IRSN
INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Enhancing nuclear safety

Assessment on the 66th day of projected external dose for populations living in the North-West fallout zone of the Fukushima nuclear accident

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IRSN certified quality management system

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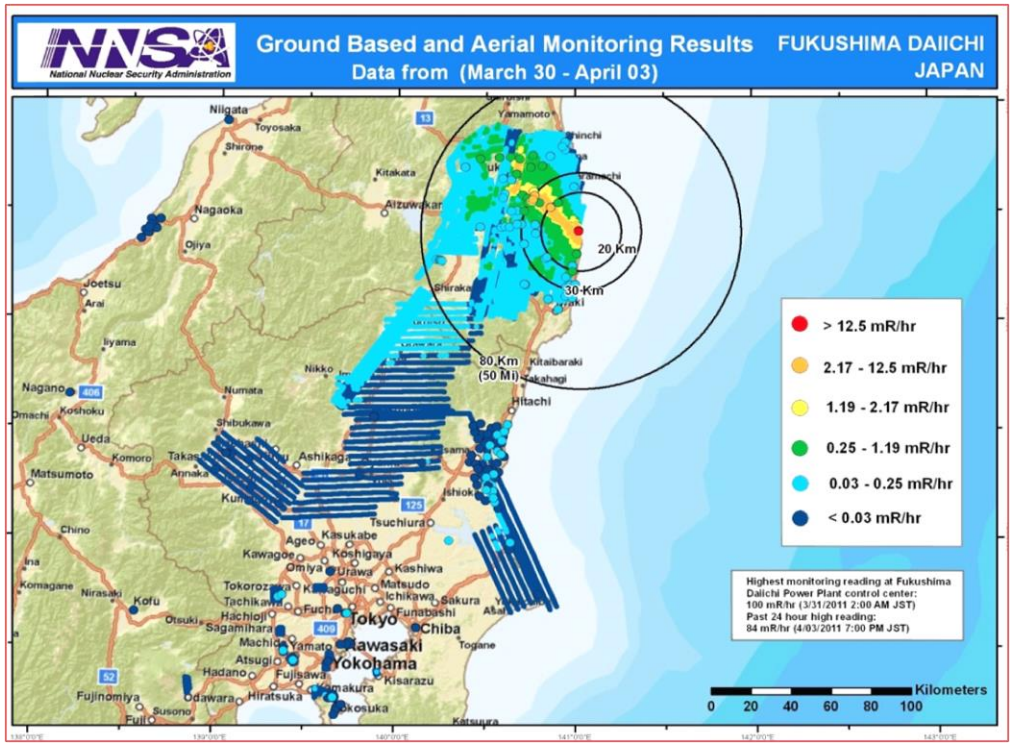
At the beginning …

- first days following the accident : **lack of reliable** data from Japan
  - release composition
  - environmental measurements
  - precise meteorology
  - contamination measurements of exposed population
  - **dosimetric impact could not be performed immediately**
- two weeks following the accident : atmospheric releases non totally stopped
  - **dosimetric impact for mid and long term was still not available**

