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Second CRIIRAD mission to Fukushima / June 2012 /

Measurements of doserate in Fukushima city and Oguni area of Date city

Context

A CRIIRAD scientist, M. Bruno Chareyron has been invited by CRMS to participate to an international conference at Inawashiro (Fukushima prefecture).

Immediately after this conference, it was agreed that CRIIRAD and CRMS teams would make ambient radiation measurements in Fukushima city and other localities in order to gather data about the levels of people exposure to radiation (external irradiation).

This report presents the radiation measurements performed by CRIIRAD from **June 25Th to 26th 2012.** This mission has been made possible with the financial support of the Conseil Régional Rhône-Alpes (France)**.** All the measurements where performed with M Wataru Iwata, director of CRMS and - in the case of Oguni- with Mr Kanno, in charge of CRMS Oguni**.**

The question of evacuation stategies

During the fist weeks after March 11th 2011, the radioactive cesium deposits on the soils have been of great magnitude in Japan.

Only the population living in a **20 km circle** around the Fukushima Daiichi nuclear reactor has been evacuated in the first days of the nuclear accident ; but the fallouts affect a very vast territory, far beyond the forbidden zone of 20 km and far beyond the Fukushima Prefecture. Depending on weather conditions, contaminated air masses swept over hundreds of kilometers and precipitations (rain and snow) percolated radioactive particles down on the ground. Cesium 134 and 137 deposits are the cause of a lasting contamination.

After **April 22nd 2011**, the Japanese authorities decided to organize additional evacuations in "**Planned Evacuation Zones**" : territories situated beyond the 20 km "forbidden zone" but where the cumulated dose due to the persistent contamination of the soil may exceed a level of **20 milliSieverts per year**. This corresponds to a cancer risk 20 times higher than the "acceptable" threat. It is even more outrageous that the inhabitants of these territories have already been exposed very extensively (see Appendix 2). The dose above which the long term risk of cancer is considered as inacceptable by the ICRP (International Commission on Radiological Protection) is **1 milliSievert per annum, which corresponds to 17 cancers[1] for each 100 000 exposed persons.**

According to the Japanese government, a place where the dose rate is below **0.23 µSv/h**, is a place where the long term dose due to Fukushima would be below **1 mSv/year**. It should be noted that this calculation does not include doses due to the internal contamination that these people continue to receive by ingesting contaminated foods nor the dose due to the inhalation of dusts from the resuspension of contaminated soils and from the continuous releases of radioactive substances from the Fukushima Daiichi reactors (According to TEPCO and the authorities, about 10 millions Becquerel of cesium are still discharged every hour).

[1]For many independent scientists these figures given by ICRP publication N°103 (year 2007) are underestimating the actual level of risk.

This means that when the ambient dose rate monitored outside is above 0.23 µSv/h, the cumulated annual dose due to this external exposure leads to an unacceptable long term risk.

The official maps published by MEXT in December 2011 show that this is the case in large portions of Fukushima prefecture, but also in territories belonging to Miyagi, Tochigi, Gunma, Ibaraki and Chiba prefectures.

Therefore, in the absence of appropriate protective measures, hundreds of thousands of people are still receiving, during year 2012, unacceptable radiation doses.

CRIIRAD and CRMS, and other groups are fighting since the very beginning of the Fukushima disaster to require a better level of protection of the population exposed to the radioactive contamination.

Selection of places to be monitored

After a meeting with CRMS staff at CRMS main office in Fukushima city (June 2012), it was agreed that measurements had to be performed in priority at places where the level of contamination is still very high, but where the population have not been evacuated yet because the calculated annual dose is below 20 mSv.

As two members of CRMS are living in highly contaminated zones : **Watari** urban area in Fukushima city and **Oguni**, a rural area of Date city, its was agreed to concentrate our efforts on these two locations.

Fukushima city is located 60-65 km away from the nuclear plant. Oguni is located about 10 km east of the city of Fukushima and 55 km north-west from the damaged nuclear reactors (see maps in Appendix 3 and 5).

Measurements have been performed at the following locations :

- **Date city**
    - Date city council offices, during a meeting with the officer in charge of radiation issues.
    - Oguni area :
        - house of Mr and Mrs Ookawara. This house has been decontaminated.
        - house of Mr. and Mrs Kanno. This house had not been decontaminated in June 2012.
        - CRMS office at Oguni Community Center
        - in front of a restaurant
- **Fukushima city**
    - Near CRMS office
    - Watari area :
        - at a location called N, where CRIIRAD and CRMS had performed measurements in May-June 2011.
        - at a location called R.

Note : when CRIIRAD made radiation measurements in Japan in May-June 2011, the population was usually very open to communicate about the radiological situation and to accept to be filmed. But during the June 2012 mission, we noticed in several cases a change in people mind. Some people are still welcoming independent radiation monitoring in their property and even inside their homes, but they do not want the results to be made public because they fear that the neighbours or in some cases their customers may be afraid and decide not to come back. This was the case for the places called R and N in Watari area of Fukushima city. For these two places, the GPS coordinates will not be given in this report.

Monitoring methodology

Ambient gamma radiation has been monitored by CRIIRAD using a very sensitive gamma **scintillometer** (DG5). This device was used continuously to check radiation rates inside the vehicle while going from one place to another and outside the vehicle when monitoring properties or buildings.

The scintillometer gives **gamma radiation rates** expressed in **counts per second (c/s).**

In order to evaluate the dose received by the population, it is necessary to monitor **dose rates** (Hp10) expressed in **µSv/h** (microSievert per hour).

Such monitoring has been performed using a calibrated **proportional counter** with energy compensation (LB123, manufactured by Berthold, Germany). Each measurement is the mean value of at least 3 individual measurements of 100 seconds duration.

Due to the very limited amount of time available for this mission, CRIIRAD and CRMS could not make as many dose rate measurements (µSv/h) as gamma radiation flux measurements (c/s).

