

RADIATION PROTECTION ORGANIZATIONS

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14.1. INTRODUCTION

Radiation protection organizations play a critical role in ensuring the safe use of ionizing radiation across various sectors, including medicine, industry, research, and nuclear energy. Their primary mission is to protect individuals, populations, and the environment from the harmful effects of radiation exposure while allowing the beneficial applications of radiation to continue under controlled and justified conditions. A radiation protection organization operates within a comprehensive framework defined by scientific principles, regulatory requirements, and international standards. The foundation of such an organization lies in the implementation of the three fundamental principles of radiation protection: justification, optimization (as low as reasonably achievable, ALARA), and dose limitation. At the institutional level, a Radiation Protection Organization typically comprises a designated Radiation Safety Officer (RSO), a multidisciplinary Radiation Safety Committee (RSC), and supporting technical staff such as health physicists and medical physicists. The RSO is responsible for day-to-day operations of the radiation protection program, including monitoring personnel exposure, maintaining inventories of radioactive materials, conducting safety training, and ensuring regulatory compliance. The Radiation Safety Committee provides oversight, approves research and clinical protocols involving radiation, and advises on policy matters. Together, they form the core administrative structure required to implement effective radiation protection measures ^[1].

International and national regulatory frameworks guide the activities of radiation protection organizations. The International Commission on Radiological Protection (ICRP) offers fundamental recommendations and guidelines on radiological protection, which are widely accepted globally. The International Atomic Energy Agency (IAEA) provides safety standards, technical documents, and capacity-building support. National regulatory authorities, such as the U.S. Nuclear Regulatory Commission (NRC), Atomic Energy Regulatory Board (AERB) in India, and the Health and Safety Executive (HSE) in the UK, develop and enforce regulations based on these international principles. These agencies also conduct licensing, inspection, and enforcement actions to ensure compliance with radiation safety requirements. An effective radiation protection program incorporates several technical and administrative components. These include personnel monitoring through dosimetry, area and environmental monitoring, radiation safety training, proper labeling and signage, radioactive waste management, emergency preparedness, and incident response planning. Records of all radiation-related activities,

including dose records, equipment maintenance logs, safety audits, and incident reports, are meticulously maintained to ensure traceability and facilitate regulatory audits. The success of a radiation protection organization depends not only on regulatory adherence but also on fostering a strong culture of safety. Continuous education, clear communication of risks, and active participation of staff in safety practices enhance the effectiveness of the protection system. In modern healthcare and research environments, where technologies are rapidly evolving and new applications of radiation are emerging, radiation protection organizations must remain adaptable, proactive, and scientifically grounded ^[2].

14.1.1. Classification of radiation protection organization

Radiation protection organizations can be classified based on their scope of operation, jurisdictional level, and functional responsibilities. Broadly, they are categorized into international organizations, national regulatory authorities, and institutional radiation safety bodies. Each level plays a distinct yet interconnected role in the overall framework of radiological protection, ensuring the safe and effective use of ionizing radiation globally and locally.

- **International:** International radiation protection organizations are responsible for developing global standards, recommendations, and guidelines for radiation protection. These bodies include the International Commission on Radiological Protection (ICRP), which formulates principles and dose limits based on scientific research and radiobiological evidence. The International Atomic Energy Agency (IAEA) plays a key role in establishing safety standards, offering technical support, conducting peer reviews, and promoting best practices among member states. The World Health Organization (WHO) contributes by addressing public health aspects of radiation exposure, particularly in medical applications. These organizations facilitate harmonization of radiation protection practices and foster international collaboration in research, training, and emergency preparedness ^[3].
- **National:** At the national level, radiation protection organizations are typically regulatory authorities mandated to enforce laws and policies concerning radiation use. These include bodies such as the U.S. Nuclear Regulatory Commission (NRC), the Atomic Energy Regulatory Board (AERB) in India, and the Health and Safety Executive (HSE) in the United Kingdom. These agencies are empowered to issue licenses, conduct inspections, monitor compliance, and take enforcement actions against violations. They adapt international guidelines to the national context and establish legal frameworks that govern the use of radioactive materials, radiation-emitting devices, and nuclear facilities.
- **Others:** The third classification comprises institutional radiation protection organizations, which function within hospitals, research institutions, universities, and industrial facilities. These organizations include the Radiation Safety Officer (RSO), Radiation Safety Committee (RSC), and supporting technical staff. Their responsibilities include implementing radiation safety programs, conducting internal audits, ensuring occupational exposure monitoring, managing radiation waste, and providing safety training. These bodies operate under the jurisdiction of national regulatory authorities and are essential for the daily execution of safety protocols. Additionally, specialized or advisory organizations may be categorized based on their functional roles. These include professional societies such as the Health Physics Society (HPS) and the Society for Radiological Protection (SRP), which promote education, certification, and dissemination of scientific knowledge in radiation protection. Furthermore, emergency response organizations are established at regional or national levels to manage radiological incidents, ensuring coordinated action during emergencies involving radiation exposure.

14.2. INTERNATIONAL RADIATION PROTECTION ORGANIZATIONS

International radiation protection organizations play a foundational role in establishing the global framework for the safe use of ionizing radiation. These organizations develop universal principles, safety standards, and technical guidelines that serve as the basis for national policies and regulatory frameworks. The International Commission on Radiological Protection (ICRP) is a leading scientific body that provides recommendations on radiation protection based on extensive research in radiobiology, epidemiology, and medical physics. Its key contributions include defining dose limits, categorizing types of exposure (occupational, public, and medical), and formulating

the core principles of justification, optimization, and dose limitation. The International Atomic Energy Agency (IAEA), a specialized agency under the United Nations, promotes the peaceful and safe use of nuclear energy. It issues safety standards, assists countries in building radiation safety infrastructure, conducts safety reviews, and offers training and emergency preparedness support. The World Health Organization (WHO) addresses radiation protection from a public health perspective, particularly in relation to medical exposures and radiation emergencies, and works closely with the IAEA on radiation safety in healthcare settings. Other organizations such as the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) evaluate and report on levels and effects of radiation exposure worldwide, providing the scientific evidence base for international guidance ^[4]. The International Labour Organization (ILO) focuses on protecting workers from radiation hazards, particularly in occupational settings. These international entities collaborate to harmonize radiation protection efforts across countries, foster scientific exchange, and ensure that radiological practices uphold the highest standards of safety and public health worldwide.

