Caution

Effects of radioactive contamination on fisheries resources and wildlife

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Overview

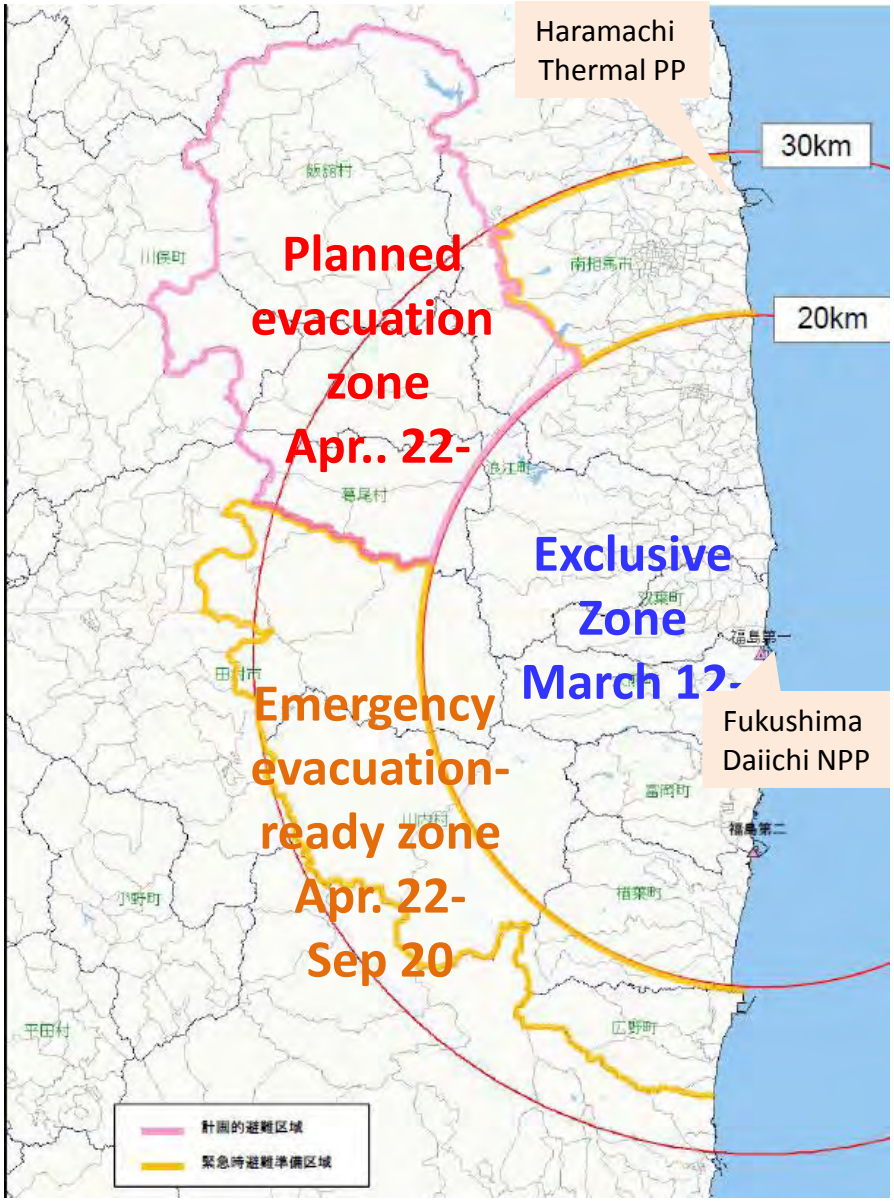
- What happened during March 11-16?
- Monitoring of radiation activities
- Cancer risk
- Radioactive contamination in seafood.