Nevertheless, there is a relation between the dose rate and the gamma flux for a given energy spectra of the gamma radiations.

We decided to prepare two calibration curves for conversion of gamma flux (c/s) into dose rate (µSv/h). These curves are based on results of monitoring performed in June 2012. They are plotted in Appendix 4.

- Curve “I” is based on measurements made inside buildings at 7 locations with a dose rate range of 0.07 to 0.55 µSv/h.
- Curve “O” is based on measurements made outside, at 14 locations with a dose rate range of 0.37 to 2.95 µSv/h.

Two curves were necessary because the energy spectrum is slightly different outside and inside.

Outside, the gamma radiations - which are emitted mainly by the contaminated soil - are less attenuated than the gamma radiation received inside a building (in this last case, radiations are emitted from the contaminated soil or vegetation or roofs located outside).

When only a gamma flux monitoring result was available, it has been converted into a dose rate using curves I or O accordingly.

Dose rates values plotted in Appendix 6 are therefore either actual measurements (in this case the figure is written like X µSv/h) or calculated values based on gamma flux measurements. In the tables, the letter “O” means that measurements were performed outside and “I” inside. All the results are plotted in Appendix 6.

In the following paragraphs, unless special mention, we will comment the values of dose rate monitoring performed **1 m above the ground**.

Example of a decontaminated house in Oguni

The case of the house of Mr. and Mrs Ookawara in Oguni, illustrates the difficulty of decontamination efforts.

Some pictures are presented below.

The local authorities have conducted decontamination work at this place from **October to December 2011**. The upper surface of the soil in the immediate surroundings of the house has been extracted. This task is particularly difficult in the case of a traditional Japanese garden with so many rocks and plants (picture P4).

In order to lower the gamma radiation rates emitted from the contaminated trees located on a hill opposite the road in front of the house, the lowest branches of the trees have been cut (picture P2).

P1 / entrance of the property

P2 / hill with contaminated trees in front of the house

P3 / surroundings of the house

P4 / pleasure garden after decontamination

Despite these efforts, the dose rates inside the house were still elevated, between **0.3 to 0.52 µSv/h** at the first floor, and **0.4 to 0.56 µSv/h** at the second floor. The highest values were monitored in the rooms facing the hill with contaminated trees (gamma radiation from cesium 134 and 137 can travel more than 60 meters in the open air loosing only half of their energy).

In the immediate surroundings of the house (a few meters around) the dose rate ranges from **0.37 to 0.98 µSv/h**. The highest values are monitored in the pleasure garden facing the valley. This is due to the gamma radiation coming from the river banks which have not been decontaminated (picture P6, next page).

Outside the property, in front of the property, on the main road covered with asphalt, the dose rate ranges from **0.93 to 1.48 µSv/h**. The highest values are monitored on both sides of the road (highest contamination of the natural soil and the ditches).

P5 / Entrance of the house

P6 / pleasure garden close to the river

In the garden used for growing vegetables, the dose rate ranges from **0.98 to 1.23 µSv/h**, with a hot spot at **1.73 µSv/h**. The comparison between gamma flux monitored one meter above ground and on contact of the soil shows that most of the radiation is coming directly from the soil and not indirectly from the hill with contaminated trees.

These measurements show that, in the surroundings of this house, the dose rates are very heterogeneous with a factor of variation of 4.6.

The cumulated dose after one year [2] of exposure depends on the time spent at different locations. Examples of calculations are given in table T1 below for 7 000 hours spent inside and 1 760 hours outside. The annual dose is between **2.8 and 7 mSv**. The addition of the dose linked to internal irradiation by food consumption and inhalation of contaminated air (re-suspension of radioactive dust) would increase these figures.

When subtracting to these calculations the natural background, we can estimate for **year 2012**, an external dose due to Fukushima between **1.8 and 6 mSv**. These results remain above the annual dose limit of 1 milliSievert. This shows that, in this case, decontamination efforts are not sufficient to guarantee that the risk of adverse effects from radiation will be kept below "acceptable" limits. The option of evacuation has to be considered.

What is particularly surprising is the fact that the garden used for growing vegetables has not been decontaminated and that according to M. Wataru Iwata *: "They are allowed to use the garden, field to grow vegetables. There has been a restriction for rice farming in Date city for this year, but not for the field crops".*

T1 / estimation of cumulated external irradiation for an inhabitant of the decontaminated house (CRIIRAD estimation)

Calculation 1	**Dose rate (µSv/h)**			**Annual dose (mSv)**	
Location	**Minimum**	**maximum**	**Hours per year**	**Minimum**	**maximum**
Inside the house	0,3	0,56	7000	2,1	3,9
Outside the house	0,37	1,73	1760	0,7	3,0
Total (external irradiation only)		**Total (mSv/year)**		**2,8**	**7,0**

[2] For a more precise calculation, it is necessary to take into consideration the decrease of the dose rate over time in particular for the contribution of Caesium 134 whose half-life is equal to 2 years. But if we consider the cumulated dose of the whole year 2012, this preliminary result based on June 2012 values, gives a good estimate. See CRIIRAD magazine "Trait d'Union", Avril 2012, page18.

Example of a house not yet decontaminated in Oguni

The case of the house of Mrs and Mr Kanno, in Oguni, illustrates the radiation impact for people living in a house not yet decontaminated and the efforts that the citizens have to make if they want the authorities to launch additional decontamination operations.

The house of Mrs and Mr. Kanno is located in a hill near a forest (see picture P7 below).

Inside the house, the dose rate is about **0.33 µSv/h** at the first floor (near the bed and table of the living room). At the second floor, the dose rates monitored in a bedroom, ranged from **0.44 µSv/h** (opposite the valley) to 0.6 µSv/h (facing the valley). In the corridor between the bedroom and the valley, the dose rate is **0.72 µSv/h**. These variations suggest an influence of the gamma radiation coming from the valley in front of the house.