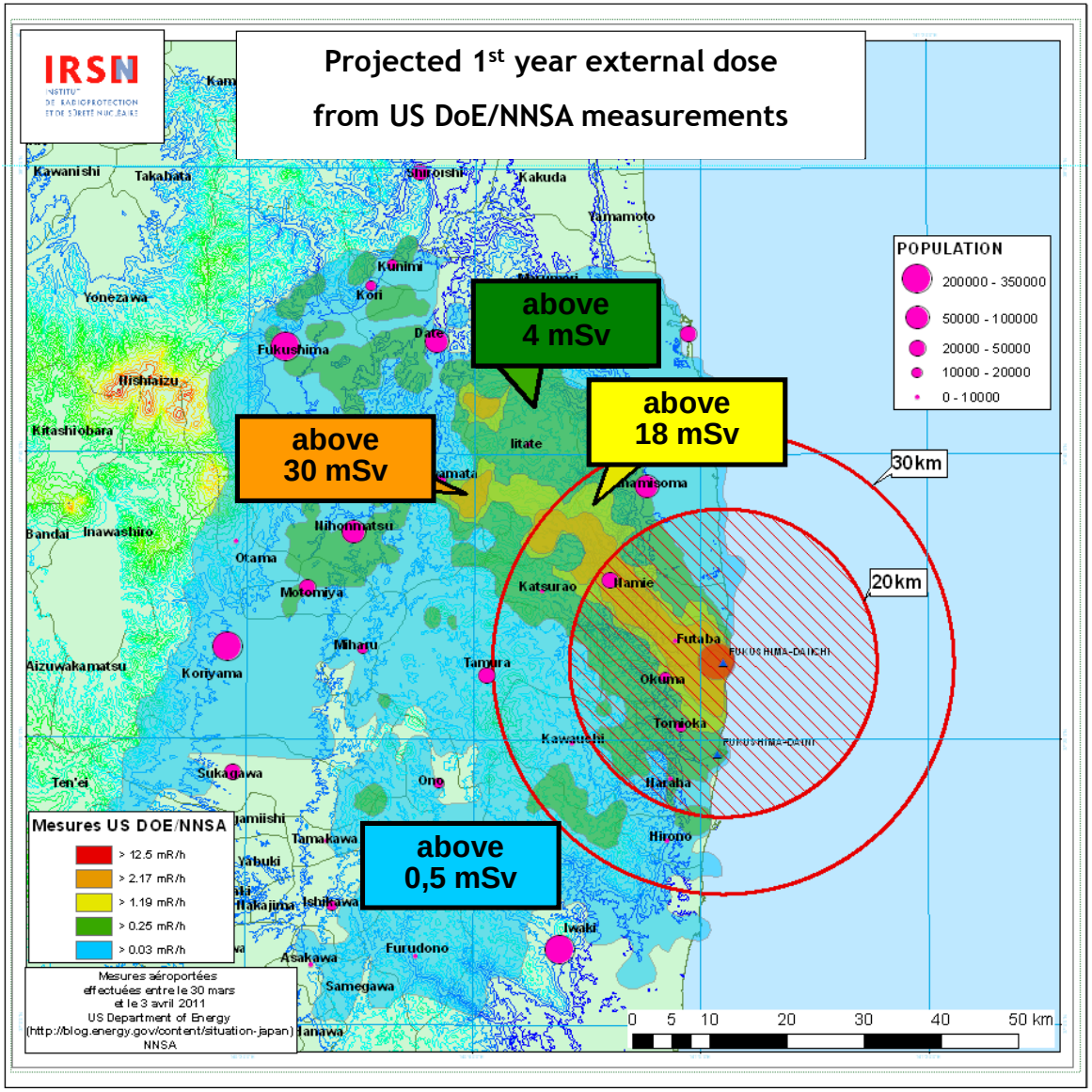
US dose rate map



- airborne measurements by US DoE / NNSA between March 30th – April 3rd
- published by NNSA April 7th
- particularly high dose rate in a north-west strip about 20 km width, 50 km length
- deposit in this strip appear to have been particularly important (rain and snow)

