

Japan: After the Disasters

CS171 Final Project
Process Book
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Overview and Motivation

- In 2011, Japan suffered the blow of three major disasters. A massive earthquake led to an even more devastating tsunami.
- The tsunami reached heights of 40 meters in some areas of Japan, and it overwhelmed the sea-wall protecting the Fukushima-Daiichi nuclear power plant resulting in the meltdown of its reactors.
- The motivation behind this project is to showcase the myriad effects the disasters had on Japan and its people, and the persistent impact they have on life in Japan today.

Questions?

The objectives of the project were:

- To answer questions about the effects of the disasters on the people and environment of Japan, including the lasting effects that persist now, three years after the incident.
- To illustrate the ideas and opinions that the survivors have surrounding the disaster, its aftermath, and the future of nuclear energy in Japan.
- How do the Japan disasters relate to similar catastrophes across the globe?

Related Work

- [Neue Zurcher Zeitung](#), 2013: No Time for Anger: four destinies two years after “Fukushima” [\(2\)](#)
- [The Guardian, 2011](#): Visualizing radiation leaks from the Fukushima nuclear power plant
- [Google maps and Fukushima: Collective Memory and Data Visualization](#)
- [ABC.au News](#): Japan Earthquake: before and after
- [Harvard University](#): Japan Map
- [Fukushima Radiation Map](#)

Data

- Costly / Deadly Disasters: [Munich Re NatCatService](#)
- Death and Damages: [National Police Agency of Japan](#)
- Earthquakes: [USGS](#)
- Country GDP / Population: [World Bank](#)
- Tsunami wave height: [National Geophysical Data Center, \(2\)](#)
- Radiation:
- Survey: We created our own dataset by creating a survey, translating it into Japanese, and publicizing it on social media in Japan. We got a total of 324 responses. The survey can be accessed at www.fukushimajapan.org

Data Munging

- Some data came easily in .csv, but some had to be scraped from the web (see [wave height data](#))
- We did have to do some munging in order to manipulate the geoJSON and JSON into topoJSON, and to add our .csv data to the topoJSON files. (see datamunging1.js)
- The most difficult part [for Molly] was manipulating and understanding the topoJSON data for the various visualizations without much prior programming experience.
- The data for the earthquake needed to be sorted in order of date to display in the correct sequence on the map.
- The radiation data needed to be rolled up to correctly show the reading locations along with the sum and different nuclide.

Survey

English | [Japanese](#)

In memoriam

“FUKUSHIMA”

日本の三重災害：世界中を震撼させ、歴史上最も損失の大きい自然災害となった地震、津波そして原発施設でのメルトダウン(炉心溶融)



Survey Questions



In which prefecture do you currently reside? (If you have left Japan since the disaster, please select the last option.)

Select

Were you involved in the March 11 Disaster?

- Yes
 No

What was your level of involvement? (Check all that apply)

- Not affected
 Displaced from home
 Income change due to disaster
 Injured friend/family
 Missing friend/family
 Death of friend/family

If you were displaced, please select the prefecture in which you resided before the Triple Disaster.

Select

If you experienced an income change as a result of the disaster, please enter the annual income change.

(+/-) Yen

(negative or positive value)

Do you believe the Japanese government has been taking sufficient measures to control the nuclear accident?

- 1 2 3 4 5

(1 = No, not at all, 5 = Yes, fully)

Do you believe TEPCO has been taking proper measures to treat and contain the radioactive waste water at Fukushima?

- 1 2 3 4 5

(1 = No, not at all, 5 = Yes, fully)

Do you trust TEPCO to help meet Japan's current and future energy needs?

- 1 2 3 4 5

(1 = No, not at all, 5 = Yes, fully)

Survey Questions

(1 = No, not at all, 5 = Yes, fully)

⑪ Do you or would you buy grains, vegetables and/or fruits produced in the Fukushima area?

- Yes
- No

⑫ Do you or would you buy seafood imported from the Fukushima area?

- Yes
- No

⑬ Do you support your local government to receive excess earthquake disaster debris?

- Yes
- No

⑭ Do you support the continued production of nuclear energy in Japan?

- 1
- 2
- 3
- 4
- 5

(1 = No, not at all, 5 = Yes, fully)

⑮ Do you support the future production of nuclear energy in Fukushima?