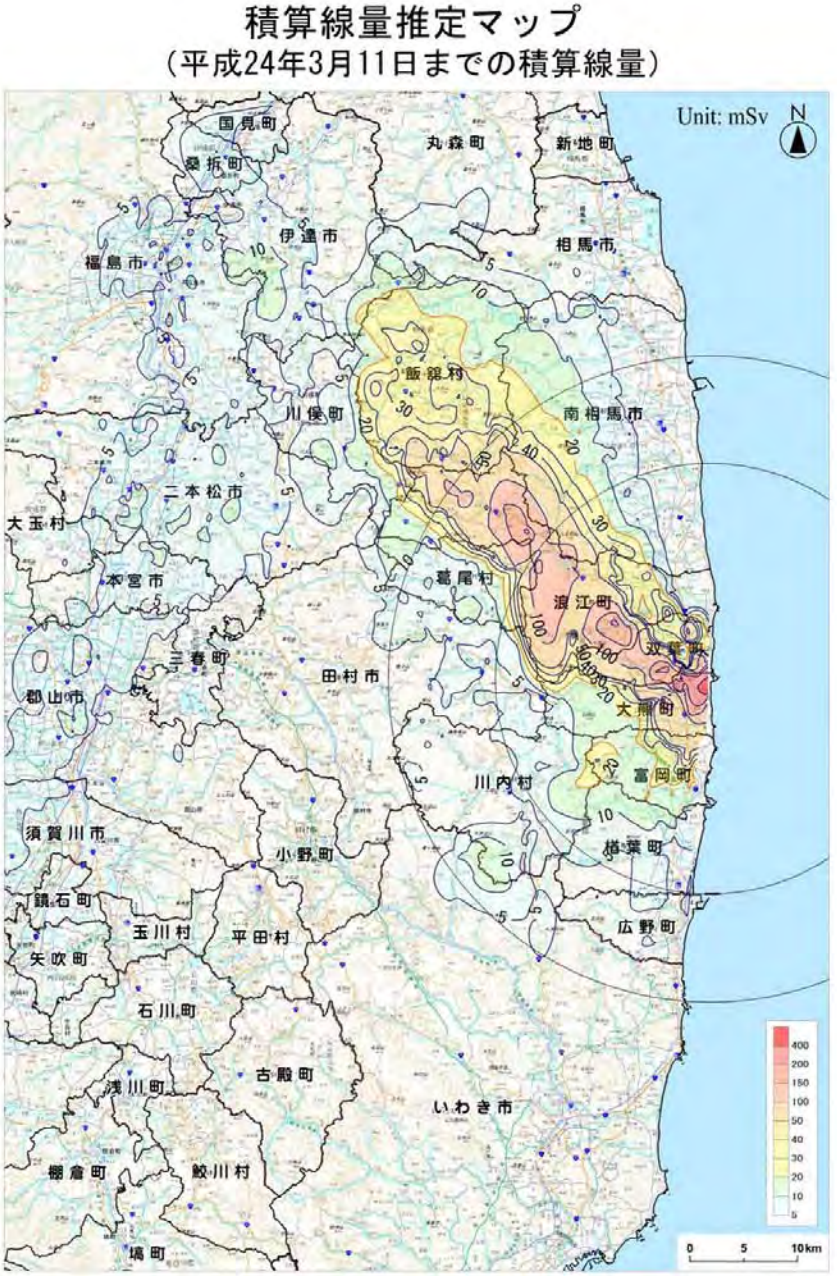
Haramachi Thermal Power Plant was damaged by tsunami

Timetable of Fukushima Daiichi NPP accident

- 3.11 14:46: Nuclear reactors 1, 2, and 3 were automatically shut down by the shake. Reactors 4, 5, and 6 were undergoing routine maintenance and were not operating, (reactor 4 was defueled in November 2010). Units 1 and 2 were not operating correctly and notified the proper officials.
- 3.11 ca 15:46: A 14m tsunami overtopped the seawall (5.7m) disabling the backup diesel generators. The automatic depressurization systems all failed.
- 3.12 15:36: A massive explosion in the outer structure of unit 1 happened, four workers were injured.
- 3.14 11:01: Unit 3 reactor bldg exploded, injuring six workers.
- 3.16 ca14:30 The fuel rod storage pool of unit 4 may have begun boiling. 18:00 Workers had been withdrawn because of the radiation rising to 1000 mSv/h.

http://en.wikipedia.org/wiki/Timeline_of_the_Fukushima_Daiichi_nuclear_disaster





http://raizen.seesaa.net/article/215897936.html

> 20mSv/yr

After Tsumune et al. (2011) 電中研Report

Release of Radioactive contamination to seawater

categories	Total emission	Max. con-centration
Direct emission	3.5±0.7　PBq	68kBq/L
From Atmosphere	ca.80% of 15PBq	
Planned low-level contaminated water release	0.000042PBq	

Cs-137 concentration near NPP

- Tsumune et al. (2011a, b) estimated that the total emission of radioactive contamination was ca.3.5 PBq, and the total release into atmosphere was 15 PBq, about 80% of which fell into the ocean. I do not know what percentage of that fell into the ocean. Several days later, because of the limit of the water tank at the NPP, low level contaminated water was deliberately released. However, the total emission level of this low-level contaminated water release was very low, at 0.000042 PBq (Tsumune et al. 2011b). Therefore, the estimated concentration of ^{137}Cs in seawater near the NPP on March 25 was very high until April 6, at ca.10MBq/kg, but this decreased drastically by April 24, which is almost 99 percent reduction. This is the reason why the major source of radioactive contamination release was the hole of the pit. At the end of April, low-level concentration was kept at 100 Bq/L. This is probably because there is another minor source of contamination release, but the major source had stopped. Therefore, the situation became much better.

