

What about risk associated with chemical releases of nuclear installations?

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Abstract

The French authority for nuclear safety requests the French institute of radiation protection (IRSN) to perform impacts assessment for the chemical discharges from nuclear facilities in the context of licensing operator. To carry out its mission, IRSN developed assessment methods and a computer tool named CALIES (CALcul d'Impact Environnemental et Sanitaire des rejets d'effluents chimiques liquides et gazeux - Risk assessment for environment and population).

Keywords: Risk assessment, chemical releases

1. Context

Missions of IRSN are notably to bring technical support to public authorities and to provide stakeholders with the information, expertises and studies they need. One of the major scientific and technical challenges of the Institute is to ensure the monitoring of radioactivity levels on national territory and to assess exposure of the concerned populations. Assessment methods and computing codes have been developed by IRSN for chronic and accidental exposure situations.

The French authority for nuclear safety requests IRSN since 2001 to perform an impact assessment for the chemical discharges from nuclear facilities in the context of licensing operators. The French authority needs IRSN's technical advice to fix limits of releases in a regulatory text for each nuclear installation. The IRSN expertise is based on a technical analysis of potential risk associated with the level of releases requested.

To carry out its mission, IRSN drew up a status report of the current situations, both at national and international level and harmonized the methods of risk assessment for chemical (technical guidance document of the European Commission ...) and radiological releases (IRSN's guides).

2. The computer tool: CALIES

A computer tool, CALIES (CALcul d'Impact Environnemental et Sanitaire - Environmental and health risk assessment) was developed to assess risk for the environment and the population located near the nuclear facilities (figure 1).



Figure 1: The computer tool CALIES

There are three modules in CALIES.

The first one reviews the available data on risk and details their references (databases consulted, date of study, uncertainty factor applied ...) (figure 2).

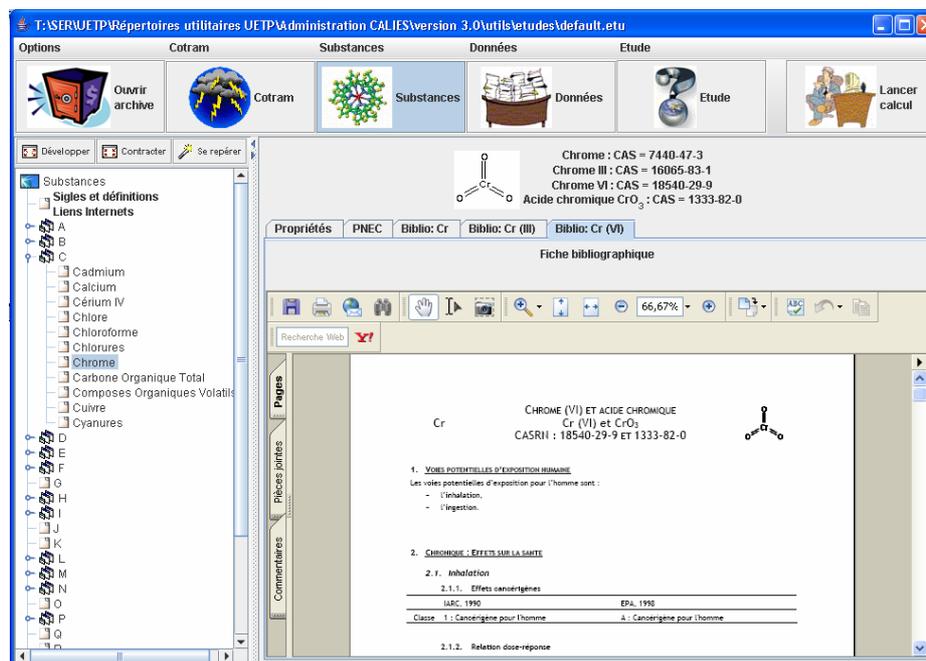


Figure 2: CALIES 's first module - bibliography synthesis

The second module presents the values of parameters selected by IRSN as the best estimate in a first stage, of the potential risk of chemical releases from nuclear installations. It presents also physical and chemical properties of more than 120 compounds, parameters related to population (food consumption, time spent outdoors, weight... - figure 3), ecotoxicological data for the evaluation of the environmental impact and toxicological data for the evaluation of the health impact.

