

Sustaining Global Best Practices in Uranium Mining and Processing

Principles for Managing Radiation,
Health and Safety,
Waste and the Environment





World Nuclear Association Policy Document:

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INTRODUCTION

The worldwide community of professionals engaged in uranium mining and processing recognizes that managing radiation, health and safety, waste and the environment is of paramount importance for the protection of workers, the public and the environment. This recognition – and the acceptance of commensurate responsibility – is fundamental to our vision, values and measures of success.

Such responsible management of uranium mining and processing projects applies at all stages of planning and activities – from exploration through development, construction and operations, and on to decommissioning. Today we are acting to ensure that all parties directly involved in uranium mining and processing – including operators, contractors, and regulators – strive to achieve the highest levels of excellence in these fields of management. We are doing so by sustaining a strong safety culture based on a commitment to a framework of common, internationally shared principles.

These international principles build on – and are complementary to – the World Nuclear Association's (WNA) “Charter of Ethics” and the WNA's “Principles of Uranium Stewardship”. (Texts appear in Annexes 1 and 2.)

The WNA Charter of Ethics is founded on our belief “... that sustainability must be the guiding principle of global development – requiring worldwide policies that meet the needs and aspirations of the present generation without compromising the opportunity of future generations to fulfil their needs and aspirations”.

The WNA Principles of Uranium Stewardship focus on the commodity on which nuclear energy is based. These principles embody best practice and ethical conduct for the entire global nuclear industry – including uranium miners, equipment suppliers, service providers, and generators of electricity. A WNA programme of Uranium Stewardship is based on our commitment to ensure that uranium and its by-products are managed so as to combine safety, environmental responsibility, sound economics and social acceptability.



This document sets out principles for the management of radiation, health and safety, waste and the environment applicable to sites throughout the world. In national and regional settings where activities of the nuclear fuel cycle have reached advanced stages of development, these principles already serve as the underpinning for “Codes of Practice” that govern uranium mining and processing¹. In any given setting, a Code of Practice is needed to guide practical implementation of these principles according to the regional, national or site-specific context.

We publish these principles in the belief that they hold special relevance for emerging uranium producing countries that do not yet have fully developed regulations for the control of radiation, health and safety, waste and the environment associated with uranium mining and processing.

The principles – aimed at sustaining already well-established best practices throughout a widening global industry – are equally relevant for operators, contractors, and regulators newly engaged in uranium mining and processing. Moreover, experience shows that close cooperation among these three parties is a key to successful management of radiation, health and safety, waste and the environment.

While the independence of regulators is clearly and unarguably essential to their function, the very existence of these regulatory agencies derives from governmental recognition that uranium mining can provide socially beneficial results. Thus, the ultimate purpose of such regulators is to enable mining and processing in compliance with acceptably high standards.

Of course, each principle affirmed here will not apply to the same extent for each party. For example, general responsibility for installations and sites lies fundamentally with operators, who must accept overall responsibility for the performance of contractors. Ultimately, the precise allocation of responsibilities must be set at the national and local levels.

Once national regulations are fully developed, they can be expected to embody the principles enunciated in this document. During any transition period during which regulatory rules and regimes are not yet fully formed, these principles should still be applied.

This document holds the status of a policy and ethical declaration by the full WNA membership, which encompasses most of the wide range of enterprises that comprise the global nuclear industry – from uranium miners, to equipment suppliers, service providers, and generators of electricity. In the category of uranium miners, the WNA membership includes all major uranium mining and processing companies as well as many mid-size and junior companies.

The principles affirmed here are supported by key relevant international organizations, including the International Atomic Energy Agency. Indeed, these principles have been affirmed as an outgrowth of an IAEA cooperation project aimed at encouraging expanded exchanges between professionals from governments and industry. These principles are also supported by the global mining community through relevant international and national associations that cover uranium mining and processing. (Supporting organizations are listed in Annex 4.)

¹ As used herein, the term “uranium mining and processing” includes all supporting activities from exploration, to waste management and disposal, site decommissioning, remediation and closure.



PRINCIPLE 1: ADHERENCE TO SUSTAINABLE DEVELOPMENT

Conduct all aspects of uranium mining and processing with full adherence to the principles of sustainable development as set forth by the International Council on Mining and Metals. (The ICMM principles appear in Annex 3.) Apply these principles with emphasis on excellence in professional skills, transparency in operations, accountability of management, and an overarching recognition of the congruency of good business and sound environmental practices.

