

DOSE CONTROL IN THE NORM INDUSTRY IN THE NETHERLANDS

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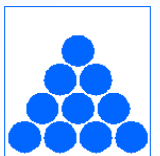
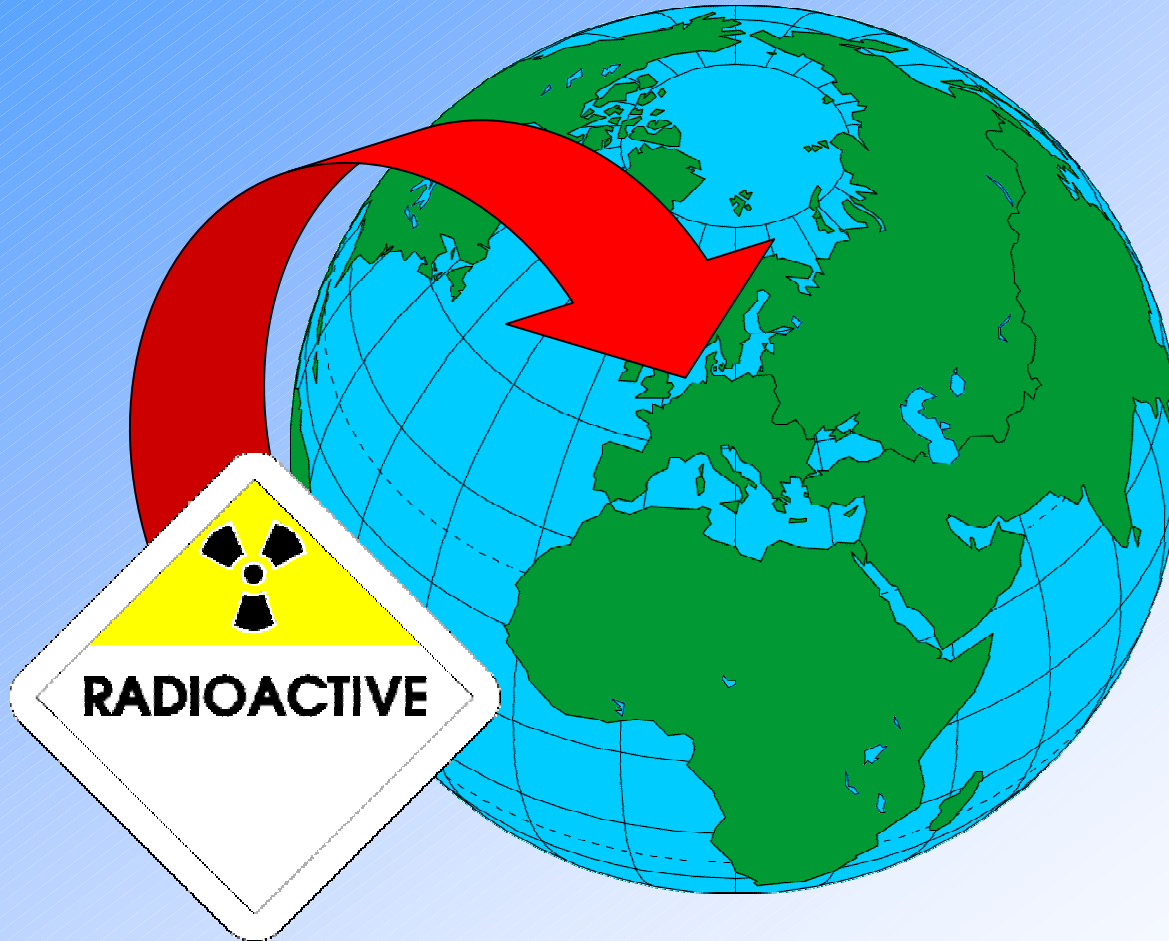
ALARA NORM, Dresden 2007



DOSE CONTROL IN NORM INDUSTRY THE NETHERLANDS

- **introduction**
- **NORM industries**
- **legal system**
- **waste treatment**
- **dose control**

