Overview

For over six decades, the Agency has pursued the objective of accelerating and enlarging the "contribution of atomic energy to peace, health and prosperity throughout the world" while ensuring that assistance provided by it "is not used in such a way as to further any military purpose." Under the motto 'Atoms for Peace and Development', it continues to make tangible contributions in meeting emerging global challenges in order to improve health, prosperity, peace and security around the world. Within the framework of its Statute, the Agency has maintained the flexibility to address the evolving needs of Member States and to help them achieve their national development goals.

This chapter provides an overview of some of the programmatic activities that focused, in a balanced manner, on developing and transferring nuclear technologies for peaceful applications, enhancing nuclear safety and security, and strengthening nuclear verification and non-proliferation efforts worldwide.

NUCLEAR TECHNOLOGY

Nuclear Power

Status and trends

At the end of 2018, the world's 450 operational nuclear power reactors had a record global generating capacity of 396.4 gigawatts (electrical) (GW(e)). During the year, 9 reactors were connected to the grid and 7 were permanently shut down. Construction started on 5 reactors, with a total of 55 reactors under construction around the world.

The Agency's 2018 projections for global installed nuclear power capacity show an increase of 30% by 2030 (from 392 GW(e) at the end of 2017) in the high case scenario, but the low case scenario projects a 10% dip in capacity by 2030. In the longer term, capacity in the low case scenario is projected to decline for around a decade before rebounding to 2030 levels by 2050. In the high case, installed capacity is projected to reach 748 GW(e) by 2050.

Major conferences

In May, the Agency organized the Third International Conference on Human Resource Development for Nuclear Power Programmes: Meeting Challenges to Ensure the Future Nuclear Workforce Capability. The conference was held in Gyeongju, Republic of Korea, with over 500 participants from 62 Member States and 6 international organizations. Participants discussed the current situation of human resource development and the future of the nuclear labour market. The conference also highlighted practical solutions for use at the organizational, national and international levels to develop and maintain the human resources needed to support safe and sustainable nuclear power programmes.

The Agency's International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle: Exploration, Mining, Production, Supply and Demand, Economics and Environmental Issues (URAM-2018), held in Vienna in June, was attended by 234 participants from 50 countries and 4 international organizations. Participants analysed uranium supply and demand scenarios and discussed new developments in uranium geology, exploration, mining, milling and processing, as well as the environmental requirements for uranium operations and site decommissioning.

The 27th IAEA Fusion Energy Conference (FEC 2018) took place in Gandhinagar, India, in October. Over 700 experts from 39 Member States and 4 international organizations shared research results, discussed progress made in national and international fusion programmes, and identified global advances in fusion theory, experiments, technology, engineering, safety and socioeconomics.

Climate change and sustainable development

At the 24th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP24), held in Katowice, Poland, in December, the Agency organized a joint side event with several organizations of the United Nations system on Sustainable Development Goal (SDG) 7, on affordable and clean energy. It also organized a side event focused on capacity building to support decision makers in planning the transition to a low carbon energy future, and participated in two other events to highlight both the role of nuclear science and technology in climate change mitigation and sustainable development and the Agency's energy planning support for Member States.

At the Ninth International Forum on Energy for Sustainable Development, held in Kyiv, in November, the Agency, in cooperation with the United Nations Economic Commission for Europe and the World Nuclear Association, organized three sessions on 'Nuclear Energy for Sustainable Development: Role in the Decarbonized Energy Mix'.

Energy assessment services

During 2018, the Agency provided technical support to Member States conducting energy planning studies and assessing the potential role of nuclear power in their future energy mix. This included energy planning tools — now in use by about 150 Member States and 21 international organizations — and related multilingual training materials and e-learning packages, as well as expert missions and energy assessment training and fellowships.

Two INPRO (International Project on Innovative Nuclear Reactors and Fuel Cycles) Dialogue Forums were held in 2018 to promote discussion of topics important for the long term sustainability of nuclear energy. The 15th INPRO Dialogue Forum, held in Vienna in July, provided 45 participants from 28 Member States and 3 international organizations with an opportunity to share information, perspectives and knowledge on issues important to national, regional and global nuclear supply chains. At the 16th INPRO Dialogue Forum, held in Vienna in December, 46 participants from 32 Member States and 2 international organizations discussed opportunities and challenges for non-electric applications of nuclear energy, including barriers to commercialization and potential solutions.

Support to operating nuclear power plants

In response to increased Member State interest, the Agency organized a Technical Meeting on the Justification of Commercial Industrial Instrumentation and Control Equipment for Nuclear Power Plant Applications, held in June in Toronto, Canada, and a Technical Meeting on Instrumentation and Control Aspects of Human Factors Engineering: Design

and Analysis, held in September in Madrid. The meetings enabled participants to share best practices and discuss instrumentation and control related challenges and issues, as well as strategies to overcome them. The Agency issued two publications on this topic in 2018: *Approaches for Overall Instrumentation and Control Architectures of Nuclear Power Plants* (IAEA Nuclear Energy Series No. NP-T-2.11) and *Dependability Assessment of Software for Safety Instrumentation and Control Systems at Nuclear Power Plants* (IAEA Nuclear Energy Series No. NP-T-3.27).

The Agency hosted the first meeting of the new Technical Working Group on Nuclear Power Plant Operations in September. At the meeting, 30 senior government officials and industry executives identified priority areas where Agency assistance could help relevant stakeholders improve the economic sustainability of nuclear power reactors in operation around the world.

Launching nuclear power programmes

The Agency continued to support Member States interested in, considering or embarking on a new nuclear power programme. In 2018, it conducted Integrated Nuclear Infrastructure Review (INIR) Phase 1 missions to the Niger, the Philippines and the Sudan, and an INIR Phase 2 mission to Saudi Arabia. The first INIR Phase 3 mission was conducted in June, to the United Arab Emirates. At the end of 2018, a total of 27 INIR missions had been conducted to 20 Member States. The Agency also conducted six expert missions to Ghana, Poland and Turkey, to support key organizations in the development of management systems for a nuclear power programme. It held workshops for Egypt, Kazakhstan and Kenya on using the Agency's Nuclear Power Human Resources modelling tool to assist them in understanding the human resource requirements and planning the workforce for new nuclear power programmes. The Agency continued to provide integrated support through Integrated Work Plans and to monitor progress using Country Nuclear Infrastructure Profiles. It also conducted around 40 interregional, regional and national capacity building activities dedicated to infrastructure development.

Capacity building, knowledge management and nuclear information

The Agency organized five Nuclear Energy Management Schools and two Nuclear Knowledge Management Schools in 2018. By the end of the year, over 1500 participants from around 80 Member States had benefited from these programmes. The Agency's Cyber Learning Platform for Network Education and Training (CLP4NET) hosted more than 640 on-line courses in 2018.

"The Agency's Cyber Learning Platform for Network Education and Training (CLP4NET) hosted more than 640 on-line courses in 2018."

The membership of the Agency's International Nuclear Information System (INIS) comprises 131 Member States and 24 international organizations. The IAEA Library continued to coordinate research support and document delivery among the 58 members of the International Nuclear Library Network.

Assurance of supply

The project to establish the IAEA Low Enriched Uranium Bank in Kazakhstan continued to make progress in 2018. The transit agreement with China entered into force on 15 February 2018. Two transport contracts were signed: one with the authorized organization from the Russian Federation and one with the authorized organization from Kazakhstan.

Concerning acquisition of low enriched uranium (LEU), the Agency signed supply contracts with two suppliers and aims to have the LEU delivered to the IAEA LEU Storage Facility before the end of 2019.

An LEU reserve in Angarsk, established following the Agreement of February 2011 between the Government of the Russian Federation and the Agency, remained operational.

Fuel cycle

"In 2018, the Agency organized more than 30 meetings aimed at increasing fuel cycle sustainability.… attended by more than 900 participants from over 50 Member States"

In 2018, the Agency organized more than 30 meetings aimed at increasing fuel cycle sustainability, including 5 technical meetings, 2 technical working group meetings, 6 research coordination meetings and 18 consultancy meetings. The meetings were attended by more than 900 participants from over 50 Member States and focused on various aspects of uranium exploration and production; environmental remediation of uranium mining sites; fuel development, design, manufacture and performance assessment; and spent fuel management. In December, the Agency and the OECD Nuclear Energy Agency jointly published *Uranium 2018: Resources, Production and Demand*, also known as the 'Red Book'.

Technology development and innovation

The Agency launched two coordinated research projects (CRPs) on advanced water cooled reactors (WCRs). The CRP entitled 'Methodology for Assessing Pipe Failure Rates in Advanced Water Cooled Reactors' will draw on five decades of operating experience data from current WCRs to develop a new methodology for predicting pipe failure rates in advanced WCRs. In the CRP entitled 'Probabilistic Safety Assessment Benchmark for Multi-Unit/Multi-Reactor Sites', probabilistic safety assessment (PSA) practitioners from 20 Member States using WCR technologies will develop their current or planned PSA methods and identify technological solutions to reduce risks specific to multi-unit sites.

In October, the Agency held a technical meeting on nuclear–renewable hybrid energy systems, which can significantly reduce greenhouse gas emissions compared with conventional fossil fuel based systems. At the meeting, held at the Agency's Headquarters in Vienna, 24 experts from 15 Member States operating nuclear power plants or expanding or embarking on a nuclear power programme and from the European Commission discussed innovative concepts and research on the coordinated use of nuclear and renewable energy sources.