14.2.1. International Commission on Radiological Protection (ICRP)

The International Commission on Radiological Protection (ICRP) is an independent, globally recognized, non-governmental organization that plays a pivotal role in the advancement of radiological protection worldwide. Established in 1928 by the International Society of Radiology, the ICRP was initially concerned with protecting individuals from the harmful effects of X-rays and radium, which were being increasingly used in medicine at the time. Over the decades, as the understanding of radiation and its applications expanded, the scope of the ICRP broadened significantly. Today, the organization provides comprehensive guidance for the protection of people and the environment from all sources of ionizing radiation and addresses all exposure situations, including occupational, public, and medical settings. The primary mission of the ICRP is to safeguard individuals and ecosystems from the detrimental effects of ionizing radiation, while still supporting the beneficial uses of radiation in fields such as medicine, nuclear energy, industry, and scientific research. To achieve this mission, the ICRP develops and disseminates authoritative recommendations and guidance rooted in the most current scientific evidence and ethical considerations. Among its key objectives are the development of a coherent and internationally applicable system of radiological protection, the promotion of the ALARA (As Low As Reasonably Achievable) principle to minimize radiation doses, the harmonization of global radiation safety standards, and the advancement of education and training in radiological protection. The ICRP also serves as an advisor to national governments, regulatory authorities, and international agencies, helping them to frame policies and implement effective radiation protection programs ^[5].



Structurally, the ICRP is composed of a Main Commission, four standing committees, and several task groups and working parties that focus on specialized areas. The Main Commission serves as the highest decision-making body within the organization and is responsible for guiding the overall strategic direction, approving final recommendations, and overseeing the activities of the committees. The four standing committees each have specific mandates: Committee 1 focuses on radiation effects, analyzing biological consequences of radiation exposure and providing scientific risk assessments; Committee 2 addresses doses from radiation exposure,

developing mathematical models and methodologies for internal and external dose calculation; Committee 3 is dedicated to protection in medicine, offering detailed recommendations for radiological safety in medical diagnosis and therapy; and Committee 4 works on the application of the Commission's recommendations, translating scientific and theoretical principles into practical guidance for use by regulators and practitioners. These committees are staffed by international experts from various disciplines including physics, biology, medicine, epidemiology, and regulatory science. Specialized task groups are also established to tackle emerging issues and support the committees in specific areas of work ^[6].

The guidance provided by the ICRP is published in its official journal, *Annals of the ICRP*, and forms the foundation for radiation protection standards adopted globally. Among its landmark publications, ICRP Publication 26 (1977) introduced the modern system of radiological protection based on the principles of justification, optimization, and dose limitation. ICRP Publication 60 (1991) updated dose limits and risk models in light of new biological data, while ICRP Publication 103 (2007) presented the current overarching recommendations, incorporating ethical perspectives and a more holistic approach to radiological protection. These publications have been adopted and adapted by international organizations such as the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO), and they serve as the reference for national regulatory frameworks worldwide. Central to the ICRP's philosophy are three guiding principles of radiation protection: justification, optimization, and dose limitation. The principle of justification asserts that any decision involving radiation exposure must provide a net benefit. Optimization requires that radiation doses be kept as low as reasonably achievable (ALARA), taking into account economic and social factors. Dose limitation ensures that the exposure of individuals remains within legally established limits, specific to occupational, public, and medical scenarios. These principles are universally applicable and are designed to be implemented across all types of exposure contexts, whether planned, emergency, or existing. The ICRP has made substantial contributions to the field of medical radiation protection, which is one of the most widespread uses of ionizing radiation today. Through its detailed guidelines, the ICRP addresses radiation safety in diagnostic radiology, interventional procedures, radiotherapy, and nuclear medicine. It emphasizes the necessity of balancing diagnostic or therapeutic benefits with potential radiation risks and promotes the use of patient-specific dose management strategies. Recent publications, such as ICRP Publications 135, 138, and 140, have provided further depth on topics including patient dose assessment, justification in imaging procedures, and ethical considerations in medical radiation use, helping to foster a safety culture within healthcare systems globally ^[7].

In recent years, the ICRP has increasingly incorporated ethical and environmental dimensions into its recommendations. Ethical values such as respect for persons, justice, and beneficence are now integral to the decision-making frameworks it advocates. Additionally, environmental protection is becoming a key focus, with growing efforts to assess and mitigate the effects of ionizing radiation on non-human species and ecosystems, recognizing that environmental sustainability is interconnected with human well-being. The global impact of the ICRP is profound. Its recommendations form the backbone of radiological protection legislation and practice in numerous countries. Regulatory bodies such as the U.S. Nuclear Regulatory Commission (NRC), the Atomic Energy Regulatory Board (AERB) in India, and similar agencies worldwide have adopted ICRP guidance as the basis for national radiation safety regulations. Furthermore, the ICRP collaborates extensively with academic institutions, professional societies, and international organizations to promote education, research, and capacity-building in radiation protection. Through its continued work, the ICRP ensures that as new technologies emerge and societal needs evolve, radiation protection practices remain scientifically grounded, ethically sound, and globally harmonized ^[8].

14.2.2. The International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency (IAEA) is a specialized agency of the United Nations, established in 1957, with the mandate to promote the peaceful use of nuclear energy and to ensure that atomic energy is not used for military purposes. Headquartered in Vienna, Austria, the IAEA plays a central role in the global nuclear governance framework and serves as the international hub for cooperation in nuclear science and technology. One of its core functions is to develop and disseminate comprehensive Safety Standards that cover all aspects of

nuclear and radiation safety, including protection against ionizing radiation, the safety of nuclear installations, radioactive waste management, and emergency preparedness and response. These safety standards are developed through consensus among member states and scientific experts and are widely adopted or adapted by national regulatory bodies. In the area of radiation protection, the IAEA collaborates closely with other international organizations such as the International Commission on Radiological Protection (ICRP), the World Health Organization (WHO), and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) to ensure a harmonized and scientifically sound approach.



The IAEA also conducts regular safety reviews, audits, and peer assessments such as the Integrated Regulatory Review Service (IRRS) and Operational Safety Review Team (OSART) missions to assist countries in evaluating and improving their nuclear safety infrastructure. In addition to its regulatory and safety functions, the IAEA is a major provider of technical assistance, offering training, education, expert missions, and equipment support to help member states build or enhance their radiation protection programs. It plays a crucial role in nuclear emergency response coordination, maintaining the Incident and Emergency Centre (IEC) to respond promptly to nuclear and radiological incidents worldwide. Through its safeguards and verification mission, the IAEA also works to ensure that nuclear material is not diverted for weapons use, thereby contributing to global security and non-proliferation. The IAEA's integrated activities in safety, security, science, and safeguards make it a key institution in both supporting the peaceful benefits of nuclear technology and ensuring the highest standards of radiological protection across the globe.