Outside the house, the dose rate ranges from **0.83 to 2.95 µSv/h** (click on the names to get access to videos). The highest values were monitored in the vicinity of rainwater drainage pipes.

P7 Back of the house of Mrs and Mr Kanno P8 / Monitoring with Mrs and Mr Kanno in front of their house

The cumulated dose after one year[3] of exposure depends on the time spent at different locations. Examples of calculations are given in table T2 below for 7 000 hours spent inside and 1 760 hours outside. The annual dose is between **3.8 and 10.2 mSv**. The addition of the dose linked to internal irradiation by food consumption and inhalation of contaminated air (re-suspension of radioactive dust) would increase these figures.

When subtracting to these calculations the natural background, we can estimate that the cumulated dose due to Fukushima during year 2012 could be about 2.8 to 9.2 mSv and will remain above the annual dose limit of 1 milliSievert.

All the measurements where made with Mrs and Mr Kanno. The DG5 scintillometer was also used by them to help them appreciating the degree of radiation, its variation depending on the distance from the soil, the proximity of the valley, etc. This monitoring probably helped them in their efforts to ask for decontamination.

[3] For a more precise calculation, it is necessary to take into consideration the decrease of the dose rate over time in particular for the contribution of Caesium 134 whose half-life is equal to 2 years. But if we consider the cumulated dose of the whole year 2012, this preliminary result based on June 2012 values, gives a good estimate. See CRIIRAD magazine “Trait d’Union”, Avril 2012, page18.

T2 / estimation of cumulated external irradiation for an inhabitant of a house not yet decontaminated (house of Mrs and Mr Kanno) / (CRIIRAD estimation)

Calculation 1	**Dose rate (µSv/h)**			**Annual dose (mSv)**	
Location	**Minimum**	**maximum**	**Hours per year**	**Minimum**	**maximum**
Inside the house	0,33	0,72	7000	2,3	5,0
Outside the house	0,83	2,95	1760	1,5	5,2
Total (external irradiation only)		**Total (mSv/year)**		**3,8**	**10,2**

According to a message sent to CRIIRAD by Mr. Wataru Iwata (October 20th 2012), the decontamination of Mr. Kanno's house is ongoing and half of it is finished.

The decontamination did not take place according to any national policy or regulation but under the regulation of Date city and the efforts of the owner of the house, M. Kanno.

Mr. Kanno requested to Date city to decontaminate in order to reduce the dose rate down to less than 0.23 µSv/h. He mentioned this figure because, according to the Japanese government, a place where the dose rate is below 0.23 µSv/h is a place where the dose due to Fukushima would be below 1mSv/year (it should be noted that this calculation does not include internal contamination but only exposure to external irradiation).

The Date city officer Mr. Hanzawa replied that **they will make an effort to reduce down to 1 µSv/h, but that the request to go down to 0.23 µSv/h was not realistic**.

The soil around the house has been removed but the trees of the mountain side have not been treated yet.

Mr. Kanno is also preparing to replace the roof by himself and he is negotiating with Date city for participation in the expenses.

Nevetheless, if we take into consideration the example of the "decontaminated house" described above, it is possible that the external irradiation will remain above 1 mSv/year.

This example illustrates the importance of giving to the population appropriate monitoring tools and information about the risks of ionizing radiation so that they get more confidence for asking decontamination or evacuation to the competent authorities. This is one of the tasks of CRMS.

Situation in Fukushima city (doserate monitored in June 2012)

In most of the city of Fukushima, the cesium 134 and 137 radioactive fallouts are several hundreds of thousands Bq/m^2. For example, CRIIRAD laboratory monitored [4] over 700 000 Bq/m^2 in the Watari area of Fukushima city.

In the city of Fukushima, located 60-65 km away from the nuclear plant, the dose rates measured by CRIIRAD in June 2012, at 1 meter above ground in the outside, were typically over 3 times, even over 10 times above normal.

For example 0.84 µSv/h on the sidewalk in front of our hotel in the center of the city.

In one of the most contaminated part of the city (Watari area), dose rates on car parkings or private houses gardens were exceeding 0.8 µSv/h and more (click on the names to get access to videos).

The irradiation is still measurable within buildings floors. Measurements carried out on the 7th floor of an hotel showed a radiation increase of 70 % when moving from the center of the room to the windows.

In Watari area, even inside a restaurant, on the table, the doserate was 0.27 µSv/h (first floor).

The inhabitants that we met received no support for evacuation or decontamination. Many of them asked us not to communicate on such results in order to limit the risk of loosing clients or being blamed by the neighbors.

CRIIRAD and CRMS team in Fukushima city (June 2012)

[4] See CRIIRAD press release of July 7th, 2011.
http://www.criirad.org/actualites/dossier2011/japon_bis/en_anglais/11-07-07_cpcriirad_eng.pdf

Need for a new law in order to improve the protection and compensation of the people affected by the Fukushima disaster

A lot of people in Fukushima prefecture, and in other areas of Japan, are still receiving annual doses in excess of 1 mSv/year. This is true even in big cities like Fukushima city.

The priority is therefore to obtain a national strategy for supporting the people affected by the contamination (compensation, support for relocation, etc..).

In Japan, a new law, called **"Child Victim's Law"** was passed in the Diet on **21st June of 2012**. It is introducing the concept of "Target support areas" where the inhabitants should receive support for either evacuation, staying there or coming back. But many issues remain unclear.

The main one is to clarify the annual dose above which a territory will be classified as " Target support area". The lawyers' group called SAFLAN, "Citizens' Forum for the TEPCO Nuclear Disaster Victims' Support Act[5]" and the members of the Diet who have been working to establish the law are requesting that the "target area" criteria should be at 1 mSv/year or below (cumulated dose, for both external and internal exposure, in addition to natural radiation).

