

# 2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons

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## Activities of the International Atomic Energy Agency relevant to article IV of the Treaty on the Non-Proliferation of Nuclear Weapons

### Background paper prepared by the Secretariat of the International Atomic Energy Agency

#### Executive summary

- The International Atomic Energy Agency (IAEA) has been a global intergovernmental organization for international cooperation in the peaceful uses of nuclear energy since its establishment in 1957 as an independent organization within the United Nations system. Starting with 68 member States in 1957, the Agency's membership had risen to 164 at the time of the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons and, as at 31 October 2021, it stood at 173.
- The present paper describes the activities of IAEA, in line with its statute and the decisions of its policymaking organs, relevant to the implementation of article IV of the Non-Proliferation Treaty and major achievements since the previous Review Conference in 2015. IAEA has endeavoured to fulfil its functions related to fostering international cooperation on the peaceful uses of nuclear energy.
- The coronavirus disease (COVID-19) pandemic that shook the world in 2020 had a significant impact on IAEA. The Agency remained proactive, quickly adapting to the challenging new circumstances to continue to carry out its functions. It successfully delivered on the largest technical cooperation project in its history to help countries to confront COVID-19. IAEA was also able to continue to deliver its programmatic activities with minimal disruption while giving full attention to the health and well-being of staff.

#### Introduction

1. At the 2010 Review Conference, States parties underlined “that IAEA activities in the field of technical cooperation, nuclear power and non-power applications contribute in an important way to meeting energy needs, improving health, combating poverty, protecting the environment, developing agriculture, managing the use of water resources and optimizing industrial process ... and that these activities, as well



as bilateral and other multilateral cooperation, contribute to achieving objectives set forth in article IV of the Treaty”.

2. In September 2015, the General Assembly adopted the 2030 Agenda for Sustainable Development, including the 17 Sustainable Development Goals. Science and technology are recognized as important enablers of the Goals. While IAEA contributes to all 17 Goals, nuclear and isotopic techniques make a more direct contribution to the following nine: zero hunger (Goal 2); good health and well-being (Goal 3); clean water and sanitation (Goal 6); affordable and clean energy (Goal 7); industry, innovation and infrastructure (Goal 9); climate action (Goal 13); life below water (Goal 14) and on land (Goal 15); and partnerships for the Goals (Goal 17).

3. Under the motto “Atoms for peace and development”, IAEA has continued to support its member States in attaining the Goals and improving the quality of lives of peoples. IAEA has also responded to regional or global emergencies such as the COVID-19 pandemic, the Ebola and Zika virus disease outbreaks and natural disasters.

4. The 2010 Review Conference, in its conclusions and recommendations for follow-on actions, called upon States parties to “ensure that, when developing nuclear energy, including nuclear power, the use of nuclear energy must be accompanied by commitments to and ongoing implementation of safeguards as well as appropriate and effective levels of safety and security, consistent with States’ national legislation and respective international obligations” (NPT/CONF.2010/50 (Vol. I), action 57). IAEA has continued to support member States, upon request, in enhancing their capacity to protect persons, property, society and the environment from ionizing radiation.

### **Activities of the Agency since the 2015 Review Conference**

#### **1. Non-power nuclear applications**

5. The peaceful application of nuclear science and technology has expanded in all spheres of life, including in food security, health care, natural resources management, industry, and research and development. The peaceful application of nuclear techniques is having a consistently increasing socioeconomic impact worldwide and offers solutions for addressing many of the emerging challenges. IAEA, through its 12 scientific research laboratories located in Austria and Monaco, continued to assist its member States in enhancing and increasing their capacity to contribute to achieving the Sustainable Development Goals.

#### *Ministerial Conference on Nuclear Science and Technology: Addressing Current and Emerging Development Challenges*

6. The IAEA Ministerial Conference on Nuclear Science and Technology, on the theme “Addressing current and emerging development challenges”, was held in 2018. The conference was attended by approximately 1,100 participants, including 54 ministers and other high-level officials from 137 member States and 15 organizations.

7. A ministerial declaration was adopted in which ministers recognized the important role of science, technology and innovation in addressing the current challenges and meeting the common goals of achieving sustainable development and protecting the environment in the context of the 2030 Agenda.

#### *Food and agriculture*

8. IAEA works together with the Food and Agriculture Organization of the United Nations (FAO), through the Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture, to support member States in the safe and appropriate use of nuclear science and technology for food security and sustainable agricultural development.

9. Initiatives have been taken to accelerate the development of practical techniques that use ionizing radiation generated by electrical machines rather than from radionuclides such as Co-60, and to facilitate their implementation. Coordinated research activities of IAEA developed new concepts for the integration of low energy electron beam and X-ray machines into commercial food irradiation.

10. Ensuring a safe and nutritious food supply is imperative for global public health. IAEA has assisted member States in the development and use of cost-effective analytical capabilities leveraging the comparative advantage of nuclear techniques such as radio receptor assays, isotope dilution methods and stable isotope measurements, with a new focus on field-deployable screening methods that can be applied in situations of crisis. These capabilities have been developed or enhanced in more than 50 member States, several of which have achieved accreditation to international (International Organization for Standardization) standards.

11. IAEA has helped member States to build mutation-breeding capacities to develop improved crop varieties with enhanced and stable productivity under adverse growth conditions such as rising global temperatures, frequent droughts and the increasing incidence/spread of diseases and pests. The mutagenesis of seed or plant material with gamma rays, X-rays, electron/proton/ion beams or cosmic radiation, combined with next-generation genomics and speed breeding technologies, now facilitates the development of new crop varieties at an increasingly fast pace.

12. IAEA has assisted member States with water-saving agriculture. Through research and development in its laboratory in Seibersdorf, Austria, it is now possible to combine a near-real-time web geographical information system tool to monitor landscape soil moisture using a cosmic-ray neutron sensor with remote sensing satellite imaging. This technique was tested in temperate (Austria) and semi-arid (Kuwait) environments, allowing soil moisture maps and water requirement information for irrigation management to be obtained at a scale useful for farmers.

13. With the spread of emerging and re-emerging animal and zoonotic diseases, spilling over to territories that had never been affected previously, IAEA has increased the pace of research and development for the early detection and rapid diagnosis of diseases. It has stepped up its on-the-ground assistance to member States through the dissemination of validated and verified standard operating procedures, equipment, consumable supplies and training courses to improve staff competences. IAEA has supported multiple member States in Africa (avian influenza H5N1, H5N8 and H7N9 from 2003 to date; Ebola virus from 2014 to 2018), Asia (Middle East respiratory syndrome in the Middle East in 2016), Europe (lumpy skin disease in 2016; African swine fever in 2018) and Latin America (Zika virus in 2016).

14. IAEA has continued to develop, test and refine the sterile insect technique against plant insect pests. It has also accelerated research and development activities to expand the use of the technique to disease-transmitting mosquitoes and its transfer to pilot projects in the IAEA member States. For greater impact, IAEA and the World Health Organization (WHO) started cooperation in 2019 to intensify research and development on the use of the technique to fight mosquito vectors carrying diseases such as dengue and the Zika virus.

15. Food and agriculture remained a top priority for member States, accounting on average for around 18.9 per cent of the technical cooperation programme each year. Farmers in Pakistan achieved a higher yield and a better market price for a new mutant variety of cotton, and a mutant variety of castor bean released in 2017 is generating additional income of around \$600 per hectare. Farmers in Indonesia, Malaysia, the Philippines and Viet Nam have boosted rice production in harsh climate conditions in the past five years. Utilizing the sterile insect technique, farmers in Thailand have

boosted durian and mangosteen production from 50 tons per year to 4,000 tons per year.

16. IAEA, through the technical cooperation programme, has trained a total of 8,289 food and agriculture professionals over the past six years, including 432 in the IAEA Seibersdorf laboratories and 7,857 through collaborating member State laboratories.

