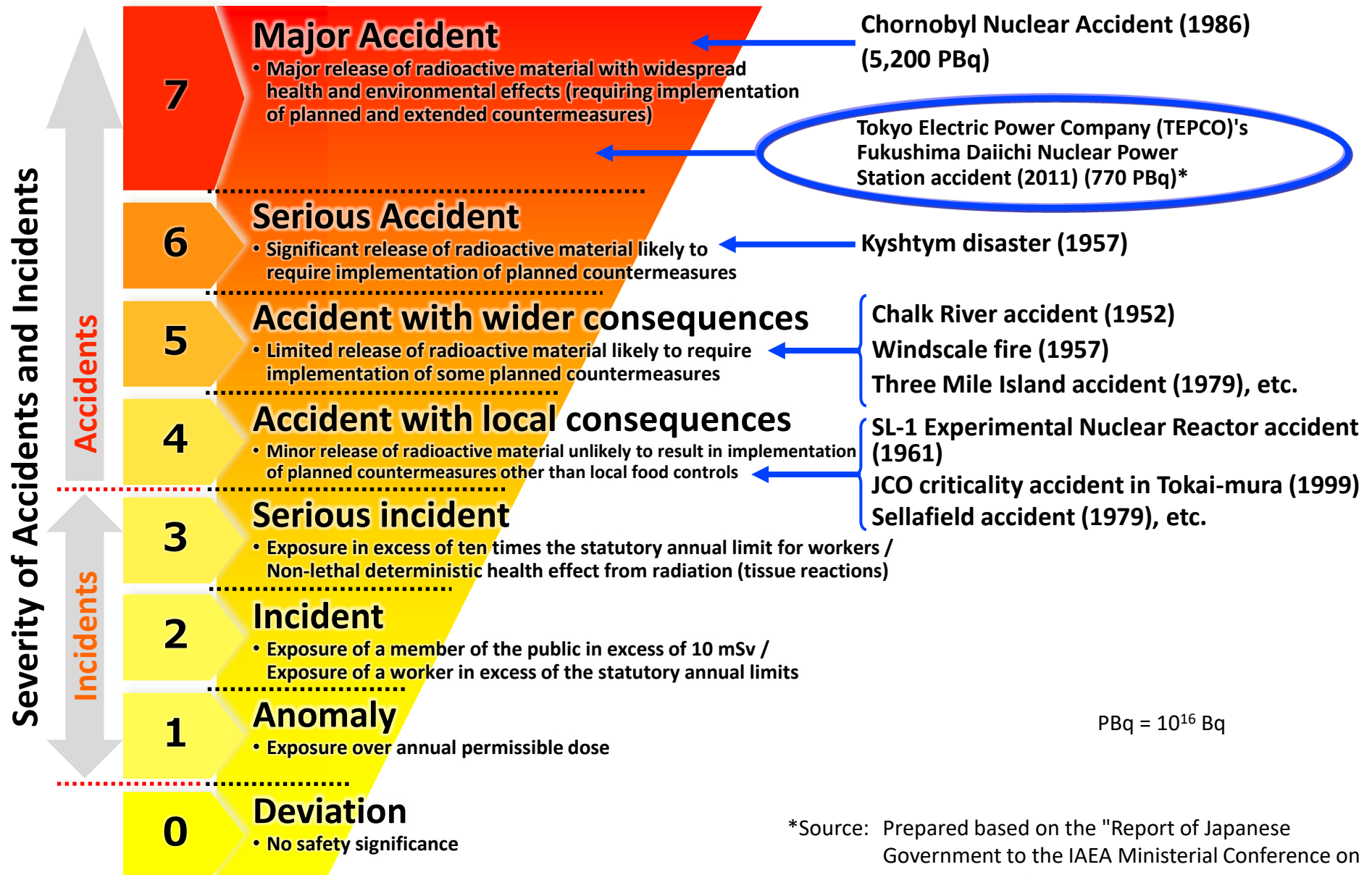