At the first meeting of the Technical Working Group on Small and Medium Sized or Modular Reactors, held in Vienna in April, 25 representatives of 14 Member States and 2 international organizations identified areas of common interest for future collaboration. These include the development of generic user requirements and criteria; collaboration on research, technology development and establishment of codes and standards; and the development of design engineering, testing, manufacturing, supply chain and construction technology to enable large scale deployment. In response to Member State requests, the Agency published a new edition of the supplement to its Advanced Reactors Information System database, entitled *Advances in Small Modular Reactor Technology Developments*, as well as *Deployment Indicators for Small Modular Reactors* (IAEA-TECDOC-1854).

The Agency issued two publications on the development and deployment of innovative liquid metal cooled fast neutron systems: *Experimental Facilities in Support of Liquid Metal Cooled Fast Neutron Systems* (IAEA Nuclear Energy Series No. NP-T-1.15), which provides an overview of and detailed information on more than 150 experimental facilities in 14 Member States and the European Union, and the proceedings of the International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17), held in Yekaterinburg, Russian Federation, in 2017.

The Agency organized three technical meetings on non-electric applications of nuclear power. At the Technical Meeting on the Deployment of Non-Electric Applications Using Nuclear Energy for Climate Change Mitigation, 18 participants from 16 Member States discussed the future role of non-electric applications of nuclear energy in efforts to combat climate change, in particular the use of waste heat from nuclear power plants in the heating and transport sectors. The Technical Meeting to Assess the Prospects of Coupling Non-Electric Applications to High Temperature Nuclear Reactors brought together 12 participants from 11 Member States, who exchanged information on near term

commercial technologies available for hydrogen production and addressed associated socioeconomic and environmental considerations. At the Technical Meeting on Efficient Energy and Water Management in Nuclear Power Plants: Strategies, Policies and Innovative Approaches, 14 experts from 10 Member States and an international organization shared operating experience related to strategies and policies aimed at improving water and energy management in nuclear power plants, and discussed possible ways to reuse waste heat for water production.

Research reactors

The Agency provided support to Member States in the planning, construction, operation, maintenance and use of research reactors through training, expert missions, peer review missions, outreach activities and networks, as well as through guidance provided in its publications. It launched the Integrated Nuclear Infrastructure Review for Research Reactors peer review service, carrying out the first two missions: to Nigeria in February, and to Viet Nam in December. In 2018, the Agency continued to support Nigeria's project to convert its miniature neutron source reactor to LEU fuel and to return the used high enriched uranium fuel to China; the three year project was completed in December.

Radioactive waste management, decommissioning and environmental remediation

At the request of Member States, the Agency completed six Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) missions — to Brazil, Bulgaria, France, Italy, Luxembourg and Spain.

In January, the Agency reported on the outcomes of a three year project undertaken in cooperation with the European Commission and the OECD Nuclear Energy Agency in *Status and Trends in Spent Fuel and Radioactive Waste Management* (IAEA Nuclear Energy Series No. NW-T-1.14). The publication provides an overview of the topic as well as information on current inventories, expected future waste arisings and strategies for their long term management.

The Agency took part in a variety of field activities throughout the year, including providing support for the multi-year project to decommission the FOTON research reactor in Tashkent, which was completed in 2018, and conducting the fourth international peer review of the Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1–4.

Nuclear fusion

In September, the Agency issued *Integrated Approach to Safety Classification of Mechanical Components for Fusion Applications* (IAEA-TECDOC-1851), the first international reference document to comprehensively address the subject. The publication highlights the differences between the approaches currently used in fission and fusion reactors to identify and classify structures, systems and components important to safety, and offers guidance for fusion specific applications.

The Agency also initiated two CRPs in the area of nuclear fusion. The first, entitled 'Development of Compact Steady-State Fusion Neutron Sources', is aimed at establishing the suitability of steady-state compact fusion neutron sources for dedicated applications in fusion, fission and other sectors, and targeted products and services. The second, entitled 'Network of Small and Medium Size Magnetic Confinement Fusion Devices for Fusion Research', seeks to enlarge the network of magnetic confinement fusion devices used to perform experiments to study relevant plasma physics and support technology development, modelling analysis and the development of simulation and software tools.

Nuclear data

In April, the Agency launched a crowdsourcing initiative by challenging atomic data specialists around the world to submit innovative ways to visualize, analyse and explore simulations of different materials suitable for building fusion reactors. In particular, participants were invited to analyse simulations of the damage that can be caused to the reactor wall by the high-energy neutrons released by the fusion reaction. Of the 142 submissions from 37 Member States, the simulation method submitted by the Max Planck Institute for Nuclear Physics, which used molecular dynamics, was selected as the winner.

Accelerator technology and its applications

In September, the Agency published *Accelerator Simulation and Theoretical Modelling of Radiation Effects in Structural Materials* (IAEA Nuclear Energy Series No. NF-T-2.2), summarizing the findings and conclusions of a CRP of the same name aimed at supporting Member States in the development of advanced radiation resistant structural materials for use in innovative nuclear systems. In October, it hosted the first research coordination meeting of the new CRP entitled 'Ion Beam Irradiation for High Level Nuclear Waste Form Development (INWARD)'. Fifteen participants from eight Member States compared the accelerated damage caused by ion beam irradiation with the damage caused by radioactive decay in high level nuclear waste forms.

Nuclear instrumentation

In June, the Agency organized an expert mission to Tashkent to perform radiation monitoring measurements using mobile gamma spectrometers mounted on backpacks for the release of the FOTON Radiation and Technological Complex site after decommissioning. In October, it provided support for a national training exercise on monitoring radiological events using unmanned aerial vehicles held at four different sites in Brazil.

At a Technical Meeting on Current Trends and Developments in Nuclear Instrumentation, held in Vienna in December, 11 experts from 11 Member States reviewed and discussed state of the art portable nuclear instrumentation for in situ environmental monitoring, including analytical methodologies.

NUCLEAR SCIENCES AND APPLICATIONS

Major conferences

The Agency hosted the FAO/IAEA International Symposium on Plant Mutation Breeding and Biotechnology in Vienna in August. The symposium highlighted the latest developments, trends and challenges in plant mutation breeding and biotechnology, and gave participants an opportunity to exchange information and share experiences. It was attended by 350 delegates from 84 Member States and 4 international organizations.

In November, the Agency held the first IAEA Ministerial Conference on Nuclear Science and Technology: Addressing Current and Emerging Development Challenges. The conference was co-chaired by Costa Rica and Japan and attended by 1100 participants, including policy makers, scientists, technical experts and 54 ministers. The meeting culminated in the adoption of a Ministerial Declaration recognizing the important role of science, technology and innovation in achieving sustainable development and protecting the environment, as well as commitments among Member States for further cooperation in nuclear science and technology toward achievement of the 2030 Agenda for Sustainable Development.

The International Symposium on the Double Burden of Malnutrition for Effective Interventions, held in Vienna in December, was organized by the Agency, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) to help tackle the double burden of malnutrition — the coexistence a range of conditions, from food insecurity and undernutrition to obesity and related non-communicable diseases. Member State experts in agriculture, nutrition, public health and the environment shared their experiences to better understand what causes the phenomenon and how to successfully prevent or mitigate it.

Renovation of the Nuclear Applications Laboratories (ReNuAL)

The Renovation of the Nuclear Applications Laboratories (ReNuAL/ReNuAL+) project made significant progress in 2018. In November, the Flexible Modular Laboratory was inaugurated during the Ministerial Conference on Nuclear Science and Technology. According to the current construction schedule, the Flexible Modular Laboratory will be completed in 2020.

Three more Member States — Brazil, Morocco and Portugal — made contributions to the laboratories' modernization during the year; by the end of 2018, 35 Member States had made financial or in-kind contributions totalling more than €34 million.

A record number of visitors — more than 100 delegations with over 1000 participants — toured the Seibersdorf laboratories during the year.

Food and Agriculture

Area-wide integrated pest management in the Niayes region of Senegal

Using the sterile insect technique as part of an integrated insect pest management approach, the Agency, in collaboration with the Food and Agriculture Organization of the United Nations, achieved the complete suppression of tsetse flies in the Niayes region of Senegal. By the end of the year, the intervention had resulted in a drastic reduction in trypanosomosis disease transmission, a significant increase in milk yields and imports of more productive cattle with a higher return on investment.

Sterile insect technique for control of mosquitoes

Significant progress was made in developing the sterile insect technique package to control disease transmitting mosquitoes (e.g. *Aedes aegypti* and *Aedes albopictus*), the vectors for dengue, chikungunya, Zika and yellow fever. Developments in mass rearing, genetic sexing strains and sex separation allowed the Agency to begin transferring the technology through a pilot project in Mexico.

Small-scale drip irrigation technology to assist farmers in Africa

The Agency scaled up the climate-smart soil and water management initiative piloted in the Sudan in 2016. The initiative, which uses small-scale drip irrigation technology guided by nuclear and related techniques, was introduced in impoverished rural areas of Mauritania and Zimbabwe in 2018. In Mauritania, more than 400 women and their families grew food for their own consumption and for selling to other areas, securing additional income for education and health. In Zimbabwe, improved crop production allowed women to generate additional income for their families.

"The Agency scaled up the climate-smart soil and water management initiative piloted in the Sudan in 2016."

Diagnosis and control of disease outbreaks

Through the Veterinary Diagnostic Laboratory (VETLAB) Network, the Agency provided Member State laboratories with training; technology packages; and equipment, reagents, emergency toolkits and personal protective equipment to strengthen their capabilities for effectively responding to outbreaks of animal diseases. During the year, it delivered validated serological and molecular techniques for disease detection and differentiation directly to Member States to fight outbreaks of zoonotic and transboundary animal diseases, including African swine fever in China, Hungary and Poland; peste des petits ruminants in Bulgaria; and avian influenza in the Democratic Republic of the Congo, Ghana, Lesotho, Mozambique, Myanmar and Namibia.