Discussion:

In establishing its sustainable development principles, the ICMM adopted the landmark definition of that term advanced by the Brundtland Commission: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs". To this the ICMM added: "In the mining and metals sector... investments should be financially profitable, technically appropriate, environmentally sound and socially responsible".

In emphasizing the practical necessity of financial profitability, the ICMM underscored that economic profitability and sustainable development, far from being at odds, must be consistent and reinforcing goals. This congruency of purpose is reflected in the ICMM commitment to "seek continual improvement in performance and contribution to sustainable development so as to enhance shareholder values".

PRINCIPLE 2: HEALTH, SAFETY AND ENVIRONMENTAL PROTECTION

In all management practices, ensure adequate protection of employees, contractors, communities, the general public, and the environment, as follows:

Mining Safety – Ensure safe, well maintained site conditions for the protection of employees and the public from all conventional mining hazards, including those related to airborne contaminants, ground stability and structure, geological and hydro-geological conditions, storage and handling of explosives, mine flooding, mobile and stationary equipment, ingress and egress, and fire.

Radiation Safety – Comply with the principles of Justification, Optimization and Limitation, as follows:

- ▶ **Justification:** Authorize the introduction of any new practice involving radiation exposure, or the introduction of a new source of radiation exposure within a practice, only if the practice can be justified as producing sufficient benefit to the exposed individuals or to society to offset any potential radiation harm.
- ▶ **Optimization and Limitation.** Optimize radiation exposure to as low as reasonably achievable, taking into account all socio-economic factors. Ensure compliance with the occupational and public dose limits laid down by the appropriate national and international regulatory and advisory bodies. In so doing, classify, according to risk, site personnel and work areas that are subject to radiation exposure. Plan and carefully monitor employee and contractor doses, radioactive discharges and emissions as well as resulting environmental concentrations and exposure rates. Estimate potential radiological impacts on the public and the environment.



Personal Protective Equipment – Ensure that employees and visitors are provided personal protective equipment (PPE) appropriate for the hazard being controlled and compliant with relevant standards or specifications to control exposure to safe levels. Ensure that relevant personnel remain properly trained on the use and maintenance of this equipment.

Ventilation – Ensure that workplaces are adequately ventilated and that airborne contaminants are minimized in workplaces. Pay particular attention to controlling radon and related radiation exposures in uranium mines and processing facilities.

Water Quality – Develop and implement site-specific water management practices that meet defined water-quality objectives for surface and ground waters (focusing particular attention on potable water supplies). Subject water-quality objectives to periodic review to ensure that people and the environment remain protected.

Environmental Protection – Overall, avoid the pollution of water, soil and air; optimize the use of natural resources and energy; and minimize any impact from the site and its activities on people and the environment. In so doing, include considerations of sustainability, bio-diversity and ecology in guarding against environmental impact.

PRINCIPLE 3: COMPLIANCE

Support the establishment of a suitable legal framework and relevant infrastructure² for the management and control of radiation, occupational and public health and safety, waste and the environment. Ensure that all activities are authorized by relevant authorities and conducted in full compliance with applicable conventions³, laws, regulations and requirements, including in particular the Safety Standard Principles of the International Atomic Energy Agency (IAEA). Do so with careful consideration to the applicable IAEA Safety Standards. In recognition that effective interaction of operators (including contractors) and the appropriate regulatory authorities is essential to safety, ensure that operators and contractors are licensed, having met the requirement of relevant authorities.

PRINCIPLE 4: SOCIAL RESPONSIBILITY

At all stages of uranium mining and processing, properly inform – and seek, gain and maintain support from – all potentially affected stakeholders, including employees, contractors, host communities, and the general public. Establish an open dialogue with affected stakeholders, carefully consider their views, and provide feedback as to how their concerns are addressed.

(See the WNA Charter of Ethics in Annex I and, in Principle 6 herein, the text on Environmental Impact Assessment.)

² A legal framework and infrastructure must address all relevant regulatory aspects of mining and processing legislation.

³ Among these conventions are relevant International Labour Organization (ILO) conventions and the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.



PRINCIPLE 5: MANAGEMENT OF HAZARDOUS MATERIALS

Manage and dispose of all hazardous materials (radioactive or non-radioactive) – including products, residues, wastes and contaminated materials – in a manner that is safe, secure and compliant with laws and regulations.