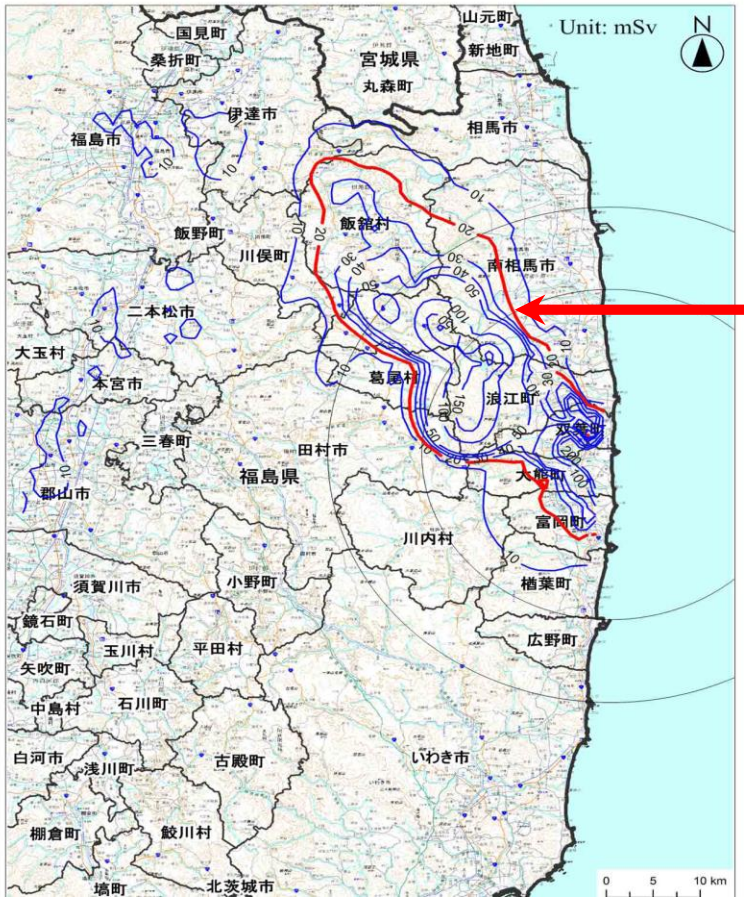
- comparison with previous measurements and improved knowledge of meteorology : deposit from March 15th and 16th releases

French map of projected 1st year external dose



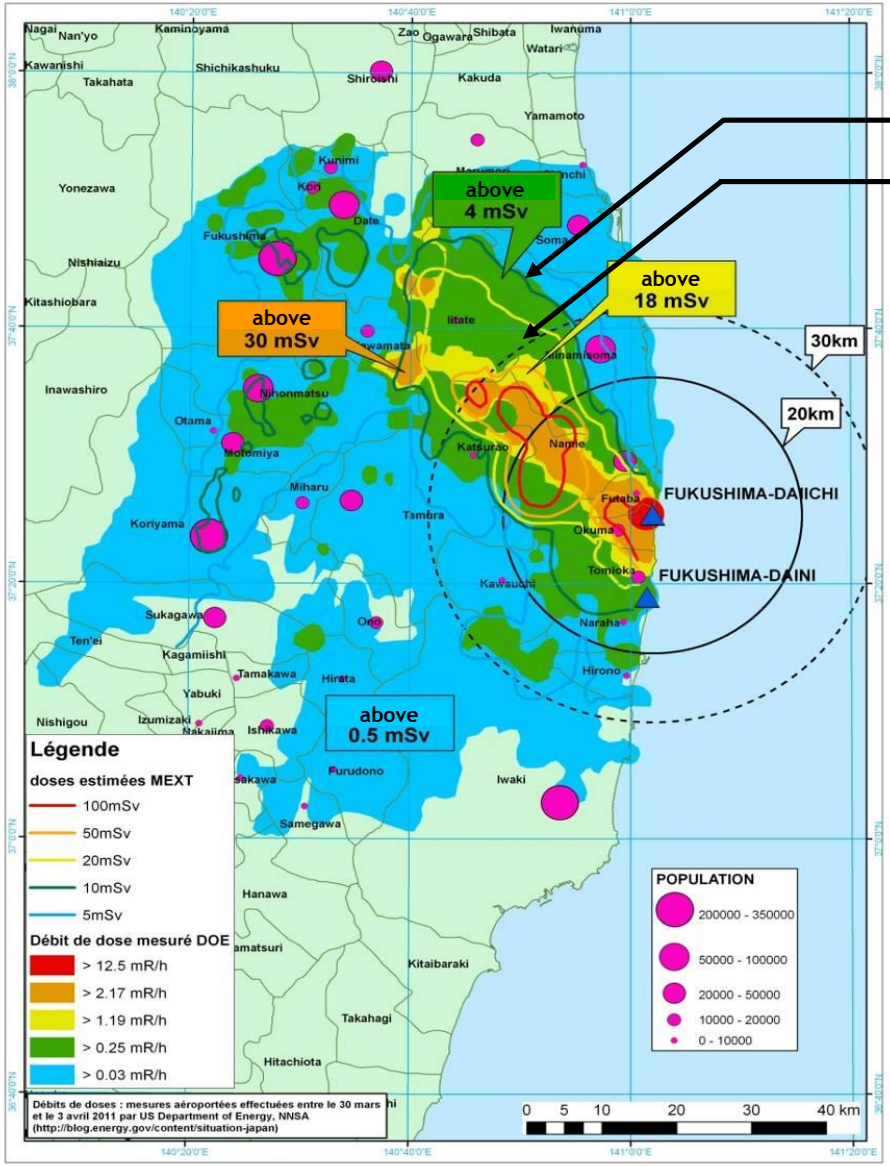
- from :
  - airborne measurements of dose rate by DoE / NNSA
  - composition of the releases estimated by IRSN
- published by IRSN April 8th 28 days after the accident