#### *Human health*

17. The IAEA programme on human health is dedicated to assisting member States in enhancing their capability to address needs related to nutrition and the prevention, diagnosis and treatment of non-communicable diseases such as cancer, cardiovascular diseases and neurological conditions.

18. To strengthen collective actions to combat malnutrition in all its forms, IAEA organized a symposium on the double burden of malnutrition in 2018 jointly with the United Nations Children's Fund and WHO. A global database on energy expenditure measurements was launched.

19. IAEA has joined the call by WHO for action to eliminate cervical cancer that was approved during the seventy-first session of the World Health Assembly, held in 2018. In 2019, IAEA and WHO launched a new road map towards a national cancer control programme. It sets out milestones which countries can follow in establishing nuclear medicine, diagnostic imaging and radiotherapy services. In March 2021, the WHO-IAEA interagency publication entitled "Technical specifications of radiotherapy equipment for cancer treatment" was released. IAEA has an active role in the Global Breast Cancer Initiative of WHO, launched in March 2020.

20. The IAEA dosimetry laboratory at its facilities in Seibersdorf provides calibration and comparison services for dosimetry instruments, as well as postal dosimetry audit services for radiotherapy machines that are used to treat cancer. Currently, more than 1,000 photon beams are being audited annually. High dose rate brachytherapy calibration services have been offered since 2020. The dosimetry laboratory took delivery of a linear accelerator in 2019. As a result, electron beam dosimetry audit services were introduced in July 2021.

21. IAEA published methodologies for comprehensive clinical audits to assess and help to improve radiation medicine processes. IAEA teams have assisted member States in conducting quality audits for radiation oncology, nuclear medicine practices, and diagnostic radiology improvement and learning.

22. IAEA has developed and maintained several databases aimed at gathering information on, inter alia, the global availability of radiation medicine equipment and professionals. The Doubly Labelled Water Database, launched in 2018, has been used in important analyses of metabolism, which help to better address obesity and related public health issues.

23. IAEA, through its technical cooperation programme, provided more than €120 million from 2015 to 2020 to assist countries in developing national cancer care and related services. During this period, it supported more than 500 projects related to cancer, nuclear medicine, radiopharmaceutical production and dosimetry worldwide.

24. In addition, IAEA, in close collaboration with its partners, is helping low- and middle-income member States to improve access to radiation medicine as part of a comprehensive cancer control approach. From 2015 to October 2021, 36 member States received integrated missions of the Programme of Action for Cancer Therapy review missions which assessed national cancer control needs and capacities. These reviews provide Governments with recommendations on the way forward in

addressing their cancer issues. As at October 2021, 105 review missions had been conducted in 92 member States.

25. IAEA provides assistance in the development of project proposals and bankable documents for fundraising in the area of cancer control. Under the IAEA-Islamic Development Bank Women's Cancers Partnership Initiative, a project document was approved for financing in the amount of \$80 million for improving the access to and quality of oncology services in several regions of Uzbekistan.

#### *Water resources*

26. Sustainable supplies of fresh surface water and groundwater are critical to meet the needs of a growing global population. Reliable scientific information is key to sound water management and to addressing the impact of aquifer overexploitation, water pollution, and climatic and land-use changes. Natural stable and radiogenic isotopes are powerful tools for remediating water pollution and for tracing important processes of the global water cycle from rainfall to the ocean, including water origin, aquifer replenishment, groundwater residence times, and the water balance of lakes, rivers and watersheds.

27. IAEA has helped member States to achieve water security using isotopic tools for the evaluation of surface water and groundwater. The Agency operates a modern isotope hydrology laboratory in Vienna, which develops new analytical and field methods and provides essential training and technical services to support member State laboratories. It has developed new low-cost isotope methods to allow member States to assess nutrient pollution impacts on surface water and groundwater. It has also assisted member States in using new noble gas radioisotope analyses to study the vulnerability of non-renewable fossil groundwater in the Sahel region, Eastern Europe and the transboundary Guarani Aquifer System in Brazil and Argentina. The Agency's global water isotope data networks have also supported member States in validating hydrological and climatic models.

28. A regional technical cooperation project to map water resources in the Sahel helped 13 countries to use isotopic techniques to assess groundwater origin and quality in five shared aquifers and basins, providing the first broad overview of the region's groundwater supplies.

#### *Environment*

29. Good environmental management underpinned by timely, accurate and relevant data is fundamental to the efforts of member States to attain the Sustainable Development Goals. Innovative nuclear and isotopic techniques help to better understand and address the most pressing environmental challenges. This includes the movement and fate of pollutants such as radionuclides, trace elements, organic pollutants and microplastics in the atmosphere and in coastal zone and marine ecosystems. It also includes the impacts of climate change and ocean acidification. IAEA conducts these activities at its Environment Laboratories in Monaco and Seibersdorf, which are unique within the United Nations system.

30. The IAEA Environment Laboratories help member States to trace elements and organic contaminants in environmental matrices by conducting comparisons and proficiency tests that involve 600 laboratories around the world. This enables member States to address various environmental challenges, update their analytical skills and capacities, and, through simulations of environmental emergencies, improve their emergency preparedness and response.

31. Over the past five years, IAEA has also developed and distributed a diverse inventory of certified reference materials or standards that serve as global benchmarks

for the accurate analysis of environmental samples. The worldwide Analytical Laboratories for the Measurement of Environmental Radioactivity network expanded from 149 laboratories in 2015 to 192 in 90 member States at the end of October 2021. IAEA Environment Laboratories also host the Ocean Acidification International Coordination Centre, which, by the end of 2020, had supported more than 850 global ocean acidification activities involving more than 575 scientists from more than 75 member States.

32. IAEA, in close collaboration with the United Nations Environment Programme and the Global Environment Facility, has intensified its efforts to support the implementation of the Minamata Convention on Mercury, a convention intended to protect human health and the environment from anthropogenic releases of mercury and mercury compounds.

33. IAEA support over the past decade, through several multi-year technical cooperation projects, has led to the emergence of a surveillance and response network of marine and coastal laboratories and research centres, mostly located in the Greater Caribbean region, that are working on topics related to environmental protection, seafood safety and human health, using nuclear and isotopic techniques.

#### *Radioisotope production and radiation technologies*

34. IAEA supports the production of radioisotopes and related products for health care and industry, and for industrial applications of radiation technologies.

35. Through a four-year coordinated research project finalized in 2019, IAEA brought together international experts from research and technological centres, museums and archives to explore and optimize the use of radiation technology to treat historical and valuable artefacts and, as a consolidation methodology, to preserve them with radiation-curable resins, using eco-friendly techniques that offer enhanced compatibility with the cultural heritage base materials.

36. With IAEA support through the technical cooperation programme, the Ruđer Bošković Institute in Croatia is now able to determine the age of more than 170 archaeological samples every year, using nuclear techniques. In addition, the Institute has been able to sterilize more than 5,000 artefacts over the past 20 years, rendering them free from biological contaminants, while in Brazil, over 20,000 artefacts have been preserved with the use of radiation techniques.

37. Efforts have been made to use non-destructive testing techniques after natural and human-made disasters, with the main objective of creating emergency centres around the world to quickly deploy equipment to evaluate the integrity of structures in affected areas.

#### *Renovation of the Nuclear Applications Laboratories*

38. The eight Nuclear Applications Laboratories located in Seibersdorf serve all IAEA member States through services, training and applied research that help the States to address development challenges in food and agriculture, human health, the environment and nuclear science. Work continued on a 2014 initiative, known as Renovation of the Nuclear Applications Laboratories, to modernize the laboratories. The project is now well advanced.

39. In June 2019, the Dosimetry Laboratory opened a new linear accelerator facility, strengthening its capacity to support cancer control worldwide. In October 2019, the Insect Pest Control Laboratory moved into a modern new building, advancing its cutting-edge research into pesticide-free control of invasive insect species that harm agriculture and human health. The new Yukiya Amano Laboratories building, named

after the late Director General, opened for operation in June 2020 and houses three additional laboratories.

