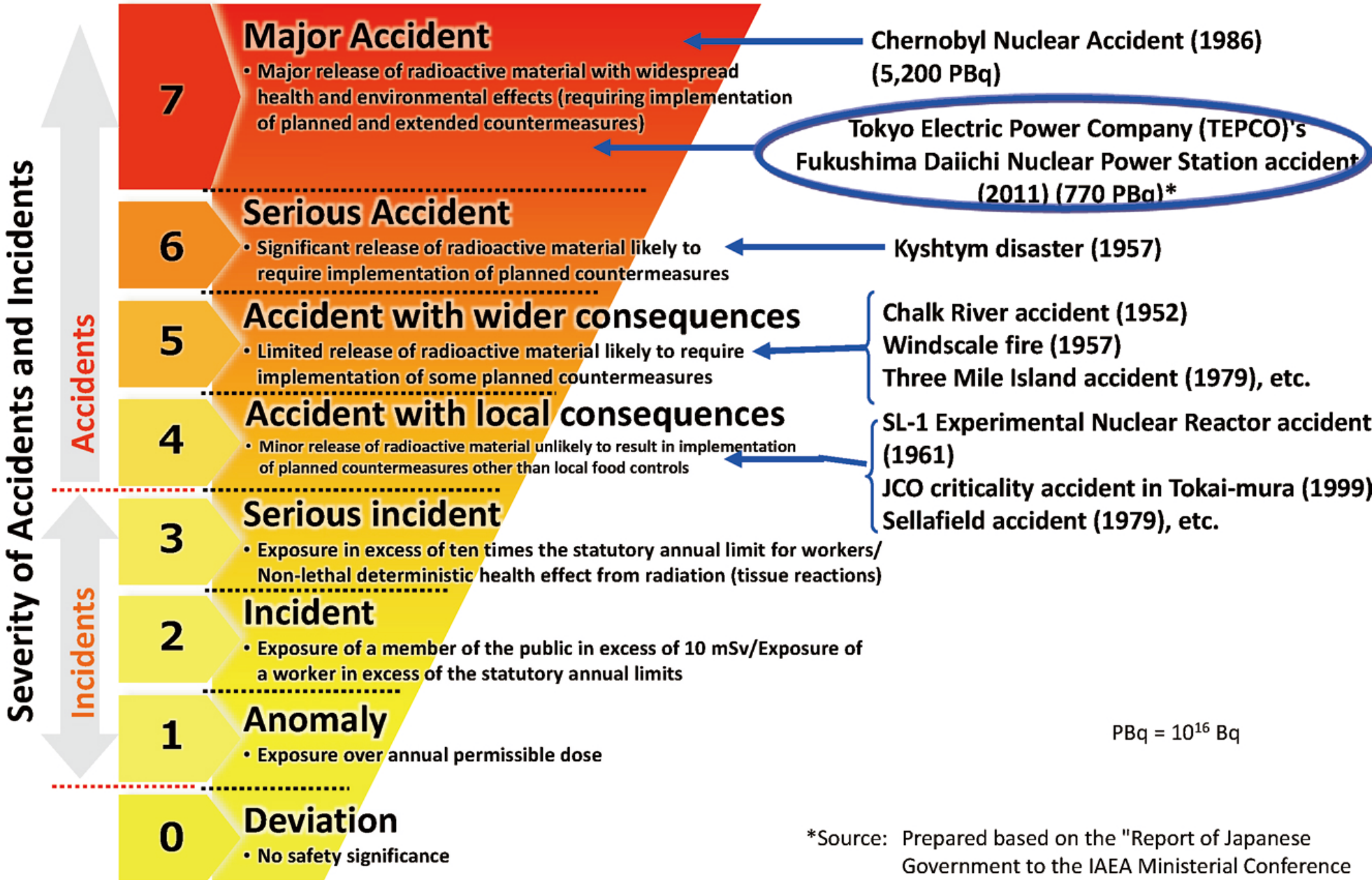
Nuclear Disaster

International Nuclear and Radiological Event Scale

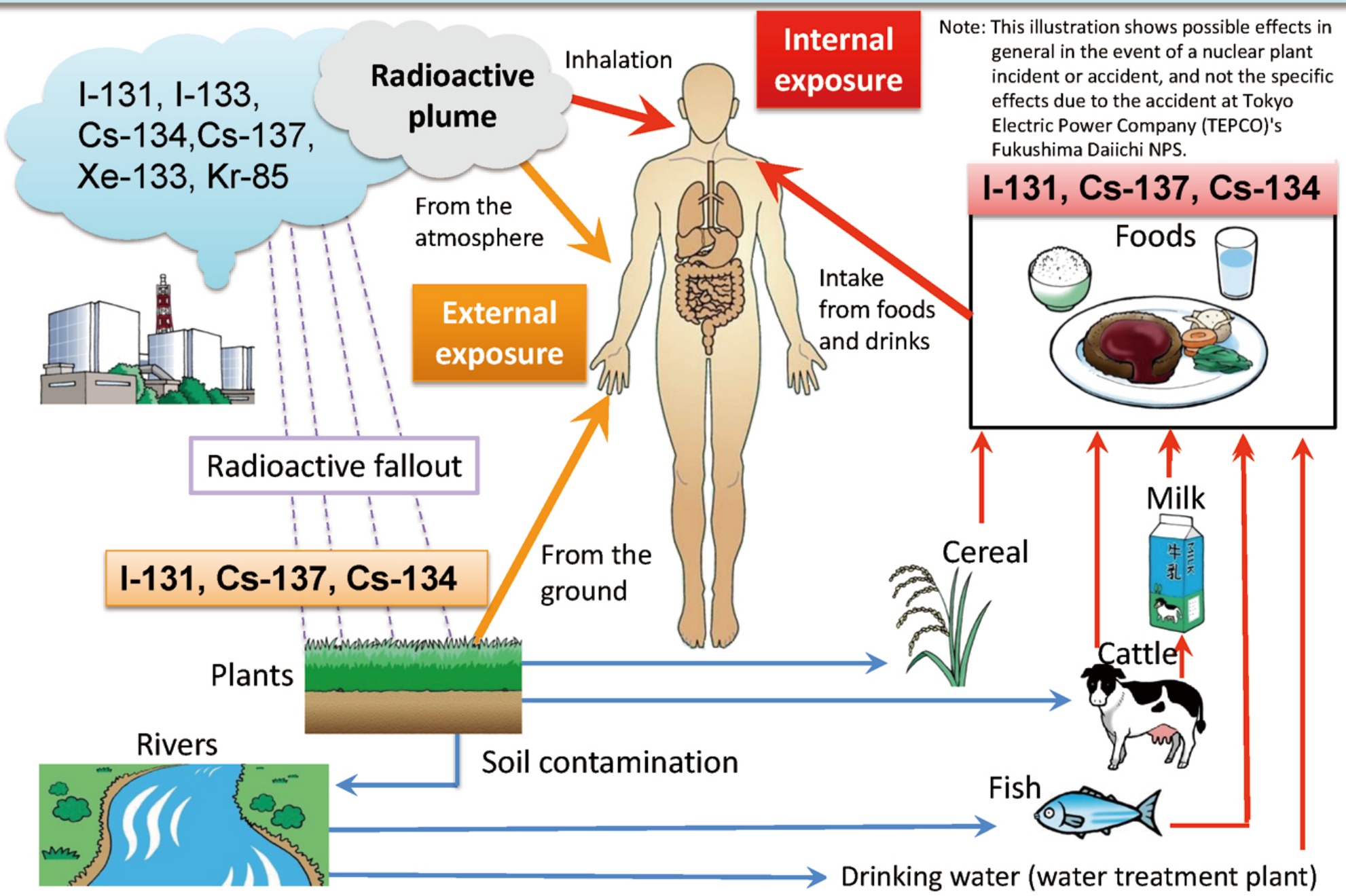


PBq = 10^{16} Bq

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

Nuclear Disaster

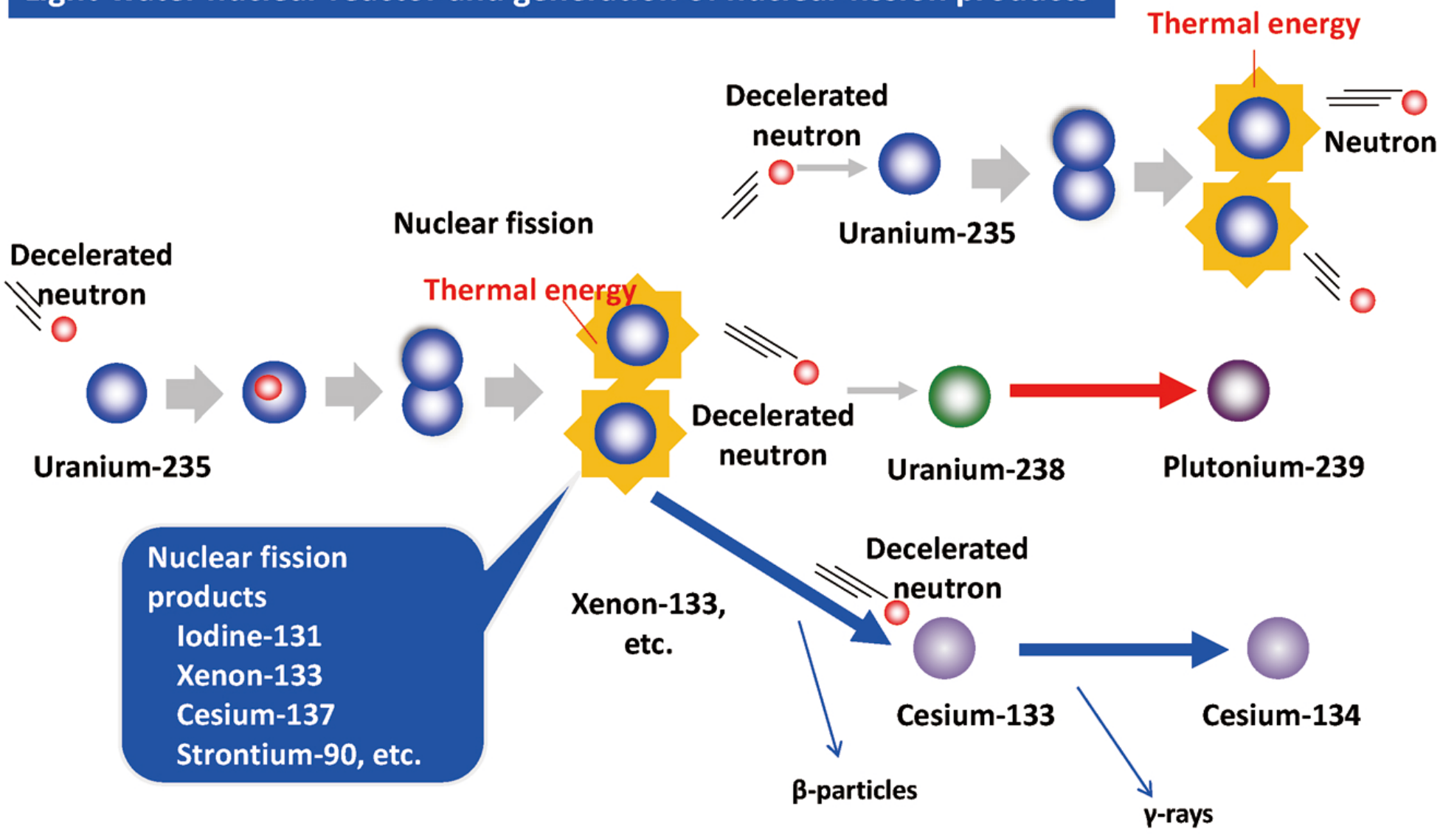
Effects of Reactor Accidents



Nuclear Disaster

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	β	β	β, γ	β, γ	β, γ	α, γ
Biological half-life	10 days *1 *2	50 years *3	80 days *2	70-100 days *4	70-100 days *3	Liver: 20 years *5
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[a]	Boiling point[b] ℃	Melting point[c] ℃	Release into the environment: PBq*		TEPCO's Fukushima Daiichi NPS/ Chernobyl NPS
				Chernobyl NPS[d]	TEPCO's Fukushima Daiichi NPS[e]	
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	1.5×10^{-2}	1.9×10^{-5}	0.0012
Plutonium (Pu)-239	24,100 years	3,235	640	1.3×10^{-2}	3.2×10^{-6}	0.00024
Plutonium (Pu)-240	6,540 years	3,235	640	1.8×10^{-2}	3.2×10^{-6}	0.00018

