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Reference level in the management of radiological legacies of the Swiss watch industry



How far do you have to go too far ?

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Action Plan Radium 2015 to 2019



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Swiss Confederation

Federal Department of Home Affairs DHA
Federal Office of Public Health FOPH



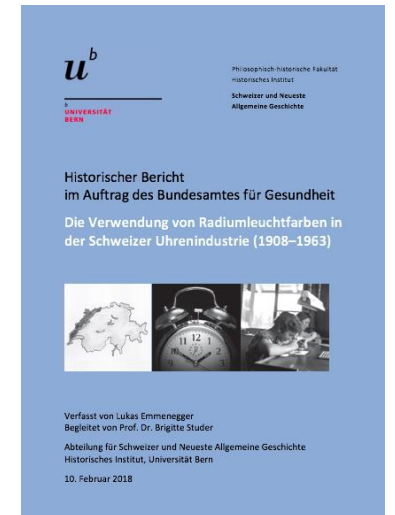
History of the Swiss radium action plan

- Trigger: discovery of radioactivity (radium) on a motorway construction site passing through a former landfill in Biel
- Publication in the press of the address of 65 potentially contaminated sites; need for action
- Origin: use of radium in the luminescent paints of the watchmaking industry (end of "wild" use in 1963)
- Known problem (CPR recommendation in 2003), but previously considered not a priority
- Political decision to set the situation right: radium action plan



Radium action plan 2015 - 2019

- Historical research
 - Entrusted to the Institute of History of the University of Bern
 - 1'000 potentially contaminated sites (starting estimate: 500)
- Diagnosis of potentially contaminated sites
 - Screening and dose estimation
- Site remediation
 - Mandate given to a specialised firm/Control by the supervisory authority
 - Waste management (landfill, incineration, federal storage)
- Monitoring of affected landfills
 - Coordination with the federal Office for the environment
 - Monitoring in case of intervention on the site



Management methods

- Management of radiological legacy as existing exposure situations

Type of situation	Workers exposure	Public exposure	Medical exposure
Planned exposure	Dose limit Dose constraint	Dose limit Dose constraint	Diagnostic reference level
Emergency exposure	Reference level	Reference level	
Existing exposure	--	Reference level	

- Dose range of the reference level according to the ICRP:
between 1 mSv / year and 20 mSv / year

Financing of the action plan

- Difficult application of the “polluter pays” principle
- Diagnosis ensured within the framework of the enforcement mandate of the regulatory authority
- Assumption of remediation costs by the Confederation (resources granted to the action plan)
- Voluntary participation of cantons, municipalities and the watch industry

Parameters involved in the choice of the RL (I)

- Protection of the public in existing exposure situation (EES)
 - Effective dose between 1 and 20 mSv/year
- Legal basis
 - In 2015, the concepts of ICRP 103 do not appear in the Swiss legislation
 - Only «limit» for the public: 1 mSv/year
- Exposure associated with a previous planned situation
 - Essential difference with radon felt like natural
- Situation of exposed persons
 - Unexpected situation for people
 - No involvement in the contamination process
 - Importance of their acceptance of the action plan

Parameters involved in the choice of the RL (II)

- Security of the place of residence
 - Protection of the private sphere
 - Endangering of the intimacy of the place of life
- Presence of sensitive people
 - Children, pregnant women
 - Behaviors involving risks (playing on the soil)
- Risk of stigmatization of people and places
 - Balance between transparency and respect for the private sphere
- Need for a margin of safety
 - Unique opportunity to intervene; no second chance

Choice of the reference level (I)

- Arguments for choosing a low level
 - Willingness to do “enough”
 - unfairness of exposure of «innocent» persons – iniquity
 - state responsibility to protect individuals – «bankruptcy» prior to this mission
 - Willingness to end legacies
 - problem occulted for 50 years
 - avoid that it re-emerges later
 - Willingness to rely on a strong legal basis
 - dose limit for exposure of the public in planned exposure as the only legal basis (1 mSv/year)
 - difficulty to justify a concept of reference level at the time of the intervention (risk of judgment of manipulation)

