IAEA's Approaches to Physical Protection of Nuclear Materials

by Wojciech Morawiecki*

Physical protection of nuclear materials has a special meaning in the terminology of the IAEA. It is distinguished from other notions, such as

- **nuclear safety** – covering the vast field of measures to prevent accidents or other unintended events causing material damage, loss of life or health hazards within nuclear installations or in their environment; and
- **safeguards** – which applies to supervision so that nuclear materials are not diverted from peaceful to military purposes.

The particular notion of **physical protection** applies to measures to prevent unauthorized interference with nuclear facilities or use of nuclear materials by individuals or non-governmental groups, such as theft, hijacking, terrorism, sabotage and vandalism.

These technical distinctions between safety, safeguards and physical protection reflect only some aspects of the same general problem: how to reduce as much as possible the risks connected with the uses of nuclear materials. This requires a comprehensive solution covering all its aspects.

Recently, however, the problems of physical protection have acquired new dimensions. The risk of sabotage of nuclear facilities and of diversion of sensitive nuclear materials by individuals has increased due to the growth of terrorism in many parts of the world. The risk will continue to grow with the accelerated and widespread process of nuclear power becoming a major source of energy and the consequent increase of facilities and quantities of nuclear materials.

PROBLEMS TO BE SOLVED BY INDIVIDUAL STATES

Protection against acts of sabotage, terrorism and theft is primarily the duty of the State on whose territory the nuclear facilities and nuclear materials are situated. Under international law, physical protection is part of the basic function of any State: that of maintaining public order and security on its own territory which is an undisputed domain of its domestic affairs.

It is for the competent governmental authorities of the State to choose such measures of protection and security of nuclear materials as they themselves consider appropriate and effective.

The protection of nuclear materials within a State may include various more or less sophisticated physical arrangements such as the construction of perimeter fences brick or

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concrete walls surrounding the protected areas; special vaults for storing most dangerous materials; monitoring and alarm installations; control and defence of the access by guards, etc. Detection of any clandestine diversion has to be based on a reliable system of accounting for and reporting on the flow of nuclear materials, which constitutes also an indispensable basis for safeguards. A national system of physical protection should also normally provide for such organisational and security arrangements as, for example, a chain of command determining personal responsibilities for reporting on the state of affairs and responding to challenges to physical security of nuclear facilities and materials; communication with and arrangements for the intervention of supporting security forces in cases of emergency, etc.

The system of physical protection is closely connected with the measures to be taken for recovering stolen or lost materials and for the prosecution and punishment of the criminals.

Close co-operation with adequate local and central security forces of the State constitutes an indispensable element of the effectiveness of the whole system of physical protection of nuclear materials, whether the facility itself is private or public property.

Some areas of the system may be regulated by public laws and some are subject to internal instructions and/or executive decisions. A more or less considerable part of the latter may be kept secret in order not to facilitate the task of potential terrorists.

INTERNATIONAL CONCERN

Although the responsibility for the establishment and operation of a physical protection system of nuclear materials within a State rests entirely with it, it is not indifferent to other States whether or how such responsibility is being fulfilled. For instance, the nuclear material stolen on the territory of one State may be used for the production of nuclear weapons to be applied in a terrorist action on the territory or against the interests of any other State. Generally speaking, deficient physical protection in one State creates a danger for other States and therefore becomes a matter for international concern. The existence of such common dangers results in a common interest among States to co-operate.

The need for international co-operation in these matters seems particularly evident in situations where nuclear material is being transported across national boundaries, for physical protection cannot be assured without one country taking over the responsibility from another. The conditions of such a transfer of responsibility can be most appropriately determined in a legal international document.

International co-operation also appears to be necessary with a view to recovering stolen or lost nuclear materials and pursuing dangerous malefactors across national boundaries.

THE AGENCY'S ROLE

In this field, the IAEA may play a role inherent to any active international organisation, that is, to facilitate the recognition by its Member States of the various problems which are common to them and, consequently, to assist them in taking appropriate measures to satisfy their common interests.