14.2.3. The International Radiation Protection Association (IRPA)

The International Radiation Protection Association (IRPA) is a globally recognized professional organization that serves as the collective voice of the international radiation protection community. Established in 1965, IRPA functions as an umbrella organization, composed of national and regional radiation protection societies from around the world, representing professionals engaged in the fields of radiological protection, health physics, radiation safety, and related disciplines. The primary aim of IRPA is to promote high standards of practice and to foster professional competence in the science and application of radiation protection. Unlike regulatory bodies or scientific commissions, IRPA does not issue safety standards or regulatory guidance; rather, it serves as a platform for information exchange, education, training, and professional networking^[9].



IRPA works in close collaboration with key international agencies such as the International Atomic Energy Agency (IAEA), the International Commission on Radiological Protection (ICRP), the World Health Organization (WHO), and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), contributing to global discussions and policy development in radiation protection. Through its International Congresses, held every four years, and various regional and national symposia, IRPA provides a major forum for professionals to share research, innovations, and best practices in radiological protection.

The association also promotes ethical standards and professionalism in the field through the development of IRPA Guidance on Ethics in Radiation Protection, encouraging transparency, stakeholder involvement, and respect for individual rights. Furthermore, IRPA supports the development of young professionals through mentoring programs and its Young Generation Network (YGN), fostering future leadership in radiation safety. By uniting experts across geographical and disciplinary boundaries, IRPA plays a crucial role in advancing the global culture of radiological protection, enhancing cooperation, and ensuring the continual development of safe and effective practices in the use of ionizing radiation.

14.2.4. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) is a prominent international scientific body established in 1955 by the United Nations General Assembly to assess and report on the levels and effects of exposure to ionizing radiation. Its primary mandate is to provide authoritative scientific evaluations of radiation exposure and its health and environmental consequences, serving as a global reference for radiation protection and public health policy. UNSCEAR conducts comprehensive reviews of scientific literature, epidemiological studies, and environmental monitoring data to assess the sources of radiation—both natural and man-made—and their effects on human populations and ecosystems. It plays a vital role in evaluating radiation risks associated with medical applications, occupational exposures, nuclear accidents, environmental contamination, and fallout from nuclear weapons testing. The Committee comprises internationally nominated experts from over 30 member states, ensuring a broad and multidisciplinary approach to its assessments. While UNSCEAR does not issue regulatory guidance or safety standards, its scientifically rigorous reports form the basis for recommendations issued by regulatory bodies such as the International Commission on Radiological Protection (ICRP) and for policy-making by organizations like the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO). Notably, UNSCEAR has produced landmark assessments on major radiological events such as the Chernobyl and Fukushima nuclear accidents, providing critical data on radiation doses, cancer risks, and long-term environmental impacts.

These reports are submitted to the United Nations General Assembly and widely used by national governments, regulatory agencies, and scientific institutions. Through its work, UNSCEAR maintains a central role in the scientific foundation of global radiation protection efforts, promoting evidence-based decision-making, public transparency, and international collaboration in addressing the risks associated with ionizing radiation.



14.2.5. The Radiation Effects Research Foundation (RERF)

The Radiation Effects Research Foundation (RERF) is a binational research organization jointly funded by the United States and Japan, dedicated to studying the health effects of atomic bomb radiation on survivors of the Hiroshima and Nagasaki bombings. Established on April 1, 1975, RERF succeeded the Atomic Bomb Casualty Commission (ABCC), which had been conducting similar research since 1947. RERF's primary mission is to investigate the long-term medical consequences of radiation exposure for the benefit of the survivors and humanity at large. The foundation operates scientific laboratories in Hiroshima and Nagasaki, Japan. One of RERF's major research programs is the Life Span Study (LSS), which examines the lifelong health effects of atomic bomb radiation. Initiated in 1950, the LSS follows approximately 120,000 individuals, including about 94,000 atomic bomb survivors and 27,000 unexposed individuals, to assess mortality and cancer incidence. The findings from RERF's studies have been instrumental in establishing international radiation protection standards and have significantly contributed to the global understanding of radiation health effects ^[10].

14.2.6. Biological Effects of Ionizing Radiation (BEIR)

The BEIR Committee (Biological Effects of Ionizing Radiation) is a scientific advisory body organized by the National Academies of Sciences, Engineering, and Medicine (NASSEM) in the United States. It provides authoritative reports on the health risks of exposure to ionizing radiation, especially at low doses—a topic critical for medical, environmental, military, and occupational safety. It was established to evaluate scientific data and make recommendations that shape radiation protection standards, regulatory policies, and public health decisions.

The BEIR I report, published in 1972, focused on the population-level risks associated with low-level radiation exposure. It laid the groundwork for future investigations into cancer risks related to radiation exposure. Following this, BEIR II, released in 1977, provided detailed risk estimates for cancer and genetic effects resulting from

ionizing radiation. It also acknowledged the significant uncertainties and variabilities present in interpreting radiation data. In 1980, BEIR III expanded on earlier findings by closely examining radiation dose-response relationships, especially the ongoing debate between linear and threshold models. It offered a more nuanced understanding of cancer risks, with particular emphasis on leukemia. BEIR IV, published in 1988, assessed the health hazards posed by alpha-emitting radionuclides such as radon and its progeny. This report directly addressed indoor radon exposure and its link to increased lung cancer risk. BEIR V, issued in 1990, updated cancer and heritable genetic risk estimates based on more recent data. Notably, it endorsed the Linear No-Threshold (LNT) model, asserting that even very low levels of radiation exposure could contribute to cancer development. BEIR VI, released in 1999, focused exclusively on indoor radon exposure and its strong correlation with lung cancer, significantly influencing the EPA's radon safety guidelines. The most recent report, BEIR VII, published in 2006, is titled "Health Risks from Exposure to Low Levels of Ionizing Radiation." It reinforced the LNT model by concluding that no safe threshold for ionizing radiation exists. The report emphasized that any dose, however small, could potentially cause cellular and genetic damage leading to cancer or heritable conditions. These conclusions were drawn from comprehensive epidemiological data, particularly from atomic bomb survivors (via RERF), as well as from occupational and medical exposure studies. BEIR VII also provided updated risk models for solid cancers, leukemia, and genetic mutations.

Key Contributions of the BEIR Committee: The BEIR reports have had significant global influence on federal and international radiation protection standards, informing the policies of agencies such as the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the International Commission on Radiological Protection (ICRP). Their findings have helped guide radiation safety practices across sectors including medicine, nuclear energy, and aerospace. Additionally, BEIR's work has shaped legal frameworks and compensation programs for individuals exposed to radiation, such as veterans and nuclear workers. The reports have also been instrumental in promoting foundational scientific research into DNA damage and repair mechanisms, cancer biology, and radiation genetics.