Choice of the reference level (II)

- Arguments for choosing a high level
 - Acceptance of a situation related to a legacy
 - strong link between the region and the watch industry
 - Comparison with exposures due to natural sources
 - including radon exposure (12 mSv/year at baseline level of 300 Bq/m³)
 - Acceptance of the ICRP protection strategy
 - management of radiological legacy as an existing exposure situation
 - Principle of proportionality
 - Devote efforts to high doses
 - Avoid “creating a problem” for negligible exposure
 - Financial aspect
 - Costs associated with remediation
 - Does not concern historical research and diagnostic

Choice of the reference level (III)

- Swiss choice according to the prevailing crisis circumstances
 - Reference level of 1 mSv/year => optimisation below
- Arguments having mainly weighed
 - Protection of the population in its intimate sphere
 - To be able to “forget” this legacy
 - Solid legal basis
 - No follow-up to the 2003 recommendations of the Federal Radiation Protection Commission

Modeling the dose associated with the radium contamination of an apartment

- Fixing a model of occupation of premises
 - for adults and children
 - position in the room relative to the contaminated area
 - height position (standing, sitting, lying down)
 - allocation of the most contaminated places to the most occupied ones
- Taking into account all the exposure pathways
 - external exposure
 - exposure to contact
 - ingestion/inhalation (excluding radon)

Diagnostic procedure

- Screening
 - apartment and outdoor area
 - criterion: ambient dose rate less than $0,1 \mu\text{Sv/h}$ at 1 m and 10 cm from the ground on a grid of 1m x 1m
- Diagnostic
 - measured on a finer grid (0.5 m x 0.5 m)
 - smear samples at critical points
 - estimation of the annual effective dose according to the model
 - determination of the soil contamination of external areas
- Remediation decision
 - annual effective dose above 1 mSv
 - soil contamination above 1'000 Bq/kg

