

ENVIRONMENT RADIOACTIVITY AND ONGOING SURVEILLANCE PROGRAMME IN TURKEY

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ABSTRACT

The ever going releases of radioactive substances to the environment have resulted in a global excess irradiation of all living organisms in the environment due to nuclear accidents, testing of nuclear weapons, discharges from the nuclear industry and the like. Eventually, activities like these increase the background radiation of the environment. National authorities need to decide in which parts of their territory and for which activities and working conditions it would be appropriate for doses from background radiation to be regarded as part of occupational exposure or even public exposure by continuously monitoring the environment.

1. INTRODUCTION

Environment is protected from radioactive release by preventing the emission, taking socio-economic factors into account using best available technique and technologies, using safer alternatives and obtaining payment from polluter. In all these activities public dose limit are very important to protect man or other non-human species in the environment.

In this paper after given a brief introduction of environmental surveillance programme in Turkey and criteria to protect the human and non-human species from radioactive release (acute or chronic) will be mentioned.

2. ENVIRONMENTAL MEASUREMENTS IN TURKEY

The Environmental Radiation Evaluation Division (ERED) of the Radiation Health and Safety Department of the Turkish Atomic Energy Authority (TAEA) is responsible for the compilation, evaluation and protection of environmental data such as radioactivity in water, air, soil, building material, etc., the analyses of which are carried out by the Research and Training Centers of the TAEA.

In the research centers located in Ankara and Istanbul various systems such as gamma spectrometer, alpha-beta counting system, low level gamma counting system, whole body counter, X-ray fluorescence spectrometer, neutron activation analysis system (HPLC, AAS, UV-Visible spectrometer are used. Qualitative and quantitative elemental analyses are done by using alpha beta counting systems,

gamma spectroscopy and radioactivity analyses are carried out in air samples, rainwater and soil samples.



Figure 1. Radiation Early Warning Environmental Stations



Figure 2. Early Warning Station of Ankara

Radiation early warning environmental monitoring stations (approximately sixty stations) have been installed at various locations throughout Turkey, which are linked to the Emergency Response Center of Turkish Atomic Energy Authority. Figure 1. shows the important Early Warning stations established around Turkey and Figure 2 is the picture of Ankara Early Warning Station.

3. ADEQUATE PROTECTION?

While the BSS [1-2] brings exposures to natural radiation sources within the same general framework as other exposures to radiation, this does not mean that identical procedures are to be followed in the case of natural and artificial sources. ICRP [3] believes that: "If man is adequately protected then other living things are also likely to be sufficiently protected". The standard of environmental control needed to protect man will ensure that other species are not put at risk. At present, there is no internationally agreed criterion or policy that explicitly protect the environment from ionized radiation. There is not even an agreement as to how "adequate protection" of the environment can be defined.

R.M. Alexakhin [4] explained the importance of radiation protection for humans and biota in the environment. In most radiological situations exposure doses to biota (living organism) are higher than to man. In most radiological situations exposure doses to biota (living organism) are higher than to man, with the difference being sometimes significant. Table 1 gives biota/man ratio of absorbed doses of irradiation after the Chernobyl accident. It is seen from the table that biota/man ratio sometimes increases to 50.

Table 1. Biota/man ratio of absorbed doses of irradiation after Chernobyl Accident		
Ecosystem type	South Urals	Chernobyl NPP
Forests	7-27	47-16
Meadows	17-77	45-95
Rodents	1.4-28	30

The protection of other species from the harm of radiation is an admirable concept and should take into account ecological processes of radionuclide concentration, possible creation of combined effects of several damaging factors, possible existence of synergetic and additive mechanisms of ecological agents, etc.

4. SOME PRINCIPLES TO PROTECT ENVIRONMENT

- a) The pollution prevention principle: Emissions should be controlled to the extent practical, taking socio-economic factors into account.
- b) The principle of using best available technique and technologies: The discharges to environmental should be kept minimum by employing the most robust techniques.

- c) The Substitution Principle: Safer alternatives should be promoted as a substitute to the activity.
- d) The Polluter-Pays Principle: The polluters are responsible for the damage to the environment and should pay for its protection.
- e) Public Dose Limit Proposal: ICRP has recommended a dose limit on effective dose of 1 mSv/y. In special circumstances, a higher value of effective dose can be allowed in a single year, provided that the average dose over 5 years does not exceed 1 mSv/y.

P.H. Jensen, of Riso Nat. Lab. of Denmark [5], suggested a change to public dose limit to ICRP. He argues that public dose limits are not necessary and individual-related reference levels, such as 10 mSv/y as a total annual dose, should be used.

Others proposed “derived levels of concern for non-human sectors of the living environment, such as, if relative dose (rate) is higher than 10 times of normal background action should be considered, but if it is greater than 100 to 1000 times remedial actions should be considered.”

IAEA published a report in 1999, on protection of the environment from the effects of ionized radiation. This report presented various issues and approaches for establishing an environmental protection framework and criteria. According to IAEA, the permissible dose rates under chronic irradiation of any biota representative amounts to 4 Gy/y [4]. The report aims to develop IAEA Standards on environmental radiation protection. UNSCEAR published a comprehensive report on the effects of radiation protection on the environment. The report gives recommendations to the regulatory bodies to develop standards. According to UNSCEAR these dose rates for plants and animals are 4 Gy/y and 0.4-1 Gy/y for disturbances in the reproductive cycle. In the USA the following permissible dose rates were suggested: Terrestrial plants 10 Gy/y, terrestrial animals 0.4 Gy/y [4]. Organizing three international fora also give OECD-NEA over the next years in collaboration with ICRP to discuss radiological protection of the environment. European Union is also funding scientific research (e.g. FASSET, EPIC etc.) for a system to demonstrate protection of the environment.

5. CONCLUSION

The concept of “if man is adequately protected then other living things are also likely to be sufficiently protected” will ensure protection to a certain degree to non-human species in the environment. However, there are circumstances where humans are absent or have been removed and the distribution of radionuclides in the environment is such that exposure to humans would be minimal, but other organisms could be exposed. National Authorities need to decide in which parts of their territory and for which activities and working conditions it would be appropriate for doses from background radiation to be regarded as part of

occupational exposure or even public exposure by continuously monitoring the environment.

It is recommended that since in an environment with all conditions suitable for human life at a dose of 1 mSv/y, similar doses to biota in the same area will hardly exceed 1 mGy/d [4].

References

1. International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources - Safety Series:115, International Atomic Energy Agency, IAEA (1996).
2. Euratom Council Directive 96/29 of 13 May 1996 lays down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiations.
3. ICRP 1990 Recommendations of the International Commission on Radiological Protection -, Report No.60 (1990).
4. R.M. Alexakhin "Radiation Protection of Humans and Biota in the Environment" (obtained from www.oita-nhs.ac.jp/~irpa10/CD-ROM/Full/01279.pdf).
5. P.H. Jensen, Riso Nat.Lab., Denmark.