EX) 4 1	500 9.6	6.1	8	Kolkata (IND)	32 19	200 .1	1.4	8	Jiaojing (CHN)	2 700 3.1	0.3
Э	Taipei (TWN)	2 100 8.1	8.0	9 Chen	nai (IND)	1 600 8.5	4.0	9	Cairo (EGY)	3 1	500 7.7	5.5	9	Ho Chi Minh (VI	VM)20 9.1	000	1.3	9	Guayaquil (ECU)	900 2.4	0.3
	0 Istanbul (TUR)	4 100 11.5	6.4	10 Taina (TWN	n Kaohsiung J)	3100 5.1	4.0	10	Tianjin <mark>(</mark> CHN)	2 5	600 .8	5.5	10	New York-Newa (USA)	rk 11 16	900 .5	1.1	10) Chennai (IND)	1600 8.5	0.2



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 ranki	ng		Storm ranking			River flood ranking			Storm surge ran	king		Tsunami ranking		
Metro area	Area (km²) population (mn)	; People potentially affected(mn)	Metro area	Area (km²) population (mn)	; People potentially affected(mn	Metro area Ar pc) (m	rea (km²) pulation in)	; People potentially affected(mn)	Metro area	Area (km²); population (mn)	People potentially affected(mn)	Metro area	Area (km populatio (mn)	People n potentially affected(mn)
1 Tokyo- Yokohama (JPI	16300 N) 37.1) 29.4	1 Pearl River Delt (CHN)	a 20.600 42.4	17.2	1 Pearl River Delta (CHN)	2060 42.4	0 12.0	1 Pearl River Del (CHN)	ta 20.600 42.4) 5.3	1 Tokyo-Yokoham (JPN)	a 16300 37.1	2.4
2 Jakarta (IDN)	11 600 33.1) 17.7	2 Tokyo-Yokoham (JPN)	a 16300 37.1	14.1	2 Shanghai (CHN)	8000 17.6	11.7	2 Osaka-Kobe (J	PN) 13500 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)	3200 19.1	10.5	3 Mumbai (IND)	2600 20.6	2.6	3 Osaka-Kobe (JP	N) 13 500 18.6	1.8
4 Los Angeles (L	JSA) 14400 15.4) 14.7	4 Osaka-Kobe (JF	N) 13600 18.6	7.8	4 Jakarta (IDN)	1060 33.1	0 10.0	4 Tokyo-Yokohar (JPN)	ma 16300 37.1	2.3	4 Shantou (CHN)	5200 10.0	0.7
5 Osaka-Kobe (J	PN) 13600 18.6) 14.6	5 Taipei (TWN)	2 100 8.1	5.4	5 Delhi (IND)	5700 21.9	8.9	5 Amsterdam- Rotterdam (NE	10800 DL) 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	0 8.9	6 Nagoya (JPN)	15600 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)	3500 9.5	7.1	7 Shanghai (CHN	N) 8000 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 (ME)	X) 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)	1600 8.5	4.0	9 Cairo (EGY)	3 500 17.7	5.5	9 Ho Chi Minh (V	/NM)2000 9.1	1.3	9 Guayaquil (ECU)) 900 2.4	0.3
10 Istanbul (TUR)	4 100 11.5	6.4	10 Tainan-Kaohsiu (TWN)	ng 3100 5.1	4.0	10Tianjin (CHN)	2600 5.8	5.5	10 New York-New (USA)	ark 11900/ 16.5) 1.1	10 Chennai (IND)	1600 8.5	0.2



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 <u>the sum</u> of losses would be higher than the other cities.

Presentation of data by Bertin's Matrix



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.