- 1
- 2
- 3
- 4
- 5

(1 = No, not at all, 5 = Yes, fully)

Munich Re(Insurance)

NatCatSERVICE

Munich RE 

Significant natural catastrophes 1980 - 2012

10 deadliest worldwide events

Period	Event	Affected Area	Overall losses	Insured losses	Fatalities
			US\$ m, original values		
12.1.2010	Earthquake	Haiti: Port-au-Prince, Petionville, Jacmel, Carrefour, Leogane, Petit Goave, Gressier	8,000	200	222,570
26.12.2004	Earthquake, tsunami	Sri Lanka, Indonesia, Thailand, India, Bangladesh, Myanmar, Maldives, Malaysia	11,200	1,000	220,000
2-5.5.2008	Cyclone Nargis, storm surge	Myanmar: Ayeyawaddy, Yangon, Bugalay, Rangun, Irrawaddy, Bago, Karen, Mon, Laputta, Haing Kyi	4,000		140,000
29-30.4.1991	Tropical cyclone, storm surge	Bangladesh: Gulf of Bengal, Cox's Bazar, Chittagong, Bola, Noakhali districts, esp. Kutubdia	3,000	100	139,000
8.10.2005	Earthquake	Pakistan, India, Afghanistan	5,200	5	88,000
12.5.2008	Earthquake	China: Sichuan, Mianyang, Beichuan, Wenchuan, Shifang, Chengdu, Guangyuan, Ngawa, Ya'an	85,000	300	84,000
July - Aug 2003	Heat wave, drought	France, Germany, Italy, Portugal, Romania, Spain, United Kingdom	13,800	1,120	70,000
July - Sept 2010	Heat wave	Russian Federation: Moscow region, Kolomna, Mokhovoye	400		56,000
20.6.1990	Earthquake	Iran: Caspian Sea, Gilan province, Manjil, Rudbar; Zanjan, Safid, Qazvin	7,100	100	40,000
26.12.2003	Earthquake	Iran: Bam	500	19	26,200

Munich Re(Insurance)

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Significant natural catastrophes 1980 - 2012

10 costliest events worldwide ordered by overall losses

Period	Event	Affected Area	Overall losses	Insured losses	Fatalities
			US\$ m, original values		
11.3.2011	Earthquake, tsunami	Japan: Honshu, Aomori, Tohoku; Miyagi, Sendai; Fukushima, Mito; Ibaraki; Tochigi, Utsunomiya	210,000	40,000	15,840
25-30.8.2005	Hurricane Katrina, storm surge	USA: LA, New Orleans, Slidell; MS, Biloxi, Pascagoula, Waveland, Gulfport	125,000	62,200	1,322
17.1.1995	Earthquake	Japan: Hyogo, Kobe, Osaka, Kyoto	100,000	3,000	6,430
12.5.2008	Earthquake	China: Sichuan, Mianyak, Beichuan, Wenchuan, Shifang, Chengdu, Guangyuan, Ngawa, Ya'an	85,000	300	84,000
24-31.10.2012	Hurricane Sandy, storm surge	Bahamas, Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, USA, Canada	65,000	30,000	210
17.1.1994	Earthquake	USA: CA, Northridge, Los Angeles, San Fernando Valley, Ventura, Orange	44,000	15,300	61
1.8-15.11.2011	Floods	Thailand: Phichit, Nakhon Sawan, Phra Nakhon Si Ayutthaya, Pathumthani, Nonthaburi, Bangkok	43,000	16,000	813
6-14.9.2008	Hurricane Ike	Cuba, Haiti, Dominican Republic, Turks and Caicos Islands, Bahamas, USA	38,000	18,500	170
May - Sept 1998	Floods	China: Jangtsekiang, Songhua Jiang	30,700	1,000	4,159
27.2.2010	Earthquake, tsunami	Chile: Bió Bió, Concepción, Talcahuano, Coronel, Dichato, Chillán; Del Maule, Talca, Curicó	30,000	8,000	520

National Police Agency of Japan

National Police Agency of Japan
Emergency Disaster Countermeasures Headquarters

Damage Situation and Police Countermeasures associated with 2011 Tohoku district - off the Pacific Ocean Earthquake March 11, 2014