The clarifications should be included in additional legislations but they are postponed to **January of 2013**.

International pressure is welcomed so that the final legislation be effective for lowering the doses still accumulated by Japanese citizens including children and pregnant women.

During year 2011, hundreds of thousands of people already received doses far above "acceptable" limits. During year 2012, many citizens are still accumulating doses in excess of 1 mSv. This is increasing the risk of various pathologies (including cancer) in the long term. As the risk is cumulative with the dose, everything should be done to enable people to move to non contaminated territories.

Written by Bruno Chareyron, nuclear physics engineer, director of the CRIIRAD laboratory, in cooperation with M. Wataru Iwata, CRMS director and Mr. Kanno, in charge of CRMS Oguni laboratory.

The CRIIRAD mission to Japan (June 2012) and the scientific work associated have been made possible using CRIIRAD NGO internal resources (including the donations of CRIIRAD members) and a grant from Conseil Régional Rhône Alpes

[5] Representative is Mr. Nakate (former president of Fukushima Network for Saving Children from Radiation). CRMS is one of the supporting groups.

Appendix 1 / A few words about CRMS and CRIIRAD

What is CRMS ?

CRMS (Citizen's Radioactivity Measurement Station) is a non-profit organization, created in Japan in 2011, whose goal is to improve people protection against ionizing radiation. It is an independent organisation with a mission to offer people tools which allow everybody to have access to knowledge in the field of radioprotection, to learn how to measure radiation and thus to get protected in an autonomous way. CRMS is monitoring radiation at people's request and is publishing the data on its website and/or on other media in order to share this information with more people.
The radioactivity measurements, basically of food samples (using gamma spectrometers) and/or of people internal contamination (using a whole body counter (WBC)), are performed by citizens at 9 different stations in Fukushima prefecture and 1 station in Tokyo.

More information at :
http://www.crms-jpn.com/
http://en.crms-jpn.com/
http://fr.crms-jpn.com/

What is CRIIRAD ?

CRIIRAD (Commission for Independent Research and Information about RADiation) is a French Non Governmental Organization created in 1986. In 1986, French citizens were surprised by the dishonesty of the French Government about the actual contamination of the French territory by iodine 131 and radioactive caesium coming from Chernobyl. In order to make independent measurements CRIIRAD created its own private Laboratory.

CRIIRAD Laboratory is equipped with 2 gamma spectrometry HpGe detectors in order to measure gamma emitting radionuclides, a liquid scintillation counter in order to measure tritium and alpha and beta emitters and on site equipment (portable radiation meters and a gamma spectrometer, radon monitors, etc..). The CRIIRAD laboratory is accredited by the French Nuclear Safety Authority (ASN).

From 1987 to 1993, CRIIRAD Laboratory established a map of Chernobyl caesium contamination over France. From 1996 to 1998, CRIIRAD demonstrated[6] that, due to Chernobyl fallout, some soil samples in the Alps (mountains) were radioactive waste.

After the Fukushima nuclear disaster (March 2011), CRIIRAD made an assessment of the consequences on the French territory and gave support to Japanese citizens in their effort to create CRMS.

For additional information about CRIIRAD cooperation with CRMS during year 2011 see the document (in French) :

http://www.criirad.org/actualites/dossier2011/japon_bis/crms/extrait_Japon.pdf

and

http://www.criirad.org/actualites/dossier2011/japon_bis/en_anglais/english.html

More information at : www.criirad.org

[6] B. Chareyron / "Chernobyl fallout over France. The specific situation of the alpine environment" / In International Journal of Radiation Medicine – special issue 4 (1-4), 2002, p. 163-172.
See also : "Contaminations radioactives : atlas France et Europe" written by CRIIRAD and M.André Paris, éd. Yves Michel, Feb. 2002

Appendix 2 / A population already severely exposed to radiations

The persisting contamination in iodine 131 of the soils sampled by the CRIIRAD laboratory at the end of May 2011 in Fukushima city allowed to determine the initial iodine 131 fallouts in millions of Bq/m^2.

The iodine 131 has a half-life of 8 days, its radioactivity was therefore over 600 times higher during the fallouts. This attests of the severe contamination in the air during the incursion of the contaminated plumes, in particular on March 15th, 2011.

Other radioactive substances were also present and which significantly decayed since such as : cesium 136, tellurium 129, tellurium 132, iodine 132, iodine 133, etc.. as well as radioactive gases such as xenon 133 and krypton 85 that did not build-up in the soils.

The inhabitants of this city have been subjected to a very severe internal contamination, first, by inhaling contaminated air and mostly by ingesting foods contaminated by the deposits of radioactive substances.

The Japanese authorities adopted consumption restrictions within the FUKUSHIMA prefecture only on March 21st and 23rd (according to food types).

Populations therefore consumed, for a period of over a week, extremely contaminated foods without any restriction notice and with no information.