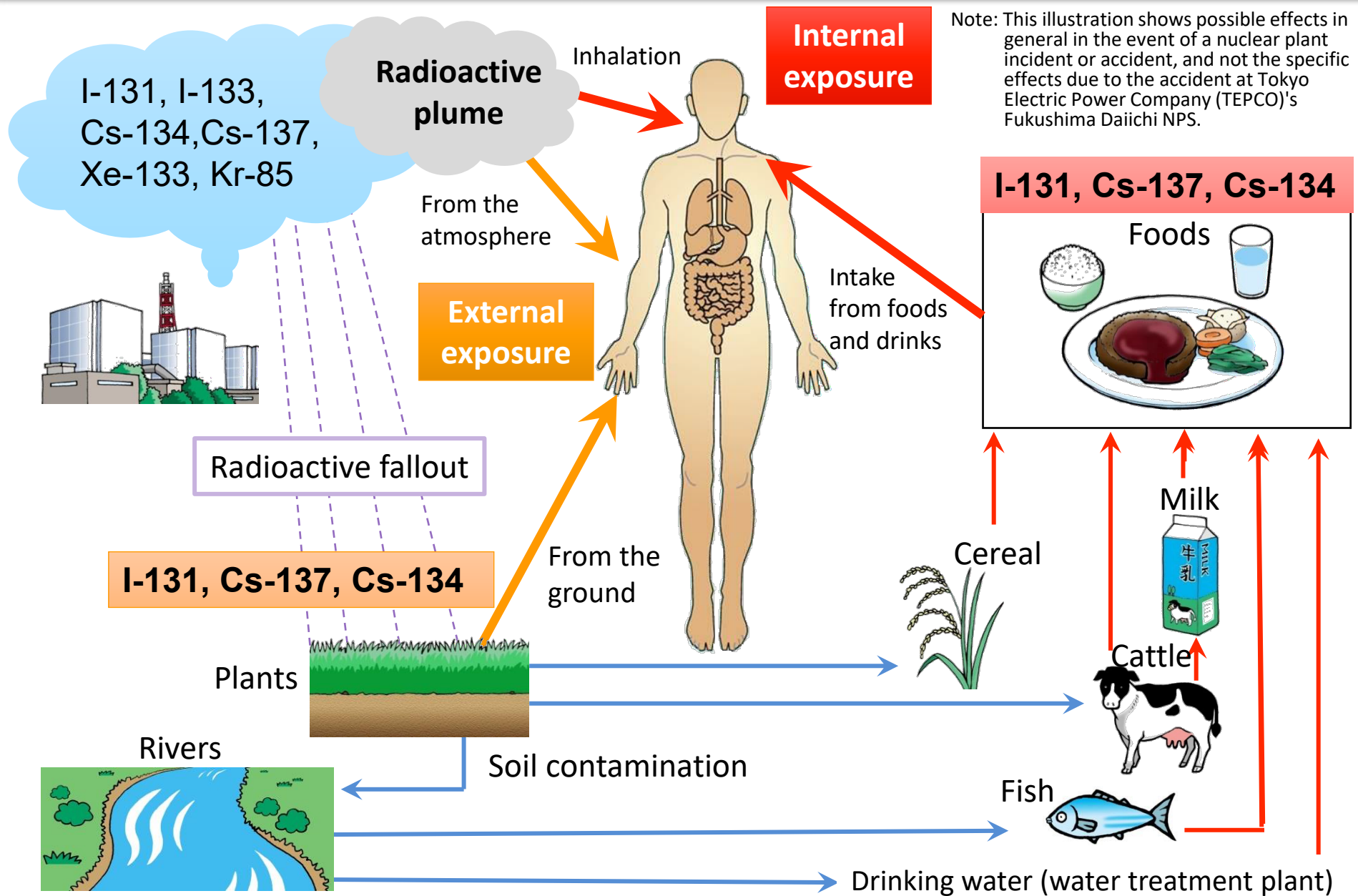