Prefecture	Personnel damages										Property damages										
	Killed		Missing		Injured		Total		Door		Door		Door		Door		Door		Door		
	Person	Person	Person	Person	Severely injured	Slightly injured	Total	Door	Door	Door	Door	Door	Door	Door	Door	Door	Door	Door	Place	Place	
Hokkaido	1				3	3	4					329	545	7	469						
Aomori	3	1	25	86	111	308	701								1,006	1,402	2				
Iwate	4,673	1,142			213	19,107	6,599			33			6	18,601	4,368	30	4	6			
Miyagi	9,537	1,280			4,145	82,912	155,085			135			7,796	222,847	28,893	390	12	51	45	26	
Akita			4	7	11									3	3	9					
Yamagata	2		8	21	29									21	96	21		29			
Fukushima	1,607	207	20	162	182	21,246	73,449		77	3	1,061	338	167,332	1,117	187	3	9				
Tokyo	7		20	97	117	15	198		1					4,847	1,101	295	55	6			
Ibaraki	24	1	34	678	712	2,628	24,327		31	1,799	779	185,877	19,953	307	41						
Tochigi	4		7	126	133	261	2,118							73,326	295	257		40		2	
Gunma	1		14	26	40		7							17,679		36		9			
Saitama			7	38	45	24	199		1	1			1	1,800	33	160					
Chiba	21	2	29	229	258	801	10,121		15	157	731	54,938	660	2,343	55			1			
Kanagawa	4		17	121	138		41							459	13	160	1	2			
Niigata			3	3										17	9						
Yamanashi			2	2										4							
Nagano			1	1																	
Shizuoka			1	2	3								5	13							
Gifu																	1				
Me			1	1						2					9						
Tokushima													2	9							
Kochi				1	1								2	8							
Total	15,884	2,633		6,148	127,302	272,849		297	3,352	10,218	748,777	58,421	14,198	116	207	45	29				

* Unidentified information is included.