Management of Hazardous Wastes and Contaminated Materials – Act systematically to establish and implement controls to minimize risks from such wastes and contaminated materials.

Take actions to maintain and treat sources of hazardous materials on-site wherever it is practicable to do so. Control and minimize any releases into the environment, using carefully planned strategies that involve pollution control technologies, robust environmental monitoring, and predictive modelling to ensure that people and the environment remain well protected. Rely where possible on proven, best-available, industry-scale technologies.

- ▶ Focus particular attention on managing ore stockpiles and such potentially significant sources of contamination as waste rock, tailings, and contaminated water or soils. With tailings, concentrate special effort on the design and construction of impoundments and dams and on the application of a recognized tailings management system for operations, monitoring, maintenance and closure planning. Use risk analysis and controls to account for current and long-term stability of waste repositories and containment.
- ▶ As an integral aspect of mining and processing, characterize ore and waste rock. Consider the geochemistry and assess the risk of acid rock drainage (ARD)⁴; where ARD could occur, develop an ARD management plan which accounts for ARD-producing ore, reject materials and gangue, and which provides for appropriate scheduling of mining, stockpile segregation, processing and contaminant containment. Use effective containment designs to ensure against long-term liability from ARD-producing rock.
- ▶ Use all opportunities to reduce the creation of hazardous wastes and contaminated materials⁵. To the extent practicable, recover, recycle and re-use such wastes and materials, regarding waste disposal as a last-resort option. From each site, control the release or removal of wastes and contaminated materials, using a chain-of-custody approach where needed. Safely manage all off-site streams for hazardous materials and contaminated wastes.

⁴ Acid Rock Drainage is the property of certain rock to generate acid that can in turn release contaminants (e.g. metals).

⁵ This does not apply to tailings and waste rock, which require specific management and disposal measures.



PRINCIPLE 6: QUALITY MANAGEMENT SYSTEM

Employ a recognized quality management system – including the quality-assurance steps of Plan, Do, Check and Act (PDCA) – in administering the management of all activities pertinent to radiation, health and safety, waste and the environment.

Planning – At all development and operational stages, plan for the management of radiation, health and safety, waste and the environment. With the constant goal of avoiding risk and optimizing the use of natural resources and energy, update such plans regularly, and particularly in response to any significant change in activities or site conditions. Include, as a central element in such plans, steps for the control of emergencies and unplanned events. Ensure that plans are well documented and communicated.

- ▶ In developing a uranium mining or processing project, prepare a formal Environmental Impact Assessment (EIA) that deals with all questions and concerns related to radiation, occupational and public health and safety, waste and the environment, as well as socio-economic impact. Submit the EIA as part of the public review process so as to provide response opportunities for stakeholders, especially the workforce and host communities. During the life of a project, prepare further EIAs if and as warranted by new circumstances.

Risk Management – Apply risk assessment and management procedures to radiation, occupational and public health and safety, waste and the environment.

- ▶ Identify, characterize and assess all risks that can impact on health, safety and environmental protection.
- ▶ Mitigate risks with controls in engineering, administration and other protective measures. Apply a hierarchy of risks and controls.
- ▶ Monitor risks and take timely action to offset the emergence of new risks. Regularly review performance to improve procedures, further reduce risk, detect weaknesses and trigger corrective measures.
- ▶ Document and report relevant data, and maintain records in compliance with regulatory requirements. Place special emphasis on data required and acquired by the quality assurance management system.

PRINCIPLE 7: ACCIDENTS AND EMERGENCIES

Identify, characterize and assess the potential for incidents and accidents, and apply controls to minimize the likelihood of occurrence. Develop, implement and periodically test emergency preparedness and response plans. Ensure the availability of mechanisms for reporting and investigating all incidents and accidents so as to identify "root cause" and facilitate corrective actions.



PRINCIPLE 8: TRANSPORT OF HAZARDOUS MATERIALS

Package and transport all hazardous materials (radioactive and non-radioactive) – including products, residues, wastes, and contaminated materials – safely, securely, and in compliance with laws and regulations. With radioactive materials, adhere to IAEA Regulations for the Safe Transport of Radioactive Material, relevant IAEA Safety Guides, applicable international conventions, and local legislation.