Japan projected 1st year external dose map



- isodose MEXT 20 mSv (red curve)
- published by MEXT April 26th
  44 days after the accident

Comparison IRSN versus MEXT



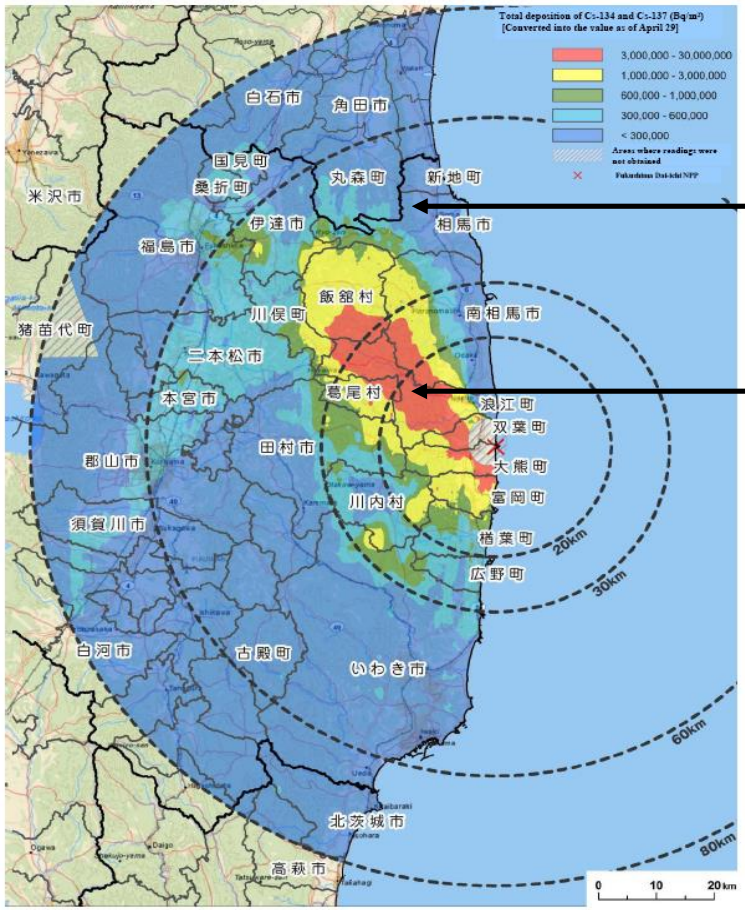
MEXT isodose 10 mSv green curve

IRSN green zone > 4 mSv

IRSN underestimation of 2.5

- one hypothesis : the contribution of Ba-140/La-140 in measured dose rates could be around 10% and not 50% as originally considered by IRSN (IRSN doses to be multiplied by 1.6)