Integrated screening techniques for climate-smart agriculture

The Agency continued to develop integrated screening techniques based on molecular markers to speed up the development of improved plant varieties. Molecular marker technologies can accelerate crop improvement through faster screening for desirable plant traits, including tolerance to drought and/or high temperatures. During 2018, traditional mutation breeding technologies continued to produce new climate-smart varieties in Member States. Tafra-1, a new groundnut variety with 11% increased yield and terminal drought tolerance, was developed with Agency support and released in the Sudan. In Zambia, two varieties of cowpea — Lunkhwakwa and Lukusuzi — were released, both with improved yield and tolerance to drought, among other traits.

"In Zambia, two varieties of cowpea — Lunkhwakwa and Lukusuzi — were released, both with improved yield and tolerance to drought, among other traits."

New analytical technologies for supporting food authenticity and food traceability systems

In 2018, the Agency successfully concluded the CRP entitled 'Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety'. This five year project, with 17 participants from 15 Member States, successfully demonstrated the feasibility of using stable isotope and trace element analysis, combined with other nuclear and related techniques, to establish the geographical origin and authenticity of liquid milk and powdered milk.

Human Health

Estimating medical physics staffing levels for radiology and nuclear medicine departments

Unlike in radiation oncology, the role of the medical physicist in medical imaging is still underestimated, even though the vast majority of the population's exposure to ionizing radiation is due to medical imaging, and radiation injuries have been reported in computed tomography and interventional radiology. To help medical imaging departments determine the number of medical physicists needed to support established services, the Agency published *Medical Physics Staffing Needs in Diagnostic Imaging and Radionuclide Therapy: An Activity Based Approach* (IAEA Human Health Reports No. 15). The publication, endorsed by the International Organization for Medical Physics, describes an algorithm developed to estimate staffing levels. Information on the publication was disseminated at the Annual Meeting of the American Association of Physicists in Medicine in July and at the European Congress of Medical Physics in August. Since its publication in February, the report has remained one of the ten most downloaded publications on the Agency's web site.

Information technology to enhance management of cervical cancer

Every year, over one million gynaecological cancer cases and half a million related deaths are registered worldwide. The highly specialized oncology workforce needed for safe, effective management of these cancers is not readily available in all Member States. The Agency's African Radiation Oncology Network (AFRONET) provides access to training, up-to-date published literature, expert opinion and peer review of clinical cases in Africa to support better diagnosis and treatment of gynaecological malignancies through case presentations and discussions. In July, the Agency launched a new AFRONET e-learning module entitled 'Radionuclide Imaging in the Management of Gynaecological Cancers'. The new module presents 12 clinical cases involving the use of fluorine-18 fluorodeoxyglucose positron emission tomography–computed tomography (^{18}F-FDG PET–CT) to treat diverse gynaecological tumours in different clinical stages (e.g. evaluation of recurring disease, restaging after adjuvant therapy, monitoring the efficacy of treatments, radiotherapy planning). It also covers the emerging application of radioguided sentinel lymph node biopsy in patients with vulvar and cervical cancer.

Capacity building in hybrid imaging technologies

The Agency continued to support Member States in the use of nuclear techniques to address non-communicable diseases such as cancer and cardiovascular diseases, as well as infectious diseases such as tuberculosis and malaria. In 2018, it successfully concluded four CRPs on the appropriate use of medical imaging in the management of breast cancer, paediatric lymphoma and lung cancer, and on the role of different imaging modalities in the evaluation of patients with spinal infection after surgical interventions and the identification of patients with multidrug resistant tuberculosis. The results of the projects were used to establish standardized evaluation criteria for these clinical conditions and for clinical application of hybrid imaging for both non-communicable and communicable diseases. Participants in the workshops and training courses on hybrid imaging were awarded with continuing medical education credits from the European Union of Medical Specialists.

In February, the Agency launched a new three year project on the use of PET–CT in the evaluation of locally advanced breast cancer, a leading cause of cancer related morbidity and mortality in many Member States.

In 2018, the Agency released two e-learning modules, each with around 450 visitors, and broadcast two live webinars with around 100 participants each.

Water Resources Management

Mainstreaming of IWAVE methodology

The Agency began mainstreaming the IAEA Water Availability Enhancement (IWAVE) methodology in 2018. Its use is now standard in evaluations of technical cooperation projects on enhancing hydrological understanding to increase water availability and sustainability. The IWAVE methodology, developed and tested in Costa Rica, Oman and the Philippines through the Peaceful Uses Initiative, helps ensure the feasibility of isotope hydrology projects and their effective contribution to SDG 6, on clean water and sanitation. In 2018, IWAVE workshops were conducted through regional cooperation projects in Bolivia, Colombia, Kenya, Mexico, the Niger and Paraguay, focusing on the central question of whether national hydrological understanding was adequate to realize SDG 6.

Environment

High precision atmospheric greenhouse gas monitoring

"[The Agency] prepared three new isotopic standards for carbon, … enabling laboratories worldwide to report consistent isotopic data on greenhouse gases"

Knowledge of the small changes in the isotopic composition of greenhouse gases such as carbon dioxide is indispensable for calculating sources and sinks. The Agency provides certified reference materials to the global atmospheric science community and supports intergovernmental and national organizations to ensure the quality and comparability of high precision greenhouse gas measurements. In 2018, it prepared three new isotopic standards for carbon, to supplement a standard released in 2016, enabling laboratories worldwide to report consistent isotopic data on greenhouse gases, a necessary input for global climate models.

Understanding contaminants in the environment and in seafood

The Agency conducts research and builds scientific and technical capacity in Member States to help improve understanding of the behaviour of contaminants such as heavy metals, persistent organic pollutants and radionuclides in the environment and in seafood. In 2018, it validated a method for analysing brominated flame retardants — emerging contaminants that have adverse effects on the environment and humans — and developed a new double-tracer radioisotope technique to assess the bioaccumulation of caesium in commercially relevant fish. The Agency also helped build environmental monitoring capacity in Member States, to address impacts of climate change such as ocean acidification, ocean warming and deoxygenation, eutrophication and nutrient release, harmful algal bloom, and sea level rise.

Analysis of mercury in the marine environment

In 2018, the Agency began working closely with the United Nations Environment Programme (UNEP) and the Global Environment Facility to support implementation of the Minamata Convention on Mercury, a treaty to protect human health and the environment from anthropogenic releases of mercury and mercury compounds. The Agency participated in the second Conference of the Parties to the Minamata Convention on Mercury and associated side events, held in Geneva in November, where it presented its work on capacity building through the establishment of laboratories for analysis of mercury and its compounds, and training of laboratory personnel. The Agency also presented three new analytical methods validated in 2018 that enable Member States to better monitor mercury in, and help eliminate its release to, the marine environment.

Radioisotope Production and Radiation Technology

Major outcomes of a technical workshop on supply of the medical isotope actinium-225

Recognizing the growing focus on targeted alpha therapy using actinium-225 (Ac-225), the Agency organized a two day technical workshop on the supply of Ac-225 in October, with more than 70 participants from national laboratories, research institutes and private companies in 17 Member States. Participants highlighted the growing worldwide demand for Ac-225 for targeted alpha therapy and discussed the advantages and disadvantages of three main production routes to meet this projected demand: 'milking' of stockpiled uranium-233, spallation of thorium-232 with high energy proton accelerators, and production of Ac-225 from radium-226 with either proton cyclotrons or electron linear accelerators. They also

presented Ac-225 supply projections, shared recent research results and exchanged ideas on addressing the challenges of establishing a reliable supply of Ac-225.

Technical Meeting on Strategies for Preservation and Consolidation of Cultural Heritage Artefacts through Radiation Processing

The Agency, in cooperation with the Ruđer Bošković Institute, held a Technical Meeting on Strategies for Preservation and Consolidation of Cultural Heritage Artefacts through Radiation Processing in Zagreb in June. More than 30 experts from 20 countries discussed recent advances in radiation technology for cultural heritage preservation and shared their experiences in using these technologies in cooperation with stakeholders such as conservators and restorers for the preservation of cultural heritage.

Training and certification of professionals in the use of radiotracers and sealed sources for industrial applications

The demand from Member States for training and certification of professionals in the use of radiotracers and sealed sources continued to increase. To meet the growing need for capacity building in this area, the Agency organized four training and certification courses in 2018. Two regional training courses were held in Seibersdorf, in March, under the African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA), and in November, as part of a project under the Co-operation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL) for the Latin America and the Caribbean region. Two regional training courses were held at the National Institute for Nuclear Science and Technology, in Saclay, France, under AFRA, in June, and for the European region, in October. In total, 40 radiotracer specialists from 25 Member States were trained and certified according to International Society for Tracer and Radiation Applications standards in 2018.

NUCLEAR SAFETY AND SECURITY

Nuclear Safety

Priorities for nuclear safety

The Agency's identified priorities for nuclear, radiation, transport and waste safety, and emergency preparedness and response include strengthening regulatory frameworks, ageing management and long term operation of nuclear installations; leadership and management for safety; safety culture; training in emergency response arrangements; radiation protection; the safe management of disused sources; and activities related to decommissioning of nuclear installations, radioactive discharges to the environment and environmental remediation.