I131/Cs137 ratio shows no more release from NPP

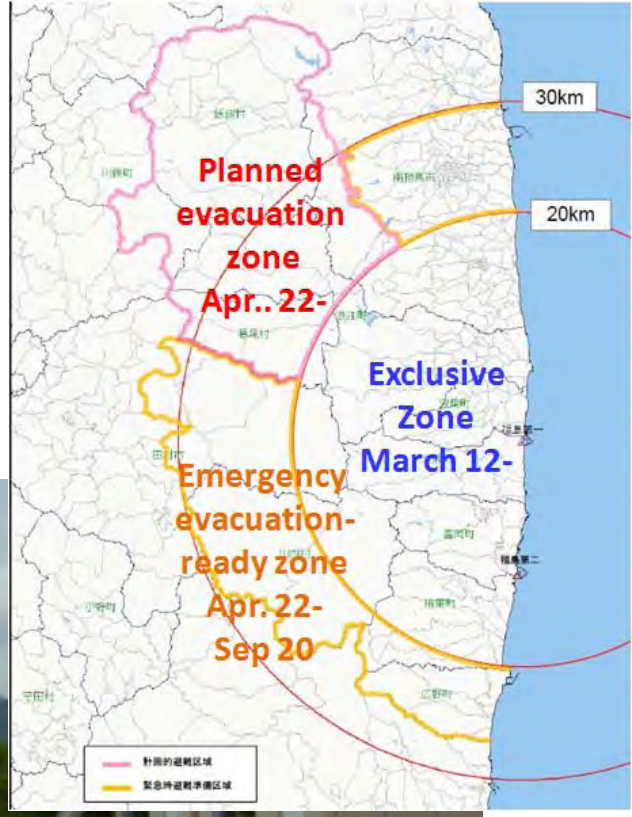
- This graph shows the ratio of two radio isotopes, ^{131}I and ^{137}Cs. The physical half-life of ^{131}I is just 8 days, but that of ^{137}Cs is about 30 years. Because of the difference, this ratio decreases. This decline rate is the same as the predicted rate by the difference of the half-life periods. After the mid May, this ratio does not concise with decay of the theoretical model. This means that there are some other miner sources of the contamination release, but the major source is one. There was only one single source from the same origin of the explosion. Therefore, the major source of ^{137}Cs release has been stopped by April 6.