40. In September 2020, the Director General, Rafael Mariano Grossi, launched the final phase of the initiative, known as Renovation of the Nuclear Applications Laboratories 2, to upgrade the laboratory facilities that had not yet been modernized. The final phase will comprise three main elements: the construction of a new laboratory building, provisionally called the Flexible Modular Laboratory 2, to house three of the laboratories; the replacement of ageing greenhouses, on which the work of three laboratories depends; and the refurbishment of the Dosimetry Laboratory.

#### *Zoonotic Disease Integrated Action*

41. The Zoonotic Disease Integrated Action project was initiated in the early days of the COVID-19 pandemic, when IAEA was receiving and responding in record time to the requests for assistance from its member States for equipment and training on pathogen detection using real-time reverse transcription polymerase chain reaction. The project was developed on the basis of IAEA experience gained from six decades of work supporting many veterinary laboratories. Zoonotic Disease Integrated Action is designed to build capacities globally of national laboratories (designated Zoonotic Disease Integrated Action National Laboratories) in member States to safely use nuclear and related techniques for the early, rapid and accurate detection of transboundary animal and zoonotic diseases, and to carry out targeted research at the national, regional and/or international levels. In November 2020, an interregional technical cooperation project was launched to support the building of the infrastructure and human capacity needed to implement project activities. As at October 2021, 119 nominations for the National Laboratories had been received from the 147 member States that had nominated their Zoonotic Disease Integrated Action National Coordinators. Through the project, IAEA also envisages providing increased access to reliable data for member States to improve understanding of the impact of zoonotic diseases on human health and to support science-based decision-making using radiation imaging technologies or radiomics.

#### *Nuclear Technology for Controlling Plastic Pollution*

42. In 2020, IAEA launched the Nuclear Technology for Controlling Plastic Pollution programme to assist member States in integrating nuclear techniques into their efforts to address plastic pollution. The programme consolidates and builds on the IAEA portfolio around plastic recycling using radiation technology and the marine monitoring of microplastics using isotopic tracing techniques. It responds to the global call for science, technology, innovation and partnerships in addressing the issue in an integrated, coordinated and solution-oriented approach. The programme supports the research and uptake of nuclear techniques to better understand the abundance and impact of marine plastic pollution, to reduce plastic waste volumes by using radiation technologies to improve plastic recycling methods, and to develop bio-based alternatives to single-use petroleum-based plastics. IAEA hosted a series of round-table discussions with high-level officials and experts from industry, academia and international organizations for the Africa, Asia and the Pacific, Europe, and North, Central and South America and the Caribbean regions to discuss ongoing efforts, innovative solutions, and partnerships to tackle plastic pollution.

## **2. Nuclear power applications**

43. Nuclear power continued to receive growing interest as a number of countries pursue it as a stable and low-carbon source of energy. IAEA provides a variety of scientific and technical support measures to member States, including guidance, technical reports, publications, databases and e-learning, review services, coordinated

research activities, the facilitation of discussions and sharing of lessons learned, and the dissemination of information and knowledge. It also designs and, through the technical cooperation programme, supports interested member States in building capacity and developing the infrastructure necessary for managing various phases of a nuclear programme.

#### *Status and trends*

44. The number of nuclear power reactors in operation worldwide at the end of 2020 was 442, with a total generating capacity of 392.6 GW. From 2015 to 2020, 43.5 GW of nuclear power (44 reactors) was supplied to the grid, including 5.5 GW (five reactors) in 2020 (1.1 GW (one reactor) in Belarus, 2.0 GW (two reactors) in China, 1.3 GW (one reactor) in the United Arab Emirates and 1.1 GW (one reactor) in the Russian Federation). From 2015 to 2020, construction started on 30 reactors (33.2 GW), including 4 (4.5 GW) in 2020 in China and Turkey. At the end of 2020, a total of 52 reactors (54.4 GW) were under construction, of which 36 reactors (36.8 GW) were in Asia. Nuclear power accounted for about 10 per cent of total global electricity generation and nearly one third of the world's low-carbon electricity production.

#### *Climate change and the role of nuclear power*

45. IAEA has taken an increasingly active role in helping member States to better understand the role that nuclear power plays in providing reliable low-carbon electricity and other clean energy products to meet their climate goals. That was a key topic at the International Ministerial Conference on Nuclear Power in the Twenty-first Century, held by the Agency in 2017, and the focus of the International Conference on Climate Change and the Role of Nuclear Power, held by the Agency in 2019.

46. IAEA takes part in the annual session of the Conference of the Parties to the United Nations Framework Convention on Climate Change and regularly releases publications on the issue. The Director General attended the twenty-fifth session of the Conference of the Parties, held in Madrid in December 2019, and also attended the twenty-sixth session, held in Glasgow, United Kingdom of Great Britain and Northern Ireland, in November 2021, at which IAEA organized and participated in several events highlighting the fundamental role that nuclear power and nuclear technologies can play in mitigating and adapting to climate change.

#### *Capacity-building for energy planning and knowledge management*

47. IAEA works with its member States to build their capacity on energy system planning and the assessment of the potential contribution that nuclear power could make to a sustainable energy mix. The models and training provided by IAEA cover energy demand and supply, environmental impacts, finance, system optimization and indicators for sustainable development. They are “technology-neutral”, with no special focus on nuclear power.

48. IAEA organizes several Nuclear Energy Management Schools and Nuclear Knowledge Management Schools every year. From 2015 to the end of 2019, over 1,100 participants from around 90 member States benefited from these programmes. The membership of the IAEA International Nuclear Information System comprises 132 member States and 24 international organizations.

#### *Assistance to countries considering or introducing nuclear power*

49. At the end of 2020, 27 countries were considering or embarking on new nuclear power programmes. In addition, 13 member States plan to expand their existing



nuclear power capacity. IAEA provides support to member States considering or embarking on new nuclear power programmes through a wide range of technical support services and the provision of tools and databases. The Agency's Integrated Nuclear Infrastructure Review, an expert peer review, was conducted in 16 missions for 15 member States between 2015 and 2020. Since the outset of the programme in 2009, 32 review missions and follow-ups have been conducted in 22 member States upon their request.

50. By the end of 2020, the United Arab Emirates and Belarus had connected the first units of their first nuclear power plants to the grid. Others, such as Turkey and Bangladesh, had begun construction. Egypt, Poland and Saudi Arabia have prepared for a nuclear power programme and the required national infrastructure. A number of other nuclear newcomer countries were making progress towards the introduction of nuclear power. In addition to the 32 member States operating nuclear power plants, between 10 and 12 new member States are planning to operate new nuclear power plants by 2035.

51. Technical cooperation projects provide assistance to these and other countries. About 50 member States benefited from participation in a large-scale interregional technical cooperation project from 2016 to 2020 which supports decision-making and builds capacities for developing the sustainable infrastructure required for a safe, secure and peaceful nuclear power programme in member States introducing or expanding their nuclear power programmes.

#### *Support for existing nuclear power programmes*

52. Continuously improving the performance, safety and security of nuclear power plants throughout their life cycles is essential. IAEA assists member States operating and expanding nuclear power programmes through a wide range of technical support services. It also develops safety standards and security guidance and publications on nuclear power plant operation and maintenance. As several countries pursue broad sector decarbonization through hydrogen production, energy storage and other non-electrical nuclear energy applications using currently operating reactors, IAEA also provides support in these areas.

53. By the end of 2020, more than two thirds of the world's operating nuclear capacity had been in operation for longer than 30 years. While nuclear reactors are typically licensed for 30 to 40 years, some operating lifespans are being extended through life management programmes. IAEA facilitates support to address material ageing and degradation, plant life management beyond 60 years, and the reduction of operational costs through peer reviews of safe long-term operation and assessments of essential nuclear power plant structures, systems and components.

