Input to the round table discussion on Fukushima

How people's perception can be influenced
Examples from UNSCEAR

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STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

How people's perception can be influenced
Three examples from UNSCEAR

- Population exposure from normal operation versus reactor accidents
- Population exposure in the contaminated areas versus the Chernobyl red forest
- Protection of the environment: routine discharges versus accidental discharges

➡ By the choice of the data and the way they are presented

Collective effective dose to members of the public from the nuclear fuel cycle in normal operation

1	Mining of uranium ore	**0.19**
	Milling of uranium ore	**0.008**
	Mine and mill tailings (release of radon over 5 years)	**0.04**
2&3	Enrichment and fuel fabrication	**0.003**
4	Reactor operation: atmospheric discharges	**0.22**
	Reactor operation: aquatic discharges	**0.05**
5	Reprocessing: atmospheric discharges	**0.028**
	Reprocessing: aquatic discharges	**0.081**
1&6	Transportation	**< 0.1**

During normal operation: **0.72 manSv/GWy**

The nuclear electricity production in the world in 2010: 300 GWyear

➡ The exposure from the nuclear fuel cycle is in normal operation very low:
300 x 0.72 ≈ 200 manSv

Source UNSCEAR 2008 (evaluation period 1998-2002)

Individual doses to members of the public from the nuclear fuel cycle

Individual doses to the local population are in normal operation very low. Typical values for the most exposed members of the public are:

- Mining and milling 25 µSv/y
- Fuel fabrication 0.2 µSv/y
- Reactor operation 0.1 µSv/y
- Reprocessing 2 µSv/y

➡ Reactor accidents are the biggest threat but these small risks with far-reaching consequences are not included in the UNSCEAR figures

Source UNSCEAR 2008 (evaluation period 1998-2002)

Chernobyl is equal to 1800 years of normal operation and Fukushima 240 years!

Major radiation accidents worldwide

(in decreasing collective dose to the population)

Year	Accident	manSv
1986	**Chernobyl**	**360 000**
2011	**Fukushima**	**48 000**
1957	Kyshtym	2 500
1964	SNAP 9A	2 100
1957	Windscale fire	2 000
1983	Ciudad Juarez	150
1987	Goiânia	60
1979	TMI	40
1978	Cosmos 954	20
1966	Palomares	3
1999	Tokai-mura	< 0.6
1993	Tomsk	0.02

For the sake of comparison

- Atmospheric weapons testing: **22 000 000 manSv**
- Medical exposure in Belgium: **22 000 manSv/y**

Source UNSCEAR

Population exposure in the contaminated areas after the Chernobyl accident

The total effective dose accumulated during the first 10 years by the 5 million people living in the most contaminated areas around Chernobyl was not very high (excluding thyroid dose)

- 0 - 5 mSv: 59 % (< annual average exposure in Belgium: 4.6 mSv)
- 5 - 10 mSv: 20 % (~ one CT-scan)
- 10 - 20 mSv: 13 %
- 20 - 50 mSv: 6.9 % (> annual limit for radiation workers: 20 mSv)
- 50 -100 mSv: 0.9 %
- 100 - 200 mSv: 0.02 %
- > 200 mSv: 0.002%

➡ This additional exposure is less than the difference in exposure between the Ardennes and the Campine region of Belgium

(average difference . 20 mSv in 10 years)