Map of Cs deposit by MEXT

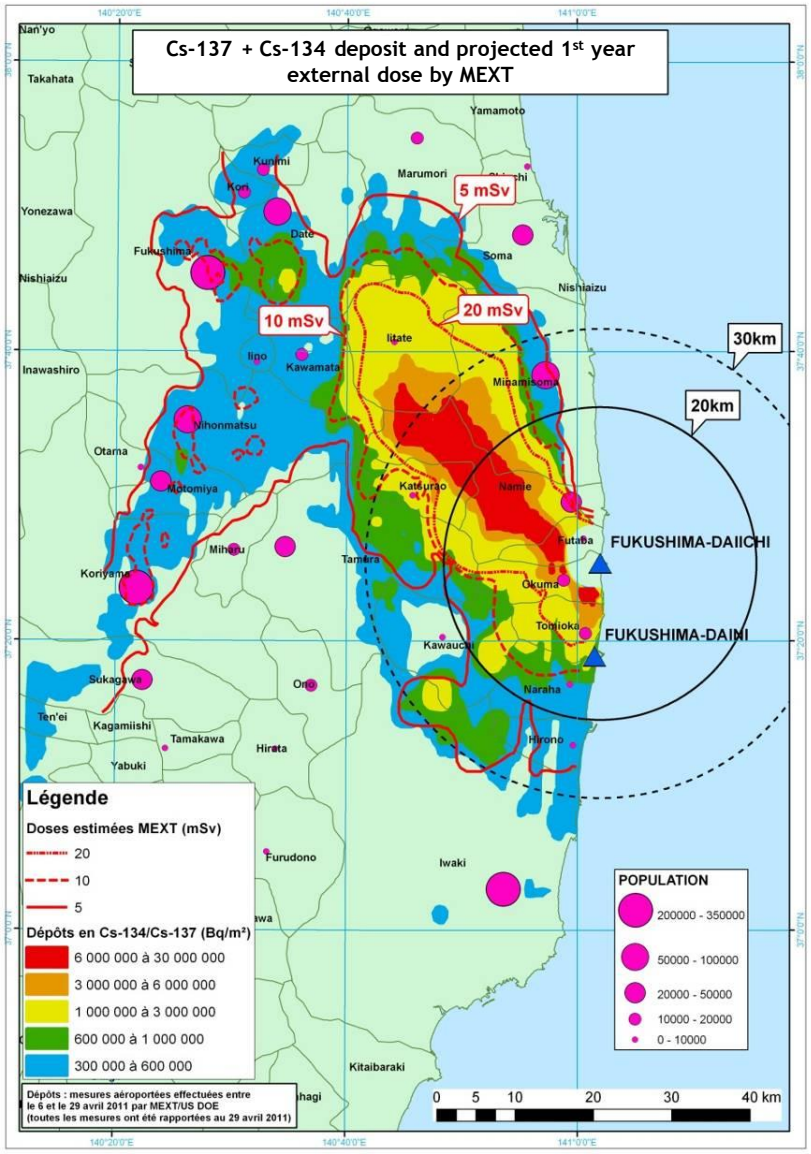


blue area, < 300,000 Bq/m^2

red area, > 3,000,000 Bq/m^2

- published by MEXT May 6th

Comparison of MEXT Cs deposit and dose maps



the values of deposit
300,000 Bq/m^2 to 600,000 Bq/m^2
correspond to values of external dose
received in the first year
from 5 mSv to 10 mSv

the conversion coefficient
of the surface activity in Cs (134+137)
in external dose received in the first year is
found to be

16.6 (mSv/year) / (MBq/m^2)

Deposit, dose and population

Deposit of caesium (137+ 134) (Bq/m^2)	> 300,000	> 600,000	> 1 million	> 3 millions	> 6 millions
External dose 1st year (mSv)	> 5	> 10	> 16	> 50	> 100

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External dose 1st year (mSv)	> 5	> 10	> 16	> 50	> 100
External dose 70 years (mSv)	> 41	> 82	> 136	> 408	> 816