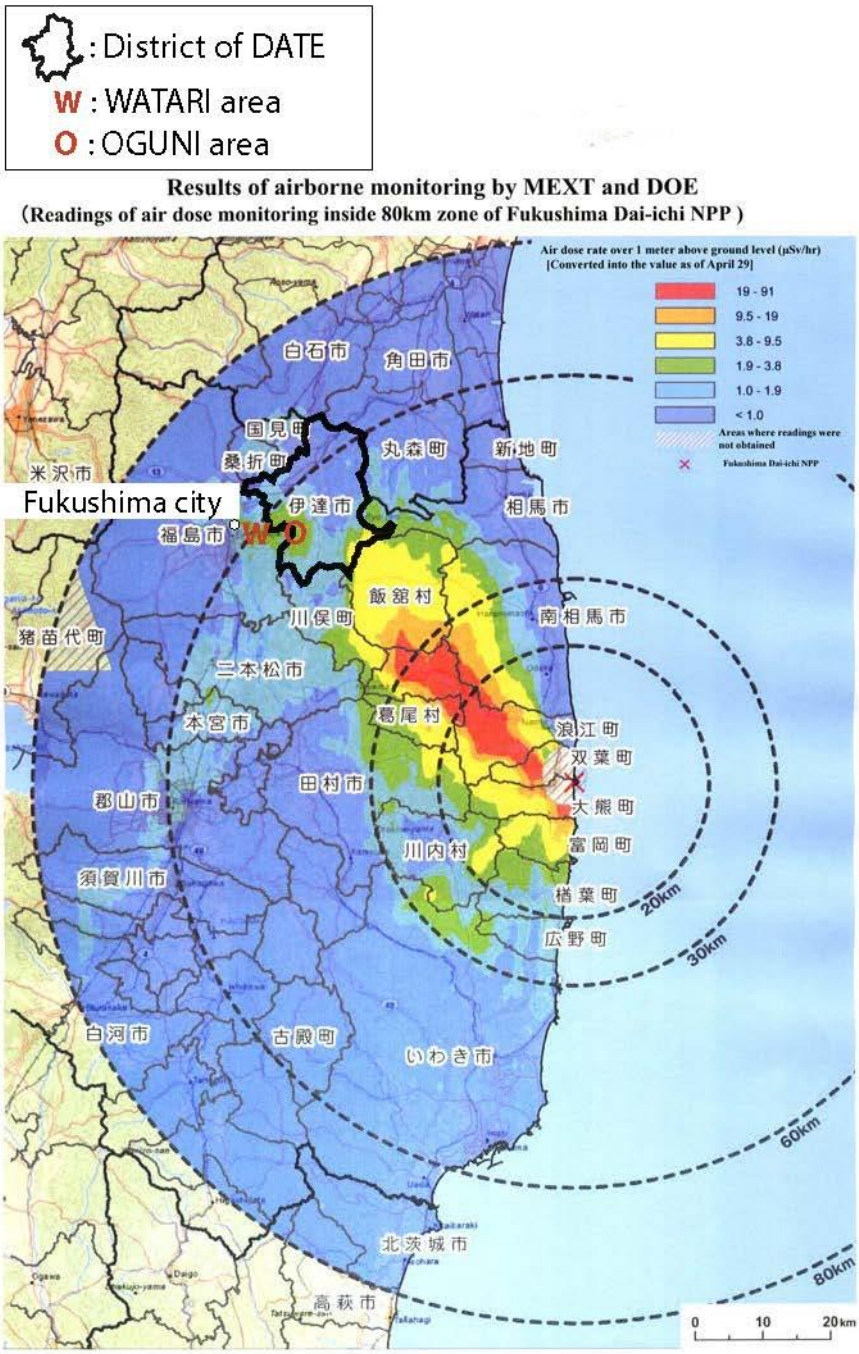
Some people may have therefore received effective doses of several dozens milliSievert and doses to the thyroid gland exceeding the Sievert.

For the record, the initial contamination of the spinach supply in iodine 131, at 100 km south of the nuclear plant was such that when consuming 200 grams, a young child would exceed the maximal annual dose limit of 1 milliSievert. At 40 kilometers northwest, the plants were so contaminated that the annual limit would be reached when consuming only 5 grams.

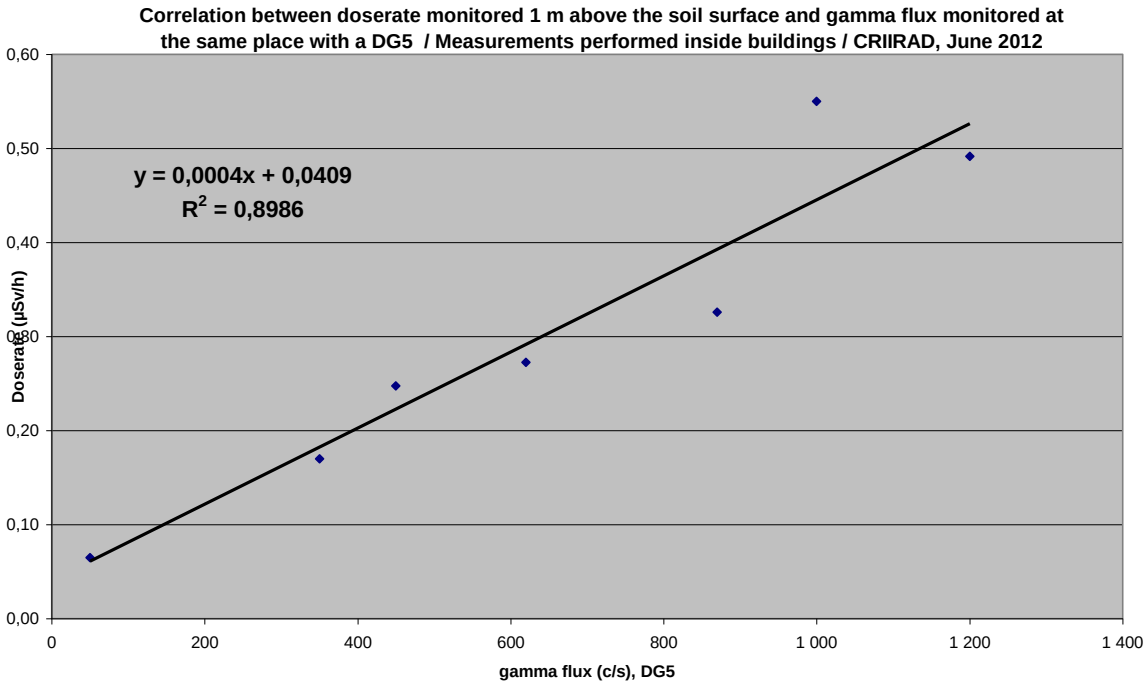
It is essential that the exposed populations obtain reliable assessments on the dose levels they have been receiving and it is of utmost importance to strive to control further exposure in the future.