Safety standards

In November, the Commission on Safety Standards endorsed for submission to the Board of Governors the draft Safety Requirements publication *Site Evaluation for Nuclear Installations* (IAEA Safety Standards Series No. SSR-1). Its forthcoming publication will complete the Agency's set of Safety Requirements publications.

The Agency made the safety standards and nuclear security guidance publications issued in 2018 available on the Nuclear Safety and Security Online User Interface platform.

The platform was also used to develop a strategic plan for the revision of Safety Guides on the safety of nuclear fuel cycle facilities.

Peer review and advisory services

Member State requests for peer review and advisory services continued to increase in 2018. During the year, the Agency conducted 58 safety related peer review and advisory service missions to 50 Member States, including the 100th Integrated Regulatory Review Service (IRRS) mission and the 200th Operational Safety Review Team (OSART) mission. The Agency carried out nine IRRS missions, including two follow-up missions; two Emergency Preparedness Review (EPREV) missions; two Site and External Events Design (SEED) review missions; eight OSART missions, including a pre-OSART mission and two follow-up missions; two Independent Safety Culture Assessment (ISCA) missions; five Occupational Radiation Protection Appraisal Service (ORPAS) missions, including one follow-up mission; 13 Advisory Missions on Regulatory Infrastructure for Radiation Safety (AMRAS), including three follow-up missions; six Safety Aspects of Long Term Operation (SALTO) missions, including four pre-SALTO missions; three Integrated Safety Assessment of Research Reactors (INSARR) missions, including one follow-up mission; one Education and Training Appraisal (EduTA) mission; one Peer Review of Operational Safety Performance Experience (PROSPER) mission; and six Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) missions, including the first combined IRRS–ARTEMIS mission. The Agency also carried out three Technical Safety Review (TSR) services: a Periodic Safety Review (TSR-PSR), a Design Safety Review (TSR-DS) and a Safety Requirements Review (TSR-SR).

Strengthening technical and scientific expertise

The Agency organized the fourth International Conference on Challenges Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety and Security: Ensuring Effective and Sustainable Expertise, held in Brussels in October. More than 250 participants from 61 Member States and 5 international organizations discussed initiatives to develop and strengthen scientific and technical capabilities to support regulatory decision making for enhanced nuclear and radiation safety and security.

Safety of nuclear power plants, research reactors and fuel cycle facilities

A technical meeting to share experience on implementing safety improvements at existing nuclear power plants was held in Vienna in June, attended by 35 participants from 21 Member States and 3 international organizations. The information shared on national practices will contribute to the development of an IAEA Technical Document.

The Agency finalized a study on the applicability of the safety requirements on nuclear power plant design established in *Safety of Nuclear Power Plants: Design* (IAEA Safety Standards Series No. SSR-2/1 (Rev. 1)) to small and medium sized or modular reactors intended for near term deployment. The Small Modular Reactor Regulators' Forum established three working groups: on licensing; on design and safety analysis; and on manufacturing, commissioning and operations.

Incident and emergency preparedness and response

The Agency held an International Symposium on Communicating Nuclear and Radiological Emergencies to the Public in Vienna in October, attracting almost 400 participants from 74 countries and 13 international organizations. The participants

emphasized the importance of implementing the Agency's safety standards and making use of its training materials, exercises and tools.

Radioactive waste management, environmental assessments and decommissioning of nuclear facilities

During the year, the Agency published *Guidance on the Management of Disused Radioactive Sources*, supplementary to the *Code of Conduct on the Safety and Security of Radioactive Sources*. The guidance addresses safety and security in an integrated manner, taking into account the Agency's safety standards and nuclear security guidance. The Agency also published the *Strategic Master Plan: Environmental Remediation of Uranium Legacy Sites in Central Asia*.

Two Safety Guides were issued to support Member States in their efforts to protect the environment from harmful effects of ionizing radiation: *Regulatory Control of Radioactive Discharges to the Environment* (IAEA Safety Standards Series No. GSG-9) and *Prospective Radiological Environmental Impact Assessment for Facilities and Activities* (IAEA Safety Standards Series No. GSG-10). Both publications were jointly sponsored by the Agency and UNEP.

Radiation protection

Three Safety Guides published in 2018 provide recommendations and guidance on meeting the requirements for the safe use of radiation established in the International Basic Safety Standards (IAEA Safety Standards Series No. GSR Part 3): *Radiation Protection and Safety in Medical Uses of Ionizing Radiation* (IAEA Safety Standards Series No. SSG-46), jointly sponsored by the International Labour Office, Pan American Health Organization and WHO; *Occupational Radiation Protection* (IAEA Safety Standards Series No. GSG-7), jointly sponsored by the International Labour Office; and *Radiation Protection of the Public and the Environment* (IAEA Safety Standards Series No. GSG-8), jointly sponsored by UNEP.

Capacity building in nuclear, radiation, transport and waste safety, and in emergency preparedness and response

In 2018, the Agency conducted 428 capacity building activities in nuclear, radiation, transport and waste safety, and emergency preparedness and response. This included the Agency's 100th six month Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources, which took place in Malaysia, with 35 participants from 18 Member States. More than 1800 students have now completed the course.

Two new Capacity Building Centres for Emergency Preparedness and Response were designated: one in China, operated by the China Institute for Radiation Protection and the General Hospital of Nuclear Industry, and one in the Russian Federation, operated by the Rosatom Technical Academy and the Rosatom Emergency Centre, St. Petersburg. The centres will provide national and international training courses, workshops and exercises on medical management of radiation exposures and dose assessment.

Strengthening global and regional networks and forums

The Agency coordinated over 100 national, regional and international activities under the auspices of the Global Nuclear Safety and Security Network (GNSSN) in 2018. This included support for the third meeting of the Steering Committee for the European and Central Asian Safety (EuCAS) Network, held in Prague in August, at which a new Working Group on Education and Training was established.

The Agency hosted the 27th Asian Nuclear Safety Network (ANSN) Steering Committee meeting in Vienna in May. The third ANSN plenary meeting, held in Vienna in September,

"The Agency coordinated over 100 national, regional and international activities under the auspices of the Global Nuclear Safety and Security Network (GNSSN) in 2018."

endorsed the new Terms of Reference for ANSN organizations, as well as a new ANSN vision and the establishment of new topical groups.

The Ibero-American Forum of Radiological and Nuclear Regulatory Agencies (FORO) approved three new projects at its annual plenary meeting, held in Brasilia in July: periodic verification and maintenance of reusable packaging for the transport of radioactive material not subject to design approval; licensing criteria and inspection requirements for centralized radiopharmacies; and regulatory practices in the licensing of nuclear reactor operators.

The CANDU Senior Regulators Group shared regulatory experience and information on safety enhancement programmes, events and associated corrective actions within the CANDU community during its annual meeting, held in Vienna in December.

Safety conventions

The Agency hosted and provided secretariat support to the Sixth Review Meeting of Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, held in Vienna and attended by more than 850 delegates from 69 Contracting Parties and 4 observers. The Contracting Parties approved several recommendations, and also decided to hold an Extraordinary Meeting prior to the Organizational Meeting of the Seventh Review Meeting.

The Organizational Meeting for the Eighth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety, held in October in Vienna, inter alia, established country groups and elected the Eighth Review Meeting president, vice presidents and country group officers.

The Agency's Radiation Safety and Nuclear Security Regulator

The Agency's Radiation Safety and Nuclear Security Regulator authorized the decommissioning of the Safeguards Analytical Laboratory; inspected and renewed the operation authorization of the Nuclear Material Laboratory; approved the Master Security Plan for the site of the Agency's laboratories in Seibersdorf; and authorized activities relating to the ReNuAL project, including the installation and acceptance testing of a linear accelerator for the Dosimetry Laboratory. Two Technical Agreements on the safety and on the security of the Agency's laboratories in Seibersdorf were concluded with the relevant Ministries of the Republic of Austria. They entered into force in February 2018 and December 2017, respectively.

Civil liability for nuclear damage

The International Expert Group on Nuclear Liability (INLEX) is an expert group that provides advice on issues related to nuclear liability as requested by the Director General or the Director of the Office of Legal Affairs. The 18th regular meeting of INLEX took place in Vienna in May. The Group, inter alia, discussed liability issues related to disposal facilities for radioactive waste. It was reaffirmed that the nuclear liability conventions would continue to apply during the period when institutional controls remained active, but that they could not be applied following the cessation of institutional controls over the site and in the absence of an operator, and therefore the State that had agreed to the closure of the installation would be expected to assume responsibility in case of any nuclear incident. The Group also discussed liability issues concerning the exclusion of radioisotopes that have reached the final stage of fabrication from the definition of 'radioactive products or waste' in the nuclear liability conventions and therefore from the scope of such conventions. In this respect, INLEX concluded that materials which have not reached the final stage of fabrication so as to be usable for any industrial, commercial, agricultural, medical, scientific or educational purpose, and the facilities where such materials are transformed into their

final form, are covered by the nuclear liability conventions. Based on this conclusion, INLEX specifically noted that molybdenum-99 contained in generators sent to hospitals and medical clinics falls outside the scope of the nuclear liability conventions.

INLEX continued to discuss the issue of the application of the nuclear liability conventions to transportable nuclear power plants and reiterated its conclusions that such a plant in a fixed position (i.e. in the case of a floating reactor, anchored to the seabed or the shore and attached to the shore by power lines) would fall under the definition of a 'nuclear installation' and therefore be covered by the nuclear liability regime. INLEX also noted that the transport of a factory-fuelled reactor would also be covered by the nuclear lability conventions, just as any other transport of nuclear material. Specific issues relating to transportable nuclear power plants will be addressed by INLEX at its next meeting in 2019.