PRINCIPLE 9: SYSTEMATIC APPROACH TO TRAINING

In each area of risk, provide systematic training to all site personnel (employees and contractors) to ensure competence and qualification; include in such training the handling of non-routine responsibilities. Extend such training, where appropriate, to visitors and relevant persons in communities potentially affected by these risks. Regularly review and update this training.

PRINCIPLE 10: SECURITY OF SEALED RADIOACTIVE SOURCES AND NUCLEAR SUBSTANCES

Ensure the security of sealed radioactive sources and nuclear substances⁶, using the chain-of-custody approach where practicable and effective. Comply with applicable laws, international conventions and treaties, and agreements entered into with stakeholders on the safety and security of such sources and substances.

PRINCIPLE 11: DECOMMISSIONING AND SITE CLOSURE

In designing any installation, plan for future site decommissioning, remediation, closure and land re-use as an integral and necessary part of original project development. In such design and in facility operations, seek to maximize the use of remedial actions concurrent with production. Ensure that the long-term plan includes socio-economic considerations, including the welfare of workers and host communities, and clear provisions for the accumulation of resources adequate to implement the plan. Periodically review and update the plan in light of new circumstances and in consultation with affected stakeholders. In connection with the cessation of operations, establish a decommissioning organization to implement the plan and safely restore the site for re-use to the fullest extent practicable. Engage in no activities – or acts of omission – that could result in the abandonment of a site without plans and resources for full and effective decommissioning or that would pose a burden or threat to future generations.

⁶ For uranium mining and processing, the relevant nuclear substance is natural uranium because it contains the fissile isotope uranium-235.



ANNEXES

Annex 1 - WNA Charter of Ethics

Annex 2 - WNA Principles of Uranium Stewardship

Annex 3 - International Council of Mining and Metals (ICMM) Sustainable Development Principles

Annex 4 - Supporting Organizations



Annex I

WNA Charter of Ethics

The World Nuclear Association established its Charter of Ethics to serve as a common credo amongst Member organizations. This affirmation of values and principles summarizes the responsibilities of the nuclear industry and the surrounding legal and institutional framework that has been constructed through international cooperation to fulfil President Eisenhower's seminal vision of 'Atoms for Peace'. The text follows:

We, the Members of the World Nuclear Association, affirm:

Premises

- ▶ Our belief that sustainability must be the guiding principle of global development - requiring worldwide policies that meet the needs and aspirations of the present generation without compromising the opportunity of future generations to fulfil their needs and aspirations;
- ▶ Our confidence that nuclear power is a 'sustainable development' technology because its fuel will be available for multiple centuries, its safety record is superior among major energy sources, its consumption causes virtually no pollution, its use preserves valuable fossil resources for future generations, its costs are competitive and still declining, and its waste can be securely managed over the long-term;
- ▶ Our conviction that nuclear technology is a unique and indispensable tool of sustainable global development -
 - Unparalleled in its capacity to generate electricity cleanly, safely and on a large scale for a rapidly expanding world population whose future depends on the availability of environmentally sound energy resources; and
 - Highly beneficial and cost-effective in worldwide efforts to promote agricultural productivity, eradicate virulent pests, protect livestock health, preserve food, develop water resources, enhance human nutrition, improve medical diagnosis and treatment, and advance environmental science;
- ▶ Our recognition that nuclear science is proving equally valuable in supporting industrial societies and in helping the world's poorest countries to advance;
- ▶ Our keen awareness of the need to strengthen and sustain public confidence, both in the reliability of nuclear technology and in the people and institutions responsible for its use;

Principles

- ▶ Our commitment to ensuring that nuclear technology is used safely and peacefully;
- ▶ Our resolve to prevent and expose unsafe or illicit practices regarding nuclear material and to use all necessary precautions to protect individuals, society and the environment from any harmful radiological effects arising from nuclear material during use, storage, transport and waste disposal;
- ▶ Our adherence to the principle and practice of transparency regarding all types of civil nuclear activity, insofar as there exists a demonstrable public interest in the availability of such information and consistent with the public interest in protecting:
 - Commercially valuable knowledge; and
 - The confidentiality integral to full and candid participation in voluntary systems of review and exchange designed to enhance and maintain nuclear safety;