Appendix 3 / location of Fukushima city ; Watari area (W) of Fukushima city and Oguni area (O) of Date city

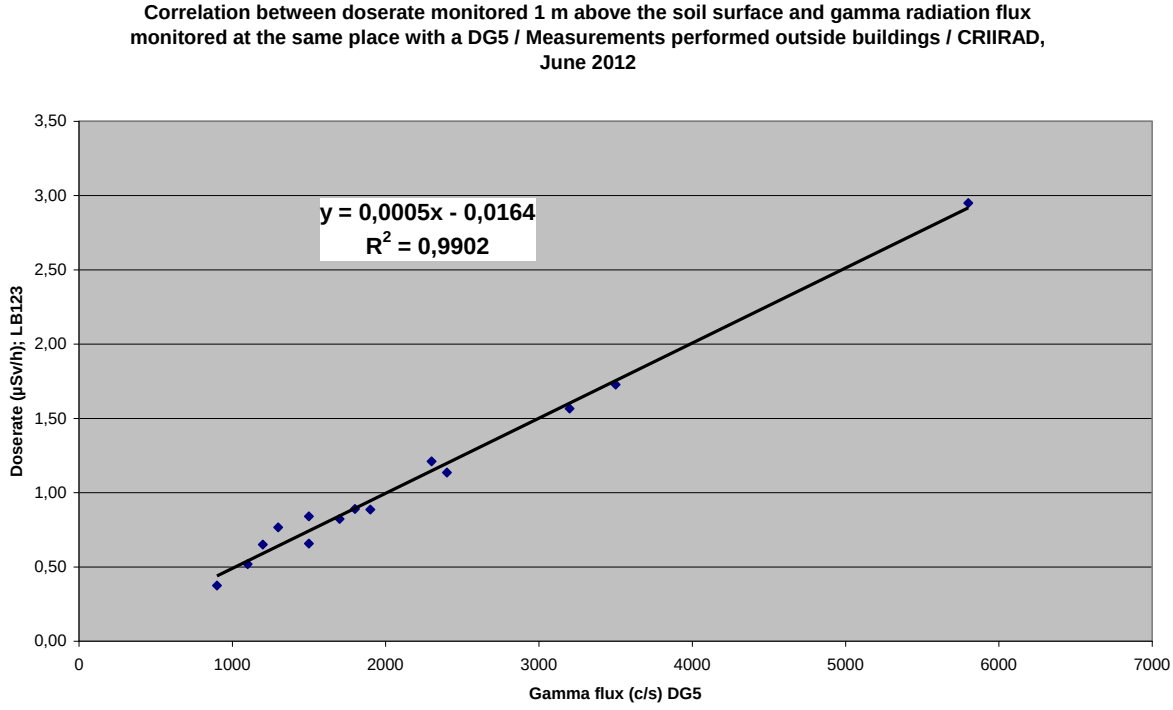
Map published by MEXT (dose rate April 29th 2011)



Appendix 4: Correlation between doserate monitored 1 m above the soil surface and gamma flux monitored at the sample place with a DG5 scintillometer (CRIIRAD, June 2012)

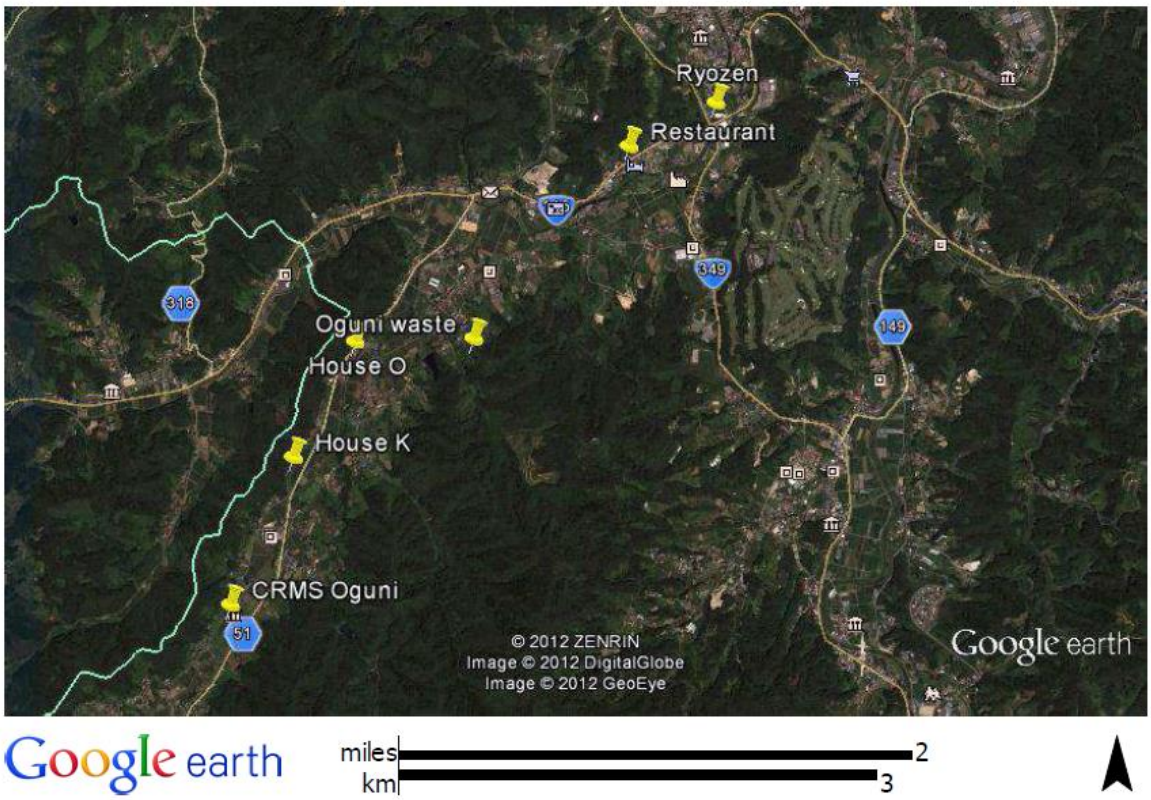


Graph O / monitoring outside buildings



Appendix 5: Map showing places where CRIIRAD made radiation monitoring in June 2012