# International Nuclear and Radiological Event Scale



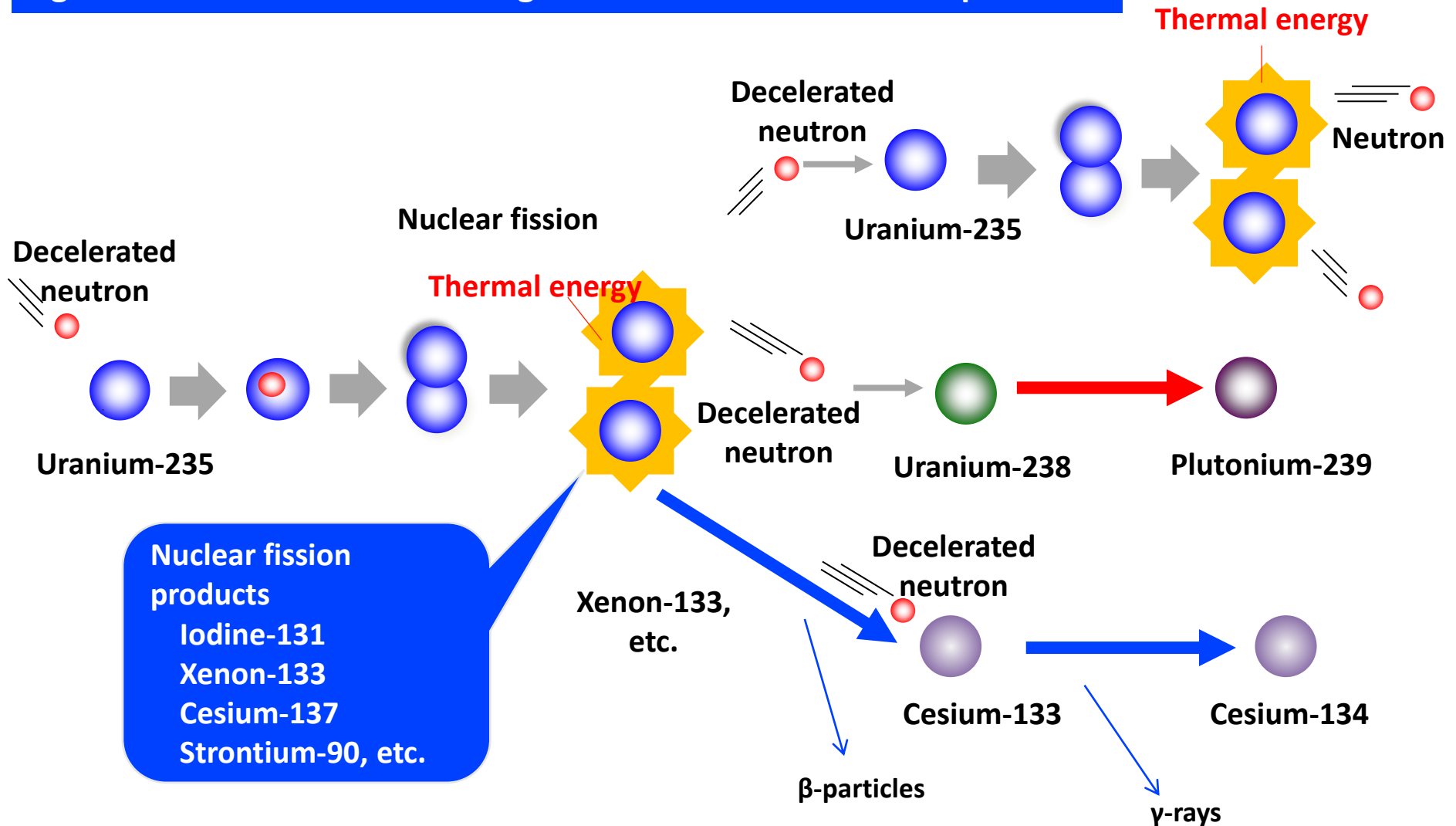
\*Source: Prepared based on the "Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety" (June 2011)