The seventh Workshop on Civil Liability for Nuclear Damage was also held in Vienna in May. The workshop provided participants with an introduction to the international legal regime of civil liability for nuclear damage. A national Workshop on Civil Liability for Nuclear Damage was held in Khartoum in November.

Nuclear Security

Priorities for nuclear security

The Agency's identified priorities in the area of nuclear security include preparations for the third International Conference on Nuclear Security, to be held in 2020, and the promotion of universal adherence to the Amendment to the Convention on the Physical Protection of Nuclear Material (A/CPPNM).

International Conference on the Security of Radioactive Material: The Way Forward for Prevention and Detection

In December, the Agency organized the International Conference on the Security of Radioactive Material: The Way Forward for Prevention and Detection. The conference, which drew more than 550 experts from over 100 Member States, was the first Agency conference to bring together experts in facility protection and experts in the security of radioactive material out of regulatory control. Participants shared lessons learned and good practices, inter alia, in implementing the *Nuclear Security Recommendations on Radioactive Material and Associated Facilities* (IAEA Nuclear Security Series No. 14) and the *Nuclear Security Recommendations on Nuclear and Other Radioactive Material out of Regulatory Control* (IAEA Nuclear Security Series No. 15).

Amendment to the CPPNM

The Agency organized the fourth Technical Meeting of the Representatives of States Parties to the Convention on the Physical Protection of Nuclear Material (CPPNM) and the CPPNM Amendment, in Vienna in December, with the participation of more than 60 States Parties. The representatives discussed, inter alia, the role of designated Points of Contacts, as well as the exchange of information on laws and regulations giving effect to the CPPNM and A/CPPNM. In December, the Secretariat also facilitated an informal meeting of States Parties to the A/CPPNM, where preparations began for a conference of the States Parties to review the implementation of the CPPNM as amended, planned for 2021. Around 50 States Parties participated. Three regional workshops were also organized to promote universal adherence to the A/CPPNM.

IAEA Nuclear Security Series

The Nuclear Security Guidance Committee completed its second three-year term and started a third term in June. Five new IAEA Nuclear Security Series publications were issued in 2018: *Physical Protection of Nuclear Material and Nuclear Facilities (Implementation of INFCIRC/225/Revision 5)* (IAEA Nuclear Security Series No. 27-G); *Developing Regulations and Associated Administrative Measures for Nuclear Security* (IAEA Nuclear Security Series No. 29-G); *Sustaining a Nuclear Security Regime* (IAEA Nuclear Security Series No. 30-G); *Building Capacity for Nuclear Security* (IAEA Nuclear Security Series No. 31-G); and *Computer Security of Instrumentation and Control Systems at Nuclear Facilities* (IAEA Nuclear Security Series No. 33-T). By the end of 2018, a total of 32 publications had been issued in the series, a further 10 had been approved for publication and 14 more were at various stages of development.

Capacity building

"the Agency conducted 105 security related training activities — 42 at the national level and 63 at the international or regional level — providing training to more than 2200 participants from 139 States."

In 2018, the Agency conducted 105 security related training activities — 42 at the national level and 63 at the international or regional level — providing training to more than 2200 participants from 139 States. It also prioritized the development and implementation of Integrated Nuclear Security Support Plans (INSSPs) to assist Member States, upon request, in enhancing their nuclear security regimes. Three Member States approved their INSSPs in 2018, bringing the total number of approved INSSPs to 81. The Agency also provided assistance to five States hosting major public events aimed at strengthening implementation of nuclear security measures before and during the events. A workshop on nuclear security systems and measures for major public events held in Washington, D.C., in June was attended by an additional seven States planning to host major public events in the near future.

Peer review and advisory services

The Agency conducted four International Physical Protection Advisory Service (IPPAS) missions — to Ecuador, France, Japan and Switzerland. It also established a set of guidelines for International Nuclear Security Advisory Service (INSServ) missions.

NUCLEAR VERIFICATION[1,2]

Implementation of safeguards in 2018

At the end of every year, the Agency draws a safeguards conclusion for each State for which safeguards are applied. This conclusion is based on an evaluation of all safeguards relevant information available to the Agency in exercising its rights and fulfilling its safeguards obligations for that year.

[1] The designations employed and the presentation of material in this section, including the numbers cited, do not imply the expression of any opinion whatsoever on the part of the Agency or its Member States concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers.

[2] The referenced number of States Parties to the Treaty on the Non-Proliferation of Nuclear Weapons is based on the number of instruments of ratification, accession or succession that have been deposited.

In 2018, safeguards were applied for 182 States[3,4] with safeguards agreements in force with the Agency. Of the 129 States that had both a comprehensive safeguards agreement (CSA) and an additional protocol (AP) in force[5] the Agency drew the broader conclusion that *all* nuclear material remained in peaceful activities for 70 States[6]; for the remaining 59 States, as the necessary evaluation regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing, the Agency concluded only that *declared* nuclear material remained in peaceful activities. For 45 States with a CSA but with no AP in force, the Agency concluded only that *declared* nuclear material remained in peaceful activities. For those States for which the broader conclusion has been drawn, the Agency is able to implement integrated safeguards: an optimized combination of measures available under CSAs and APs to maximize effectiveness and efficiency in fulfilling the Agency's safeguards obligations. During 2018, integrated safeguards were implemented for 67 States[7,8].

Safeguards were also implemented with regard to nuclear material in selected facilities in the five nuclear-weapon States party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) under their respective voluntary offer agreements. For these five States, the Agency concluded that nuclear material in selected facilities to which safeguards had been applied remained in peaceful activities or had been withdrawn from safeguards as provided for in the agreements.

For the three States for which the Agency implemented safeguards pursuant to item-specific safeguards agreements based on INFCIRC/66/Rev.2, the Agency concluded that nuclear material, facilities or other items to which safeguards had been applied remained in peaceful activities.

As of 31 December 2018, 11 States Parties to the NPT had yet to bring CSAs into force pursuant to Article III of the Treaty. For these States Parties, the Agency could not draw any safeguards conclusions.

Conclusion of safeguards agreements and APs, and amendment and rescission of small quantities protocols

The Agency continued to implement the *Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols*[9], which was updated in September 2018. During 2018, a CSA with a small quantities protocol (SQP) and an AP entered into force for Liberia. In addition, the Board of Governors approved a CSA with an SQP for the State of Palestine[10]. An AP entered into force for Serbia. An AP was signed for Algeria and the

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3 These States do not include the Democratic People's Republic of Korea (DPRK), where the Agency did not implement safeguards and, therefore, could not draw any conclusion.

4 And Taiwan, China.

5 Or an AP being provisionally applied, pending its entry into force.

6 And Taiwan, China.

7 Albania, Andorra, Armenia, Australia, Austria, Bangladesh, Belgium, Botswana, Bulgaria, Burkina Faso, Canada, Chile, Croatia, Cuba, Czech Republic, Denmark, Ecuador, Estonia, Finland, Germany, Ghana, Greece, Holy See, Hungary, Iceland, Indonesia, Ireland, Italy, Jamaica, Japan, Kazakhstan, Republic of Korea, Kuwait, Latvia, Libya, Lithuania, Luxembourg, Madagascar, Mali, Malta, Mauritius, Monaco, Montenegro, Netherlands, New Zealand, North Macedonia (the name 'North Macedonia' replaces the former name 'The former Yugoslav Republic of Macedonia' as of 15 February 2019), Norway, Palau, Peru, Philippines, Poland, Portugal, Romania, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Tajikistan, Ukraine, United Republic of Tanzania, Uruguay, Uzbekistan and Viet Nam.

8 And Taiwan, China.

9 Available at: *https://www.iaea.org/sites/default/files/18/09/sg-plan-of-action-2017-2018.pdf*

10 The designation employed does not imply the expression of any opinion whatsoever concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers.

Board of Governors approved an AP for Sri Lanka. A voluntary offer agreement and an AP thereto were signed for the United Kingdom. An SQP was rescinded for Malaysia and SQPs were amended for Paraguay, Tonga and the United States of America[11], in keeping with the Board of Governors' decision of 20 September 2005 regarding such protocols. By the end of 2018, safeguards agreements were in force with 183 States and APs were in force with 134 States. An AP continued to be provisionally applied pending its entry into force for the Islamic Republic of Iran. By the end of 2018, 64 States had accepted the revised SQP text (which was in force for 58 of these States) and 8 States had rescinded their SQPs.

Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)

Throughout 2018, the Agency continued to verify and monitor the nuclear-related commitments of the Islamic Republic of Iran (Iran) under the Joint Comprehensive Plan of Action (JCPOA). During the year, the Director General submitted four reports to the Board of Governors and in parallel to the United Nations Security Council entitled *Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)* (GOV/2018/7, GOV/2018/24, GOV/2018/33 and GOV/2018/47).

Syrian Arab Republic (Syria)

In August 2018, the Director General submitted a report to the Board of Governors entitled *Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic* (GOV/2018/35) covering relevant developments since the previous report in August 2017 (GOV/2017/37). The Director General informed the Board of Governors that no new information had come to the knowledge of the Agency that would have an impact on the Agency's assessment that it was very likely that a building destroyed at the Dair Alzour site was a nuclear reactor that should have been declared to the Agency by Syria.[12] In 2018, the Director General renewed his call on Syria to cooperate fully with the Agency in connection with unresolved issues related to the Dair Alzour site and other locations. Syria has yet to respond to these calls.

On the basis of the evaluation of information provided by Syria, and all other safeguards relevant information available to it, the Agency found no indication of diversion of declared nuclear material from peaceful activities. For 2018, the Agency concluded for Syria that declared nuclear material remained in peaceful activities.