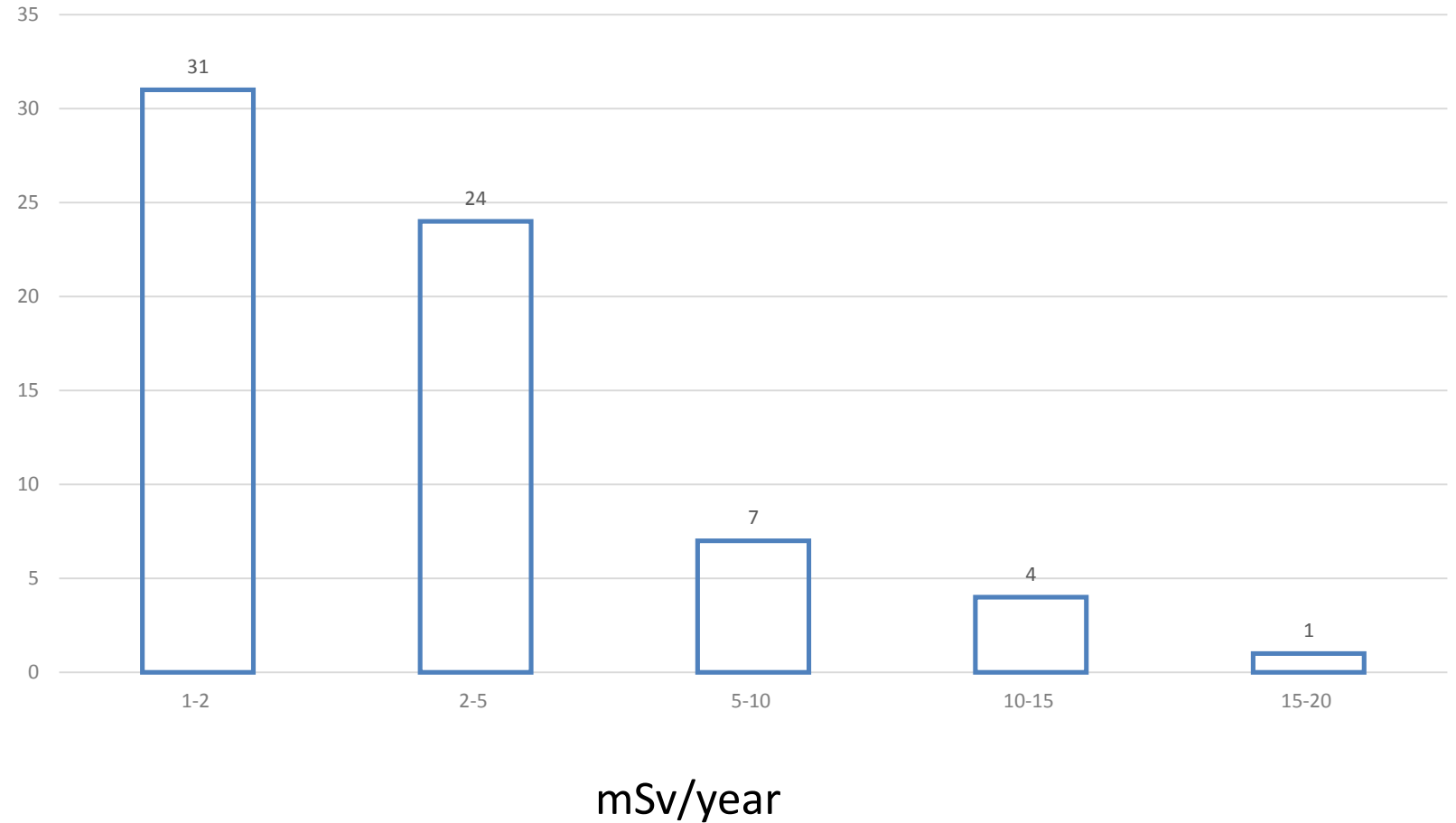




Exposure in apartments with positive screening



Number of properties



Financial commitment

- Remediation cost
 - Average cost per remediation: 50'000 CHF
 - 35'000 CHF for decontamination
 - 15'000 CHF per refurbishment
- Number of remediation according to the RL
 - 0,5 mSv/a : 117
 - 1,0 mSv/a: 63
 - 2,0 mSv/a: 35
- Inversely proportional relationship



Communication strategy

- Information of the population
 - Information on the FOPH website
 - Publication of the action plan
 - Press releases and articles
- Contact with owners/tenants
 - Great effort on transparency
 - Personal contact throughout the procedure
 - Support for remediation below the RL
(workers protection and waste management)
 - Positive results of the satisfaction survey



Accompanying the action plan

- Setting up an accompaniment group
 - Mission: link with the field, facilitation of the Communal, cantonal and federal representatives
 - Press releases and articles
- Discussed themes
 - Presentation of the radium action plan and its progress
 - Waste management (landfill – incineration)
 - Problematic of mixed pollutions (chemical & radiological)
 - Volatil organic compounds, heavy metals, asbestos
 - Financial aspects



Limitations of stakeholder involvement

- Responsibilities of public health authorities
 - Decision to launch the action plan
 - Choice of the RL (mission of protection of the population)
 - Technical arrangements for implementing the action plan
- Roles of stakeholders (accompanying group)
 - are informed of the plan's options
 - have the opportunity to give their opinion
 - do not bear the responsibility for the options taken
 - are not able to participate in the choice of the RL (risk of destabilization towards an authority that does not take its responsibilities)
 - Evaluation of the implementation of the Swiss radium action plan 2015-2019 by the CEPN belonging to the accompanying group

Conclusions

- Delicate choice of RL at a time when its impact on costs can not be measured
- Option chosen revealed practicable
- Relatively high overall cost: between 5 and 10 millions CHF
- Need to accept residual contaminations
- Assistance to individuals for decontamination below the RL
- Approach well accepted by the population
- Inherent risk of missing a situation (site not identified by historical research, source escaping screening)
- Limits of stakeholder involvement

Thank you for your attention

Action Plan Radium 2015 to 2019

*The Swiss radium action plan
proved to be a complete
example of applied
radiological protection*