#### *Nuclear fuel cycle*

54. IAEA shares information on uranium resources, exploration, mining and production to ensure the development and dissemination of good practices relating to uranium exploration, mining and processing, through the biennial editions of the Red Book (the most recent of which was issued in 2020) published jointly with the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD).

55. Through two coordinated research projects finalized in 2019, IAEA brought together international experts to analyse and better model nuclear fuel behaviour in accidental conditions and to develop fuels for water-cooled reactors with increased accident tolerance.

*Radioactive waste and spent fuel management, and decommissioning*

56. In 2019, IAEA organized the International Conference on the Management of Spent Fuel from Nuclear Power Reactors. The conference was aimed at helping to overcome current issues and expected future challenges by addressing all aspects of the back end of the fuel cycle (storage, transportation, recycling, integrated approaches and advanced recycling technologies for innovative reactors).

57. IAEA facilitates the development of guidance and information exchange on all aspects of radioactive waste and spent fuel management, decommissioning and environmental remediation involving the peaceful (power and non-power) applications of nuclear technology. From 2015 to 2021, IAEA led three international reviews of the efforts of Japan to decommission the Fukushima Daiichi nuclear power station.

58. IAEA continued its close cooperation with the European Commission and OECD Nuclear Energy Agency on preparing the tripartite report entitled *Status and Trends in Spent Fuel and Radioactive Waste Management*. In June 2021, the IAEA Spent Fuel and Radioactive Waste Management portal was launched to share data on member States' spent fuel and radioactive waste inventories.

59. To improve the flow of knowledge and experience, IAEA continued its extensive and detailed work in support of member States, through publications, professional networks, e-learning materials, training courses, coordinated research projects and a wiki project. Over 70 technical cooperation projects were undertaken to build capacity within member States, and field operations were conducted to support the safe and effective management of disused sealed radioactive sources.

*Innovative technology*

60. In 2017, in response to member State interest in small and medium-sized or modular reactors, IAEA established the Technical Working Group on Small and Medium-sized or Modular Reactors, which continued to discuss, among other things, how such reactors can be integrated with variable renewables in hybrid energy systems that may also feature non-electric applications (e.g., seawater desalination, hydrogen production, district heating and tertiary oil recovery).

61. IAEA has strengthened its broad suite of nuclear power plant simulators for different reactor technologies, including a number of toolkits for various non-electric applications of nuclear power, such as hydrogen production, water management in nuclear power plants and cogeneration. IAEA also manages the Advanced Reactor Information System, a unique database of detailed information on all types of advanced reactors.

62. The IAEA International Project on Innovative Nuclear Reactors and Fuel Cycles continued to grow and now comprises 42 participants (41 member States and the European Commission). Through the project, the Agency has developed a comprehensive assessment methodology for innovative nuclear energy systems, addressing the environment, safety, proliferation resistance, waste management, infrastructure and economics.

63. In 2019, IAEA, together with several other organizations, organized Innovation for the Future of Nuclear Energy – A Global Forum. The goal of the forum was to tackle urgent challenges facing the nuclear sector and examine barriers and opportunities for innovative technological and process solutions in order to enhance nuclear safety while reducing costs.

### *Research reactors*

64. IAEA supports member States in the construction, operation and utilization of research reactors. This support includes assistance related to research on reactor ageing, modernization and refurbishment. In 2018, IAEA conducted its first two missions as part of the Integrated Nuclear Infrastructure Review for Research Reactors. In 2019, IAEA conducted two missions as part of the Operation and Maintenance Assessment for Research Reactors.

65. The International Centres based on Research Reactors programme, launched in 2014 to help member States, primarily those without research reactors, to access research reactor infrastructure, conduct research and development and build capacity, has expanded to a total of six centres in six countries. In 2015, IAEA founded the Internet Reactor Laboratory programme, an education and training initiative through which nuclear engineering students and young professionals, typically from countries without a research reactor, can connect remotely and take part in reactor experiments, engage with reactor staff and collect data.

66. IAEA supports the minimization of the civilian use of high enriched uranium through conversion to low enriched uranium fuel and targets, and the repatriation of high enriched uranium to countries of origin. Between 2015 and 2020, four research reactors (in China, Ghana, Jamaica and Nigeria) were converted from high enriched uranium to low enriched uranium with IAEA support. Overall, by the end of 2020, a total of 103 research reactors and four medical isotope production facilities had been converted to the use of low enriched uranium fuel or targets, or confirmed as shut down. In total, international programmes have completed the removal or confirmed disposition of approximately 6,815 kg of high enriched uranium of Chinese, Russian, American and other origin. In 2018, with the removal of high enriched uranium fuel from the research reactor of Nigeria, all 11 research reactors in Africa were running on low enriched uranium.

## **3. Technical cooperation programme**

### *Managing the transfer of technology and supporting member States' development priorities*

67. The technical cooperation programme is the Agency's principal mechanism for the delivery of scientific, technical, legal, advisory and support services to its member States. The programme transfers technology to member States through human and institutional capacity-building and addresses priorities in health and nutrition, food and agriculture, water and the environment, industrial applications, and nuclear knowledge development and management. It helps member States to identify and meet future energy needs and assists them in improving radiation and nuclear safety and nuclear security, including through legislative assistance.

68. The technical cooperation programme is a shared responsibility, involving IAEA and the member States. It is demand-driven and responds to the needs of member States.

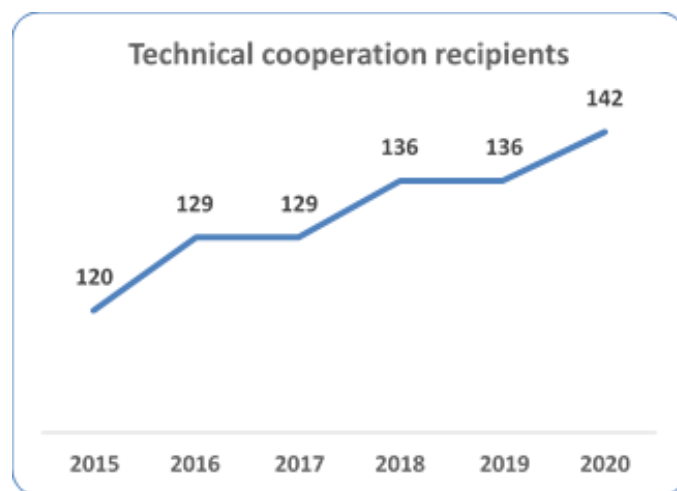
69. In country programme frameworks, the main strategic planning tool of national technical cooperation programmes, member States, in collaboration with IAEA, define national development needs and priorities that can be supported through the technical cooperation programme and that are aligned with relevant Sustainable Development Goals, as appropriate. By the end of 2020, 113 valid country programme frameworks had been put in place.

70. The technical cooperation programme is delivered in Africa, Asia and the Pacific, Europe and Latin America and the Caribbean. Since 2015, the number of

member States and territories participating in the programme as recipients has increased from 120 to 142 (see figure I).

