UN makes sense on radiation

Among the good works the United Nations has attempted in recent decades, its committee on the effects of atomic radiation deserves a special cheer.

MOST of the work undertaken by the United Nations is for one reason or another controversial, which in itself is a good reason for welcoming the latest report from the UN Scientific Committee on the effects of atomic radiation, now published. Since the committee was set up in 1955, at the height of world-wide anxiety about the effects of radioactive fallout from nuclear weapons tests, it has acquired a remarkable reputation for fair dealing and impartiality. By good management rather than by good luck, each successive report in the previous seven to be published has added to the committee's reputation. During the period for which the committee has been at work, its membership has naturally changed several times. So, too, has the problem — fallout is now less on people's minds than the possible exposure of the general public to radiation from the operation of civilian nuclear power plants, for example. The committee's eighth report, the bulkiest so far, is both a vivid pointer to the way in which the problem continues to change and a stimulating guide to the way in which scientific developments in widely different fields — nuclear engineering on the one hand and genetics on the other — can be welded into a sensible discussion of an interdisciplinary problem.

The committee's objective from the start has been to compile nothing less than a global inventory of people's exposure to radiation from all sources, natural and artificial. The general conclusion remains what it has always been — that natural sources of radiation, cosmic rays and the decay products of naturally occurring radioactive elements, remain the chief cause of people's exposure to radiation and thus, potentially, of damage. Part of the interest of the eighth report is that it clearly shows how even in the apparently well trodden field of the assessment of radiation exposure from natural sources, the conventional wisdom keeps changing. The most important development since the committee's previous report in 1977 is the recognition of the importance of airborne radioactive nuclides, principally radon and thoron, as sources of radiation exposure.

Exposure to cosmic rays, the effects of which vary both with altitude and with geomagnetic latitude, are calculated to yield an average dose of external radiation exposure of 0.30 millisieverts a year, not very different from but more accurate than previous estimates. The average external radiation dose from naturally occurring radioactive elements of the uranium-238 and thorium-232 series is,however, calculated as 0.23 millisieverts while the internal radiation dose provided by the volatile members of these radioactive series is estimated at an average of 1.15 millisieverts a year (with radon five times as important as thoron). The recognition that radon and thoron significantly contribute to the natural exposure of people to radiation is not of course new, but the numerical estimates now given are striking. It is no wonder that several public authorities have embarked on detailed studies of the exposure of their populations to radiation on this account. The committee's wry comment that exposure to airborne radioactivity may be increased by measures taken to conserve heat in houses, which have the effect of reducing ventilation, is unlikely to have much influence on the way that people behave if governments encourage them to do so. The practical consequence of this development is that it modifies the baseline, the natural exposure of people to radiation, against which the dangers of exposure from artificial sources must be assessed.

Fallout, the chief reason for the committee's existence, appears now to be less threatening only because of the way in which the nuclear powers have mostly given up the testing of nuclear weapons in the atmosphere. In reality, the average annual radiation dose from fallout is now declining below one per cent of that from natural sources (compared with the peak of 7 per cent in 1963). The consequences of medical irradiation, whatever they may be, are on the average at least ten times as important. Even so, the committee's new calculations have the virtue that they take account of a greater range of fallout nuclides (a total of 21) and are better informed than previously of the variation of fallout deposition from one part of the world to another.

The most novel part of the committee's latest report is its calculations of the consequences of civil nuclear power for the exposure of the general population to radiation. Hitherto, most estimates of the consequences of the development of a civil nuclear power industry have been guesswork, based on estimates by the designers of nuclear plants of the radiation doses to which workers would be exposed. This eighth report from the UN committee includes an impressive compilation of operating experience at reactors scattered around the world. Most reactors and all reprocessing plants release substantial amounts of radioactivity in the form of gaseous and volatile isotopes to the atmosphere (argon-41 and iodine-129 for example), as a result of which the exposure of the general population is increased.

What stands out from the committee's new report is what has been intuitively clear all along — that at least in the short run, the exposure of the world's population as a whole to the release of radioactive materials in this form is so far, in aggregate, less important than the exposure of particular groups of people occupationally exposed to radiation. For the time being, however, it is clear that the committee is straining at a gnat. Its estimate of the total collective dose in 1979 to people occupationally exposed in the worldwide nuclear power industry — 2,000 man-sieverts — is identical with the estimate of the increased collective dose to people from travel in high-altitude jet aircraft. (It is worth noting that the committee's estimates of the doses accumulated by workers at reactors and reprocessing plants are roughly equal, that uranium mining does comparatively well and that waste storage has so far contributed negligible amounts of radiation dose.) What the future holds depends on two unknowable considerations — the pace at which the nuclear industry will grow, and the degree to which nuclear plant designers will be required to moderate the exposure of people to radiation.

The committee's next report will be well worth reading on this point, as will be its hoped-for account of the resolution of the doubts that have arisen in the past two years of the relative importance of gamma rays and neutrons in causing biological damage at Hiroshima and Nagasaki. The issue is whether the carcinogenic effects of the two kinds of radiation were inaccurately assessed in the early studies of the consequences of these two explosions. A changed estimate would principally affect the calculation of the likelihood that people exposed to different kinds of radiation would contract some kind of cancer. Wisely, the committee keeps its counsel on this important point. In doing so, it defines an issue to which radiobiologists everywhere should direct attention. And, in the process, it offers to other committees of the United Nations an example of restraint that should be more widely followed. □

Ionizing Radiation: Sources and Biological Effects. United Nations Scientific Committee on the Effects of Atomic Radiation 1982 Report to the General Assembly, with annexes.