



**Application of the United Nations Framework Classification  
for Resources and the United Nations Resource Management  
System: Use of Nuclear Fuel Resources for Sustainable  
Development – Entry Pathways**

**A report prepared by the Expert Group on Resource Management  
Nuclear Fuel Resources Working Group**

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## Note

This report was prepared within the context of the work of the Expert Group on Resource Management (EGRM) of the United Nations Economic Commission for Europe (UNECE). The technical integrity of the report has been reviewed by experts at the International Atomic Energy Agency (IAEA), Organisation for Economic Co-operation and Development Nuclear Energy Agency (OECD-NEA) and World Nuclear Association (WNA).

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## Preface

The 2030 Agenda for Sustainable Development (2030 Agenda), adopted by all United Nations Member States in 2015, provides a blueprint for peace and prosperity for people and the planet, now and into the future. While some progress is visible, overall action to meet the 2030 Agenda is not advancing at the speed or scale required. The world had agreed to make 2020 the year to usher in a decade of ambitious action to deliver the Sustainable Development Goals (SDGs) by 2030. Unfortunately, the end of 2019 brought a more urgent challenge in the form of the Covid-19 pandemic, which is not only causing substantial human suffering, but also is grinding the global economy to a halt.

With possible economic stress caused by the pandemic, there could be a push to adopt solutions that undermine sustainable development and aggravate the impacts of climate change. An essential understanding of the technologies that can lead towards a green recovery is needed. The context for such understanding can be provided by the United Nations Framework Classification for Resources (UNFC) and the United Nations Resource Management System (UNRMS) that is being developed to complement UNFC. Both UNRMS and UNFC are offered as tools to support countries in meeting the SDGs, notably for affordable, clean energy and for climate action.

The focus of this report is on the need expressed by decision and policy makers in a number of countries worldwide who are exploring nuclear energy as part of a portfolio of options and including the utilization of local uranium resources in supporting sustainable development. Some countries choose to pursue nuclear energy with the view that it can play an important role in their energy mix, while other countries have decided not to depend on nuclear energy for a variety of reasons.

An earlier report, *Redesigning the Uranium Resource Pathway*<sup>1</sup>, which was developed by the Nuclear Fuel Resources Working Group of the Expert Group on Resource Management and published by the United Nations Economic Commission for Europe in 2019, examined new approaches to uranium resource recovery and valorisation. The current report complements *Redesigning the Uranium Resource Pathway* and focuses on how best to use that resource, whether within the context of a national nuclear energy programme, or perhaps as part of regional cooperation for balanced, sustainable energy provision, or within the context of international initiatives for sustainable development and climate action.

It is hoped that this report would provide a touchstone for future United Nations projects on energy, such as the Carbon Neutrality Project. Successfully addressing climate change and other pressing environmental challenges while still achieving the economic growth necessary to improve the living standards of billions of people will require the use of all available low-carbon technologies, as well as technologies which have yet to be commercialized. This report can serve as a guide for the many countries that choose to deploy nuclear power as part of their sustainability pathway.

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<sup>1</sup> [Redesigning the Uranium Resource Pathway: Application of the United Nations Framework Classification for Resources for Planning and Implementing Sustainable Uranium Projects](#), ECE Energy Series No. 57, United Nations Economic Commission for Europe (August 2019)

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## Executive Summary

The world's energy sector is undergoing a profound transition. This transition is driven by the need to expand access to clean energy in support of socio-economic development, especially in emerging economies, while at the same time limiting the impacts of climate change, pollution and other unfolding global environmental crises. Fundamentally this transition requires a shift from the use of polluting energy sources towards the use of sustainable alternatives. The ongoing Covid-19 pandemic also reminds us of the importance of resilience in the energy system and is a profound motivation for countries to 'build back better'. There are many pathways to achieving this transition and each country will pursue its own route, taking into account its own endowment of natural resources as well as other local and regional factors. The UN's 2030 Agenda for Sustainable Development, distilled in the Sustainable Development Goals, has become an indispensable tool for decision makers concerned with navigating these difficult decisions.

This report explores the potential for nuclear energy as part of the energy portfolio and shows how the utilisation of local or regional uranium resources can provide a platform for sustainable development. Some countries have chosen to pursue nuclear energy with the understanding that it can play an important role in their energy mix, while other countries have yet to make a decision or currently have chosen not to depend on nuclear energy for a variety of reasons. This report meets a need expressed by global decision makers to better understand the role nuclear energy may play in the energy transition.