Scientific Concepts Underpinning BEIR Findings: BEIR's conclusions are rooted in key scientific concepts related to ionizing radiation, which includes high-energy particles and waves such as X-rays, gamma rays, and alpha/beta particles. These forms of radiation can ionize atoms, potentially leading to cellular and DNA damage. The health impacts of radiation are typically categorized into two types: stochastic effects, which are random and include conditions like cancer (where risk increases with dose but severity does not), and deterministic effects, which have a dose threshold and increase in severity once that threshold is crossed (e.g., skin burns or cataracts). Central to BEIR's assessments is the Linear No-Threshold (LNT) model, which assumes that the risk of harm is directly proportional to the dose of radiation received, implying that no level of radiation exposure is completely safe.

14.2.7. World Health Organization (WHO)

The World Health Organization (WHO) plays a pivotal role in promoting radiation safety and protection globally, focusing on safeguarding the public, patients, and workers from potential health risks associated with both ionizing and non-ionizing radiation. Key Initiatives and Activities:

1. **Global Initiative on Radiation Safety in Health Care Settings:** This program mobilizes the health sector to ensure the safe and effective use of radiation in medicine. By integrating radiation protection into standard medical practices and healthcare quality services, WHO fosters collaboration among health authorities, regulatory bodies, professional societies, and other stakeholders to enhance the implementation of radiation safety standards in healthcare environments.
2. **Enhancing Radiation Safety Culture in Healthcare:** WHO provides guidance to establish and maintain a robust radiation safety culture within healthcare settings. This involves promoting organizational and individual behaviours that prioritize safety, offering tools to assess current safety cultures, and sharing best practices. The aim is to ensure the protection of both patients and healthcare personnel involved in medical exposures.

3. **Development of Safety Standards:** In collaboration with international organizations such as the International Atomic Energy Agency (IAEA), WHO contributes to the formulation of safety standards for radiation protection. These standards serve as a framework for national regulations, ensuring consistent and effective radiation safety measures worldwide.
4. **Risk Assessment and Management:** WHO assesses population exposure to radiation, particularly in medical settings, and develops strategies to manage and mitigate associated risks. This includes efforts to reduce unnecessary radiation exposure by emphasizing the justification and optimization of radiological procedures and preventing accidental or unintended exposures.
5. **Risk Communication:** Recognizing the importance of effective communication, WHO develops strategies and tools to facilitate informed discussions about radiation risks and benefits between healthcare providers, patients, and caregivers. This ensures that individuals are well-informed and can make decisions that align with their health needs and safety.



Through these initiatives, WHO underscores the importance of integrating radiation protection into healthcare policies and practices, aiming to maximize the benefits of radiation technologies while minimizing potential health risks.

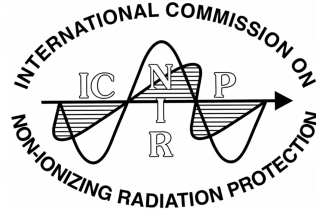
14.2.8. The Nuclear Energy Agency (NEA)

The Nuclear Energy Agency (NEA) is a specialized agency within the Organisation for Economic Co-operation and Development (OECD), established in 1958, that focuses on fostering international cooperation to ensure the safe, environmentally sound, and economical use of nuclear energy for peaceful purposes. Comprising over 30 member countries, primarily from Europe, North America, and the Asia-Pacific region, the NEA plays a key role in coordinating scientific research, policy discussions, and regulatory frameworks related to nuclear energy, including radiation protection and nuclear safety. Through its Committee on Radiation Protection and Public Health (CRPPH), the NEA addresses radiological protection issues by promoting the development and implementation of scientifically based, ethical, and practical policies. The CRPPH works in collaboration with international organizations such as the International Atomic Energy Agency (IAEA), the International Commission on Radiological Protection (ICRP), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), and the World Health Organization (WHO) to harmonize radiation safety standards and promote consistency in protection practices across different sectors and countries. The NEA also supports extensive work in areas such as occupational exposure control, emergency preparedness and response, environmental radiological protection, decommissioning, and waste management. One of its notable initiatives is the International Radiological Protection School (IRPS), designed to train regulators and professionals in advanced radiological protection principles and applications. The NEA provides scientific assessments, policy recommendations, and best practice models that contribute to the continuous improvement of nuclear safety culture, including radiological protection for workers, the public, and the environment. By integrating scientific research with regulatory experience and stakeholder engagement, the NEA significantly enhances global capacity to manage radiological risks associated with the production and use of nuclear energy.

14.2.9. The International Commission on Non-Ionizing Radiation Protection (ICNIRP)

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an independent, non-profit scientific organization established in 1992, with the primary objective of providing guidance and recommendations on protection against non-ionizing radiation (NIR). Unlike ionizing radiation, which has sufficient energy to remove tightly bound electrons from atoms, non-ionizing radiation includes electromagnetic fields (EMF) such as ultraviolet (UV), visible light, infrared (IR), microwave, radiofrequency (RF), extremely

low-frequency (ELF), and static electric and magnetic fields, which do not carry enough energy to ionize atoms or molecules. ICNIRP's work is critical in addressing growing global concerns related to public and occupational exposure to sources like mobile phones, Wi-Fi, power lines, UV lamps, laser devices, and medical technologies. The commission is composed of internationally recognized experts in physics, biology, epidemiology, and health risk assessment, who review and evaluate scientific literature to develop evidence-based exposure guidelines.



These guidelines are widely used by national and international bodies, including the World Health Organization (WHO), the International Telecommunication Union (ITU), and regulatory agencies across the globe to develop standards and policies for safe NIR exposure. ICNIRP guidelines emphasize dose-response relationships, thermal and non-thermal biological effects, and incorporate precautionary principles to protect vulnerable populations such as children and pregnant women. Notable publications include the ICNIRP Guidelines for Limiting Exposure to Electromagnetic Fields (2020), which updated safety limits for radiofrequency fields used in wireless communication technologies. Although ICNIRP does not enforce regulations, its scientifically grounded recommendations have a significant influence on national legislation, urban planning, occupational safety protocols, and technological development. The commission also engages in public education and stakeholder communication to address societal concerns about NIR-related health risks. Overall, ICNIRP plays a vital role in promoting global health and safety in an era of rapidly evolving non-ionizing radiation technologies.

