electronic form. Increasing attention in the past year has gone to applying so-called geographic information systems techniques in geographic data presentation in FEWS. Collins says that electronic composition of maps means that there is virtually "no limit on the layers, overlays" that can be incorporated. With an integrated database, political boundaries, rivers, vegetation, transportation systems, and population distribution can be indicated and the data manipulated, for example, to identify population living near roads. FEWS has gotten increasing help from U.S. Geological Survey experts.

To build the system, the FEWS group used available computer programs, but modified them by writing its own software. From the start, instructions were to "aim for Africanization," says Collins, meaning that the system should be designed so that the countries now being monitored could take over and operate it. This required that both hardware and software be suitable for transfer—FEWS has been designed to run on personal computers and the software is "user friendly and teachable."

FEWS was set up to meet an emergency, and its mission was not clearly defined. It has been subject to differing, sometimes conflicting demands and has operated on a series of short-term extensions that lent uncertainty to the enterprise. The FEWS primary mandate was to provide timely information for Washington decision-makers, which activated traditional tensions between Washington and the field. As the evaluation puts it, FEWS has "no explicit role for missions and host governments." An effective system "would provide valuable support to missions and country resource management activities." The need for support is most obvious in making crop estimates and in resource planning.

Realizing the potential would require improvement in the quality of data collected by host governments and creation of an adequate database for the region. Also implied is better cooperation with other aid organizations operating in the region and links with other early warning systems such as those of the United Nations Food and Agriculture Organization and the European Community. Such cooperation has so far been minimal.

The report calls FEWS a "valuable prototype which can serve as a basis for an effective long-term early warning system." USAID has begun the process of designing a future FEWS and will have to decide whether to make the investment and commitment necessary not only to make it a better warning system but also to give it broader influence on development of the region. ■ JOHN WALSH

Radon's Health Risks

The health risks from breathing radon are significantly higher for smokers, according to a recent report on radon by a National Research Council committee. But people can cut the risk of lung cancer from radon even after they have inhaled the radioactive gas by reducing further exposure, the committee concluded.

These are among the new findings of the report, "Health Risks of Radon and Other Internally Deposited Alpha-Transmitters." The report, which was released on 6 January, is based on a 3-year study funded by the Environmental Protection Agency (EPA) and the Nuclear Regulatory Commission, and is likely to be used by EPA to drive home the point with that radon is a serious problem.

Radon is a colorless, odorless gas that may be seeping into millions of American homes, EPA estimates. Radon is emitted by the radioactive decay of uranium in rock and soil and enters a building through cracks in the foundation, sump pumps, areas around drainage pipes, and other openings.

Authorities have had difficulty estimating the exact national dimensions of the indoor air pollution from radon. Radon may pose a problem in every state, EPA says based on a few surveys. In August, an EPA study of ten states showed that 21% of the 11,600 homes tested had elevated radon levels. Geology is a good indicator of high-risk areas, EPA says, but levels can vary widely from house to house.

The public health risks posed by radon have been unclear too, but the council report provides fresh findings. Experts have debated, for example, whether smoking greatly increases an individual's chances of developing lung cancer if the person is also exposed to radon. Specifically, they have questioned whether the separate risks of lung cancer from smoking and from radon exposure should be added or multiplied. The council committee found that radon exposure multiplies the lung cancer risk in smokers by at least tenfold.

Researchers also have disagreed whether the risk of lung cancer remains constant after people inhale radon, even when exposure is eliminated. Some researchers have maintained that the risk from radon, as a radioactive substance, remains the same over time, analogous to the cancer risk to atomic bomb survivors, William Ellett, staff director of the council study, explains. But the council study showed that the risk posed by radon is instead similar to the cancer risks posed by cigarette smoking. Reduced exposure to radon will reduce the chances of developing cancer, just as ceasing smoking cuts lung cancer risk. Radon exposure in homes can be reduced by increasing ventilation or sealing openings where the gas may be entering.

Uncertainties about the magnitude of the problem have led to a wide range of estimates about the number of excess lung cancer deaths. EPA has calculated that every year 5,000 to 20,000 lung cancer deaths are linked to radon, making the gas the second leading cause of lung cancer deaths. The risk estimates by the council committee fell into the middle of EPA's range, although it did not cite a specific number. Last year, 136,000 Americans died of lung cancer of which about 85% was caused by smoking, according to American Cancer Society estimates.

The committee developed its risk estimates by reviewing an extensive amount of original data from several key epidemiological studies of uranium miners from United States, Sweden, and Canada. The data were then analyzed with advanced statistical techniques developed in the past few years with the help of better, faster computers, says Jacob Fabrikant, committee chairman and professor at the University of California at Berkeley.

The council committee calculated its risk estimates using a measurement called working level months (WLM). A WLM expresses exposure based on a 170-hour work month to a specific amount of alpha particle energy per liter of air. EPA says that homeowners should reduce radon levels if they are equal to or greater than 4 picocuries per liter. A person who stays home an average of 12 hours per day exposed to 4 picocuries per liter would receive an annual exposure of about 0.5 WLM.

Only a few states, such as Pennsylvania and New Jersey, have extensive radon detection and educational programs about radon. Governments have little authority to control radon in the home, so regulatory action has been limited. EPA has been urging states to survey for radon and support educational programs. EPA itself is currently conducting another survey of another seven states this winter to detect radon on homes. ■ MARJORIE SUN