The need for a general reinforcement of physical protection measures is now widely recognised. The IAEA started its work in this direction in 1971.[1]

As a result of recent Agency activities in this field a revised text of recommendations to States, based on the current state of the art in physical protection hardware and systems and on current types of nuclear facilities, was published in September 1975 as INFCIRC/225 under the title "The Physical Protection of Nuclear Materials".

In particular, it lays down detailed physical protection recommendations for various categories and amounts of materials. The extent of vulnerability of nuclear material to theft or hijacking is also closely related to different stages in the nuclear fuel cycle.

The highest degree of protection should apply to category I of material including, for example, all plutonium in amount of 2 kg or more and uranium-235 enriched to 20% or more in amount of 5 kg or more. Nuclear material in this category should be used and stored within a special **inner area** encircled by another **protected area,** both characterized by high, although differentiated, degrees of limitations of access, control of persons, monitoring, etc.

The medium category II, that is plutonium in amount less than 2 kg but more than 500 g (or even more than 10 g if it is "easily dispersable") and uranium-235 enriched to 20% or more in amount less than 5 kg but more than 1 kg, or uranium-235 enriched to 10% but less than 20% in amount of 10 kg or more. Nuclear material in this category should be subject to somewhat less rigid physical protection.[2]

The lowest category III comprises for example plutonium in amount 500 g or less (or 10 g or less if "easily dispersable") and uranium-235 enriched to 20% or more if less than 1 kg, uranium-235 enriched to 10% but less than 20% if less than 10 kg, and uranium enriched above natural but less than 10% if 10 kg or more. Nuclear material in this category is to be kept in an area to which access should be controlled but no special protected area is necessary.[3]

Separate protective measures have been defined for nuclear materials in transit, also in accordance with the three categories outlined above.

The need for the reinforcement of national systems of physical protection and international co-operation in this field was expressed by many States, both at the NPT Review Conference in Geneva in May 1975 and at the XIXth session of the General Conference of the IAEA in September 1975. On 26 September the General Conference unanimously adopted a resolution[4] in which it expressed its concern about the dangers connected with the risk of interference with nuclear facilities or of unauthorized use of nuclear materials as a result of acts of theft, vandalism, terrorism or hijacking.

The resolution further noted with satisfaction the publication of the Agency's INFCIRC/225 as an indication of what can be done by Member States to establish their national systems for physical protection of nuclear materials or to improve the quality and effectiveness of such systems.

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1 For past activities see: Physical Protection of Nuclear Material, International Atomic Energy Agency Bulletin, vol. 17, no. 2, April 1975

2 Irradiated fuel when in reprocessing plant was put in category I and when on reactor site in category II.

3 Uranium-235 was classified in all three categories in the same way as plutonium.

4 GC(XIX)/238

It also requested the Director General regularly to review and bring up to date these recommendations, to reflect changes in the situation. All Member States were urged to review and, if necessary, strengthen their physical protection systems.

The resolution also called upon Member States and the Director General to consider ways and means of facilitating international co-operation in dealing with problems of physical protection of nuclear facilities and materials which are common to Member States, with special reference to the international transfer of nuclear materials.

In order to implement the resolution and to coordinate the work of the Agency's activities in the field, a Task Group on Physical Protection of Nuclear Materials was set up within the IAEA's Secretariat.

POSSIBLE ACTIONS IN THE FUTURE

A wide range of possible actions by the IAEA in the field of physical protection of nuclear facilities and materials can be envisaged in the future.

– A standing working group, for instance, of governmental experts could be set up by the Board of Governors, to follow the technological development, introduction of new types of facilities and advances in the state of the art, and to review accordingly the recommendations on physical protection measures.