14.2.10. The International Labour Organization (ILO)

The International Labour Organization (ILO), a specialized agency of the United Nations founded in 1919, plays a vital role in establishing global standards for occupational safety and health, including the protection of workers from radiation hazards. While the ILO's mandate spans a broad range of labor issues, one of its key objectives is to ensure safe and healthy working conditions across all sectors, particularly in industries involving exposure to ionizing and non-ionizing radiation, such as nuclear energy, medical radiology, industrial radiography, and telecommunications. The ILO collaborates with international bodies like the International Atomic Energy Agency (IAEA), the World Health Organization (WHO), and the International Commission on Radiological Protection (ICRP) to develop guidelines and conventions that help protect workers from radiation-related health risks. A cornerstone of the ILO's contribution is the Radiation Protection Convention, 1960 (No. 115), which sets out binding obligations for member states to regulate exposure, monitor radiation levels, and provide protective equipment and training for workers. This convention emphasizes key radiological protection principles such as justification, optimization (ALARA), and dose limitation, aligning with international best practices. The ILO also provides technical guidance, training programs, and policy advice to help countries develop and implement national radiation safety regulations within the framework of labor legislation. Through its work, the ILO promotes the rights of workers to be informed about radiation risks, to participate in safety decisions, and to be protected from undue exposure. Additionally, the organization addresses issues related to occupational health surveillance, compensation for radiation-induced illnesses, and safe working environments in both normal operations and emergency situations. The ILO's efforts contribute significantly to the harmonization of occupational radiation safety standards worldwide and support the development of a strong safety culture in radiation-prone workplaces.

14.2.11. The Inter-Agency Committee on Radiation Safety (IACRS)

The Inter-Agency Committee on Radiation Safety (IACRS) is a collaborative mechanism established to enhance coordination and coherence among major international organizations involved in radiation safety and protection.

Composed of key global bodies such as the International Atomic Energy Agency (IAEA), the World Health Organization (WHO), the International Labour Organization (ILO), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the Food and Agriculture Organization (FAO), the Nuclear Energy Agency (NEA) of the OECD, and the Pan American Health Organization (PAHO), the IACRS serves as a platform for inter-agency dialogue and harmonization of policies. Its primary mission is to strengthen global radiation protection frameworks by ensuring that the scientific, technical, regulatory, and public health guidance issued by participating organizations is consistent and based on the most up-to-date knowledge.



The committee plays a crucial role in facilitating the implementation of the International Basic Safety Standards (BSS) for Protection against Ionizing Radiation and for the Safety of Radiation Sources, which are co-sponsored by several IACRS member organizations. By fostering information exchange, promoting best practices, and addressing overlapping responsibilities, IACRS helps reduce duplication of efforts and ensures a unified approach to protecting workers, the public, and the environment from radiation risks. The committee also contributes to international preparedness and response strategies for radiological and nuclear emergencies, supports capacity-building efforts in developing countries, and encourages ethical and transparent communication of radiation risks. Through its collaborative initiatives, the IACRS significantly enhances the effectiveness of the global radiation safety regime and underlines the importance of inter-agency synergy in managing radiation-related challenges in health, agriculture, industry, and the environment.

14.2.12. The International Organization for Standardization (ISO)

The International Organization for Standardization (ISO) is an independent, non-governmental international organization that develops and publishes a wide range of proprietary, industrial, and commercial standards. Established on February 23, 1947, and headquartered in Geneva, Switzerland, ISO comprises national standards bodies from over 160 countries, each representing their respective nation. ISO's mission is to promote the development of standardization and related activities worldwide, aiming to facilitate the international exchange of goods and services and to foster cooperation in intellectual, scientific, technological, and economic spheres. By bringing together global experts, ISO establishes consensus-based standards that ensure quality, safety, efficiency, and interoperability across various industries. ISO operates through a network of national standards bodies, with one member per country. These members collaborate within technical committees and subcommittees to develop international standards. As of July 2024, ISO has published over 25,000 international standards covering nearly all aspects of technology and manufacturing.



Radiation Protection Standards: In the realm of radiation protection, ISO plays a crucial role by developing standards that address the safe use of ionizing radiation. This work is primarily conducted through ISO/TC 85/SC 2, the subcommittee dedicated to radiological protection. Their scope includes standardization for the design and

use of equipment, radiation metrology, dosimetry protocols, environmental monitoring methods, and the control of materials containing radioactive substances. Notable standards in this area include:

- **ISO 2919:2012:** Establishes a classification system for sealed radioactive sources based on performance tests, specifying general requirements, performance tests, production tests, marking, and certification.
- **ISO 20553:2006:** Specifies minimum requirements for designing professional programs to monitor workers exposed to the risk of internal contamination with radioactive materials.

International Collaboration: ISO collaborates closely with other international organizations, such as the International Electro-Technical Commission (IEC) and the International Telecommunication Union (ITU), to ensure comprehensive and harmonized standards across different sectors. This cooperation facilitates the integration of ISO standards into national regulations and supports global efforts in areas like radiation protection and safety. Through its extensive network and collaborative approach, ISO continues to be instrumental in developing standards that enhance safety, efficiency, and quality across various industries worldwide.

14.3. NATIONAL ORGANIZATIONS

National organizations responsible for radiation safety and protection play a fundamental role in implementing international guidelines and adapting them to the specific legal, cultural, technological, and environmental contexts of individual countries. These bodies are typically regulatory authorities or scientific institutions that establish and enforce national standards for the safe use of ionizing and non-ionizing radiation in various sectors such as healthcare, industry, nuclear energy, research, and agriculture. Key responsibilities of national organizations include licensing and regulation of radiation sources, monitoring occupational and public exposure, radiation protection training, emergency preparedness and response, and public health communication. Examples of such agencies include the U.S. Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA) in the United States, the Atomic Energy Regulatory Board (AERB) in India, the Federal Office for Radiation Protection (BfS) in Germany, and the Office for Nuclear Regulation (ONR) in the United Kingdom. Many countries also have national radiation protection institutes, such as Public Health England (PHE) or the Radiation and Nuclear Safety Authority (STUK) in Finland, which conduct research, surveillance, and risk assessments to support evidence-based regulation. These organizations typically operate under the guidance of international standards set by bodies such as the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP), but retain authority to develop stricter or more tailored requirements based on national needs. In addition, national agencies often collaborate through regional and global forums, share best practices, and contribute data to international monitoring systems. By maintaining a robust regulatory infrastructure and engaging in continuous scientific and technical development, national organizations serve as the cornerstone of effective radiation protection, safeguarding workers, the public, and the environment within their respective jurisdictions.

14.3.1. Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA)

The U.S. Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA) are two principal federal agencies in the United States responsible for regulating and overseeing radiation safety and protection, particularly concerning ionizing radiation. Established in 1974, the NRC is an independent agency that regulates the civilian use of nuclear materials and facilities, including nuclear power plants, radioactive waste management, medical and industrial uses of radioactive materials, and transportation of nuclear materials. The NRC's primary mission is to ensure the safe use of radioactive materials for beneficial civilian purposes while protecting people and the environment. It develops and enforces regulations, issues licenses, conducts inspections, and responds to nuclear incidents. The NRC also maintains a strong focus on occupational exposure control, emergency preparedness, and public communication regarding radiation risks. In parallel, the Environmental Protection Agency (EPA), established in 1970, holds broader environmental protection responsibilities and plays a critical role in setting standards for radiation in the environment, including air, water, and soil. The EPA develops federal radiation protection guidance for various exposure scenarios and works on limiting public exposure to radiation from both natural and man-made sources, such as radon gas, nuclear fallout, and legacy contamination

from past nuclear activities. Through its Office of Radiation and Indoor Air (ORIA), the EPA conducts scientific assessments, maintains radiation monitoring networks like RadNet, and publishes public health advisories and educational resources. The NRC and EPA collaborate on joint responsibilities, such as setting exposure limits and managing radioactive waste, ensuring that U.S. policies align with international standards established by organizations like the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP). Together, these agencies play complementary roles in the United States' comprehensive framework for radiation protection, upholding regulatory oversight and environmental stewardship in the face of evolving technological and environmental challenges.