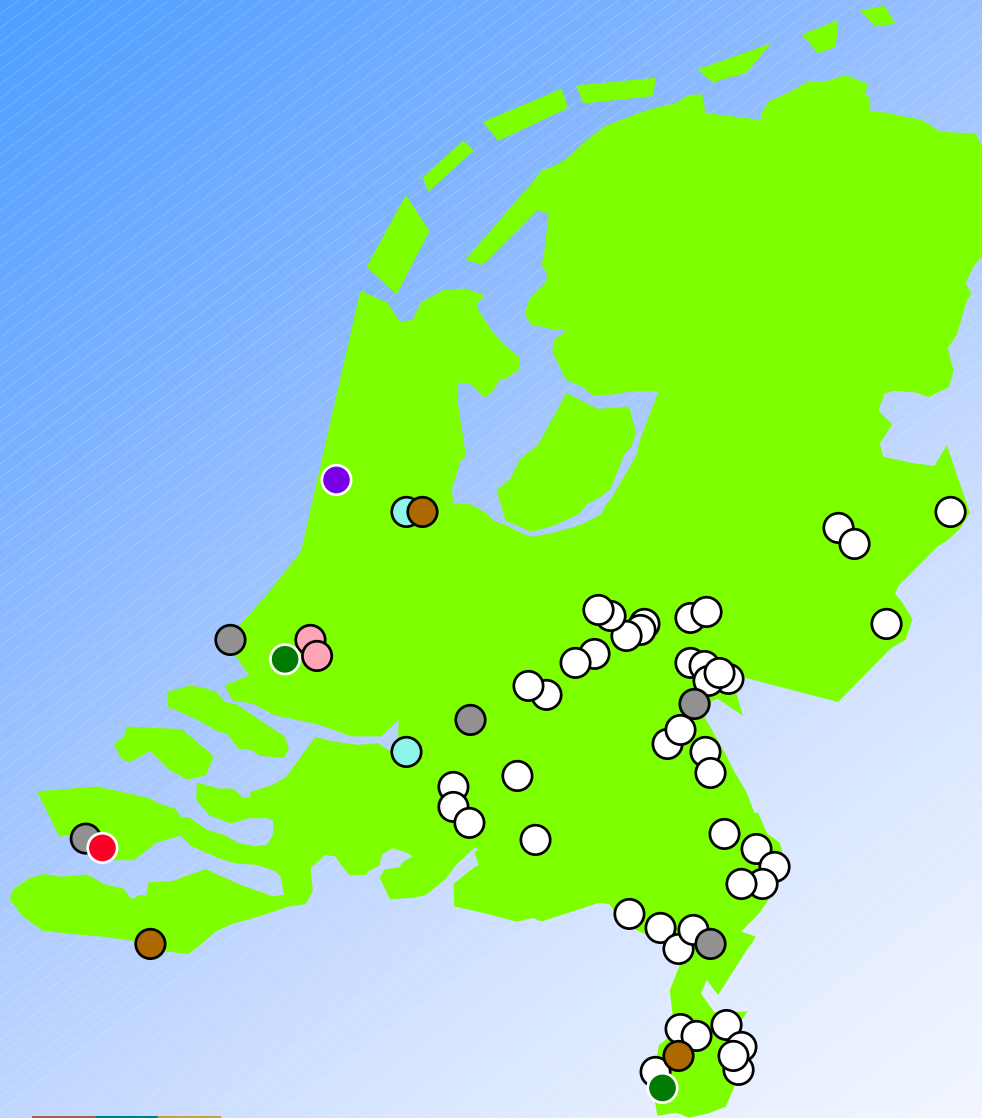
The Netherlands



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