- ▶ Our strong support for the work performed -
 - By governments, through the International Atomic Energy Agency (IAEA), to promulgate nuclear safety standards for the worldwide nuclear industry and to ensure that there has been no spread of nuclear weapons arising from the civil nuclear fuel cycle; and
 - In industry, through the World Association of Nuclear Operators (WANO), to develop and maintain, using a comprehensive system of technical exchange and operational peer review, a rigorous safety culture at nuclear facilities worldwide;

International Legal Obligations

- ▶ Our individual and common responsibility to uphold respective international legal commitments embodied in -
 - The IAEA statute; safeguards agreements concluded pursuant to the Treaty on the Non-Proliferation of Nuclear Weapons; and regional and bilateral accords providing for IAEA verification;
 - The Convention on Nuclear Safety; the Convention on the Physical Protection of Nuclear Material; the Convention on Early Notification of a Nuclear Accident; the Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency; the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter; and the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management; and
 - Other international treaties and conventions that contribute to ensuring the safe and peaceful use of nuclear technology throughout the world;

Public Policy

- ▶ Our intention to cooperate, in a spirit of partnership, with those engaged in the research, development and operation of other technologies that yield energy without adverse effect on the biosphere; and
- ▶ Our determination to promote, as a matter of ethical principle and urgent public need, an ongoing debate on energy resources that focuses citizens and governments alike on the real choices facing humankind and on the severe dangers - for the prospects of global development and for the biosphere - if decision-making on this fundamental policy is shaped by ideology and myth rather than by science and facts.



Annex 2

WNA Principles of Uranium Stewardship

Uranium Stewardship is a WNA programme of action based on a continued commitment by responsible enterprises to ensure that uranium and its by-products are managed in a manner that is safe, environmentally responsible, economical and socially acceptable.

A key mission of the Uranium Stewardship programme is to earn public trust for the global nuclear fuel cycle through the continued replacement of standard practice with best practice.

Recognizing that uranium stewardship is a responsibility shared by enterprises in every sector in the nuclear fuel cycle, we, the members of the World Nuclear Association, commit ourselves to:

1. The safe and peaceful use of nuclear technology
2. Continual improvement of our health, safety, security and environmental performance to minimize the impact of our activities on people and the environment
3. Recognition of fundamental human rights
4. Contribute to social and economic development of the regions where we operate
5. Open, honest and transparent communication
6. Operate ethically with sound corporate governance
7. Share knowledge to encourage widespread adoption of best practices
8. Act responsibly in the areas that we manage and control, and share our concern in other sectors of the nuclear fuel cycle
9. Provide responsible sourcing, use and disposition of uranium and all its by-products
10. Act as an industry to regularly review, update and communicate to our stakeholders our progress in implementing these principles.



Annex 3

International Council of Mining and Metals (ICMM) Sustainable Development Principles

1. Implement and maintain ethical business practices and sound systems of corporate governance.
2. Integrate sustainable development considerations within corporate decision-making process.
3. Uphold fundamental human rights and respect cultures, customs and values in dealing with employees and others who are affected by our activities.
4. Implement risk management strategies based on valid data and sound science.
5. Seek continual improvement of our health and safety performance.
6. Seek continual improvement of our environmental performance.
7. Contribute to conservation of biodiversity and integrated approaches to land use planning.
8. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products.
9. Contribute to the social, economic and institutional development of the communities in which we operate.
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

Annex 4

Supporting Organizations

WNA MEMBERSHIP

Within the WNA membership, the following uranium mining and processing companies account for more than 90% of worldwide uranium mining production:

Areva
Atomergoprom
BHP Billiton
Cameco
Kazatomprom
Navoi
Nufcor-AngloGold Ashanti
Paladin Resources
Rio Tinto
Uranium One

OTHER ORGANIZATIONS

International Atomic Energy Agency
International Council on Mining and Metals
Australian Uranium Association
Mining Association of Canada
Namibia Chamber of Mines
National Mining Association, USA

The World Nuclear Association is the international private-sector organization **supporting the people, technology, and enterprises** that comprise the global nuclear energy industry.

WNA members include the full range of enterprises involved in producing nuclear power – from uranium miners to equipment suppliers to generators of electricity.

With a secretariat headquartered in London, the **WNA serves as a global forum** for industry experts and as an authoritative information resource on nuclear energy worldwide.

World Nuclear Association

Carlton House • 22a St. James's Square • London SW1Y 4JH • UK

tel: +44(0)20 7451 1520 • fax: +44(0)20 7839 1501

www.world-nuclear.org • info@world-nuclear.org