- no exposure due to diet, nor initial cloud
- effective total projected doses are higher, depending on the type of deposit (wet or dry), the diet and the origin of food

Deposit, dose and population

<table>
<tr><td>Deposit of caesium (137+ 134) (Bq/m²)</td><td>> 300,000</td><td>> 600,000</td><td>> 1 million</td><td>> 3 millions</td><td>> 6 millions</td></tr>
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<tr><td rowspan="3">Population (excluding exclusion zone)</td><td rowspan="3">292,000</td><td colspan="4">69,400</td></tr>
<tr><td rowspan="2">43,000</td><td colspan="3">26,400</td></tr>
<tr><td>21,100</td><td>3,100</td><td>2,200</td></tr>
</table>

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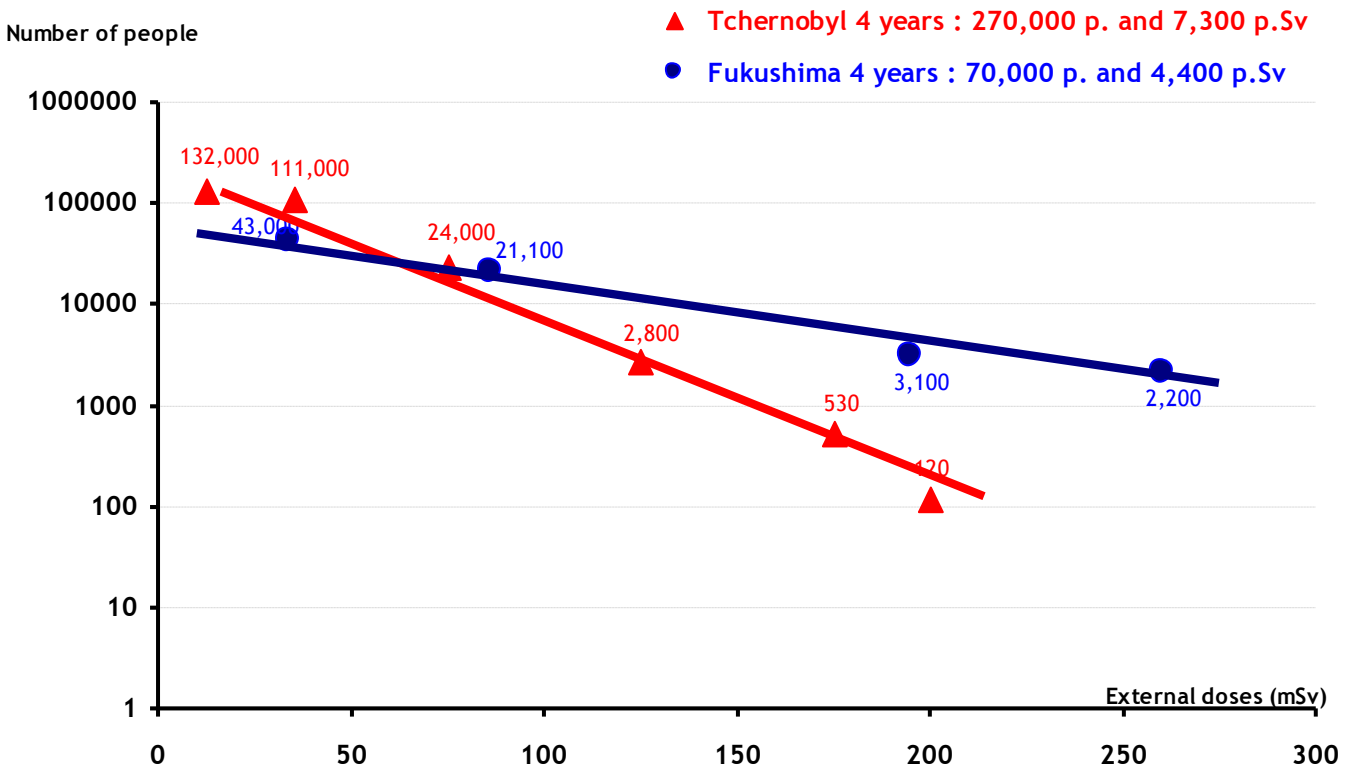
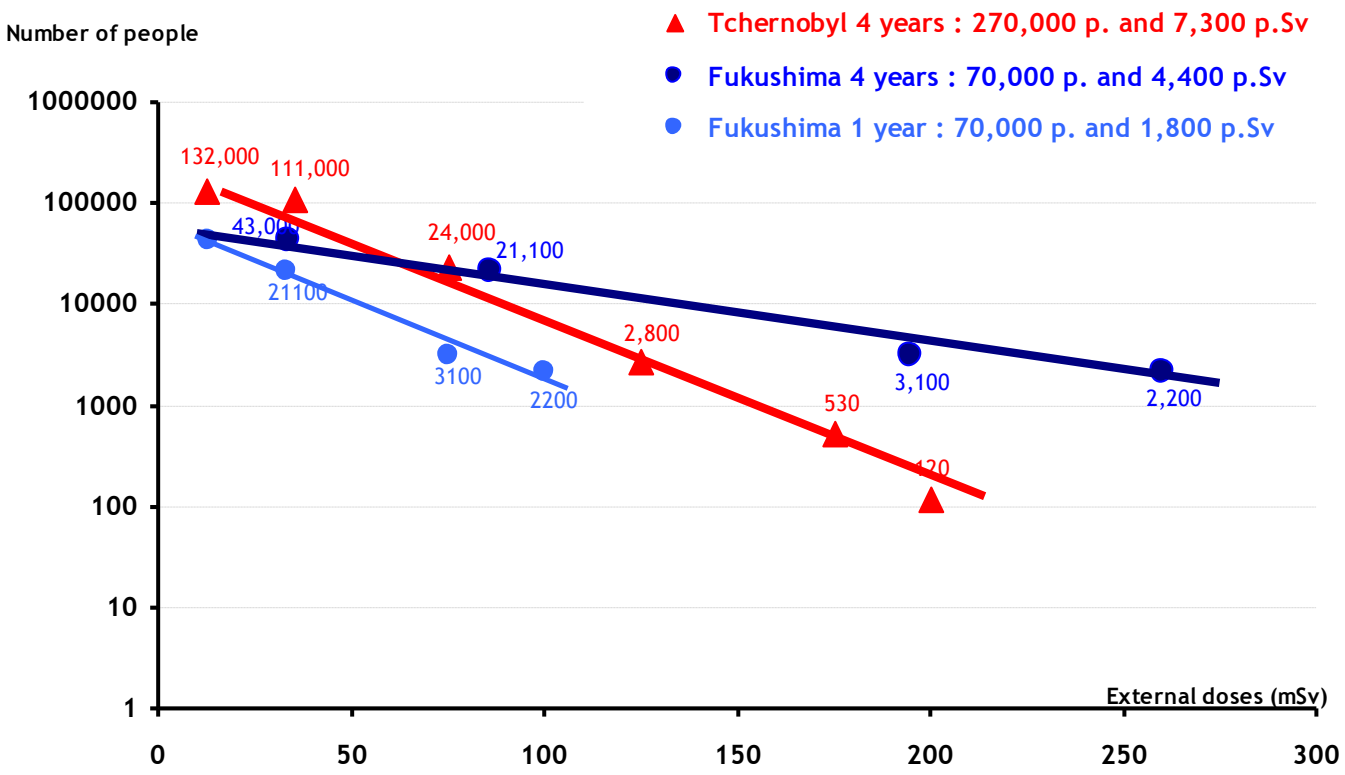
- effective total projected doses are higher, depending on the type of deposit (wet or dry), the diet and the origin of food