Map 1 / Oguni area



Appendix 6 : Dose rate and gamma radiation monitoring results CRIIRAD, June 2012

Day	DG5 Contact (c/s)	DG5 1 m (c/s)	Dose rate 1 m (µSv/h)	inside or outside	description	place
1 / Oguni / Date city / storage of radioactive waste						
26/06/2012	27 000		37,8 (contact)	O	Waste storage	Oguni / Date city
26/06/2012		1 700 to 2500	0,83 to 1,23	O	Path leading to Waste storage	Oguni / Date city
2 / Oguni / Date City / House Mr K. (not decontaminated)						
26/06/2012	1 000	1 000	0,44	I	bedroom second floor : away from the valley	Oguni / Date city House Mr K.
26/06/2012		1 200	0,52	I	bedroom second floor : middle of the room	Oguni / Date city House Mr K.
26/06/2012	1 200	1 400	0,60	I	bedroom second floor : facing the valley	Oguni / Date city House Mr K.
26/06/2012		1 700	0,72	I	corridor in front of bedroom second floor : facing the valley	Oguni / Date city House Mr K.
26/06/2012	800	870	0,33	I	bedroom first floor	Oguni / Date city House Mr K.
26/06/2012		870	0,33	I	first floor living room : middle of the room (on the table)	Oguni / Date city House Mr K.
26/06/2012		2 900	1,43	O	middle of path in front of house (official A)	Oguni / Date city House Mr K.
26/06/2012		2200 à 2600	1,14	O	middle of path in front of entrance of house (official B)	Oguni / Date city House Mr K.
26/06/2012		1 900 to 3 700	0,93 to 1,83	O	path in front of houses (200 m length)	Oguni / Date city House Mr K.
26/06/2012	23 000	5 800	2,95	O	drainage pipe from garage	Oguni / Date city House Mr K.
26/06/2012	3000 to 5000	1700 to 2800	0,83 to 1,38	O	between house and garage	Oguni / Date city House Mr K.
26/06/2012		2200 to 3400	1,08 to 1,68	O	between house and bottom of the hill	Oguni / Date city House Mr K.
26/06/2012	9 000	3 400	1,68	O	between house and bottom of the hill (hot spot)	Oguni / Date city House Mr K.
26/06/2012		2500 to 2800	1,23 to 1,38	O	between house and ruined house	Oguni / Date city House Mr K.
26/06/2012	18 000	4 000	1,98	O	angle of house near drainage of roof (mosses)	Oguni / Date city House Mr K.
26/06/2012	7 000	3 500	1,73	O	access of drainage close to ruined house	Oguni / Date city House Mr K.

Day	DG5 Contact (c/s)	DG5 1 m (c/s)	Dose rate 1 m (µSv/h)	inside or outside	description	place
3 / Oguni / Date City / House Mrs O. (already decontaminated)						
26/06/2012		900 to 1000	0,4 to 0,44	I	second floor (middle)	Oguni / Date city House Mrs O.
26/06/2012		900 to 1 300	0,4 to 0,56	I	second floor	Oguni / Date city House Mrs O.
26/06/2012		1 100	0,48	I	second floor (window facing valley)	Oguni / Date city House Mrs O.
26/06/2012		1 200	0,49	I	second floor (30 cm from window facing forest)	Oguni / Date city House Mrs O.
26/06/2012		1000 to 1200	0,44 to 0,52	I	first floor, windows facing forest	Oguni / Date city House Mrs O.
26/06/2012		850 to 900	0,38 to 0,4	I	first floor, windows facing valley	Oguni / Date city House Mrs O.
26/06/2012		650 to 850	0,3 to 0,38	I	first floor , middle of rooms	Oguni / Date city House Mrs O.
26/06/2012		2000 to 2500	0,98 to 1,23	O	garden for vegetables	Oguni / Date city House Mrs O.
26/06/2012	5 200	3 500	1,73	O	garden for vegetables (hot spot), 2 m from limit of garden facing the forest	Oguni / Date city House Mrs O.
26/06/2012		3 000	1,48	O	between road and garden (50 meters checked)	Oguni / Date city House Mrs O.
26/06/2012		1 900	0,93	O	middle of road (asphalt) 50 m checked	Oguni / Date city House Mrs O.
26/06/2012		2400 to 3000	1,18 to 1,48	O	between road and forest (50 meters checked)	Oguni / Date city House Mrs O.
26/06/2012	1 300	1 900	0,89	O	limit between pleasure garden and valley	Oguni / Date city House Mrs O.
26/06/2012		1 000 to 2 000	0,48 to 0,98	O	pleasure garden after decontamination(sector 5 and 6)	Oguni / Date city House Mrs O.
26/06/2012		900	0,37	O	entrance of house (facing valley)	Oguni / Date city House Mrs O.
26/06/2012		1100 to 1200	0,53 to 0,58	O	section 3 asphalt	Oguni / Date city House Mrs O.
26/06/2012		900 to 1 500	0,43 to 0,73	O	section 4 / facing forest	Oguni / Date city House Mrs O.
26/06/2012	1 300	1 500	0,66	O	section 4 / facing forest	Oguni / Date city House Mrs O.
26/06/2012		1200 to 1500	0,58 to 0,73	O	entrance of house gate (asphalt)	Oguni / Date city House Mrs O.