14.3.2. The Federal Office for Radiation Protection (BfS)

The Federal Office for Radiation Protection (BfS), known in German as the Bundesamt für Strahlenschutz, is the national authority in Germany responsible for ensuring radiation protection across all sectors involving ionizing and non-ionizing radiation. Established in 1989, BfS operates under the jurisdiction of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV). The agency's core mandate includes protecting human health and the environment from the harmful effects of radiation, based on the principles of justification, optimization (ALARA), and dose limitation. BfS carries out a wide range of tasks, including the regulatory oversight of nuclear facilities, radioactive waste management, monitoring of environmental radioactivity, emergency preparedness and response, and public risk communication. In addition, it manages the national radon program, conducts dosimetry services, and oversees radiation exposure control in occupational and medical settings. BfS also plays a significant role in scientific research, supporting studies on radiobiology, epidemiology, and long-term health effects of radiation, such as those associated with low-dose exposures and electromagnetic fields. The agency maintains several radiation monitoring networks and contributes to national and international radiological emergency preparedness. BfS collaborates closely with international organizations like the International Atomic Energy Agency (IAEA), the World Health Organization (WHO), and the International Commission on Radiological Protection (ICRP) to align Germany's radiation protection standards with global best practices. Notably, BfS emphasizes transparency and public participation in its regulatory processes, regularly publishing detailed reports, guidelines, and educational materials to keep the public informed. Through its comprehensive regulatory, scientific, and advisory functions, BfS serves as a pillar of radiation safety governance in Germany and a model agency in the global radiological protection community.

14.3.3. The Office for Nuclear Regulation (ONR)

is the United Kingdom's independent nuclear regulatory authority, responsible for ensuring the safety and security of nuclear operations, including the protection of workers, the public, and the environment from ionizing radiation. Established as a statutory public corporation in 2014 under the Energy Act 2013, the ONR operates independently of government, although it is accountable to the UK Parliament through the Department for Work and Pensions (DWP). ONR's regulatory functions encompass nuclear safety, nuclear security, safeguards, and transport of radioactive materials, as well as the enforcement of radiation protection legislation in alignment with both national law and international standards, such as those set by the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP). A critical part of ONR's work includes the implementation and oversight of the Ionising Radiations Regulations (IRR17), which govern occupational radiation protection in the UK, ensuring that exposures are justified, optimized (ALARP – As Low As Reasonably Practicable), and within established dose limits. The ONR conducts licensing, inspection, assessment, and enforcement activities at all nuclear licensed sites in the UK, including nuclear power stations, fuel cycle facilities, and waste repositories. It also ensures emergency preparedness and coordinates with other national and local authorities during radiological incidents. The ONR works closely with other UK agencies such as the Environment Agency, Public Health England (now part of the UK Health Security Agency), and the Health and Safety Executive (HSE), as well as with international partners to share best practices and maintain regulatory excellence. Through a risk-informed, transparent, and evidence-based regulatory approach, the ONR plays a central role in maintaining the UK's high standards of nuclear safety and radiation protection, contributing to national security and public confidence in the nuclear industry.

14.3.4. PHE AND STUK

Public Health England (PHE), now integrated into the UK Health Security Agency (UKHSA) as of 2021, played and continues to play a pivotal role in radiation protection and public health monitoring in the United Kingdom. Through its former Centre for Radiation, Chemical and Environmental Hazards (CRCE), PHE provided scientific expertise, policy advice, and health surveillance related to both ionizing and non-ionizing radiation. The agency was instrumental in assessing radiation risks, developing national dose reference levels, supporting emergency preparedness, and guiding safe practices in medical, industrial, and environmental radiation applications. PHE also managed the UK's national dosimetry services, provided training and consultancy to healthcare providers, and contributed to international radiological safety initiatives alongside organizations such as the World Health Organization (WHO) and the International Atomic Energy Agency (IAEA). Its ongoing functions under UKHSA continue to emphasize public protection, risk communication, and evidence-based policy development in the area of radiation safety. In Finland, the Radiation and Nuclear Safety Authority (STUK) is the country's central regulatory authority for radiation and nuclear safety. Established in 1958, STUK operates under the Ministry of Social Affairs and Health and is internationally recognized for its strong scientific and regulatory capacity. Its responsibilities include licensing, inspection, enforcement, radiation monitoring, and radiation dose assessment across sectors including nuclear power, medicine, industry, and research. STUK enforces national laws such as the Radiation Act and ensures compliance with international standards derived from the IAEA and ICRP. The authority operates Finland's national radiation monitoring network, oversees occupational and public exposure control, and manages preparedness for radiological emergencies. STUK is also deeply engaged in public education, stakeholder engagement, and scientific research, and regularly publishes technical reports and safety guides. Its collaborative approach with European and global radiation safety institutions has made STUK a model of excellence in integrated scientific regulation and public health protection.

14.3.5. The Atomic Energy Regulatory Board (AERB)

AERB is the national regulatory authority of India responsible for ensuring the safe use of ionizing radiation and nuclear energy across all civilian applications. Established in November 15, 1983 under the provisions of the Atomic Energy Act, 1962, AERB operates under the aegis of the Department of Atomic Energy (DAE) but functions as an independent statutory body to enforce safety regulations and protect workers, the public, and the environment from radiation hazards. The AERB's responsibilities include developing safety codes, guides, and standards based on both national requirements and international guidelines, particularly those from the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP). The Board regulates activities such as the construction, operation, and decommissioning of nuclear facilities, transport and storage of radioactive materials, and the use of radiation sources in medicine, industry, and research. It conducts site evaluations, safety assessments, licensing, inspections, and audits, and mandates the establishment of effective radiation protection programs and emergency preparedness plans. AERB also oversees the National Occupational Dose Registry, maintains a centralized e-licensing portal (eLORA) for radiation facilities, and promotes a strong safety culture through education, training, and outreach activities. The organization works in coordination with other Indian bodies such as the Bhabha Atomic Research Centre (BARC), Indian Medical Association (IMA), and public health authorities to enhance radiation awareness and safe practices nationwide. Additionally, AERB engages in international cooperation through participation in global forums and bilateral agreements, thereby reinforcing India's commitment to high standards of nuclear and radiological safety. With its science-based, transparent, and precautionary approach, the AERB serves as a pillar of India's radiation protection infrastructure, ensuring the sustainable and safe use of atomic energy for national development.