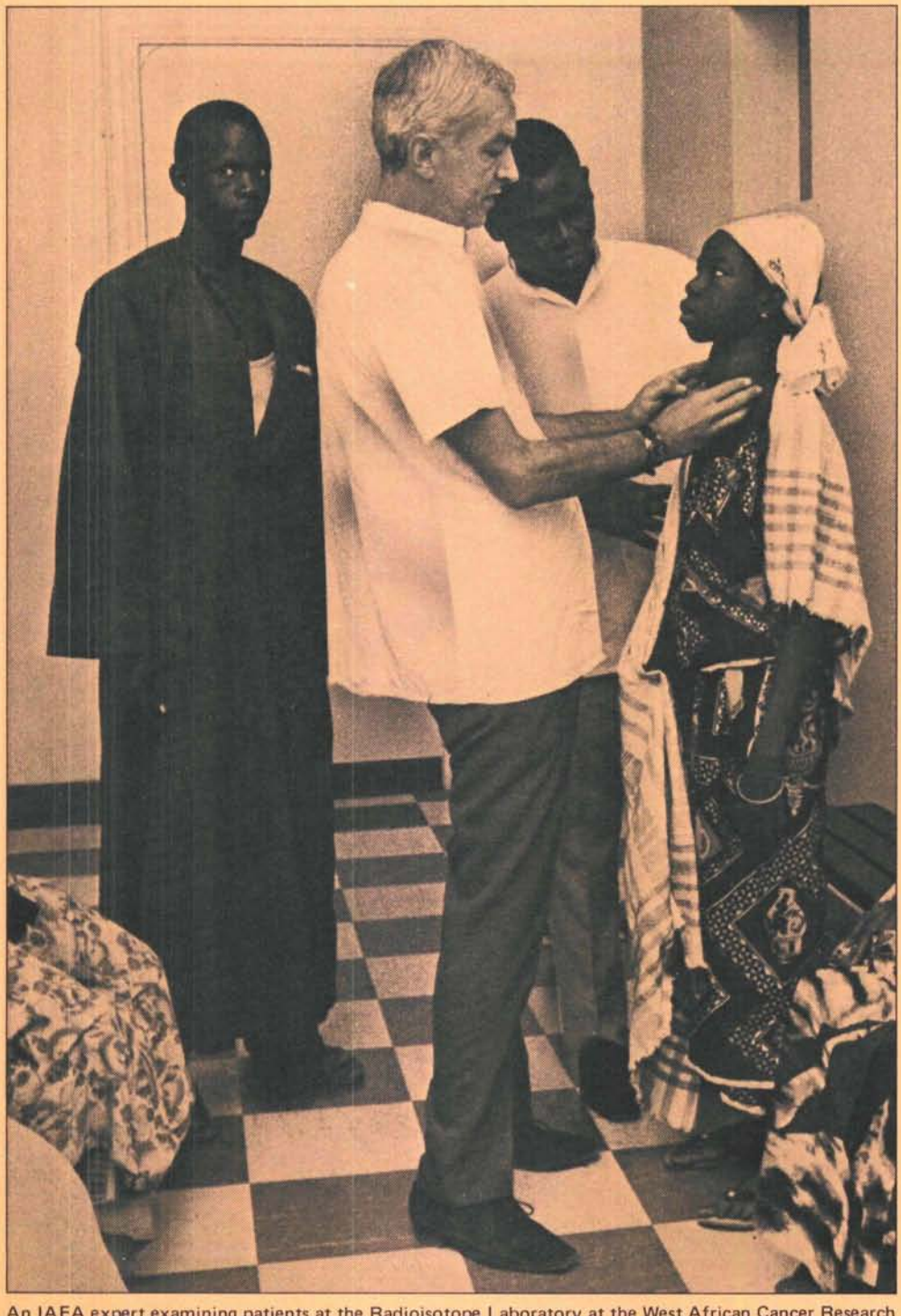
– The possibility could also be considered of submitting an appropriate version of such recommendations for approval by the Board in the form of a Guide of Practice on Physical Protection which could to some extent up-grade their regulatory influence.

– A roster of experts on physical protection could be established, and special training courses organized by the Agency, in keeping with the Agency's role in rendering technical assistance, if requested by interested Member States.

– The Agency could also serve as a clearing house of information on physical protection. On a more or less informal and systematic basis it could get non-confidential information on national physical protection programmes from Member States. Making such programmes known could create a better atmosphere of mutual reliability conducive to closer international co-operation.

– Various legal forms for co-operation and regulation of international relations in the field of physical protection of nuclear facilities and materials can be envisaged. In their bilateral agreements on co-operation or supply of nuclear facilities and material, States may introduce special clauses on physical protection. They may also under Safeguards Transfer Agreements with the IAEA arrange for various forms of Agency Control over the execution of such clauses. It seems that multilateral conventions could be envisaged as legally binding instruments for some selected areas, especially international transport of nuclear material or recovery of nuclear material moved illicitely across national boundaries.