Day	DG5 Contact (c/s)	DG5 1 m (c/s)	Dose rate 1 m (µSv/h)	inside or outside	description	place
4 / Oguni / Date City / Restaurant						
26/06/2012		1 500 to 2 000	0,73 to 0,98	O	Parking	Restaurant Oguni
26/06/2012		1 100	0,53	O	Entrance	Restaurant Oguni
26/06/2012		780	0,35	I	Entrance	Restaurant Oguni
5 / Oguni / Date City / CRMS local office						
26/06/2012		700	0,32	I	entrance main buildind, close to window (uphill)	CRMS Oguni
26/06/2012		260	0,14	I	Middle entrance main buildind	CRMS Oguni
26/06/2012		350	0,17	I	Middle meeting room (table)	CRMS Oguni
26/06/2012		300 to 500	0,16 to 0,24	I	CRMS laboratory, middle of room	CRMS Oguni
26/06/2012		1 200	0,65	O	In front of CRMS lab	CRMS Oguni
26/06/2012		1 000	0,55	I	CRMS laboratory, contact window	CRMS Oguni
26/06/2012		450	0,25	I	CRMS laboratory, middle of room (table)	CRMS Oguni
26/06/2012	800 to 3 600 (tree)	1 300 to 2 000	0,63 to 0,98	O	Between building and road (uphill)	CRMS Oguni
26/06/2012	4 500	3 200	1,57	O	meadow (grass)	CRMS Oguni
26/06/2012		3 400 to 6 000	1,68 to 2,98	O	storage of contaminated soil (blue plastic), rod for limit	CRMS Oguni
26/06/2012	3 500	2 500	1,23	O	tree close to building	CRMS Oguni
26/06/2012	1 700	1 600	0,78	O	decontaminated former playground (homogeneous)	CRMS Oguni
26/06/2012	(2000 on grass besides parking)	1 300 to 1 600	0,63 to 0,78	O	Parking (asphalt)	CRMS Oguni
26/06/2012		1 700	0,83	O	inside monitoring post	CRMS Oguni
26/06/2012		2 000	0,98	O	middle of road (asphalt), less than 5 m from monitoring post	CRMS Oguni
26/06/2012		2 600	1,28	O	besides tree less than 10 m from monitoring post	CRMS Oguni
26/06/2012		2 800	1,38	O	above rain collector less than 10 m from monitoring post	CRMS Oguni
26/06/2012	4 600	3 200	1,57	O	grass 2 m from monitoring post	CRMS Oguni

Day	DG5 Contact (c/s)	DG5 1 m (c/s)	Dose rate 1 m (µSv/h)	inside or outside	description	place
6 / Date City Office						
26/06/2012		1 000	0,44	I	window 3Floor	Date City Office
26/06/2012		300 to 500	0,16 to 0,24	I	table 3Floor	Date City Office
26/06/2012		600 to 1500	0,28 to 0,73	O	in front of building (parking, lawns and pathways)	Date City Office
26/06/2012	19 000	3 800	1,88	O	contaminated grass, entrance of building	Date City Office
7 / Fukushima city / Hotel						
26/06/2012	2 160	1 500	0,84	O	in front of hotel, sidewalk	Fukushima city
26/06/2012	(8000 between two blocks)	900 to 1600	0,43 to 0,78	O	in front of hotel, sidewalk	Fukushima city
26/06/2012	1 950	1000 to 1500	0,48 to 0,73	O	in front of hotel, sidewalk	Fukushima city
26/06/2012		80	0,07	I	inside hotel, 7F, corridor	Fukushima city
26/06/2012		200	0,12	I	inside hotel, 7F, Room, close to window	Fukushima city
26/06/2012		300	0,13	I/O	inside hotel, 7F, Room, outside window	Fukushima city

Day	DG5 Contact (c/s)	DG5 1 m (c/s)	Dose rate 1 m (µSv/h)	inside or outside	description	place
8 / Fukushima city / Watari area (N)						
25/06/2012	2 100	1 700	0,82	O	Watari area N, parking	Fukushima city
25/06/2012		1200 to 2000	0,58 to 0,98	O	Watari area N, parking	Fukushima city
25/06/2012	2 500	2 300	1,21	O	Watari area N, private house, grass	Fukushima city
25/06/2012		1 400	0,68	I/O	Watari area N, entrance to building (covered)	Fukushima city
9 / Fukushima city / Watari area "R"						
25/06/2012		800 to 1300	0,38 to 0,63	O	Watari area R, parking, global	Fukushima city
25/06/2012	3 400	1 300	0,77	O	Watari area R, parking, small depression	Fukushima city
25/06/2012		900 to 1700	0,43 to 0,83	O	Watari area R, in front of house, global	Fukushima city
25/06/2012	24 000 (bottom of drainage box) / 7 400 (contact of concrete slab)	1 800	0,89	O	Watari area R, in front of house, rainwater drainage	Fukushima city
25/06/2012	4000 (inside open pot)	1 700	0,83	O	Watari area R, in front of house, open pot for flowers E	Fukushima city
25/06/2012	1 800	1 100	0,52	O	Watari area R, in front of house, point D	Fukushima city
25/06/2012		620	0,27	I	Watari area R, inside house close to point D (on the table)	Fukushima city
10 / Fukushima city / close to CRMS office						
25/06/2012	1000 (asphalt)	600 to 700	0,28 to 0,33	O	Near CRMS office, parking (asphalt), global	Fukushima city
25/06/2012		660	0,31	O	Near CRMS office, parking (asphalt)	Fukushima city
25/06/2012		400 to 900	0,18 to 0,43	O	Near CRMS office, sidewalks from parking to building	Fukushima city
25/06/2012		180 to 600	0,11 to 0,28	I/O	Near CRMS office, corridor between buildings (semi-covered)	Fukushima city
25/06/2012		100	0,08	I	Inside building near CRMS office, central corridor	Fukushima city
25/06/2012		50	0,07	I	Inside CRMS office, on the table	Fukushima city