

Key note address:

The consequences in Sweden of the Chernobyl accident.

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The accident in unit 4 of the Chernobyl nuclear power plant occurred at 1.23 a.m. on 26 April 1986. Substantial amounts of the radioactive material were released into the atmosphere, for example about 10 to 12% of the core content of radiocesium. Due to the high temperature the plume rose to high altitudes - several hundreds of meters to more than 1,000 meters.

The plume direction in the early phase was towards Scandinavia over the Baltic states at a height of about 1,500 m. The plume reached Scandinavia on 27 April but was not detected before the morning of 28 April when the personnel contamination control at the Forsmark nuclear power plant in the central part of Sweden gave the alarm. During the night between 28 and 29 of April a heavy rainfall occurred in some regions of the central and northern parts of Sweden. Much of the radioactive material in the air was washed out and thus deposited on the ground or vegetation. In the northern part of the most contaminated region in Sweden there was still snow on the ground and ice on the lakes. In the southern part the grass had just started to grow. The interception on vegetation at farmland was therefore rather small and most of the radioactive material was deposited on ground. In the woodland and mountain

regions more of the radioactive material was intercepted by the coniferous trees and by the dwarf shrubs, mosses and lichens.

The ground deposition of the radiocesium in Sweden was measured by aircraft equipped with 4 NaI(Tl) crystals. The measurements were performed by the Swedish Geological Company (SGAB) and they also produced a map of the ^{137}Cs deposition expressed as Bq m^{-2} (Figure 1). The deposition in Sweden is very heterogeneous. In most of Sweden the deposition is below $3,000 \text{ Bq m}^{-2}$. Along the Baltic coast from Gävle up to Umeå there is a rather high ^{137}Cs deposition. In some areas there are more than $60,000 \text{ Bq m}^{-2}$. In a rather large part of Sweden from south of Umeå to the mountain region in the western part of Sweden there are ^{137}Cs depositions of more than $30,000 \text{ Bq m}^{-2}$. The main problems with radiocesium for reindeer husbandry in Sweden is within this region. The total ^{137}Cs fallout in Sweden during the 1960s was about $3,500 \text{ Bq m}^{-2}$.

The Swedish Radiation Protection Institute decided in May 1986 on the intervention level for radiocesium. The primary aim was to restrict the intake of radiocesium by food to people in Sweden so that the additional dose

equivalent did not become higher than 1 mSv per year. For single years 5 mSv could be accepted. This is in accordance with the recommendation of ICRP. The Swedish intervention level was placed at 300 Bq of ^{137}Cs for all food including reindeer meat. In spring 1987 the level was changed to 1,500 Bq of ^{137}Cs per kg for reindeer meat as well as for game animal meat, fish, berries and mushrooms. A radiation dose of 1 mSv per year corresponded in 1987 to an yearly intake of about 50,000 Bq of ^{137}Cs calculated with the $^{137}\text{Cs}/^{134}\text{Cs}$ ratio of 1987. During 1986 the ^{137}Cs activity concentration in samples from nearly all reindeer slaughtered in Sweden were

determined to guarantee that no reindeer meat found in shops had ^{137}Cs activity concentration above the intervention level.

The ^{137}Cs activity concentrations in various kinds of animal material show very large variations. In reindeer, ^{137}Cs activity concentrations range from 100 to 40,000 Bq kg⁻¹, in moose from 20 to 3,000 Bq kg⁻¹, in roe-deer from 20 to 12,000 Bq kg⁻¹ and in cows' milk from nearly zero to 200 Bq kg⁻¹. These are mean values which have been found in a relatively large area. Higher values can be found in individual animals.

The main problems still existing in Sweden as a result of the Chernobyl fallout are associated with the reindeer and game animals, especially roe deer, moose and fish. From the radiation protection point of view, the remaining problem in Sweden due to the Chernobyl accident is that many people within the most contaminated regions eat large quantities of meat from reindeer, game animals and fish. Some of them will receive a dose equivalent of around 5 mSv per year due to intake of radiocaesium by foodstuffs. The problem will be very long-lasting, in fact no decrease in the ^{137}Cs activity concentrations have been found in, for example, roe deer and moose during the first 3 years after Chernobyl.

Key words: radioactivity, fallout, radiocaesium

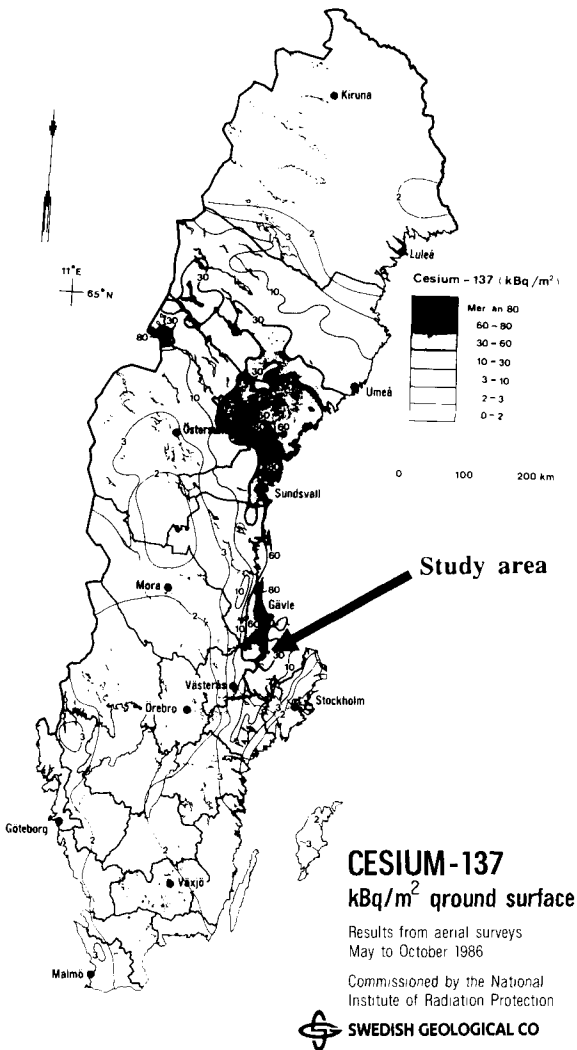


Fig. 1. The deposition of ^{137}Cs (kBq per m²) in Sweden. Measurement performed by the Swedish Geological Company.