Fukushima versus Chernobyl



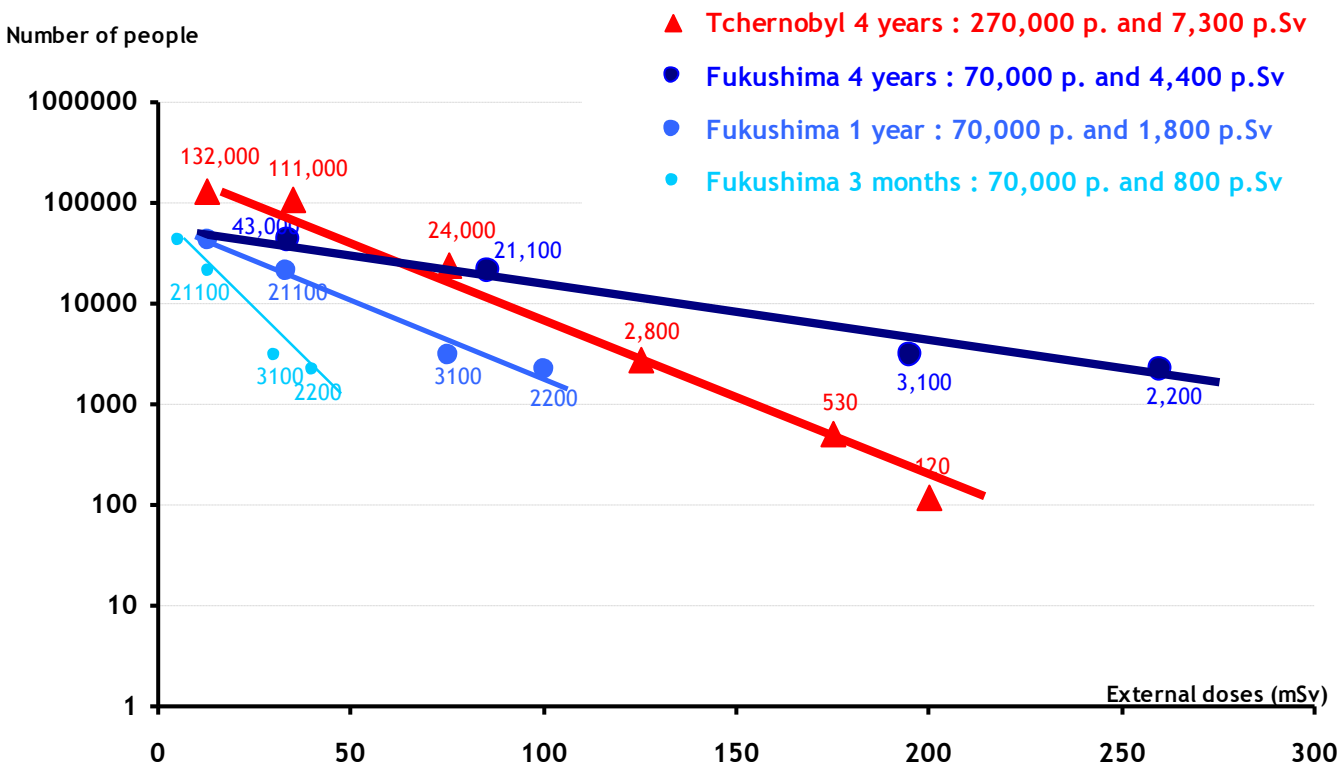
in the absence of countermeasures for evacuation for 4 years, the external dosimetric impact of Fukushima accident represents 60% of that of Chernobyl

Fukushima versus Chernobyl



evacuation of population 1 year after,
the external dosimetric impact is reduced
of 59%

Fukushima versus Chernobyl



evacuation of population 3 months after,
the external dosimetric impact is reduced
of 82%

Conclusion

- IRSN : first map of projected dose in less than one month, with US measurements
- without evacuation countermeasure : order of magnitude similar to Chernobyl
- evacuation of most contaminated territories necessary, as Japan decided May 16th

Thank you for your attention

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