Democratic People's Republic of Korea (DPRK)

In August 2018, the Director General submitted a report to the Board of Governors and General Conference entitled *Application of Safeguards in the Democratic People's Republic of Korea* (GOV/2018/34–GC(62)/12), which provided an update of developments since the Director General's report of August 2017 (GOV/2017/36-GC(61)/21). The Director General provided a further update in his introductory statement to the Board of Governors on 22 November 2018.

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[11] The United States of America has amended its small quantities protocol to the safeguards agreement reproduced in INFCIRC/366 between the United States of America and the Agency pursuant to Additional Protocol I of the Treaty of Tlatelolco, covering the United States of America's Protocol I territories.

[12] The Board of Governors, in its resolution GOV/2011/41 of June 2011 (adopted by a vote), had, inter alia, called on Syria to urgently remedy its non-compliance with its NPT Safeguards Agreement and, in particular, to provide the Agency with updated reporting under its Safeguards Agreement and access to all information, sites, material and persons necessary for the Agency to verify such reporting and resolve all outstanding questions so that the Agency could provide the necessary assurance as to the exclusively peaceful nature of Syria's nuclear programme.

Since 1994, the Agency has not been able to conduct all necessary safeguards activities provided for in the DPRK's NPT Safeguards Agreement. From the end of 2002 until July 2007, the Agency was not able — and, since April 2009, has not been able — to implement any verification measures in the DPRK, and, therefore, the Agency could not draw any safeguards conclusion regarding the DPRK.

In 2018, no verification activities were implemented in the field but the Agency continued to monitor developments in the DPRK's nuclear programme and to evaluate all safeguards relevant information available to it, including open source information and satellite imagery.

The Executive Group and the DPRK Team, created in August 2017,[13] have intensified their efforts. The DPRK Team has increased monitoring of the DPRK's nuclear programme through more frequent collection of satellite imagery and has enhanced its readiness to promptly undertake any activities it may be requested to conduct in the DPRK. Actions to enhance readiness have included: formulation and updating of verification approaches and procedures; identification of potential inspectors for initial activities in the DPRK and provision of specialized training for them; and ensuring the availability of appropriate verification technologies and equipment to support the initial activities. All of these efforts related to the Agency's enhanced readiness have been conducted within available resources, including extrabudgetary contributions from a number of Member States. Once a political agreement has been reached among the countries concerned, the Agency is ready to return to the DPRK in a timely manner, if requested to do so by the DPRK and subject to approval by the Board of Governors.

In 2018, the Agency continued to monitor the Yongbyon site. The Agency observed indications that were consistent with the operation of the Yongbyon Experimental Nuclear Power Plant (5MW(e)) reactor until mid-August 2018. From mid-August through November 2018 there were indications of intermittent reactor operation, and in December 2018 there were no indications of reactor operation. Starting in the first quarter of 2018, activities were observed near the Kuryong River, which may have been related to changes to the cooling system for the light water reactor (LWR) under construction and/or the 5MW(e) reactor. Between late April and early May 2018, there were indications of the operation of the steam plant that serves the Radiochemical Laboratory. The duration of the steam plant's operation was not sufficient to have supported the reprocessing of a complete core from the 5MW(e) reactor. At the Yongbyon Nuclear Fuel Rod Fabrication Plant there were indications consistent with the use of the reported centrifuge enrichment facility located within the plant. At the LWR, the Agency observed activities consistent with the fabrication of reactor components and the possible transfer of these components into the reactor building.

The Agency has evaluated all safeguards relevant information, including satellite imagery and open source information, about a group of buildings within a security perimeter in the vicinity of Pyongyang. The size of the main building and the characteristics of the associated infrastructure are not inconsistent with a centrifuge enrichment facility. The timeline of construction is not inconsistent with the reported uranium enrichment programme of the DPRK.[14]

The Agency has not had access to the Yongbyon site or to other locations in the DPRK. Without such access, the Agency cannot confirm either the operational status or configuration/design features of the facilities or locations, or the nature and purpose of the activities conducted therein.

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[13] GOV/2017/36-GC(61)/21, para. 12.

[14] GOV/2011/53-GC(55)/24, para. 30. In addition, GOV/2011/53-GC(55)/24, para. 50, noted reports on the provision of centrifuge enrichment technology to the DPRK and indications that the DPRK could produce UF_6 prior to 2001.

The continuation and further development of the DPRK's nuclear programme during 2018, including activities in relation to the Yongbyon Experimental Nuclear Power Plant (5 MW(e)) reactor, the use of the building which houses the reported centrifuge enrichment facility and the construction at the LWR, are clear violations of relevant United Nations Security Council resolutions, including resolution 2375 (2017), and are deeply regrettable.

Enhancing safeguards

In July 2018, the Director General submitted a report to the Board of Governors entitled *Implementation of State level Safeguards Approaches for States under Integrated Safeguards — Experience Gained and Lessons Learned* (GOV/2018/20). This report contains the Secretariat's analysis of experience gained and lessons learned in the updating and implementation of State-level safeguards approaches (SLAs) for States under integrated safeguards, as described in GOV/2013/38 and GOV/2014/41 and Corr.1.

During 2018, the Agency developed SLAs for five States with a CSA. This brings the total number of States with a CSA for which an SLA has been developed to 130. These 130 States hold 97% of all nuclear material (by significant quantity) under safeguards in States with a CSA and include 67 States with a CSA and an AP in force for which the broader conclusion has been drawn; 35 States with a CSA and an AP in force for which the broader conclusion has yet to be drawn; and 28 States with a CSA but no AP in force. For those States where SLAs are not implemented, in-field safeguards activities are based on the Safeguards Criteria, and new techniques and technologies are implemented, as applicable, to strengthen effectiveness and improve efficiency.

Cooperation with State and regional authorities

To assist States in building capacity for implementing their safeguards obligations, the Agency conducted 13 international, regional and national training courses for those responsible for overseeing and implementing the State and regional systems of accounting for and control of nuclear material. In total, more than 250 participants from some 50 countries were trained on safeguards related topics. The Agency also participated in three other training activities organized by Member States on a bilateral basis. In 2018, the Agency, upon request, conducted an IAEA State System of Accounting for and Control of Nuclear Material Advisory Service (ISSAS) mission to Mexico and participated in two INIR missions to the Niger and Saudi Arabia, both of which included, inter alia, the provision of advice to the host countries on how to systematically enhance the capabilities necessary for the application of safeguards while embarking on a nuclear power programme.

Safeguards equipment and tools

Throughout 2018, the Agency ensured that the instrumentation and monitoring equipment installed in nuclear facilities around the world, which is vital to effective safeguards implementation, continued to function as required. It continued to implement the next generation surveillance system, replacing outdated surveillance units. By the end of 2018, a total of 881 next generation surveillance system cameras had been installed.

Safeguards analytical services

In 2018, the Agency collected 487 nuclear material samples that were analysed by the Agency's Nuclear Material Laboratory. It also collected 481 environmental samples during the year, which were analysed by the Network of Analytical Laboratories, including at the Agency's Environmental Sample Laboratory and the Nuclear Material Laboratory.

Developing the safeguards workforce

In 2018, the Agency conducted 165 safeguards training courses to provide safeguards inspectors and analysts with the necessary technical and behavioural competencies. These included two sessions of the Introductory Course on Agency Safeguards, held at the Agency's Headquarters for 30 newly recruited inspectors, and several courses held at nuclear facilities to enhance practical competencies for safeguards implementation in the field.

"In 2018, the Agency conducted 165 safeguards training courses"

Information technology: MOSAIC

The Agency completed the planned modernization of safeguards information technology on schedule in May and within scope and budget. The modernization completed under the Modernization of Safeguards Information Technology (MOSAIC) project has enhanced existing tools and software applications, introduced new IT tools and software applications, and strengthened information security.

Safeguards Symposium

In November, the Agency hosted the Symposium on International Safeguards: Building Future Safeguards Capabilities at its Headquarters in Vienna. The symposium focused on identifying innovative technologies that might be exploited for safeguards purposes; strengthening existing partnerships and creating new ones; and improving the day to day work of safeguards implementation. More than 800 people participated in the symposium, heralding from 90 Member States. Thanks to substantial support from several Member State Support Programmes, organizations and exhibitors, 90 individuals received travel support to attend the event, resulting in improved geographic diversity among the participants.

Preparing for the future

The Agency published the *Research and Development Plan — Enhancing Capabilities for Nuclear Verification* (STR-385) and the *Development and Implementation Support Programme for Nuclear Verification 2018–2019* (STR-386) in early 2018. The biennial meeting of the Member State Support Programme coordinators took place in February, at which the Secretariat informed Member States about its needs regarding improvements to the Agency's technical capabilities. The Development and Implementation Support Programme for Nuclear Verification comprises 285 support programme tasks in 25 projects. At the end of 2018, 20 Member States[15] and the European Commission had formal support programmes with the Agency.

MANAGEMENT OF TECHNICAL COOPERATION FOR DEVELOPMENT

The technical cooperation programme in 2018

The technical cooperation programme is the Agency's major vehicle for transferring technology and building capacities in the peaceful use of nuclear science and technology in Member States. In 2018, health and nutrition accounted for the highest proportion of actuals (disbursements) delivered through the technical cooperation programme, at 27.7%. This was followed by safety and security at 20.9%, and by food and agriculture at 20.3%.

[15] Argentina, Australia, Belgium, Brazil, Canada, China, Czech Republic, Finland, France, Germany, Hungary, Japan, Republic of Korea, Netherlands, Russian Federation, South Africa, Spain, Sweden, United Kingdom and United States of America.