Figure I

**Increase in the number of member States and territories receiving technical cooperation assistance**

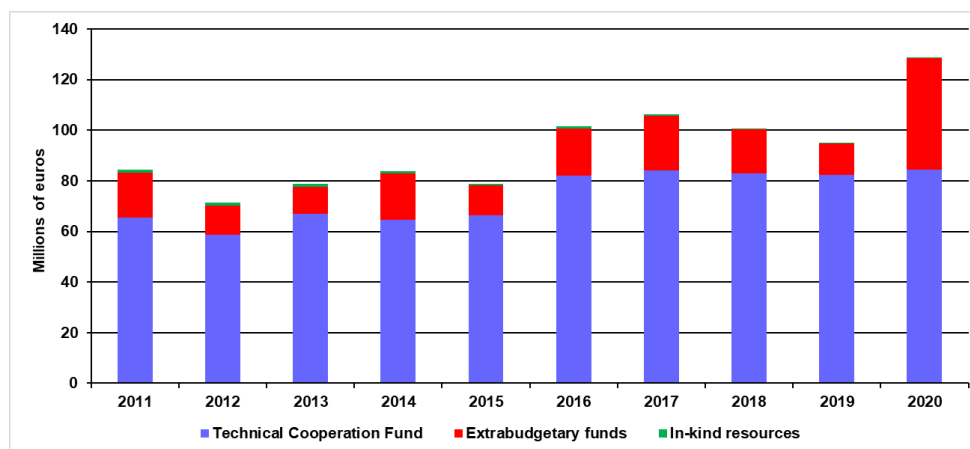


71. The regional cooperative agreements, such as the African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology, the Cooperative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology, the Regional Cooperation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean, and the Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific, play an important role in ensuring that regional projects address agreed needs and optimize the use of regional resources and expertise and that interregional projects are prepared in close consultation with member States.

*Technical cooperation programme resources and delivery*

72. The main resource for the technical cooperation programme is the Technical Cooperation Fund, supplemented by extrabudgetary contributions. The Fund target increased from €64.7 million in 2010 to €88.1 million in 2020. The total resources received to support the programme during the same period are shown in figure II.

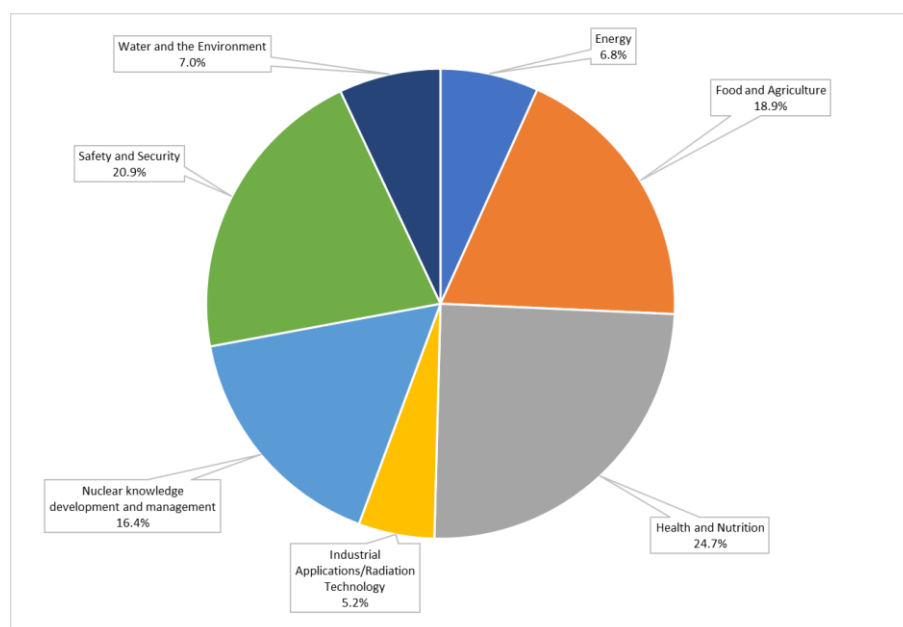
Figure II  
Trends in technical cooperation programme resources, 2011–2020



73. The technical cooperation programme disbursed a total of €522.9 million for the period 2015–2020, comprising the Technical Cooperation Fund and extrabudgetary funding such as the Peaceful Uses Initiative. The programme delivered support to 138 countries and territories in 2015 and over 144 countries and territories annually in the period 2016–2020; 19,357 expert and lecturer assignments were carried out, 31,741 participants attended meetings or undertook other project personnel assignments, 17,162 people took part in 1,040 regional training courses and 9,946 people benefited from fellowships and scientific visits.

74. The largest single sector of the technical cooperation programme over this six-year period was health and nutrition, accounting for 24.7 per cent of programme disbursements. The second largest sector was safety and security with 20.9 per cent, followed by food and agriculture at 18.9 per cent (see figure III).

Figure III  
Disbursements by technical field, 2015–2020



*International Conference on the International Atomic Energy Agency Technical Cooperation Programme*

75. The International Conference on the International Atomic Energy Agency Technical Cooperation Programme, on the theme “Sixty years and beyond – contributing to development”, took place in 2017, marking the sixtieth anniversary of the programme. The Conference brought together 1,200 high-level decision makers and policy formulators, including 19 Heads of State or Government and ministers, technical experts at the senior management level, and partners from the United Nations system and other multilateral entities. It successfully highlighted the role of the technical cooperation programme in helping member States to achieve their national development strategies or plans, and outlined its potential contribution to the attainment of the Sustainable Development Goals.

*Technical cooperation projects in the area of climate change*

76. Climate change poses a threat to sustainable global development. IAEA is committed to promoting and supporting the contribution of nuclear technologies in mitigation and adaptation efforts. From 2012 to 2020, 481 technical cooperation projects supported member State efforts around climate change adaptation. For example, in Asia and the Pacific, a regional project developed crop mutation breeding capacities in Pacific small island developing States and will lead to the development of local crop varieties that are more resilient in the face of climate change, while in Latin America and the Caribbean, a regional technical cooperation project has produced plants with greater tolerance to drought, extreme temperatures and salinity, and resistance to diseases and herbicides. In Zimbabwe, the same technique is being used to develop a cowpea strain with increased drought tolerance and insect resistance.

77. Other technical cooperation activities strengthen member States’ analytical capacities. For example, a national technical cooperation project in Djibouti has expanded analytical capacities and expertise to survey pollution in the marine environment, leading to a national initiative to set up a regional observatory for climate change. An interregional project on assessing the impacts of climate change on interactions between land and water ecosystems in polar and mountainous regions, carried out in close cooperation with FAO, has built member State capacities to establish the long-term monitoring of climate change impacts and to analyse the data collected in a way that is meaningful for policymakers.

78. Several partnership agreements signed by IAEA in 2018 refer explicitly to cooperation in the field of climate change, including a cooperation framework agreement with the Asian Development Bank and practical arrangements with the Caribbean Community Climate Change Centre, which focus specifically on building climate resilience in the Caribbean region.

*Technical cooperation projects in response to disease outbreaks and natural disasters*

79. The technical cooperation programme has a mechanism which enables IAEA to respond to emergencies in member States rapidly and effectively. IAEA has provided support to countries affected by Ebola virus disease since 2014, thereby supporting national abilities to diagnose the disease. In 2016, following the outbreak of Zika virus disease in the Latin American and Caribbean region, IAEA provided training and equipment to detect the virus and explored the application of the sterile insect technique to control mosquito vectors.

80. In 2016, IAEA supported several countries in Europe in addressing an outbreak of lumpy skin disease, a highly infectious cowpox virus that can cause significant economic losses to farmers. In 2020, the Agency provided support to a number of countries in Africa and Asia through the provision of technical advice and of serology and molecular diagnostic kits for the detection of the virus.

81. With the support of IAEA and multiple partners, an infestation of Mediterranean fruit fly in the Dominican Republic was contained in just 10 months. The infestation had led to the banning of the import of 18 fruits and vegetables, severely affecting the country's main source of income after tourism, namely, agricultural exports. In 2016, the ban was lifted for most of the country, and the insect was declared eradicated in 2017.

82. The technical cooperation programme provided emergency support following the earthquakes in Nepal in 2015, in Ecuador in 2016 and in Mexico in 2017. IAEA helped Nepal to test the integrity of damaged critical buildings and structures with the application of the non-destructive testing method. IAEA sent medical and radiological equipment to the affected areas of Ecuador, and technical advice was provided for the development of an action plan for the application of such testing. In Mexico, training was provided for the evaluation of civil structures using the testing method.