Exploratory Data Analysis

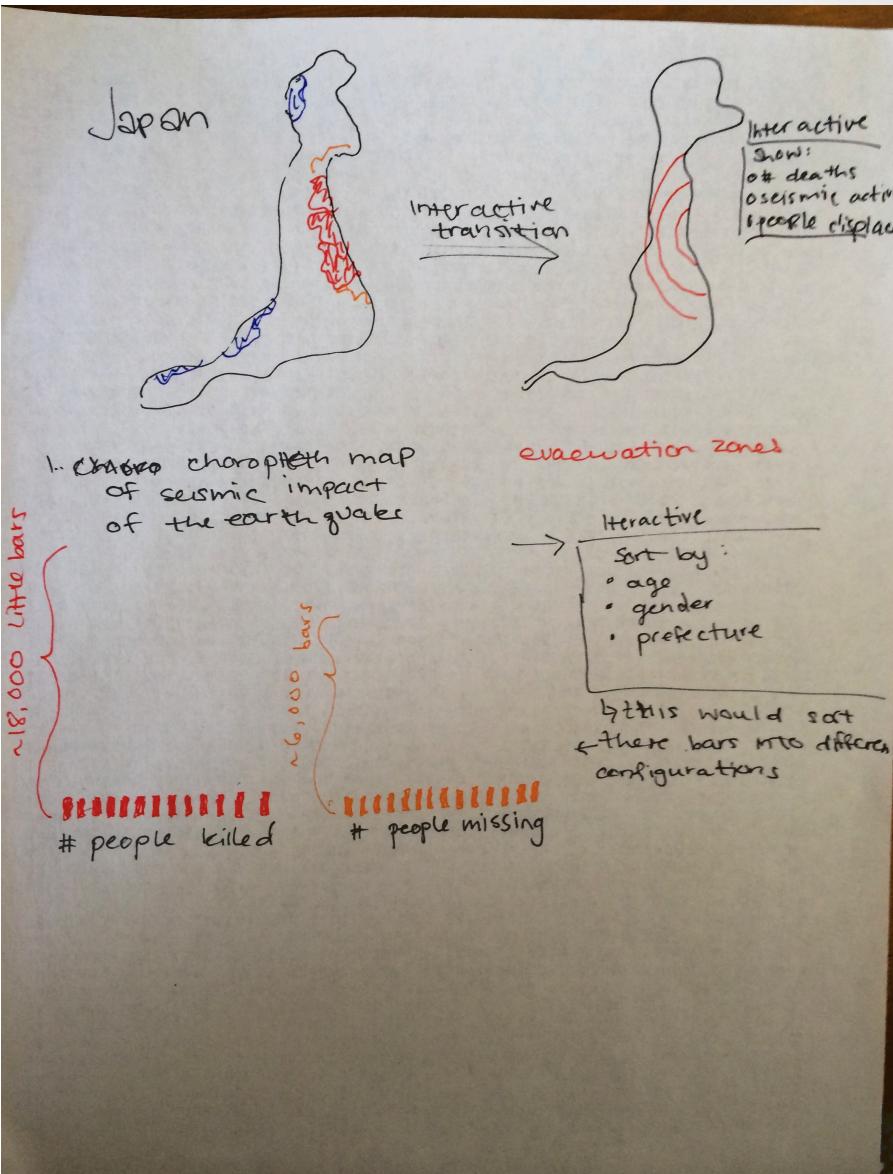
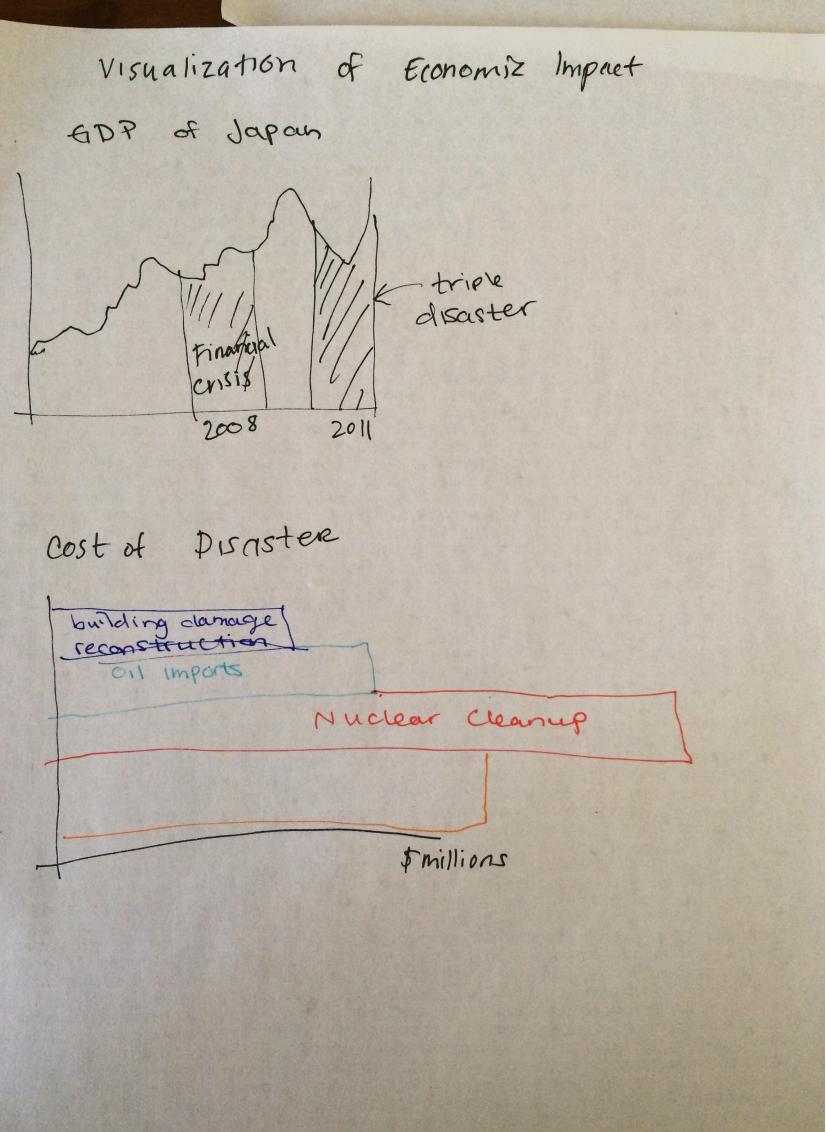
- Originally the plan was to make a single map-based visualization that would show, interactively, the three separate disasters. (i.e. buttons for “earthquake”, “tsunami”, and “nuclear meltdown”)
- After deciding on the animated time-line for the earthquake data, it became clear that a single visualization would be extremely messy, so we moved on to separating out the visualizations of the disasters.
- Visualizing the tsunami wave height was difficult at first, because the dataset is so huge (over 9000 lat/long points) and point data does not indicate height very well.
- To accommodate this, we used a heat map with hexbins (a d3.js plugin) to compress the data and extract meaning in a visually digestible manner.