'Nuclear newcomers' are countries which are considering, planning for, or introducing nuclear energy into their energy mix. Around the world many nuclear newcomers are now making steady progress in their journeys to introduce nuclear energy while other countries are poised to embark upon that journey. This report illuminates some of the key options available to newcomers as well as some of the challenges. It also explores potential entry pathways in the context of local and regional factors, including the utilization of domestic uranium resources, which could facilitate nuclear energy and economic development by applying the United Nations Resource Management System (UNRMS). Key insights include:

- Nuclear energy is an indispensable tool for achieving the global sustainable development agenda. It has a crucial role in decarbonizing the energy sector, as well as eliminating poverty, achieving zero hunger, providing clean water, affordable energy, economic growth, and industry innovation. Improved government policy and public perception along with ongoing innovation will enable nuclear energy to overcome traditional barriers to deployment and expand into new markets.
- Nuclear energy entry pathways for newcomer countries align with the 2030 Agenda for Sustainable Development. Nuclear energy programmes, based on the IAEA's Milestones Approach, support national energy needs, socio-economic, and environmental goals, and can help countries meet international climate commitments.

- There are many sustainable options for implementing a nuclear fuel cycle and waste management strategy. Countries should adopt such strategies based on their needs (e.g. enhancing economic development and security of supply) as well as the presence of domestic mineral resources, technical capabilities, and the economic opportunities they see in the different fuel cycle options.
- Currently available nuclear reactor designs are based on mature and proven technologies that in some instances have been licensed to operate for 80 years. A range of designs are available, all of which offer high levels of safety and outstanding operating performance. They provide reliable, affordable and low-carbon electricity that will support a country in meeting its sustainable development goals.
- A wide range of small modular reactor and advanced reactor designs are currently under development, with some ready for near-term deployment. These offer enhanced flexibility and will be suitable for helping to decarbonize heat and transport as well as electricity – boosting sustainability even further.
- Nuclear innovation and the pursuit of so-called hybrid energy systems are the catalysts for integrated development and strengthening linkages between the nuclear sector and other clean energy technologies and non-energy sectors. Both current nuclear technologies and new reactor designs can provide high-quality heat for electricity, industry and transport cost-competitively with fossil fuel alternatives.
- There are many ways in which nuclear and renewable energy technologies complement each other for the common goal of delivering clean, affordable and reliable energy.
- For a nuclear programme to be successful, policy makers should prioritize: nuclear energy policy, electricity market design, international cooperation, regulatory harmonization, nuclear skills and supply chain development, project structuring and management, public engagement, and building diversity and inclusivity.

The UN Economic Commission For Europe (UNECE) has supported the region in developing its energy sources to aid economic recovery in the past. In the process, UNECE has developed numerous standards and best practices adopted by the region and beyond. The United Nations Framework Classification for Resources (UNFC) and the United Nations Resource Management System (UNRMS) provide a crucial energy system management platform. They offer a framework for the assessment of the various factors related to nuclear energy and the development of its fuel resource. Sustainable pathways for nuclear development emerge as part of the full consideration of the regulatory, social, technical, environmental and economic aspects of programmes, as well as national capability and capacity.

## Chapter 1 Introduction

Many countries embrace nuclear energy as a reliable, affordable and clean source of electricity that will play an increasingly important role in meeting the global energy and climate challenge. Other countries have decided not to depend on nuclear energy because of various considerations including cost and concerns over safety and radioactive waste management and disposal. Currently, there are about 440 nuclear power reactors operating in 32 countries that represent over 60 percent of the global population. A further 53 reactors are under construction in 19 countries.

There is wide variance in the outlook for nuclear energy development in different countries. In developed nations, nuclear energy is well-established and already makes a significant contribution to electricity supply (averaging roughly 20 percent of electricity supply across the OECD countries). The contribution of nuclear energy in these countries is relatively flat, with growth in some countries and withdrawal from nuclear energy in others. In developing countries and emerging economies nuclear energy represents less than 5 percent of electricity supply. Here interest in nuclear power is rising and deployment is accelerating, with several countries making rapid progress towards construction of their first nuclear power plants.

The term ‘nuclear newcomers’ refers to countries that are planning to introduce nuclear energy into their energy mix. Several of the newcomers are at an advanced stage and are making steady progress towards their infrastructure milestones, with firm intentions to build nuclear power plants in the future. An even greater number of countries can be described as ‘potential newcomers’ and are actively considering nuclear technology as a future solution to their energy challenges but have yet to make key decisions on whether to proceed. Roughly 28 newcomer countries are considering, planning or starting nuclear power programmes. The global outlook for nuclear energy depends on the progress of these newcomers, and especially those throughout Asia and Africa.



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