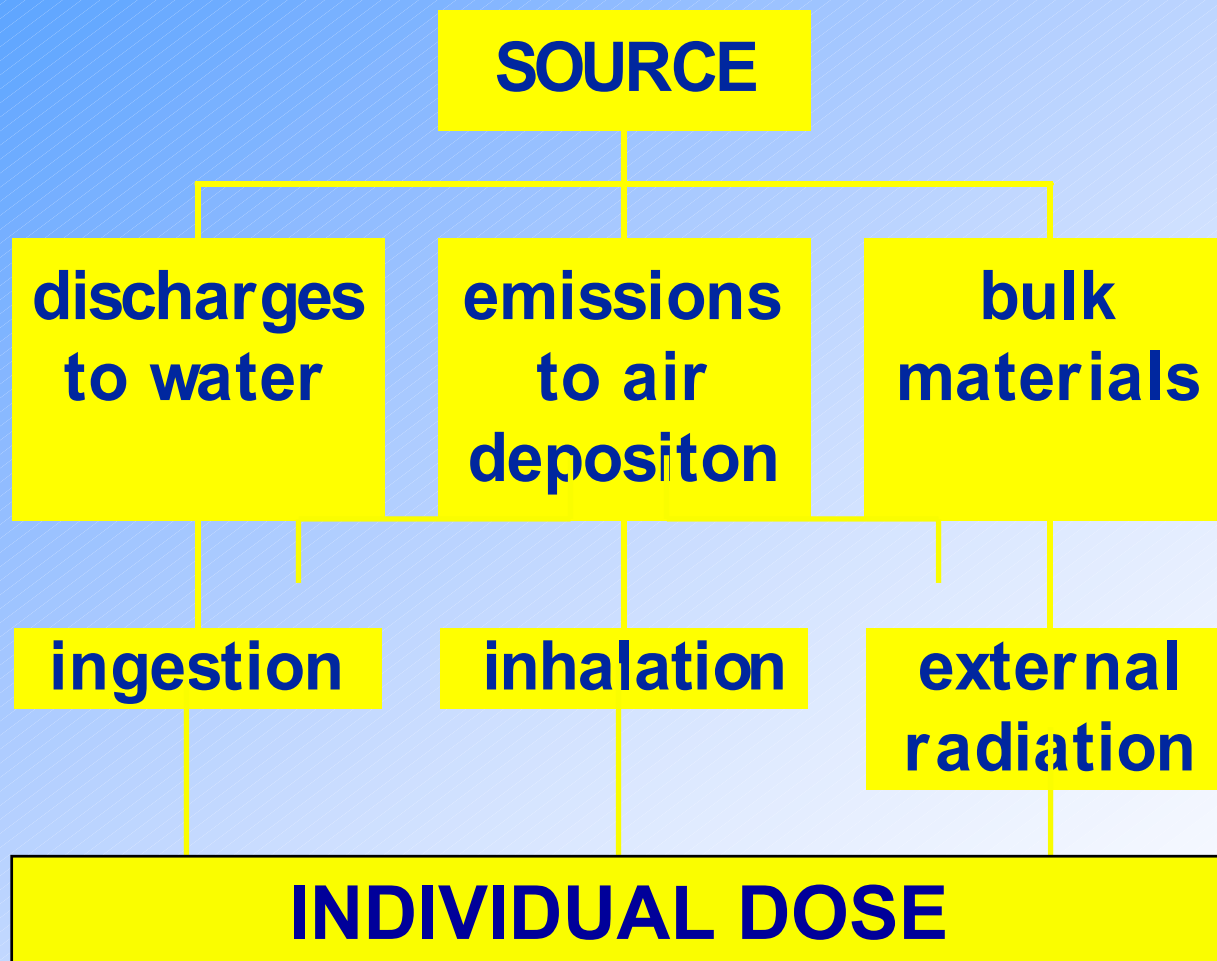
- **introduction**
- **NORM industries**
- **scenario's**
- **waste treatment**
- **conclusion**