# Effects of Reactor Accidents



# Products in Nuclear Reactors

Light-water nuclear reactor and generation of nuclear fission products



## Nuclear Disaster

# Radioactive Materials Derived from Nuclear Accidents

	H-3 Tritium	Sr-90 Strontium-90	I-131 Iodine-131	Cs-134 Cesium-134	Cs-137 Cesium-137	Pu-239 Plutonium-239
Types of radiation	$\beta$	$\beta$	$\beta, \gamma$	$\beta, \gamma$	$\beta, \gamma$	$\alpha, \gamma$
Biological half-life	10 days <sup>*1 *2</sup>	50 years <sup>*3</sup>	80 days <sup>*2</sup>	70-100 days <sup>*4</sup>	70-100 days <sup>*3</sup>	Liver: 20 years <sup>*5</sup>
Physical half-life	12.3 years	29 years	8 days	2.1 years	30 years	24,000 years
Effective half-life (calculated from biological half-life and physical half-life)	10 days	18 years	7 days	64-88 days	70-99 days	20 years
Organs and tissues where radioactive materials accumulate	Whole body	Bones	Thyroid	Whole body	Whole body	Liver and bones

Effective half-life: Related to p.27 of Vol. 1, "Internal Exposure and Radioactive Materials"

Effective half-lives are calculated based on values for organs and tissues where radioactive materials accumulate as indicated in the table of biological half-lives.

\*1: Tritium water; \*2: ICRP Publication 78; \*3: JAEA Technical Manual (November 2011); \*4: Assumed to be the same as Cesium-137; \*5: ICRP Publication 48

## Nuclear Disaster

### Comparison of Estimated Amounts of Released Radionuclides between the Chernobyl NPS Accident and the TEPCO's Fukushima Daiichi NPS Accidents

Nuclides	Half-life <sup>a</sup>	Boiling point <sup>b</sup> °C	Melting point <sup>c</sup> °C	Release into the environment: PBq <sup>*</sup>		TEPCO's Fukushima Daiichi NPS/ Chernobyl NPS
				Chernobyl NPS <sup>d</sup>	TEPCO's Fukushima Daiichi NPS <sup>e</sup>	
Xenon (Xe)-133	5 days	-108	-112	6,500	11,000	1.69
Iodine (I)-131	8 days	184	114	~1,760	160	0.09
Cesium (Cs)-134	2 years	678	28	~47	18	0.38
Cesium (Cs)-137	30 years	678	28	~85	15	0.18
Strontium (Sr)-90	29 years	1,380	769	~10	0.14	0.01
Plutonium (Pu)-238	88 years	3,235	640	$1.5 \times 10^{-2}$	$1.9 \times 10^{-5}$	0.0012
Plutonium (Pu)-239	24,100 years	3,235	640	$1.3 \times 10^{-2}$	$3.2 \times 10^{-6}$	0.00024
Plutonium (Pu)-240	6,540 years	3,235	640	$1.8 \times 10^{-2}$	$3.2 \times 10^{-6}$	0.00018

Ratio of radionuclides accumulated in the reactor core at the time of the accidents that were released into the environment

Nuclides	Chernobyl NPS <sup>f</sup>	TEPCO's Fukushima Daiichi NPS <sup>g</sup>
Xenon (Xe)-133	Nearly 100%	Approx. 60%
Iodine (I)-131	Approx. 50%	Approx. 2-8%
Cesium (Cs)-137	Approx. 30%	Approx. 1-3%

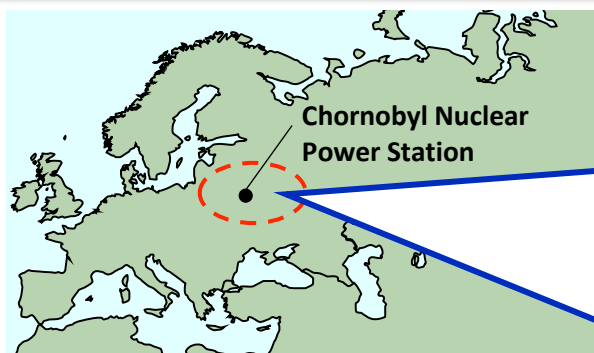
\*PBq equals  $10^{15}$ Bq.