– In accordance with its basic function and in close consultation with interested governments, the IAEA will be ready to undertake all kinds of action such as collecting information and conducting studies, sponsoring and convening meetings of experts and diplomatic conferences, organising seminars, training courses, and making available experts for technical assistance, drafting recommendations, declarations or conventions, and assisting Member States in any other way that they may consider suitable for promotion of physical protection of nuclear facilities and materials.

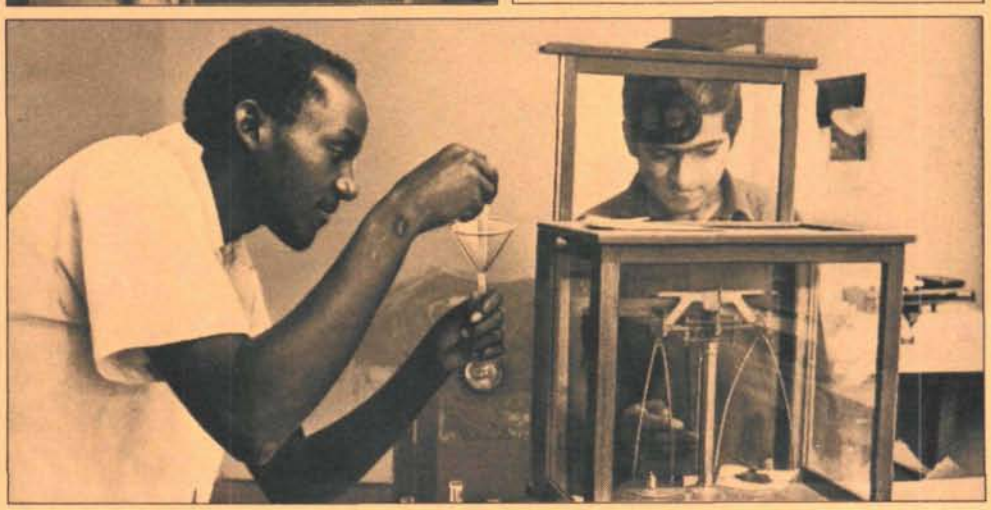


An IAEA expert examining patients at the Radioisotope Laboratory at the West African Cancer Research Institute at Dantec Hospital in Dakar, Senegal. Photo: UN

Above: General view of the Centre for Radiation Technology in Cairo, Egypt, one of the large-scale projects assisted by the Agency.

Middle: This tri-carb liquid scintillation spectrometer was supplied by IAEA to the radioisotope laboratory J-1 at the National Centre for Scientific Research, Lusaka, Zambia, in 1974. Photo: IAEA

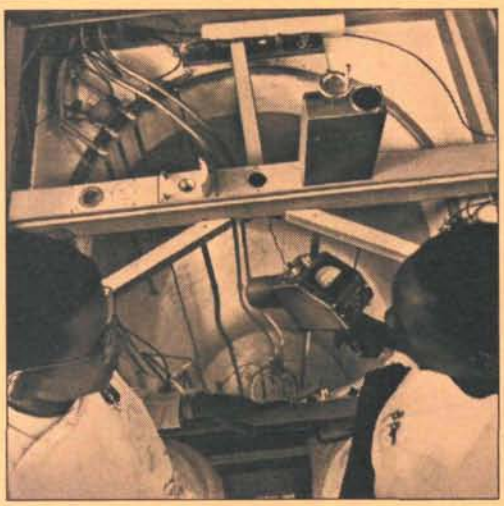
Below: Soil-weighing at Makerere University, Kampala, Uganda, for measuring distribution of radioactively-labelled insecticide in a programme sponsored by the IAEA for controlling the tsetse fly. Photo: IAEA