57.1

34.6

34.5 32.1

27.7

22.9

17.9

16.7

16.4

15.6

Recap. Writing vs Illustrating

Earthquake ranking			Storm	ranking	River flood ranking					Storm surge ranking						Tsunami ranking						
Metro area A pi (n	rea (km²); opulation nn)	People potentially affected(mn)	Metro	area	Area (km populatio (mn)	2); People n potent affecte	e tially ed(mn)	Metro a	rea	Are pop (mn	a (km²); Pe pulation po) aff	eople otentially ected(mn)	Metro ar	ea	Area (k populat (mn)	m²); Per ion pot affe	ople entially cted(mn)))	letro area	Ar po (m	ea (km²); pulation n)	People potentially affected(mn)
1 Tokyo- Yokobama (JPN)	16300 371	29.4	1 Pea	arl River De HN)	ta 2060 424	0 17.3	2	1 Pear	rl River [NI)	Delta	20600 424	12.0	1 Pear (CHI	l River Del	ta 20 42	600 4	5.3	1	Tokyo-Yokoł (JPN)	nama	16300 37.1	2.4
2 Jakarta (IDN)	11 600 33.1	17.7	2 Tok (JP	:yo-Yokoha N)	ma 1630 37.1	0 14.	1	2 Sha	nghai (C	CHN)	8000 17.6	11.7	2 Osal	., ka-Kobe (J	PN) 13 18	500 .6	3.0	2	Nagoya (JPI	N)	15 600 11.6	2.4
3 Manila (PHL)	2 900 20.9	16.8	3 Ma	nila (PHL)	2 900 20.9	12.	6	3 Kolk	kata (INE	D)	3 200 19.1	10.5	3 Mun	nbai (IND)	26 20	00 .6	2.6	3	Osaka-Kobe	(JPN)	13500 18.6	1.8
4 Los Angeles (USA) 14400 15.4	14.7	4 Os	4 Osaka-Kobe (JPN) 13600 18.6		0 7.8		4 Jaka	arta (IDN	V)	10600 33.1	10.0	4 Toky (JPN	′o-Yokohar I)	na 16 37	300 1	2.3	4	Shantou (Cl	HN)	5200 10.0	0.7
5 Osaka-Kobe (JPN) 13600 18.6	14.6	5 Tai	oei (TWN)	2 100 8.1	5.4		5 Delh	hi (IND)		5 700 21.9	8.9	5 Ams Rott	sterdam- erdam (NE	10 L) 5.4	800 I	1.8	5	Kolkata (INE))	3 200 19.1	0.6
6 Tehran (IRN)	11 000 15.1	13.6	6 Sha	antou (CHN) 5200 10.0	5.1		6 Toky (JPN	yo-Yokoł N)	hama	16300 37.1	8.9	6 Nag	oya (JPN)	15 11	600 6	1.7	6	Dhaka (BGD))	1 800 12.9	0.4
7 Nagoya (JPN)	15 600 11.6	9.4	7 Na	goya (JPN)	1560 11.6	0 4.3		7 Ban	gkok (Tł	HL)	3500 9.5	7.1	7 Shar	nghai (CHN	l) 80 17	00 6	1.4	7	Izmir (TUR)		1 400 2.7	0.4
8 Lima (PER)	2600 8.9	8.9	8 Mu	mbai (IND)	2 600 20.6	4.3		8 Mex	kico City	(MEX)) 4 500 19.6	6.1	8 Kolk	ata (IND)	32 19	00 1	1.4	8	Jiaojing (CH	IN)	2 700 3.1	0.3
9 Taipei (TWN)	2 100 8.1	8.0	9 Ch	ənnai (IND)	1 600 8.5	4.0		9 Cair	o (EGY)		3500 17.7	5.5	9 Ho (Chi Minh (\	'NM)20 9.1	00	1.3	9	Guayaquil (E	ECU)	900 2.4	0.3
10 Istanbul (TUR)	4 100 11.5	6.4	10 Taiı (TV	10 Tainan-Kaohsiung 3 (TWN) 5.		4.0		10Tianjin (CHN)		V)	2 600 5.8	5.5	10 New York-Newar (USA)		ark 11 16	900 .5	1.1		10 Chennai (IND)		1600 8.5	0.2
	Jakarta	Istanbul	Tehran	Los Angel	Lima	Taipei	Manila	Navova	NAEUYA	Osaka-Kob	Tokyo- Yokohama	Pearl Riv Delta	Kolkata	Shanghai	Tianjin	Johnston		Delhi	Mexico Cit	Cairo	Mumbai	Shantou
Earthquake																						
Wind storm						8															8	
Tsunami																						
Storm surge																						
River flood																						



Colored elements catche the reader's attention.

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