Role and responsibility: The Atomic Energy Regulatory Board (AERB) plays a pivotal role in ensuring the safe, secure, and peaceful use of ionizing radiation and nuclear energy in India. Established under the Atomic Energy Act, 1962, AERB's responsibilities span across all phases of nuclear and radiation facility operations—from site selection and design to construction, operation, and eventual decommissioning. The Board formulates safety policies, codes, and standards based on both national requirements and international best practices. AERB is responsible for issuing licenses, conducting regulatory inspections and audits, and ensuring compliance with

safety regulations. It plays a central role in radiation protection by overseeing the National Occupational Dose Registry, which tracks radiation exposure among workers. AERB also regulates the transportation, storage, and disposal of radioactive materials, ensuring environmental and public safety. Furthermore, it actively supports training, education, and public awareness on radiation safety. To streamline regulatory processes, AERB operates the eLORA portal, facilitating online licensing and tracking of radiation facilities. It also ensures emergency preparedness and response planning in collaboration with other government agencies and contributes to international efforts in nuclear safety through cooperation with organizations such as the IAEA. Through these multifaceted responsibilities, AERB acts as the guardian of radiation safety in India, fostering a strong safety culture and ensuring protection of people and the environment.

- **Regulatory Framework:** Develops and enforces safety policies, codes, and regulations for nuclear and radiation facilities.
- **Licensing Authority:** Grants licenses for siting, construction, commissioning, operation, and decommissioning of nuclear and radiation installations.
- **Inspections & Enforcement:** Conducts safety reviews, audits, inspections, and enforces compliance with regulatory requirements.
- **Radiation Protection:** Oversees the National Occupational Dose Registry to monitor radiation exposure among workers.
- **Transport & Waste Management:** Regulates the safe transport, storage, and disposal of radioactive materials and waste.
- **Emergency Preparedness:** Coordinates and supervises radiation emergency response and preparedness strategies.
- **Training & Awareness:** Promotes safety culture through training programs, workshops, and public awareness campaigns.
- **Digital Licensing:** Operates the eLORA (e-Licensing of Radiation Applications) system for streamlined regulatory processing.
- **International Cooperation:** Collaborates with global organizations like the IAEA to align with international safety standards.
- **Environmental Safety:** Ensures protection of the public and the environment from potential hazards of radiation and nuclear activities.



Government of India

AERB

Atomic Energy Regulatory Board

Radiation Safety Legal Framework in India

In India, radiation safety is governed through a comprehensive framework established under the Atomic Energy Act, 1962, and enforced primarily by the Atomic Energy Regulatory Board (AERB). While India does not have a singular “Radiation Safety Act,” the Atomic Energy Act serves as the foundational legislation that empowers the Central Government to control and regulate the use of atomic energy and radioactive substances in the country. Under this Act, the AERB was established in 1983 to develop and enforce safety standards related to ionizing radiation. The regulatory framework includes a series of rules, codes, and guidelines that govern radiation sources in medical, industrial, research, and nuclear energy sectors. Prominent among these is the Radiation Protection Rules, 2004, formulated under the Atomic Energy Act, which outlines provisions for the safe use, handling, and transport of radioactive materials and specifies duties for licensees, employers, and radiation workers. Additionally, the Environment (Protection) Act, 1986, and the Factories Act, 1948, also include provisions related to radiation hazards in workplaces and environmental protection. AERB also enforces the Ionising Radiation Rules through its digital platform eLORA, which ensures real-time regulation and monitoring of radiation sources and occupational exposures. Radiation protection in India is built around the core principles of justification,

optimization (ALARA), and dose limitation, in line with recommendations from the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA). India is also a party to several international treaties and conventions, which further influence domestic radiation safety legislation and practice. Through these integrated regulations and institutional mechanisms, India maintains a robust and evolving system for radiation safety and radiological protection across all sectors. Key Acts and Regulations Governing Radiation Safety in India are:

- **Atomic Energy Act, 1962:** Central legislation governing the development, control, and use of atomic energy and radioactive substances. Empowers the government to establish rules for radiation safety and control.
- **Radiation Protection Rules, 2004:** Issued under the Atomic Energy Act. Provides safety norms for handling radioactive materials and operating radiation facilities. Covers licensing, monitoring, disposal, and radiation worker protection.
- **Atomic Energy (Safe Disposal of Radioactive Waste) Rules, 1987:** Governs the safe disposal and management of radioactive waste materials.
- **Atomic Energy (Radiation Protection) Rules, 2004:** Specifies obligations of licensees, employers, and radiation workers. Focuses on radiation monitoring, medical surveillance, and training.
- **Environment (Protection) Act, 1986:** Ensures environmental safety from radiation hazards during industrial and nuclear operations.
- **Factories Act, 1948:** Contains provisions to protect workers from radiation hazards in factory settings.
- **Regulatory Authority:** Atomic Energy Regulatory Board (AERB) – develops safety standards and enforces radiation protection across sectors.
- **Digital Platform:** eLORA (e-Licensing of Radiation Applications) – facilitates online registration, licensing, and monitoring of radiation practices.

Table: 14.1. Functions of AERB

S. No.	Function	Description
1.	Regulation and Licensing	Grants licenses for setting up and operating nuclear and radiation facilities across sectors.
2.	Safety Standards Development	Develops safety codes, guides, and manuals in alignment with international guidelines (IAEA, ICRP).
3.	Inspections and Compliance	Conducts inspections, audits, and safety assessments; enforces regulatory compliance.
4.	Radiation Protection	Ensures radiation exposure remains within prescribed limits for workers, public, and the environment.
5.	Emergency Preparedness and Response	Coordinates emergency planning and response to radiological/nuclear incidents with relevant agencies.
6.	Incident Reporting and Analysis	Monitors, investigates, and analyzes radiation-related incidents to improve safety practices.
7.	Training and Public Awareness	Organizes educational programs, workshops, and outreach to promote safety culture and awareness.
8.	Research and Development (R&D)	Supports R&D activities in nuclear safety, radiation protection, and regulatory science.
9.	Digital Regulation (e-LORA)	Manages online registration, licensing, and tracking of radiation sources through the e-LORA portal.
10.	International Collaboration	Participates in global safety efforts and exchanges information with bodies like the IAEA and UNSCEAR.