Design Evolution

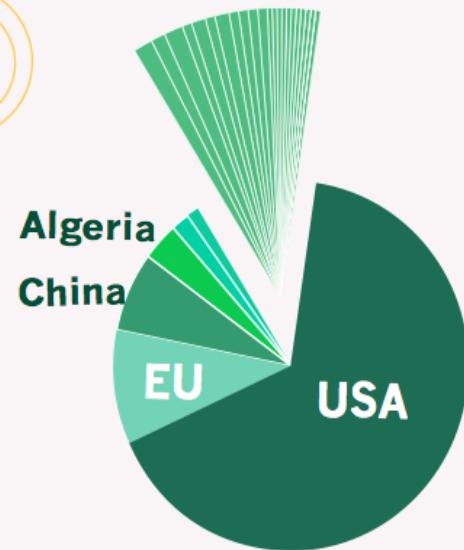
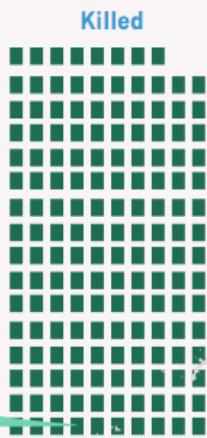
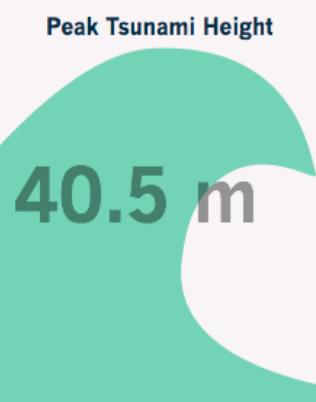
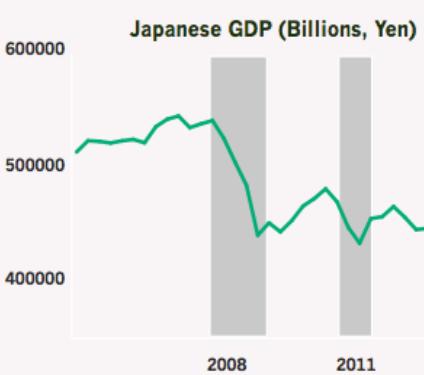
- We wanted to showcase the social and economic effects of the disaster, but the data we wanted was not readily available.
- Much of the data on displacement / evacuation is on the Fukushima Prefecture website (according to citations from other visualizations), but the website is impossible to navigate without some knowledge of Japanese.
- For the proportional symbols in the global disasters and the earthquake visualizations, we used exponential scales because perceptual science shows that users judge differences in shapes' area to be the squared difference of the radii.

Early Sketches



Design Evolution: social data sketch

Japan Triple Disaster by the Numbers



To date, over \$700,000,000 (USD) has been donated to the Japanese Relief Effort. 80% of the funds came from private donations, the remaining money came from the governments of these countries.

Implementation

- The goal was to have a one-page website that would go through the stages of the disaster chronologically and build on the data to develop a complete narrative of the event.
- We also were not able to find the specificity and depth of data we had hoped for, largely due to the language barrier and difficulty navigating Japanese websites.
- We struggled getting the website perfected as well as responsive to different screen resolutions. It was tested and works well on 1920x1080.

Evaluation

- We learned that it's very difficult to get detailed data relating to major disaster. This was partly because it was prohibitively time consuming to navigate and procure data from the Japanese government agencies.
- We also focused heavily on the visualizations, and underestimated the length of time it would take to put it all together and make a functional website— also a product of the impracticality of group projects in an online course.
- Our individual visualizations work well as distinct pieces, and when taken together, give a well balanced portrait of the reality of the experiences of those affected by the 2011 disasters.