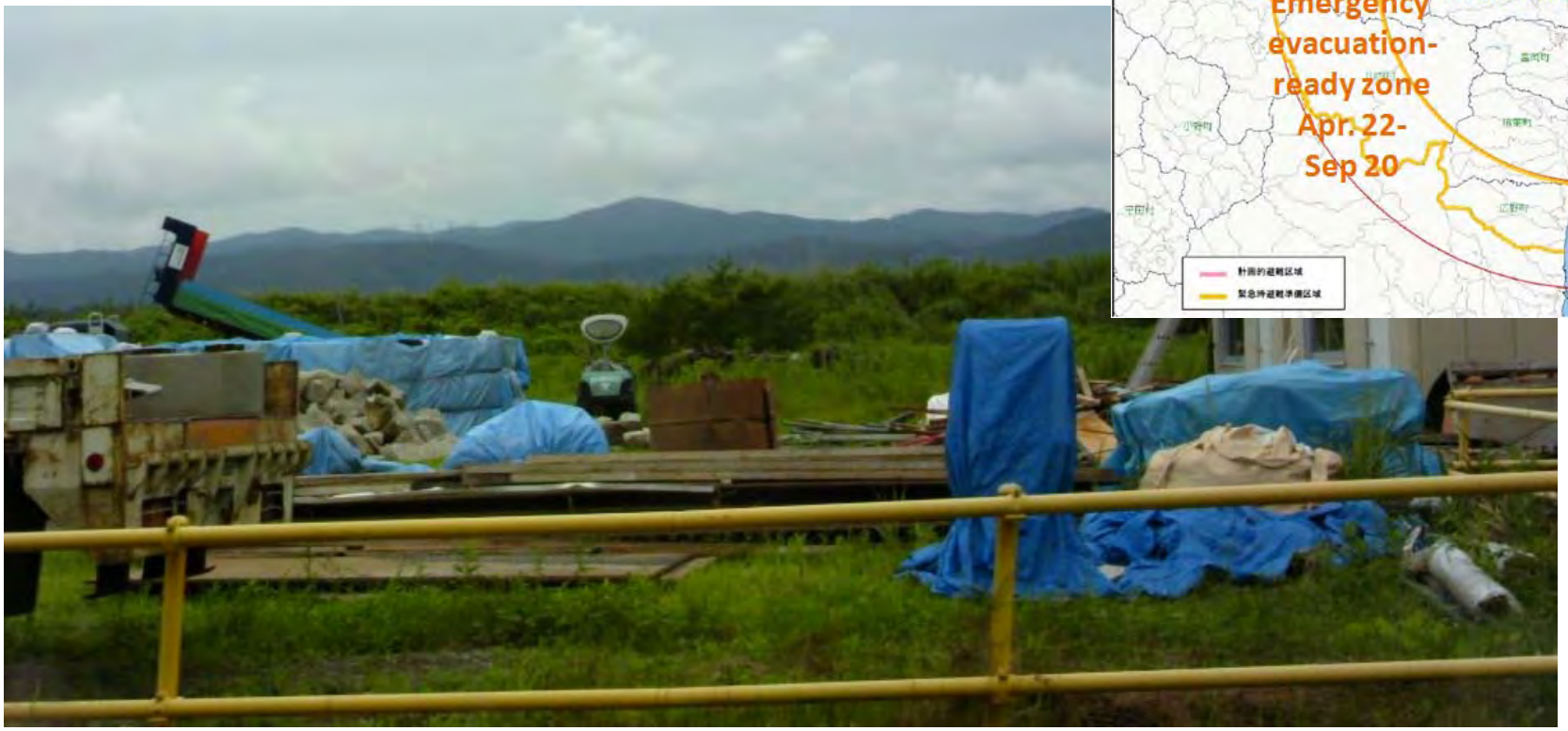
Key points

- Radioactive contaminations of I-131, Cs-137, Cs-134 are mainly concerned.
- Meltdown occurred in reactors 1, 2 and 3.
- Nuclear fuel fired in unit 4 during March 15-16.
- Major source of atmosphere contamination is explosion of units 1-4 on March 15-16.
- Major source of seawater contamination is emission by a hole into the pit near reactor 2 that was blocked by water glass on April 6 morning.

Ministry of Agriculture's campaign "Support Eastern Japan by eating foods"

Suspended farms in Iitate village (outside of exclusive zone)