83. Following the eruption of the Volcán de Fuego, in Guatemala, IAEA helped the country to regain some of its medical diagnostic capacities through the provision of mobile medical diagnostic X-ray units. In Peru, IAEA delivered mobile X-ray systems and real-time reverse transcription polymerase chain reaction kits following floods in the north of the country.

84. In 2020, IAEA supported the health sectors in Colombia, Guatemala, Honduras, Nicaragua, Saint Vincent and the Grenadines (after the category 4 hurricanes Eta and Iota) and Ukraine (after flooding) with medical diagnostic equipment, including mobile X-ray machines. A computed tomography scanner was procured to replace the one destroyed in Saint Vincent and the Grenadines – the only one in the country.

85. In 2020, following the oil spill off the south-east coast of Mauritius, IAEA provided targeted assistance to the Albion Fisheries Research Centre and the National Environmental Laboratory to develop and implement a comprehensive post-spill long-term monitoring programme in the marine environment. In 2021, following the sinking of a container ship off the coast of Colombo and the subsequent environmental damage, IAEA supported Sri Lanka with analytical instruments and accessories for environmental monitoring, including equipment for sampling and measurement.

#### *Global partnership for development and South-South cooperation*

86. In the 2030 Agenda, Member States and the international community at large are called upon to revitalize the global partnership for development (Sustainable Development Goal 17). IAEA participates in the high-level political forum on sustainable development to take stock of progress on the Goals. It is also part of the United Nations inter-agency task team on science, technology and innovation for the Sustainable Development Goals, a component of the Technology Facilitation Mechanism launched under the 2030 Agenda.

87. To ensure coordinated action and complement the work of other key development actors, IAEA has developed effective partnerships with individual member States, international and regional organizations, research institutes, academia, financial institutions and other relevant stakeholders, including the private sector, with the aim of achieving its objectives, increasing the impact of its programmes and effectively addressing the needs and expectations of member States. While many arrangements

are focused on specific thematic areas, others are focused on South-South and triangular cooperation.

88. Through regional cooperative agreements, IAEA has established essential tools to promote South-South, South-North and triangular cooperation and technical cooperation among developing countries to address common challenges efficiently and effectively, foster the exchange of best practices and encourage networking.

#### **4. Nuclear safety and nuclear security**

89. Although ensuring nuclear safety and nuclear security remains primarily the responsibility of each State, nuclear and radiological emergencies can transcend national borders. IAEA supports member States, upon request, through the publication of guidance, peer review and advisory services, legislative assistance and capacity-building, and facilitates the sharing of relevant experiences, findings and lessons learned.

##### *Nuclear safety*

90. In 2015, the report of the Director General on the Fukushima Daiichi accident was released, along with five technical volumes. They provide a description of the accident and its causes, evolution and consequences, based on the evaluation of data and information from many sources, including the results of the work carried out in implementing the Action Plan on Nuclear Safety. The Government of Japan and various Japanese organizations provided a significant amount of data.

91. IAEA systematically analysed the lessons arising from the Fukushima Daiichi accident and other relevant sources to identify priorities for the programme of work in order to strengthen nuclear, radiation, transport and waste safety, and emergency preparedness and response.

92. In November 2021 IAEA is hosting the International Conference on A Decade of Progress after Fukushima Daiichi: Building on Lessons Learned to Further Strengthen Nuclear Safety. The focus of the conference is on lessons learned, experiences shared, results and achievements from actions undertaken by national, regional and international communities following the accident, as well as on identifying ways to further strengthen nuclear safety.

93. The revision of the IAEA Safety Requirements to include lessons from the Fukushima Daiichi accident has been completed and a full set of 14 Safety Requirements has been published. Accordingly, the main focus is now on revising the Safety Guides, which provide recommendations on how to comply with the Requirements. From 2015 to date, 56 IAEA Safety Standards have been issued.

94. IAEA recently launched a new initiative to compare the best approaches for site hazard and safety assessment in order to account for the effects of climate change on plant safety for both new and existing nuclear power plant sites. The project output will be incorporated into the revised versions of the relevant Safety Guides and into dedicated technical documents.

##### *Nuclear security*

95. IAEA concluded, in 2020, the third year of implementation of its Nuclear Security Plan for 2018–2021, the fifth such plan, and initiated consultations on the Nuclear Security Plan for 2022–2025, the sixth such plan, which was agreed by member States at the meeting of the Board of Governors in September 2021. It corresponds to the priorities of member States expressed through the decisions and resolutions of the IAEA policymaking organs as well as priorities for the IAEA Nuclear Security Series guidance, as recommended by the Nuclear Security Guidance Committee.



96. IAEA continued to give high priority to the development and implementation of Integrated Nuclear Security Support Plans to assist States, upon request, in applying a systematic and comprehensive approach to enhancing their nuclear security regimes. The development and implementation of the Plans also enabled increased coordination between IAEA, the State concerned and potential donors to ensure the appropriate allocation of resources and to avoid duplication of effort. As of December 2020, 90 plans had been approved by member States.

97. Between 2015 and 2020, IAEA conducted 586 security-related training activities with more than 120,000 participants. IAEA is establishing a new Nuclear Security Training and Demonstration Centre at its laboratories in Seibersdorf. The Centre will feature advanced equipment and infrastructure to support hands-on training courses and other technical activities in nuclear security, including research on advanced and emerging topics.

98. IAEA organized the International Conference on Nuclear Security, on the theme “Commitments and actions”, in 2016, which was attended by approximately 1,700 participants from 139 member States, 47 of which were represented at the ministerial level, and 27 organizations. The International Conference on Nuclear Security on the theme “Sustaining and strengthening efforts”, in 2020, was attended by over 1,900 participants from 141 member States, 54 of which were represented at the ministerial level, and 25 organizations. A Ministerial Declaration was adopted at each conference that, inter alia, reasserted national responsibility for nuclear security, committed to addressing existing and emerging threats to nuclear security, and promoted geographical diversity and gender equality.

99. The IAEA Nuclear Security Series provides international consensus-based guidance on all aspects of nuclear security to support States as they work to fulfil their responsibility for nuclear security. From 2015 to date, 27 publications have been issued in the Series.

#### *Peer review and advisory services*

100. Peer reviews and advisory services play a key role in global nuclear safety and security, enabling countries to benefit from the independent insight of leading international experts on the basis of the common reference frame of the IAEA Safety Standards and security guidance. Member State requests for these services have continued to increase. From 2015 to 2020, IAEA provided 331 services across all safety and security areas.<sup>1</sup> In 2016, IAEA established the Peer Review and Advisory Services Committee to assess the overall structure, effectiveness and efficiency of its nuclear safety and security services. Guidelines of 11 peer review and advisory services have been issued since 2015.

<sup>1</sup> These services (from 2015 to 2020) include 56 Integrated Regulatory Review Service missions to 48 member States, 55 Operational Safety Review Team missions to 19 member States, 52 Advisory Missions on Regulatory Infrastructure for Radiation Safety to 52 member States, 14 Emergency Preparedness Review missions to 11 member States, 19 Integrated Safety Assessment of Research Reactors missions to 15 member States, 32 Safety Aspects of Long-term Operation missions to 13 member States, 23 Site and External Events Design missions to 17 member States, and 25 International Physical Protection Advisory Service missions to 24 member States. By the end of 2020, 11 Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation missions had been conducted in 10 member States, including the first combined mission of the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation and the Integrated Regulatory Review Service.

*Legal framework*

101. IAEA strengthened its activities to raise awareness and promote universal adherence to, and the effective implementation of, the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Between 2015 and 2020, IAEA held nine international and regional workshops to promote these conventions, contributing to an increase in the number of contracting parties to the Convention on Nuclear Safety from 77 in 2014 to 91 as at 31 October 2021 and to the Joint Convention from 69 in 2014 to 86 as at 31 October 2021.