A Code of Ethics is a formal set of principles, values, and standards that guide the behaviour, actions, and decision-making of individuals or organizations. It serves as a moral compass, outlining what is considered right, fair, and responsible conduct in a professional or organizational setting. In simpler terms, a Code of Ethics tells people:

- How to act ethically and professionally
- What is acceptable and unacceptable behaviour

- How to handle conflicts of interest, fairness, honesty, and responsibility

The Atomic Energy Regulatory Board (AERB) adheres to a strong Code of Ethics that underpins its regulatory functions and professional conduct. This ethical framework ensures that all decisions and actions taken by the Board and its personnel are guided by integrity, transparency, independence, accountability, and public interest. AERB's ethical code emphasizes the need for unbiased and objective regulation, free from any conflict of interest, political influence, or external pressure. Its personnel are expected to maintain professional competence and make decisions based on sound scientific and technical evidence, in alignment with national legislation and international safety standards. Confidentiality and information security are essential components, ensuring sensitive data is protected while maintaining transparency in public communication. The Board promotes openness and stakeholder engagement, ensuring that safety-related information is accessible and understandable to the public, thereby fostering trust. AERB officials are required to uphold human rights, environmental protection, and ethical responsibility in all radiation and nuclear-related regulatory activities. Furthermore, the organization fosters a safety culture by encouraging honesty, continuous learning, ethical decision-making, and the reporting of safety concerns without fear of retaliation. Overall, the AERB Code of Ethics is foundational in building and maintaining a credible, competent, and trustworthy regulatory body in India's nuclear domain.

Table: 14.2. AERB Code of Ethics

S. No.	Ethical Principle	Description
1.	Integrity and Honesty	Ensuring actions and decisions are guided by honesty and moral responsibility.
2.	Independence	Functioning free from political, commercial, or other undue influence.
3.	Accountability	Accepting responsibility for decisions and being answerable to the public and stakeholders.
4.	Transparency	Providing clear, accurate, and timely information while maintaining confidentiality where needed.
5.	Scientific and Technical Rigor	Basing all decisions on verified data, established science, and global best practices.
6.	Conflict of Interest Avoidance	Avoiding situations where personal or financial interests may compromise regulatory neutrality.
7.	Confidentiality	Safeguarding sensitive data while ensuring openness in public communication.
8.	Stakeholder Engagement	Encouraging dialogue with industries, professionals, and the public on safety matters.
9.	Promotion of Safety Culture	Encouraging reporting, learning, and ethical practices in radiation and nuclear safety management.
10.	Respect for Human Rights and Environment	Ensuring protection of people and ecosystems from radiation risks.

Relation between AERB and BARC: The Atomic Energy Regulatory Board (AERB) and the Bhabha Atomic Research Centre (BARC) are both key institutions under India's Department of Atomic Energy (DAE), but they serve fundamentally different roles. BARC is the country's premier nuclear research organization, responsible for the development and operation of nuclear technology for peaceful purposes, including power generation, medical applications, and scientific research. Established in 1954, BARC designs and operates nuclear reactors, conducts advanced research, and supports India's nuclear energy program. On the other hand, AERB, established in 1983, functions as the regulatory authority for nuclear safety in India. Its primary role is to ensure that all nuclear and radiation facilities in the country, including those operated by BARC, comply with safety standards and regulations. AERB sets these standards, grants licenses, and conducts inspections and safety reviews. Although both organizations are part of the DAE, AERB operates independently in its regulatory functions to maintain objective oversight. In essence, while BARC acts as the operator and developer of nuclear technologies, AERB serves as the watchdog that ensures those technologies are used safely and responsibly.

14.3.6. The National Council on Radiation Protection and Measurements (NCRP)

The National Council on Radiation Protection and Measurements (NCRP) is a prominent non-profit organization based in the United States that plays a vital role in the field of radiation protection. Established in 1964 through a charter granted by the U.S. Congress, the NCRP serves as an authoritative body that provides scientifically grounded guidance and recommendations on radiation protection, radiation measurements, and the safe use of radiation in various fields, including medicine, industry, environmental protection, and national security. The organization builds upon its predecessor, the National Committee on Radiation Protection and Measurements, which was formed in 1929. The primary objective of the NCRP is to formulate and disseminate information, guidance, and recommendations on radiation protection that promote the safety of workers, patients, the public, and the environment. While the NCRP does not possess regulatory authority, its reports and recommendations are widely respected and often used by regulatory agencies such as the U.S. Nuclear Regulatory Commission (NRC), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA) to develop safety standards and regulations.



National Council on Radiation Protection and Measurements

NCRP's work covers a broad spectrum of topics, including the biological effects of ionizing radiation, occupational exposure, medical imaging safety, radiation dosimetry, emergency preparedness for radiological incidents, and environmental radiation monitoring. One of the council's key contributions has been the development of dose limits and safety protocols that are aligned with the ALARA (As Low As Reasonably Achievable) principle. These recommendations are developed through expert scientific committees composed of leading researchers, health physicists, medical physicists, and other radiation professionals. In addition to publishing comprehensive technical reports, NCRP also organizes educational events, symposia, and conferences to raise awareness and promote continuous learning in the field of radiation protection. The council's publications are highly regarded and often serve as reference material for healthcare institutions, academic research, and regulatory decision-making. Overall, the NCRP plays an indispensable role in enhancing radiation safety practices, supporting informed policymaking, and fostering a culture of protection and responsibility in the use of radiation across various domains. Some other important organizations working in the field of radiology and radiation protection, beyond just the government-level (national/international):

Table: 14.3. Some Other Organisations

S. No.	Organization	Full Name	Role/Contribution
1	RSNA	Radiological Society of North America	Advances radiology through education, research, and hosts the world's largest radiology conference.
2	ACR	American College of Radiology	Develops practice standards, accreditation, and clinical guidelines in radiology.
3	SNMMI	Society of Nuclear Medicine and Molecular Imaging	Focuses on nuclear medicine education, research, and safety guidelines.
4	IRIA	Indian Radiological and Imaging Association	Main professional body for Indian radiologists; conducts CMEs, conferences, and promotes academic growth.
5	ESR	European Society of Radiology	Enhances collaboration and education in radiology across Europe; conducts the ECR congress.
6	BIR	British Institute of Radiology	Supports multidisciplinary collaboration in imaging and radiation sciences.

7	CAR	Canadian Association of Radiologists	Promotes imaging standards, health policy advocacy, and research in Canada.
8	SPR	Society for Pediatric Radiology	Dedicated to advancing pediatric imaging and promoting radiation safety in children.
9	ISRT	Indian Society of Radiographers and Technologists	Represents radiographers and technologists; promotes education, training, and safety in radiologic practice.
10	AMPI	Association of Medical Physicists of India	Supports medical physicists in radiology and radiation therapy; works with AERB on training and standards.
11	ISR	International Society of Radiology	Promotes global cooperation and radiology education, especially in developing countries.

End of Chapter

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