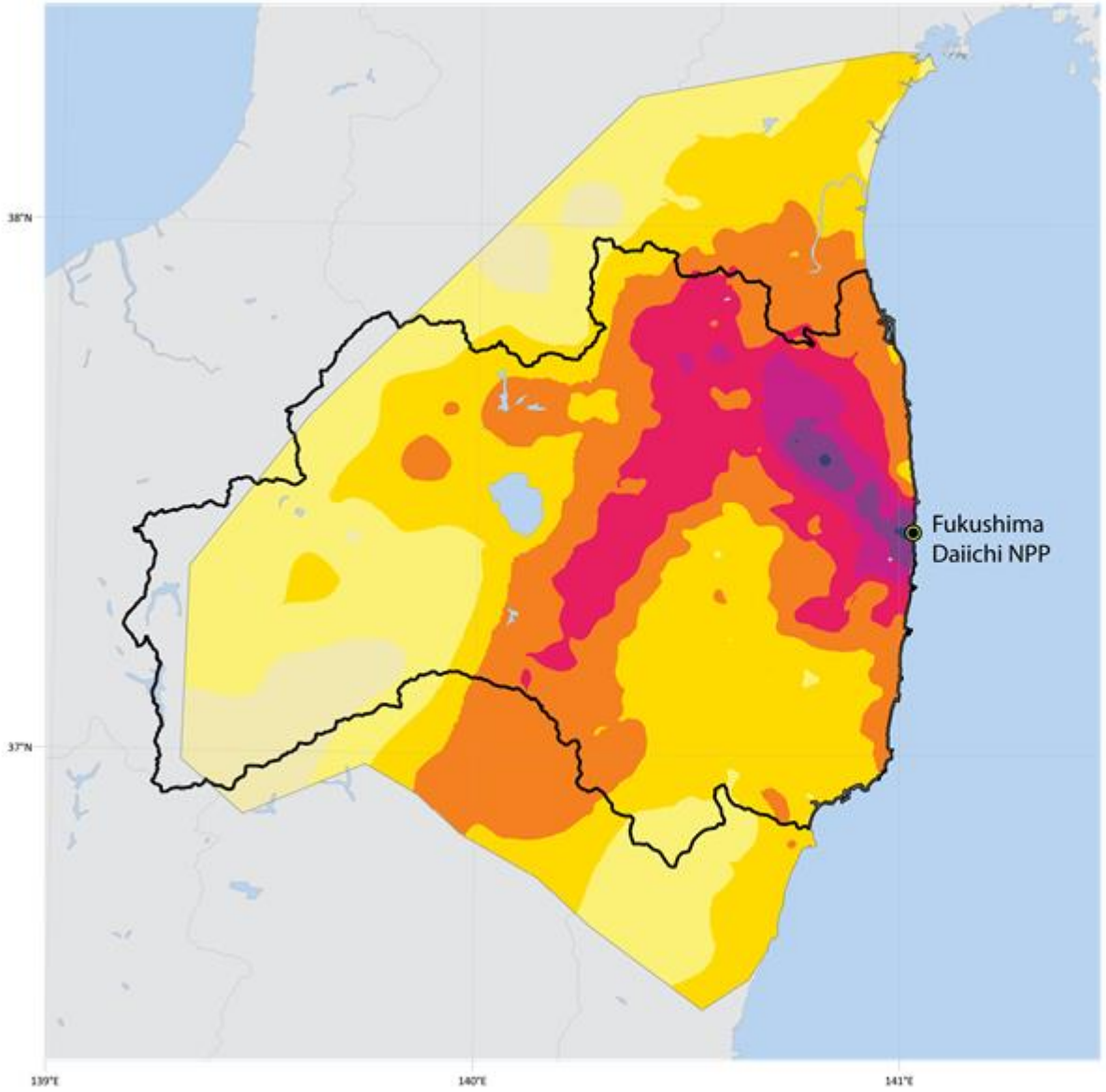
Source UNSCEAR

What if the wind blew to Pripyat instead of to the red forest

How many of the 49 000 inhabitants would have survived the initial dose rate of about 1 Gy/h?

^{137}Cs deposition on the ground

(based on measurement data adjusted to 14 June 2011)



Fukushima Prefecture

- Area: 13 783 km²
- Population: 2 million

Flanders

- Area: 13 522 km²
- Population: 6 million

The highest measurements exceeded 5 MBq/m²

Source UNSCEAR

Doses and effects for non-human biota

UNSCEAR concludes that beyond a geographically very restricted area the potential for effects on biota may be considered insignificant

- Why dealing with protection of the environment if MBq/m^2 of soil contamination with ^{137}Cs has no effect on the ecosystem?

  The contamination levels during normal operation are many orders of magnitude lower!

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Examples from UNSCEAR

- Chernobyl is equal to 1800 years of normal operation and Fukushima 240 years
- Population exposure in the contaminated areas versus "what if the wind blew to Pripyat instead of to the red forest?"
- Why dealing with protection of the environment in normal operation if MBq/m^2 of soil contamination with ^{137}Cs has an insignificant effect on the ecosystem?

➡ By the choice of the data and the way they are presented