By the end of the year, financial implementation of the Technical Cooperation Fund stood at 85.7%. Regarding non-financial implementation, the programme supported, inter alia, 3640 expert and lecture assignments, 196 regional and interregional training courses, and 1816 fellowships and scientific visits.

Technical cooperation and the global development context

In 2018, the Agency attended the Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals and the 2018 United Nations High-level Political Forum on Sustainable Development — the main platforms for follow-up and review of Agenda 2030 and the SDGs. During the High-level Political Forum on Sustainable Development, the Agency highlighted the contributions of nuclear science and technology to a variety of SDGs under review.

Throughout the year, the Agency took part in the United Nations Interagency Task Team on Science, Technology and Innovation for the SDGs, one of the pillars of the Technology Facilitation Mechanism to support implementation of SDG 17, on partnerships for the goals. It also contributed to the dialogue on implementation of the Addis Ababa Action Agenda through the United Nations Inter-Agency Task Force on Financing for Development. The 2018 Task Force report was the first to highlight the role nuclear and isotopic techniques play in increasing agricultural productivity and resilience.

In April, the Agency took part in the International Conference on Public–Private Partnerships for the Implementation of the 2030 Agenda for Sustainable Development, co-organized by the World Association for Sustainable Development and the Joint Inspection Unit of the United Nations system in Geneva. It used the opportunity to discuss lessons learned and best practices on public–private partnerships with other members of the United Nations system, and to give visibility to the Agency's support for science, technology and innovation in several thematic areas.

The Agency took part in the Global South-South Development Expo in New York in November to showcase how nuclear science and technology can promote development by leveraging the knowledge and capacities of the Global South.

Twenty-four Country Programme Frameworks and seven United Nations Development Assistance Frameworks (UNDAFs) were co-signed in 2018, bringing the total number of valid Country Programme Frameworks to 100 and the total number of valid UNDAFs to 56.

Overview of regional activities

Africa

Through its technical cooperation programme, the Agency provided assistance to 45 Member States in Africa in 2018, 26 of which are classified as least developed countries. Approximately 70% of this assistance was in the areas of food and agriculture, health and nutrition, and radiation safety — the main priority areas described in the AFRA Regional Strategic Cooperative Framework for 2019–2023 and the Regional Programme Framework for Africa. The Agency supported Member States in the attainment of the SDGs and contributed to the African Union's Agenda 2063 as well as the African Development Bank's 'High 5s' priorities — especially in the areas of energy, food and agriculture, industrialization and improving the quality of life. In 2018, the Agency and the African Union Commission concluded Practical Arrangements for the safe, secure and peaceful use of nuclear technologies for sustainable development in Africa.

In 2018, activities in Africa focused on building Member State capacities to manage national food resources and to control transboundary animal diseases, contaminants and other pollutants that might affect food safety. Nuclear techniques applied to plant breeding

helped to increase yields and to develop new varieties resistant to disease and to a more complex climate.

The Niayes area of Senegal was declared tsetse-free by the Government of Senegal on 8 December 2018. A mobile freezer was provided to Burkina Faso to facilitate the safe transport of blood from Ouagadougou abattoir to the insect mass-rearing centre in Bobo-Dioulasso. The supply of sterile males from the Bobo-Dioulasso insectary contributed to tsetse fly eradication in the Niayes area.

In Botswana, the laboratory network for early and rapid diagnosis of transboundary animal and zoonotic diseases was strengthened, leading to an improved turnaround time that enables earlier response. In 2018, the capacities of the satellite laboratory in Jwaneng, 200 km west of Gaborone, were expanded to include virological and bacteriological diagnoses, and the satellite veterinary laboratory in Maun, 1000 km north of Gaborone, became fully operational, focusing mainly on foot-and-mouth disease. In Namibia, foundation seeds for seven newly certified varieties of cowpea and four varieties of sorghum, developed through mutation breeding, were made available to farmers for planting in the 2018–2019 season.

A regional project strengthened Member State capacities to monitor marine pollution and to assess risks, contributing to marine resource conservation and management. In Morocco, environmental isotopes were used to improve the management and sustainable exploitation of groundwater in the Gharb plain and the Sebou Basin, a major agricultural region. In Zimbabwe, improved soil and water management enabled farmers to grow vegetables, in addition to the crops usually grown.

In January, Uganda inaugurated a new radiotherapy machine at the Uganda Cancer Institute, resuming essential treatment services for cancer patients following the breakdown of the country's previous equipment in 2016. The Agency supported the purchase of the new radiotherapy machine on a cost-sharing basis, as well as the decommissioning of the old machine and training of key staff required to run the centre. In the United Republic of Tanzania, Agency assistance supported the startup of radiotherapy treatment at the Bugando Medical Centre. The centre is expected to serve a population of some 13 million, easing the pressure on the country's other radiotherapy facility at Ocean Road Cancer Institute in Dar Es Salaam.

In 2018, six least developed countries — Ethiopia, Mali, Senegal, Uganda, the United Republic of Tanzania and Zambia — established or improved their first radioactive waste processing and storage facilities through regional technical cooperation projects.

Human resource capacity building activities in Africa are increasingly focused on long term training leading to professional qualification. In 2018, the Agency held two regional Postgraduate Educational Courses in Radiation Protection and the Safety of Radiation Sources, providing training in radiation safety for 40 young professionals, and two radiation safety 'train the trainers' events, for 50 participants, on the roles, duties and competencies of a radiation protection officer in medical and industrial facilities. Ten candidates completed a two year master's programme in nuclear science and technology at Alexandria University, Egypt, and the University of Ghana; and ten fellowships were awarded in the new PhD sandwich programme launched in 2018, allowing the candidates to carry out their PhD research work at a foreign university. The Agency also provided training in cancer therapy to radiation oncologists, medical physicists, radiation therapy technologists and radiopharmacists through national and regional projects.

"the Agency held two regional Postgraduate Educational Courses in Radiation Protection and the Safety of Radiation Sources, providing training in radiation safety for 40 young professionals"

Asia and the Pacific

In the Asia and the Pacific region, the key thematic areas of focus in 2018 were food and agriculture, nuclear safety and radiation protection, and human health and nutrition.

Eleven Agency fellows were trained at the International Centre for Synchrotron Light for Experimental Science and Applications in the Middle East in Jordan in 2018. The Centre

enables scientists from the region to cooperate on advanced research projects in areas such as biology, archaeology, medicine and material sciences. In 2018, the Agency strengthened South–South and triangular cooperation between Cambodia, the Lao People's Democratic Republic and Viet Nam, with the establishment of a framework for cooperation as well as the signature of Memorandums of Understanding in the areas of industrial applications, medicine, health and safety. Three sterile insect technique programmes were successfully implemented in Israel, Jordan and the territories under the jurisdiction of the Palestinian Authority, fully developing into a major integrated pest management strategy in Israel and Jordan. Integrated pest management strategies are being applied in the territories under the jurisdiction of the Palestinian Authority.

Radiation safety is a priority area for the Asia and the Pacific region. The Agency provided comprehensive and targeted assistance throughout 2018 through training activities, the provision of tools and equipment, and the revision and promulgation of national nuclear laws. Thirty-eight personnel (junior regulatory body staff, radiation protection officers and operator staff) were trained at the 15th Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources. An intercomparison exercise organized by the Agency and hosted by the Australian Radiation Protection and Nuclear Safety Agency allowed laboratories in the region to assess their dosimetry capabilities, while training in November provided by the Korea Institute of Radiological and Medical Sciences, with cost sharing from the Republic of Korea provided through the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA) Regional Office for the Asia and the Pacific region, improved the skills of 18 laboratory technicians in carrying out internal dose assessments. The Philippine Nuclear Research Institute provided training through an Agency technical cooperation project in the establishment of national registries of radiation sources to representatives from nine countries and territories that are about to establish regulatory bodies.

The Agency continued to support efforts to introduce nuclear science and technology to students in secondary schools in the Asia and the Pacific region through national and regional training courses. A new project launched in 2018 builds on the achievements of an earlier project that reached over 24 700 secondary school students in pilot countries in 2017. The new project has already reached more than 160 000 students through regional training courses and national workshops.

Europe

In 2018, the Agency provided technical assistance to 33 Member States in Europe and Central Asia focused mainly on nuclear and radiation safety, and human health.

In April, National Liaison Officers for the region endorsed the revised Regional Profile for 2018–2021, which establishes the priority thematic areas in the Europe and Central Asia region.

Two expert missions to Turkey enhanced the Turkish Atomic Energy Authority's capabilities in PSA for risk informed decision making by training nine people. Poland, an embarking nuclear power country, hosted an Agency expert mission that conducted national workshops on the Advanced Licensing Exercise Project, a capability development activity that supports the achievement of regulatory readiness. Twenty people received training through these events. A second national workshop focused on communication with the public in a nuclear or radiological emergency. Thirty-two participants from 12 Member States attended a regional workshop in Armenia that provided a forum to share experiences concerning technical challenges with the design, implementation and licensing of modern instrumentation and control systems for nuclear power plants.

Uzbekistan received assistance to enhance its environmental radiation monitoring network and to improve the laboratories of its national hydrometeorological service. With the new equipment and training for four staff provided in 2018, it is now able to determine

activity concentrations of low level alpha-emitting radionuclides, in addition to gross alpha-beta measurements. Uzbekistan's improved environmental monitoring network can now support environmental impact assessments, verify environmental safety and prepare for the implementation of environmental remediation programmes.