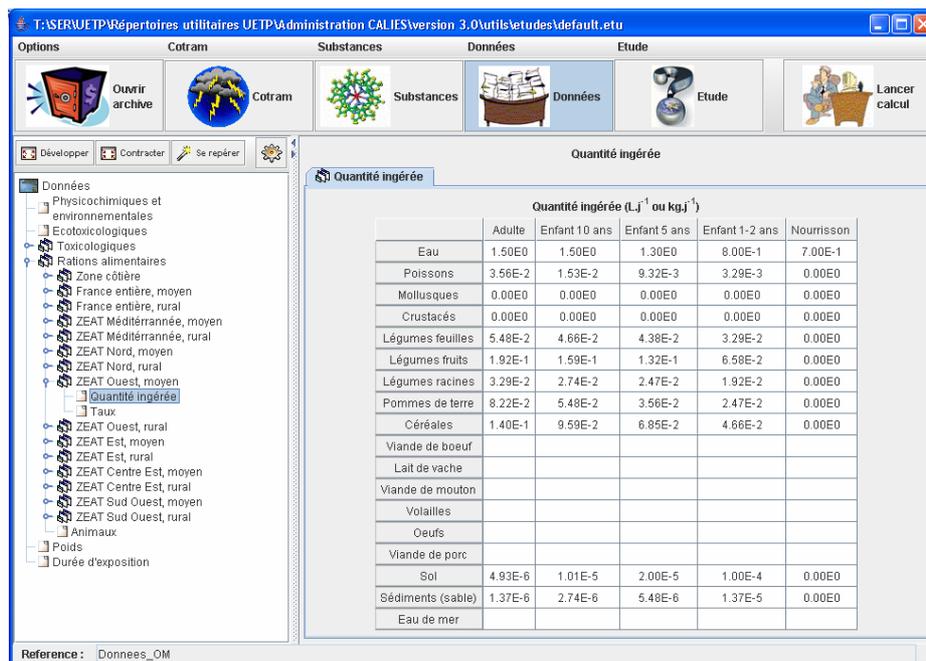


Figure 3: CALIES 's second module - food consumption

These two modules are revised at least every year and more frequently if needed.

The third module contains all the equations selected by IRSN to assess risk associated to different exposure situations. Aquatic (sea and river) and terrestrial ecosystems are taken into account, and species are in majority those consumed by population (water, fruits, fishes ...) (figure 4).

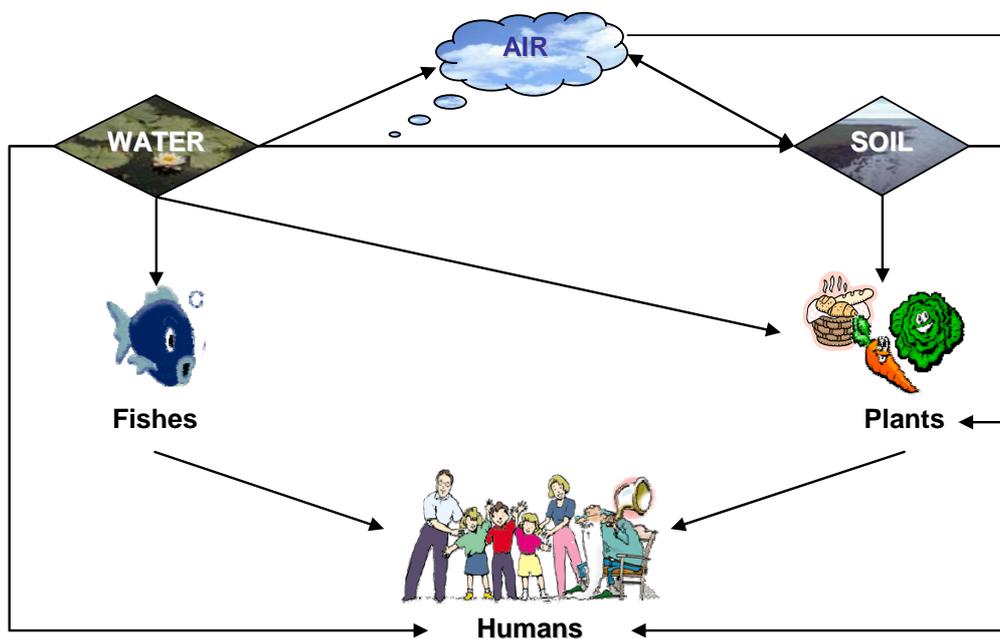


Figure 4: Simplified schema of pathways modelled in CALIES

CALIES assesses also risk of an adverse health effect for chronic, subchronic or acute exposure. Population includes adults and children. Consumption rates from national studies are proposed to the users for each scenario considered. CALIES' users have also the possibility to register their own values.

3. To be continued ...

Designed to planned or operating nuclear facilities or for accidental releases, CALIES could also be used to assess risk due to any chemical release or to an existing contamination of the environment.

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