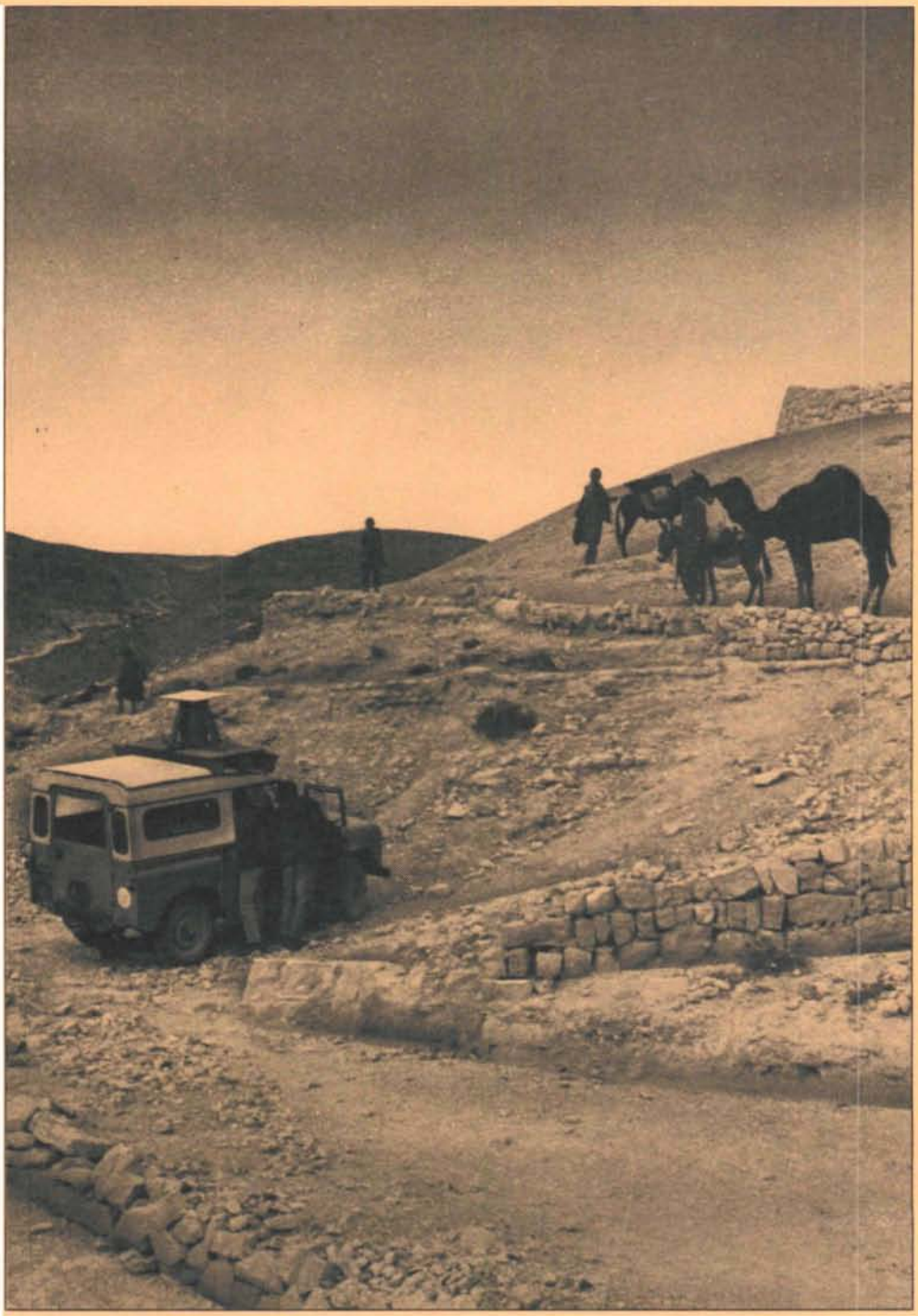


Above: View of the Central Animal Husbandry Laboratory in Bamako, Mali, where an IAEA expert assisted in the establishment and operation of a radioisotope laboratory. Photo: IAEA

Middle: The core of the TRICO nuclear research reactor at the University of Kinshasa, Zaire. Photo: UN

Below: A neutron probe in use during soil investigations under IAEA's Technical Assistance in the Gezira region in the Sudan. Photo: Cope





Modern methods of prospecting for uranium are being applied in a number of countries and the IAEA is helping its Member States by technical advice and missions. Here a van carrying prospecting equipment in Tunisia. Photo: IAEA