Latin America and the Caribbean

In the Latin America and the Caribbean region, the Agency's assistance was focused primarily on human health and nutrition, followed by safety, food and agriculture, and water and the environment. The regional programme also focused on improving the quality and sustainability of national nuclear institutions. In 2018, the first national Agency technical cooperation programmes were initiated for three new Member States: Antigua and Barbuda, Barbados and Guyana.

In health, activities focused on building capacity in radiation medicine, and the second edition of the master's programme on advanced radiotherapy was launched. Public brachytherapy services for the treatment of gynaecological tumours were re-established in Guatemala, and the first molecular radiobiology and oncology laboratory opened in the Bolivarian Republic of Venezuela with Agency support.

In safety, the regional programme focused on strengthening national regulatory infrastructure and providing assistance to ensure safety for end users of radiation sources. Assistance was provided to professional bodies in the region to finalize the Guide on the Prescription of Diagnostic Imaging for prescribing physicians to support the optimization and quality of radiodiagnostics. The first Emergency Preparedness and Response School for Caribbean Member States was successfully delivered, and the first Regional School of Nuclear and Radiological Leadership for Safety for young professionals was held in Mexico, training more than 30 future leaders in the region. In addition, a new managerial tool was developed to support strategic planning to prioritize safety assistance through national and regional programmes. Costa Rica inaugurated the first biodosimetry laboratory in Central America.

The implementation of non-destructive testing methods to evaluate the integrity and properties of civil infrastructure, material or components was a key objective for the region in 2018. Capacity building actions and equipment were procured to strengthen the identified four subregional reference centres for the inspection of civil structures which were established in Argentina, Chile, Mexico and Peru. They will have the capacity to provide immediate response in the case of national and regional emergencies and disasters.

The capacities of the Caribbean Observing Network for Ocean Acidification, which will monitor ocean acidification and its impact on harmful algal blooms, were strengthened. Agency activities helped build capacity in monitoring laboratories through four regional training events in the region.

In the field of agriculture and food safety, efforts focused on the development of new mutant varieties of tomato (tolerant of high temperature and drought), quinoa (resistant to local disease) and rice (resistant to herbicides).

In 2018, the Agency successfully supported the first pilot sterile mosquito release in Mexico — the first trial in the Latin America and the Caribbean region. The first release of sterile fruit flies took place in Ecuador, an initial step in the implementation of sterile insect technique technology in the country. At the regional level, the development of capabilities for the area-wide application of the sterile insect technique continued, contributing to opening up markets for the export of fruit and vegetables.

The delivery of low enriched fuel for the RP-10 research reactor in Peru was finalized. This reactor plays a key role in the production of radioisotopes in the country, as well as in research activities and the training of professionals and technicians.

Programme of Action for Cancer Therapy (PACT)

Throughout 2018, the Agency, in collaboration with key partners and donors, continued to help low and middle income Member States to improve the effectiveness of their radiation medicine services as part of a comprehensive cancer control framework. Activities focused on strengthening national cancer control capacities and mobilizing resources for the Agency's cancer control-related activities.

The Agency established a new partnership with Childhood Cancer International and enhanced relationships with existing partners from Member States and international financing institutions. It participated in key global health events such as the World Health Assembly in Geneva; the World Health Summit in Berlin; the Stop Cervical, Breast and Prostate Cancers in Africa Conference in Maseru, Lesotho; the Commonwealth East, Central and Southern Africa Health Ministers Conference in Harare; and the World Cancer Leaders' Summit and the World Cancer Congress, both in Kuala Lumpur.

"Seven Member States … received imPACT ('integrated missions of PACT') Review missions"

Seven Member States — Afghanistan, Guyana, Indonesia, Mauritius, Mexico, North Macedonia[16] and Ukraine — received imPACT ('integrated missions of PACT') Review missions, which looked at national cancer control capacities and needs, and provided governments with recommendations on how best to prioritize their cancer control activities and investments.

In close cooperation with WHO, expert advisory assistance was also provided to Lesotho, Malawi, Mozambique, Namibia, Nicaragua and Viet Nam to support the development of national cancer control plans. The Agency also provided expertise to examine Albania's progress in cancer control capacities.

The Agency held an expert meeting in Vienna in November to strengthen the current methodology for conducting imPACT Reviews. A workshop to support seven African Member States in the integrated planning and implementation of sustainable radiotherapy services took place at the Agency's Headquarters in December.

Legislative assistance

In 2018, the Agency continued to provide legislative assistance to its Member States through the technical cooperation programme. Country specific bilateral legislative assistance was provided to 17 Member States through written comments and advice on drafting national nuclear legislation, and one regional and five national workshops on nuclear law were organized during the year.

The Agency also organized the eighth session of the Nuclear Law Institute in Baden, Austria, in October. Sixty-one participants from Member States attended the training. The Nuclear Law Institute is designed to meet the increasing demand by Member States for legislative assistance and to enable participants to acquire a solid understanding of all aspects of nuclear law, with a particular focus on legislative drafting.

Technical cooperation programme management: Quality assurance activities, reporting and monitoring

Efforts continued throughout 2018 to develop and improve processes and tools to increase the quality of current and future technical cooperation programme cycles.

The electronic Project Progress Assessment Reports, introduced in 2017, led to higher submission rates in 2018. The new process enables quicker, more relevant reporting by Member States, contributing to more effective project implementation, monitoring and results evaluation. In addition, the Agency conducted field monitoring missions to Albania,

[16] The name 'North Macedonia' replaces the former name 'The former Yugoslav Republic of Macedonia' as of 15 February 2019.

Costa Rica, Israel, South Africa and the United Republic of Tanzania, to strengthen the programme's results oriented approach.

The Agency issued guidelines for the planning and design of the 2020–2021 technical cooperation programme cycle, and revised and updated project design templates and guidance, based on experience from past programme cycles and in response to recommendations from internal and external audits and evaluations. The Agency provided support to Member States and staff through a series of training events, workshops and briefing sessions covering every phase of the programme cycle, with the aim of increasing project efficiency, effectiveness and results orientation throughout the planning, implementation and review cycle. Close to 900 stakeholders used the recently updated e-learning course on designing technical cooperation projects using the logical framework approach in 2018.

Financial resources

The technical cooperation programme is funded by contributions to the Technical Cooperation Fund, as well as through extrabudgetary contributions, government cost sharing and contributions in kind. Overall, new resources reached a total of some €100.1 million in 2018, with approximately €82.6 million for the Technical Cooperation Fund (including assessed programme costs, National Participation Costs and miscellaneous income), €17.2 million in extrabudgetary resources, and about €0.3 million representing in kind contributions.

The rate of attainment for the Technical Cooperation Fund stood at 91.4% on payments and 92.6% on pledges at the end of 2018, while payment of National Participation Costs totalled €3.6 million.

Actuals

In 2018, approximately €94.7 million was disbursed to 146 countries or territories, of which 35 were least developed countries, reflecting the Agency's ongoing effort to address the development needs of those States.

MANAGEMENT ISSUES

Gender equality and gender mainstreaming

The Agency continued its efforts focused on promoting gender equality within the Secretariat, as well as gender mainstreaming in the Agency's programmes and activities. The Agency mainstreams gender in all relevant programmes and organizational practices, including efforts to enhance the participation of women as training participants, fellows, scientific visitors, project counterparts, researchers, experts and panellists. For the first time, the proportion of women in the professional and higher categories went over 30% as of the end of 2018, while that of women in senior management positions (D level or higher) was 29%.

Managing for results

The Agency's results based management approach to programme planning, monitoring and reporting was further strengthened in 2018. In the draft Programme and Budget for 2020–2021, specific focus was placed on better defining clear, outcome oriented results and indicators, while also mainstreaming cross-cutting issues. Related guidance was developed, and targeted training was provided. An accountability framework was issued to ensure that

the Secretariat delivers on its functions by fostering an environment of achieving concrete results through effective synergy and alignment of its activities and processes.

Partnerships and resource mobilization

The Secretariat continued to implement the Strategic Guidelines on Partnerships and Resource Mobilization using a one-house approach. It took steps to systematize its approval procedures and processes, enhance coordination and monitoring, and improve information sharing. The Secretariat continued existing collaboration arrangements and developed new partnerships, particularly with Member State institutions to promote technology transfer; and it leveraged mechanisms such as the United Nations Global Marketplace to reach out to a wider range of non-traditional partners.

Information and IT security

The Agency continued to strengthen its information and IT security in 2018, focusing on reducing the risk posed by phishing and unsupported legacy applications. The Agency also strengthened its efforts to further protect sensitive information.

Multilingual web site

The Agency launched web sites in Arabic, Chinese, French, Russian and Spanish in June. These sites contain over 450 static pages explaining the Agency's work in different areas, as well as over 250 news items. Each month, some five news articles or videos were made available in Arabic, Chinese, French, Russian and Spanish; different topics were selected for each site, based on their relevance and interest to the respective language community.

IAEA SCIENTIFIC FORUM

The IAEA Scientific Forum 2018, held during the 62nd General Conference in September, examined the role that nuclear science and technology play in addressing the challenges of climate change and how they can help more Member States. High level speakers, including Princess Sumaya bint El Hassan of Jordan, science ministers and experts, joined the Director General to present the role of nuclear techniques in mitigating, monitoring and adapting to climate change. Panellists noted public acceptance of nuclear power and capacity building in nuclear techniques as the main challenges. Further deployment of these nuclear techniques would benefit efforts to address challenges associated with climate change in the areas of food security and water scarcity, and help to reduce greenhouse gas emissions in a sustainable manner.