102. The number of parties to the Convention on Early Notification of a Nuclear Accident increased from 119 in 2014 to 130 as at 31 October 2021 and to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency from 112 in 2014 to 124 as at 31 October 2021.

103. The Amendment to the Convention on the Physical Protections of Nuclear Material entered into force in May 2016. Since 2015, 44 States have joined the Amendment, bringing the total number of parties to 127 as at 31 October 2021. In 2018, IAEA initiated preparations for the Conference of the Parties to the Amendment to review the implementation of the Convention as amended and its adequacy five years after the entry into force of the Amendment, as stipulated in article 16.1 of the Amendment. In the light of the ongoing constraints related to the COVID-19 pandemic, the Preparatory Committee agreed to postpone the Conference to the week of 28 March 2022. IAEA also continued to encourage States to adhere to the Convention and the Amendment thereto.

104. Member State support for the Code of Conduct on the Safety and Security of Radioactive Sources continued to grow. By the end of October 2021, 140 member States had made a political commitment to implementing the Code, compared with 123 in 2014, and 123 member States had notified the Director General of their intention to act in a harmonized manner with the supplementary Guidance on the Import and Export of Radioactive Sources, compared with 90 in 2014. In 2018, IAEA published its Guidance on the Management of Disused Radioactive Sources, supplementary to the Code. Forty-two member States have made a political commitment to implementing this supplementary guidance. IAEA continued to assist member States in the application of the Code of Conduct on the Safety of Research Reactors.

105. Over the past five years, IAEA, through its Legislative Assistance Programme, provided assistance to its member States to promote adherence to the relevant international legal instruments and support the development of adequate national legal frameworks in all branches of nuclear law. Specific bilateral legislative assistance was provided to 64 member States through written comments and advice on drafting national nuclear legislation. By the end of 2020, 11 awareness missions for policymakers, decision makers and parliamentarians had been conducted. In addition, 27 regional, subregional and national workshops on nuclear law had been held. Lastly, 368 officials had been trained in nuclear law, the majority at the annual IAEA Nuclear Law Institute, a two-week intensive nuclear law course with a focus on legislative drafting.

*Transport safety and security*

106. IAEA published several publications, including the 2018 edition of its *Regulations for the Safe Transport of Radioactive Material*, *Implementing Guide Security of Radioactive Material in Transport* and *Managing the Interface between Safety and Security for Normal Commercial Shipments of Radioactive Material*. It

also launched an e-learning platform to support regulatory bodies in implementing the regulations.

107. The issue of the denial of shipments remains on the international agenda. IAEA has launched a new initiative to undertake further analysis of the problems and the implementation of identified measures. IAEA held technical meetings in March and August 2021, and papers will be presented at the International Conference on the Safe and Secure Transport of Nuclear and Radioactive Materials, to be held in December 2021. One recommendation from the technical meetings is that a denial of shipment working group be formed, and arrangements will be made for its formation, enabling its first meeting to take place in the first quarter of 2022.

108. IAEA continued to support the dialogue between coastal and shipping States. In 2017, IAEA facilitated a simulated tabletop exercise for participants in the dialogue. Participants practised transboundary cooperation and communication in emergencies relating to nuclear materials transported by sea.

#### *Safety and security infrastructure for embarking countries*

109. IAEA continued to assist, through peer reviews and advisory services, those member States that are considering or planning a new nuclear power programme in establishing and strengthening their national safety and security infrastructure. Through these services, the Agency continued to identify the need for a comprehensive legal framework and the independence of regulatory bodies, to build regulatory capacity and competence, and to establish safety regulations and licensing processes, together with effective regulatory oversight programmes.

110. An increasing number of member States have expressed interest in small and medium-sized or modular reactors, with a corresponding increase in requests from countries embarking on the development of such reactors for assistance related to technology and associated licensing and safety matters. More than 50 designs for such reactors are in various stages of development, and a few concepts are close to deployment. IAEA finalized a study on how a set of 60 Safety Standards relevant to nuclear power are applicable to small and medium-sized or modular reactors intended for near-term deployment, with the consideration of aspects of safety, security and safeguards by design. In 2018, IAEA launched a coordinated research project on the development of approaches, methodologies and criteria for determining the technical basis for emergency planning zones. It also initiated a project on the security of such reactors in order to identify additional guidance regarding security requirements.

#### *Emergency preparedness and response*

111. Effective information exchange and emergency communication is a priority for IAEA member States. Between 2015 and 2020, IAEA was informed by the competent authorities, or became aware through earthquake alerts or media reports, of 1,443 events that involved or were suspected to have involved ionizing radiation. This number continued to increase over the years. IAEA took action in response to 251 of these events and made 31 offers of good offices, including for events that had involved lost radioactive sources and been triggered by earthquakes.

112. By the end of October 2021, 37 of the 124 States parties to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency had registered national assistance capabilities in the Response and Assistance Network, an increase from 27 of 112 States parties in 2014.

113. IAEA organizes, on average, 11 Convention Exercises with member States and international organizations each year. The exercises are carried out under the Convention on Early Notification of a Nuclear Accident and the Convention on

Assistance in the Case of a Nuclear Accident or Radiological Emergency, and are used to test emergency communication channels, assistance mechanisms and the Agency's assessment and prognosis process. In 2017 and in 2021, IAEA conducted its largest level 3 Convention Exercises to date.

114. In 2020, following the explosion in the port of Beirut, IAEA responded to the request from Lebanon for assistance through the Response and Assistance Network. IAEA deployed an assistance mission and checked that no hazard was presented by materials containing naturally occurring radionuclides that are stored in the port.

## **5. IAEA and the COVID-19 pandemic**

115. The COVID-19 pandemic, which shook the world in 2020, had a significant impact on IAEA. The Agency remained proactive, quickly adapting to the challenging new circumstances to continue to carry out its functions. IAEA staff demonstrated their professionalism, resilience and dedication and achieved some remarkable outcomes, despite the constraints of lockdowns and disrupted international transport. IAEA successfully delivered on the largest technical cooperation project in its history, in terms of both the number of beneficiary countries and the disbursement of resources, to help countries to confront COVID-19. IAEA was also able to continue to deliver its programmatic activities with minimal disruption while giving full attention to the health and well-being of staff.

### *Support to member State efforts to address the pandemic*

116. In response to the growing number of requests for assistance with the rapid detection of COVID-19, IAEA procured and delivered to member States diagnostic kits that use nuclear-derived techniques (real-time reverse transcription polymerase chain reaction) through a dedicated technical cooperation project. Fifteen member States and one private company supported IAEA efforts with generous extrabudgetary funding totalling €27.4 million, in addition to the kind support provided by some member States.

117. Under this technical cooperation project, the largest in the Agency's history, every effort was made to ensure timely procurement and delivery. IAEA coordinated with suppliers and freight forwarders on production and shipment and worked closely with member States to facilitate customs clearance and local deliveries. As a result, by the end of October 2021, IAEA had procured real-time reverse transcription polymerase chain reaction and diagnostic kits, biosafety cabinets, reagents and other supplies, which were delivered to 129 countries and territories.

118. To ensure that the equipment and materials procured to address member State requests were in alignment with the overall United Nations response, IAEA coordinated with United Nations system organizations through the United Nations Crisis Management Team for COVID-19 and the supply chain task force as well as consortiums led by WHO. IAEA also worked closely with FAO and WHO to provide a coordinated response to requests from its member States.

119. Complementing these procurement activities, IAEA conducted a series of webinars and one-on-one advisory sessions to strengthen member States' COVID-19 testing laboratories. The topics included laboratory requirements for the effective use of real-time reverse transcription polymerase chain reaction, including biosafety and biosecurity frameworks; best practices for sample collection and preparation; and the interpretation of results and quality assurance and quality control. Additional guidance and webinars were provided to help health-care providers in nuclear medicine and radiology facilities to adjust their standard operating procedures to minimize the risk of COVID-19 infection among patients, staff and the public. This was particularly important for radiology practices used in COVID-19 diagnosis.