Sources of NORM

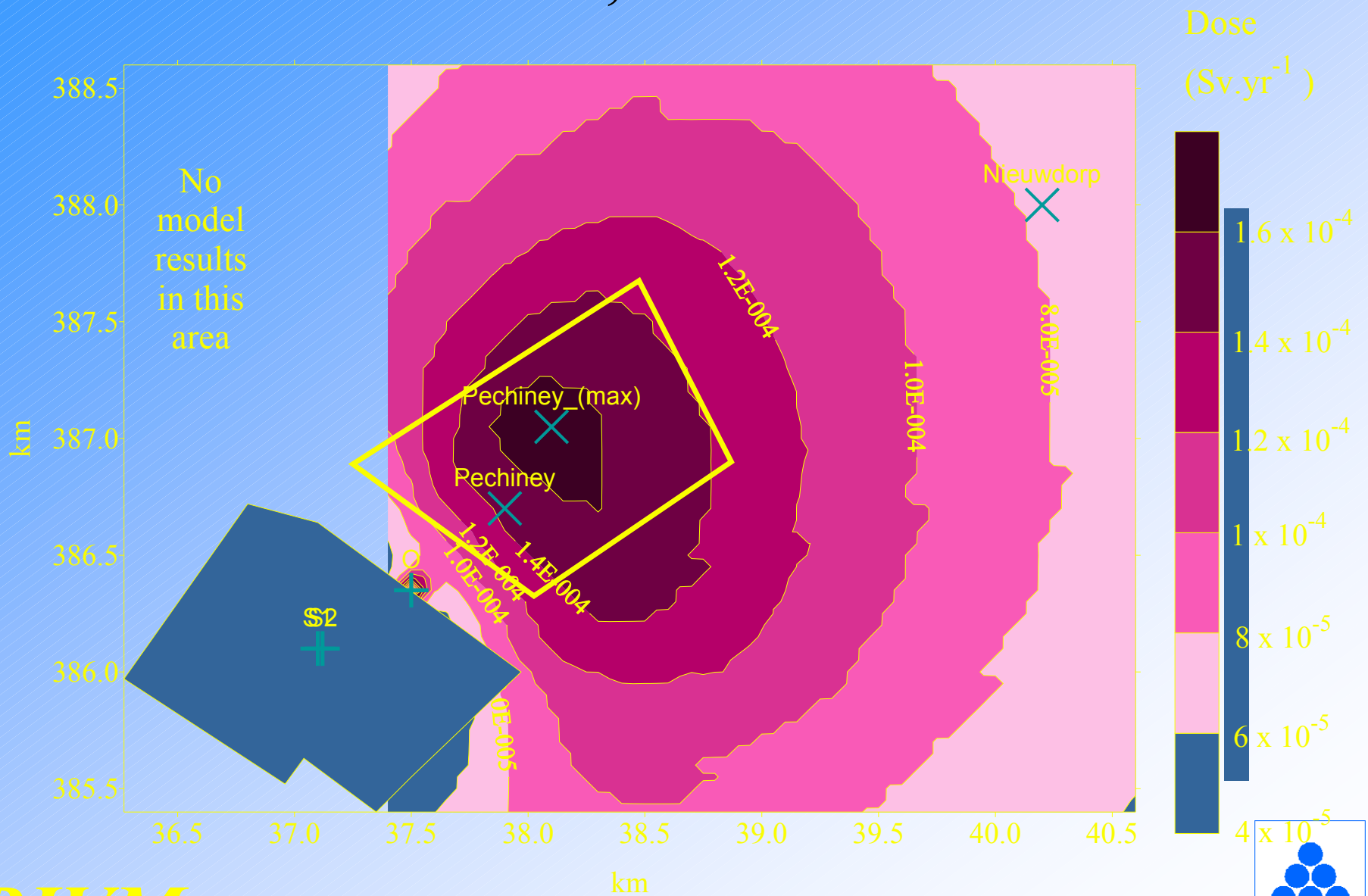


- elemental phosphorus
- phosphoric acid
- iron and steel
- cement
- fertilisers
- mineral sands
- coal-fired power
- ceramic products