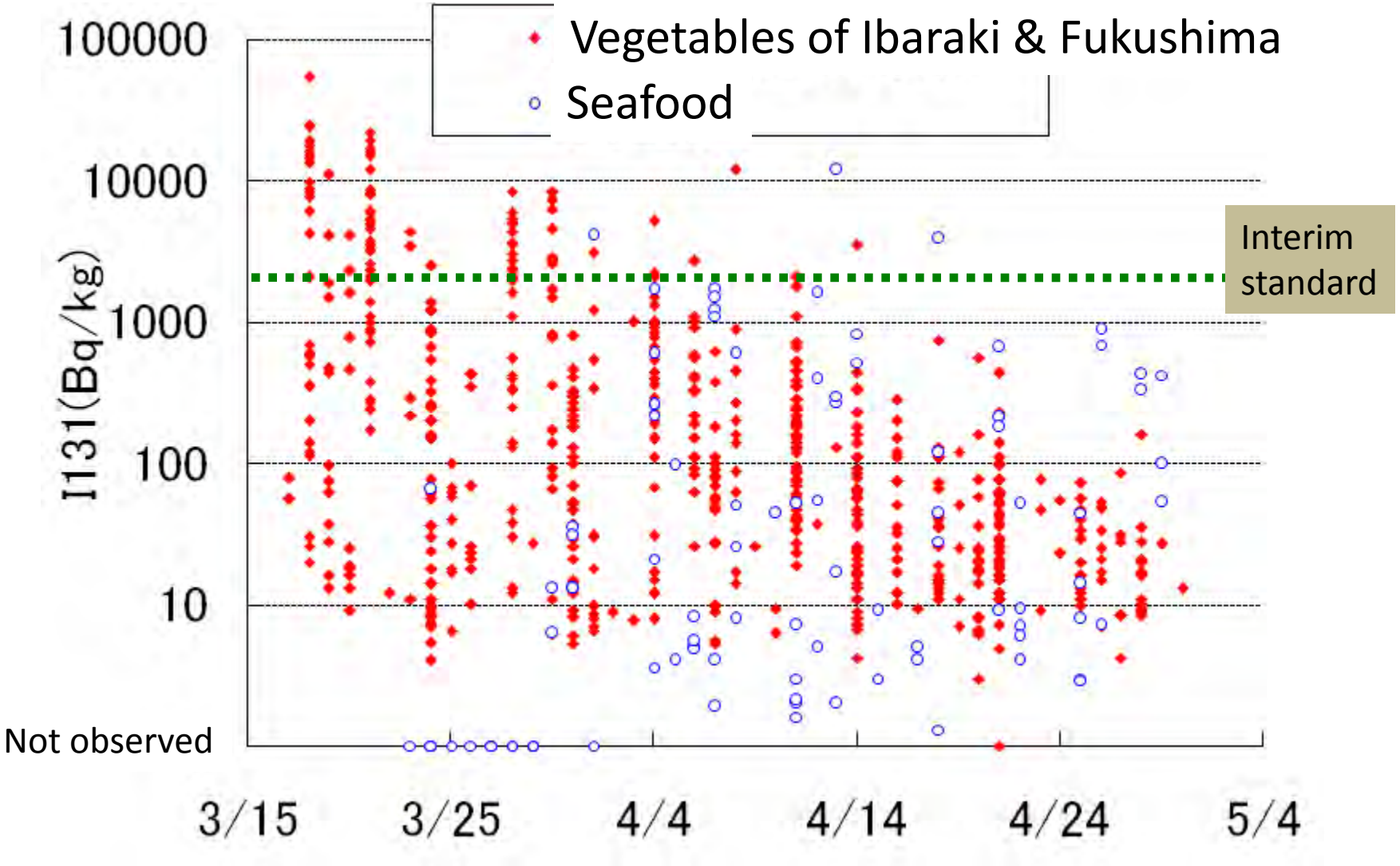


[See http://www.iitate-madei.com/village06_2011.html](http://www.iitate-madei.com/village06_2011.html) for a better photo

Problems of wildlife in Japan

- Recent concerns of wildlife management in Japan is not extinction, but "over-abundance" of deer, monkeys and boars, all of which inhabits near Fukushima Daiichi NPP.
- Human excluded zone (20km zone) is a "heaven" of wildlife despite of radioactive contamination
- Wildlife may threat damage on agriculture outside of the 20km zone.
- We cannot catch them in the 20km zone.

Contamination of food products



From K. Yoshida
要文献検索

Biomagnification

- See http://www.nougaku.jp/symposium/2011/yosida.pdf
- Some people also worry about biomagnifications. In the case of DDT, the contamination level of top predator is much larger than contamination level of seawater, which ratio is about 10,000 or 100,000 (K.Yoshida, pers. comm). However, in the case of ^{137}Cs, the ratio is about 10 or at most 100 fold. In the case of iodine, because of a short biological half-life period, biomagnifications is not a big matter.

Total exposure (mSv/yr) and cancer risk (%)

- Major source of exposure is external at least >20km far from Fukushima Daiichi NPP.
- Exposure from foods depends on person (to buy or not products of Fukushima)

Place	Exter-nal	Respi-ration	Drink	Foods	soil	Total (mSv/yr)	Cancer Risk (%)
Fuku-shima city	8.0	~1.0	0.03	1.01	<0.5	11	0.06
Tokyo	0.13	~0	~0	?	~0	0.5	0.003

Conclusion

- I-131 Physical half-life period (HLP) = 8 days. Seaweeds may be highly contaminated, but it is effective to prevent I-131 from thyroid.
- Cs: Biological HLP = ca. 50 days. Some ground fish is still contaminated. Check inspection data! Keep the interim standard (500Bq/kg for Cs-134 & Cs-137, 2kBq/kg for I-131)
- Sr-90: Physical HLP = 28.8yrs; accumulated into bones. Japanese do not eat bone of tunas!
- Pu: very low concentration.