120. In addition, more than 500 animal production and health counterpart laboratories received updated standard operating procedures, reagent information and validation data from IAEA through the Veterinary Diagnostic Laboratory Network platform. Eighteen instructional videos were produced on the use of personal protective equipment; the collection, transport and storage of samples; and the use of real-time reverse transcription polymerase chain reaction specifically for the detection of COVID-19.

121. As of June 2021, IAEA survey findings revealed that the 171 laboratories that had responded by that time had provided testing services to over 16.7 million people (8.7 million (52 per cent) men and 8.0 million (48 per cent) women).

*Operation, safety and security of nuclear and radiation facilities and activities during the pandemic*

122. IAEA information systems remained fully operational. The International Reporting System continued to collect and disseminate lessons learned from the member States. A COVID-19 Nuclear Power Plant Operating Experience Network was introduced to enable information- and experience-sharing between operating organizations, technical support organizations, relevant international organizations and other stakeholders.

123. The IAEA Incident and Emergency Centre continued to ensure that the communication channels for the notification of and exchange of information on nuclear and radiological emergencies remained fully operational on a 24/7 basis, including during the lockdowns.

124. IAEA conducted two surveys on the impact of the COVID-19 pandemic on the safety and regulatory oversight of radiation sources; the conclusions, based on responses from 93 regulatory bodies to the first survey and 30 responses to the second, were shared with member States. An IAEA survey of major reactor-based medical radioisotope producers indicated that most research reactors that produce radioisotopes continued to operate – as the production facilities had been defined as essential by the relevant Governments – but that hospitals could face shortages due to bottlenecks in transport and distribution.

125. The development of safety standards and security guidance continued, and a gap analysis was performed to assess the need to enhance standards or guidance in order to meet additional requirements of pandemic situations.

## **6. IAEA low enriched uranium bank in Kazakhstan**

126. In December 2010, the IAEA Board of Governors approved the establishment of the IAEA low enriched uranium bank. IAEA and Kazakhstan completed the basic legal framework in 2015 to establish the bank at the Ulba Metallurgical Plant in Ust-Kamenogorsk, Kazakhstan.

127. The new IAEA Storage Facility was completed on schedule and within budget in August 2017. In October 2019, the low enriched uranium bank in Kazakhstan was established and became operational upon receipt of low enriched uranium cylinders. In December 2019, the stock of low enriched uranium was completed.

128. Transport contracts with the authorized organizations from China, Kazakhstan and the Russian Federation have been signed, providing two routes of transportation to and from the low enriched uranium bank.

## **7. Gender equality**

129. IAEA continued its efforts focused on promoting gender equality within its secretariat, as well as gender mainstreaming in its programmes and activities. To promote gender parity among its staff, in March 2020, the Director General established the goal of achieving gender parity in the Professional and higher categories by 2025. Special measures for achieving this goal have been adopted and implemented. As at June 2021, the representation of women in IAEA stood at 35 per cent, the highest level to date. IAEA also continued its efforts to mainstream gender into all relevant programmes and organizational practices, including through efforts to enhance the participation of women as training participants, fellows, scientific visitors, project counterparts, researchers, experts and panellists. In August 2021, IAEA updated its Gender Equality and Action Plan to further align IAEA policies with relevant United Nations system-wide policies and ensure accountability for gender equality objectives.

130. In 2020, IAEA launched the Marie Skłodowska-Curie Fellowship Programme, with the aim of helping to increase the number of women in the nuclear field, supporting an inclusive workforce and contributing to and driving global scientific and technological innovation. It provides scholarships for master's programmes at accredited universities focused on nuclear science and technology, nuclear safety and security, and non-proliferation studies; and an opportunity to pursue internships facilitated by IAEA for up to 12 months. In December 2020, the first 100 students of 71 nationalities were awarded the scholarships to study at universities across 40 countries. The group of fellows for 2021 will be increased to 110 additional scholars.

## **8. Partnerships and resource mobilization**

131. The secretariat made significant progress on seeking new partnerships and resources to enable IAEA to broaden its services to member States. The renewed corporate approach to partnerships and resource mobilization is based on four pillars: strategic dialogue; an enabling environment; strong internal coordination; and consistent communication and reporting.

132. The Director General launched initiatives that cut across different fields of expertise and go beyond the Agency's traditional donors, forging new partnerships with a broader donor base. IAEA projects which played a catalytic role in resource mobilization include the following:

- Marie Skłodowska-Curie Fellowship Programme (March 2020)
- Zoonotic Disease Integrated Action Project (June 2020)
- Renovation of the Nuclear Applications Laboratories 2 (September 2020)
- Comprehensive Capacity-Building Initiative for Systems of Accounting for and Control of Nuclear Material and State Regulatory Authorities (September 2020)
- Nuclear Technology for Controlling Plastic Pollution (May 2021)
- Integrated support for establishing radiation medicine centres (ongoing)

133. Member States and several non-traditional partners responded positively to these initiatives and provided strong financial support for IAEA efforts. In addition, IAEA assistance to strengthen member States' capacity for the rapid detection of COVID-19 received significant support.

134. The secretariat strengthened its strategic partnerships with other organizations of the United Nations system and other international organizations. Strong

partnerships with several national and international professional associations and organizations were expanded to extend the reach and impact of IAEA activities, particularly in the areas of training and capacity-building. As a result of greater external outreach, extrabudgetary resources received by IAEA increased to more than €171 million in 2020, the highest amount since the Board of Governors approved the Strategic Guidelines in 2015. This is an increase of 18.7 per cent for the period 2019–2020 compared with the period 2017–2018. At the same time, IAEA entered into nearly 50 practical arrangements and concluded three new memorandums of understanding.

135. Several components of IAEA activities meet the criteria for official development assistance (ODA) eligibility. The Development Assistance Committee of OECD has determined coefficients<sup>2</sup> (for calculating the share eligible to be counted as ODA) to be applied to funds flowing through IAEA.

## 9. Peaceful Uses Initiative of IAEA

136. The Peaceful Uses Initiative, originating from the proposal made during the 2010 Review Conference, continued to be instrumental in mobilizing extrabudgetary contributions that supplement the Technical Cooperation Fund to support various technical cooperation projects and other unfunded projects of IAEA in the peaceful application of nuclear technology. In 2020, the tenth anniversary of the Initiative was celebrated.

137. As of September 2021, €201 million in financial contributions had been received from 25 member States, the European Commission and one private corporation, in support of over 400 projects from which more than 150 member States had benefited. Since the 2015 Review Conference, over €130 million has been received through the Peaceful Uses Initiative.

## Conclusion

138. Thanks to the strong support and generous contribution of member States, IAEA has, since the previous Review Conference in 2015, continued its efforts to respond to the evolving needs and priorities of those States. Making nuclear science and technology available to its member States, especially developing countries, in a safe, secure and peaceful manner will continue to be an important part of the Agency's work. IAEA continues to endeavour to deliver concrete results and make a real difference to the lives of people all over the world. In order for IAEA to fulfil increasing and diverse expectations, it will require the strong commitment and continued support of its member States and the international community.

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<sup>2</sup> The coefficients are as follows: 100 per cent of member States' contributions to the Technical Cooperation Fund are ODA-eligible; extrabudgetary contributions to the technical cooperation programme are 100 per cent eligible if earmarked for countries qualified to receive ODA; 33 per cent of member States' contributions to the IAEA regular budget are ODA-eligible. For extrabudgetary contributions to regular budget projects, distinct coefficients apply, up to 89 per cent, determined by the major programme under which a given contribution will be implemented: nuclear energy (61 per cent); nuclear sciences and applications (70 per cent); nuclear safety and security (66 per cent); nuclear verification (0 per cent); management (33 per cent); and technical cooperation (89 per cent).