DOSE CALCULATION



PHOSPHOR, VLISSINGEN



COLLECTIVE DOSE in NORM

production or processing	emissions discharges		total
	to air	to water	
elemental phosphorus, Vlissingen	22	165	187
phosphoric acid, Vlaardingen	0.18	86	(86)
phosphoric acid, Pernis	0.20	81	(81)
iron and steel, IJmuiden	4.7	6.6	11
ceramic products, several locations	4.5	-	4.5
cement, Maastricht	2.3	-	2.3
coal-fired power, several locations	0.34	-	0.34
fertilisers, Amsterdam	0.013	-	0.013
total:	34	338	206



COLLECTIVE DOSE in INDUSTRY

Source	Collective Dosis (mansievert a year)
Labs/Hospitals	0,6
Industry/R&D	3,4
NPP & RR	9,0
Procesindustry	206

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LEGAL FRAMEWORK

Euratom 1996:

-practices and workactivities

Dutch Decree: Radiation Protection

-criteria for notification and licensing

Ordinance:

Natural Activity from Sources of Ionising Radiation

- **Exemption levels in Bq/g and Bq**
- **Surface contamination (4 Bq/cm²)**
- **External radiation (10 μSv/hour)**
- **Discharges to water and air**
- **List of industries**

LEGAL FRAMEWORK

NABIS:

- **Notification** (“Chain” notification)
- **Licensing**
- **Mixing of NORM**
- **Mixing of Waste**

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PHOSPHOR INDUSTRY WASTE

- **calcinate**
Po-210, Bi-210, Pb-210
- **500 ton/yr**
- **500-4000 Bq/g**
- **decays within 150 y**



OIL & GAS INDUSTRY

- **solid waste**
pipes, pumps, valves, etc.
contaminated with scaling
Ra-226, Pb-214, Pb 210, Ac-228, Th-228
- **1 m³ /yr**
- **500 Bq/g**



OIL & GAS INDUSTRY

- **liquid waste (sludge)**
seawater / sand / clay / oil / tar / grease
contaminated with heavy metals (Hg)
contaminated with scaling
Ra-226, Pb-214, Pb 210, Ac-228, Th-228
- **10 m³ /yr**
- **500 Bq/g**



VDSU 850041-14
SE 2276
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RE

MODIFICATION

11/27/14

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OIL & GAS INDUSTRY WASTE

Liquid waste (sludge):

- ~~direct solidification~~

- pre-treatment:

dewater

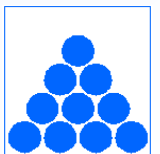
remove Hg/HM

remove organics

remove solids



solidify





GMR



3107



Treatment and storage of RADWASTE



pigment / TiO_2 industry

- **solid waste**

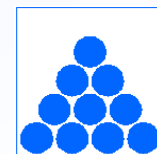
filters with scale

precipitates of Ra

U and Th with daughters

- **5 m³/yr**

- **1000 Bq/g**







Treatment and storage of RADWASTE

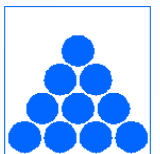


pigment / TiO_2 industry

- **Very Low Level Waste (ZELA)**

scale U and Th with daughters

- **25,000 tonnes/yr**
- **< 10 Bq/g**





HAZARDOUS WASTE IN THE NETHERLANDS

- **Not a COVRA activity**
- **2 depositories for chemical waste accept ZELA waste.**
- **Within Nuclear Energy Act**
- **Employing Radiation Protection Advisor**

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Dose Control in the Netherlands

- **discharge** < 1 $\mu\text{Sv} / \text{y}$
- **external radiation** < 10 $\mu\text{Sv} / \text{y}$
- **at the fence of COVRA** < 40 $\mu\text{Sv} / \text{y}$
- **at the fence of ZELA** < 100 $\mu\text{Sv} / \text{y}$
- **mixing (workers)** < 300 $\mu\text{Sv} / \text{y}$
- **workers & public*** < 1000 $\mu\text{Sv} / \text{y}$
- **radiological workers** < 2000 $\mu\text{Sv} / \text{y}$

– 10 sources policy