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

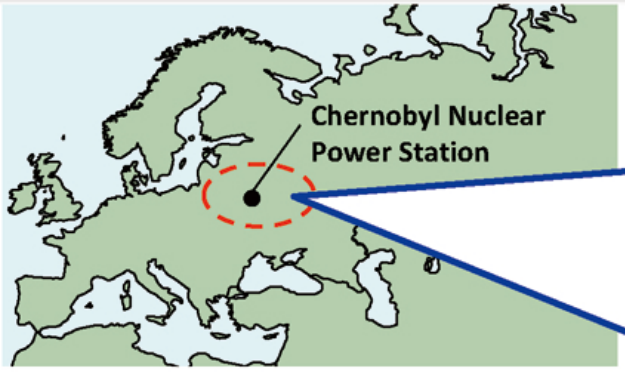
Nuclides	Chernobyl NPS[f]	TEPCO's Fukushima Daiichi NPS[g]
Xenon (Xe)-133	Nearly 100%	Approx. 60%
Iodine (I)-131	Approx. 50%	Approx. 2-8%
Cesium (Cs)-137	Approx. 30%	Approx. 1-3%

*PBq equals 10^{15}Bq.

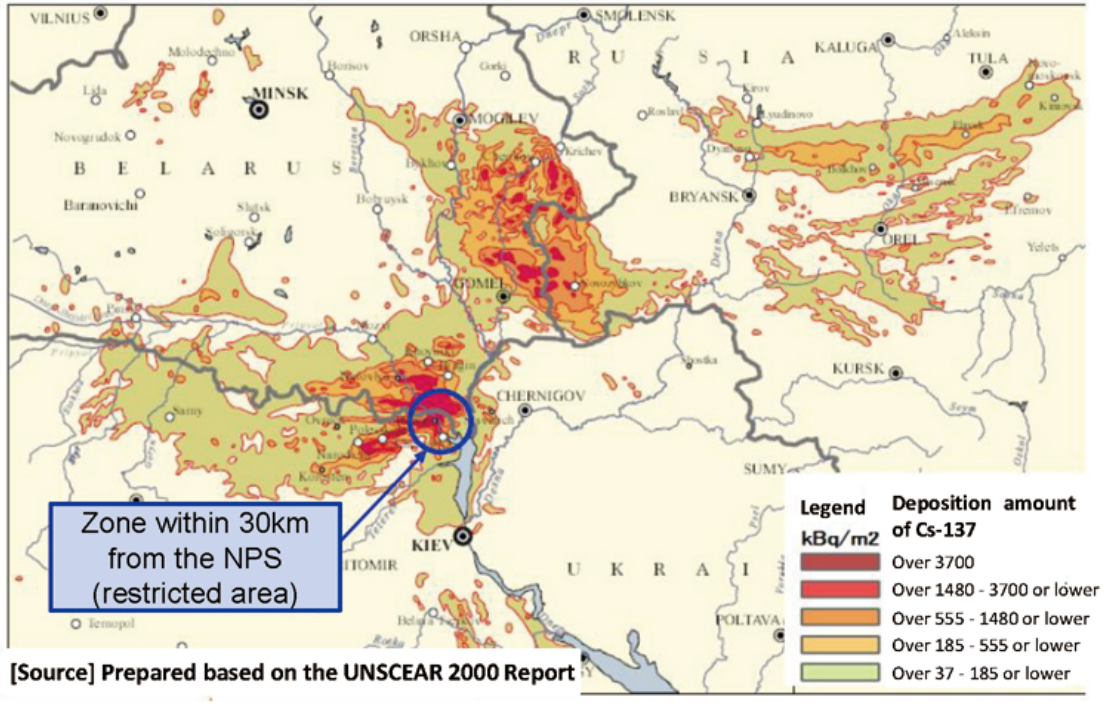
Sources: a: ICRP Publication 72 (1996); b and c: Rikagaku Jiten 5th edition (1998); d: UNSCEAR 2008 Report, Scientific Annexes C, D and E; e: Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety (June 2011); f: UNSCEAR 2000 Report, ANNEX J; g: UNSCEAR 2013 Report, ANNEX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

Nuclear Disaster

Comparison between the Chernobyl NPS Accident and the TEPCO's Fukushima Daiichi NPS Accident

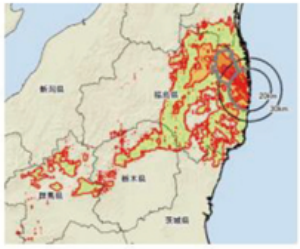


Contamination due to the Chernobyl NPS Accident (as of December 1989)



[Source] Prepared based on the UNSCEAR 2000 Report

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



Two figures on the same scale

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

Contamination concentration (kBq/m^2)	Area of the contaminated region (km^2)		Size of the TEPCO's Fukushima Daiichi NPS Accident compared with that of the Chernobyl NPS Accident
	Chernobyl 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)