Sources: a: ICRP Publication 72 (1996); b and c: Rikagaku Jiten 5th edition (1998); d: UNSCEAR 2008 Report, Scientific Annexes C, D and E; e: Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety (June 2011); f: UNSCEAR 2000 Report, ANNEX J; g: UNSCEAR 2013 Report, ANNEX A



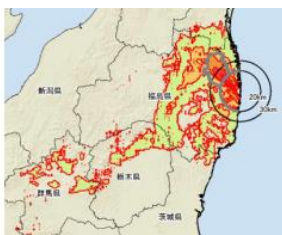
## Nuclear Disaster

# Comparison between the Chornobyl NPS Accident and the TEPCO's Fukushima Daiichi NPS Accident



Chornobyl Nuclear Power Station

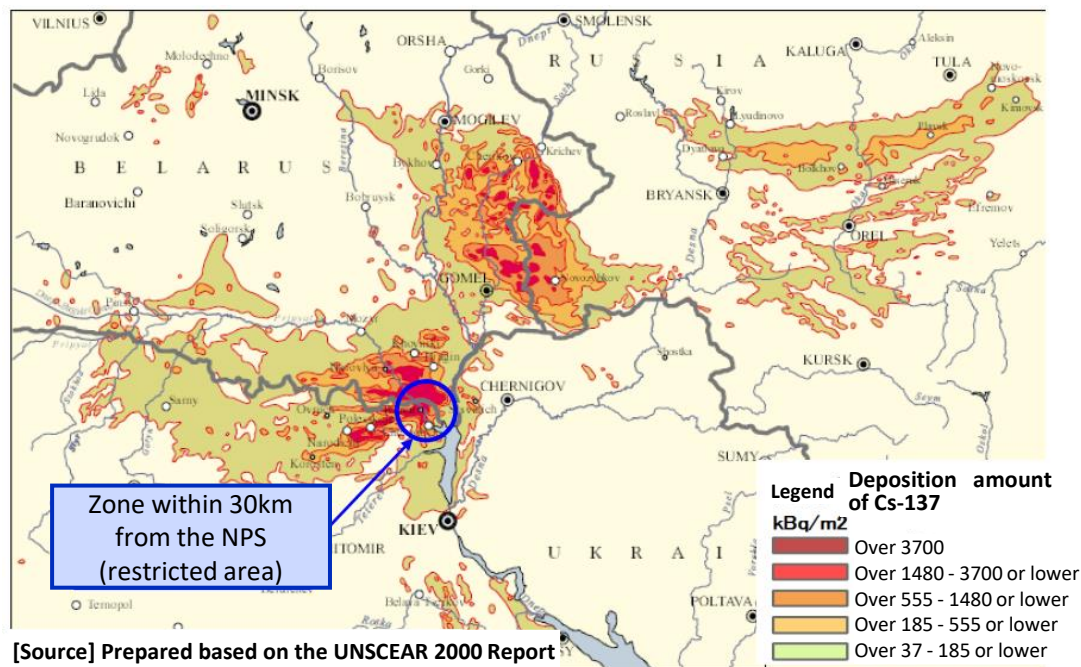
Contamination due to the TEPCO's Fukushima Daiichi NPS Accident (as of November 2011)



[Source] Prepared based on the materials published by MEXT (November 2011)

Two figures on the same scale

Contamination due to the Chornobyl NPS Accident (as of December 1989)



Contamination concentration (kBq/m²)	Area of the contaminated region (km²)		Size of the TEPCO's Fukushima Daiichi NPS Accident compared with that of the Chornobyl NPS Accident
	Chornobyl NPS Accident	TEPCO's Fukushima Daiichi NPS Accident	
> 1,480	3,100	200	6 %
555 – 1,480	7,200	400	6 %
185 – 555	18,900	1,400	7 %
37 – 185	116,900	6,900	6 %
Total area	146,100	8,900	6 %

Source: Prepared based on the report by the Team in Charge of Assisting the Lives of Disaster Victims, "Standard of the Annual Dose Limit of 20mSv" (March 2013)