IAEA Technical Cooperation in Asia and the Pacific

International Atomic Energy Agency
Department of Technical Cooperation

IAEA

Technical Cooperation Programme

Foreword by the Head of Technical Cooperation

The IAEA's technical cooperation (TC) programme in Asia and the Pacific collaborates with 41 Member States and territories and provides support to 38 countries and territories in the peaceful application of nuclear technology for sustainable development. The programme is designed to meet the strategic priorities of the region's countries and territories, in line with their national and regional development plans.

This brochure provides an overview of the TC programme in Asia and the Pacific, highlighting successful projects in the region that have contributed positively to the region's development plans. It also describes important initiatives in south-south cooperation and in enhancing capacity building in nuclear science and technology, especially in future generations.

I look forward to our continued work with Member States in the Asia and the Pacific region in the peaceful uses of nuclear science and technology, and to contributing to regional efforts to address developmental priorities, particularly those relevant to the UN Sustainable Development Goals.

Dazhu Yang
Deputy Director General
Head of the Department of
Technical Cooperation

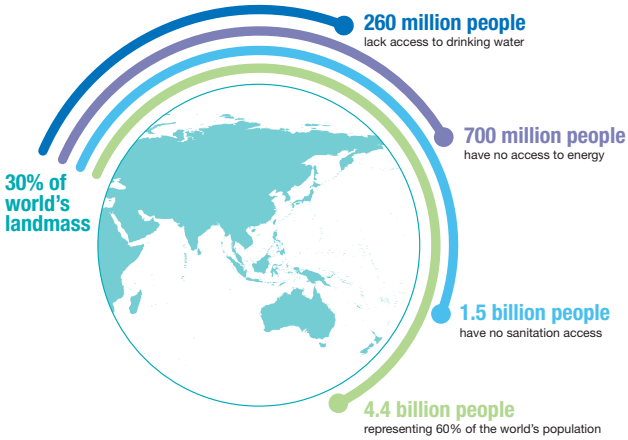
What is the IAEA Technical Cooperation Programme?

The technical cooperation programme is the Agency's primary mechanism for building capacities in the peaceful application of nuclear technology in Member States, supporting their efforts to address key development priorities in areas such as health and nutrition, food and agriculture, water and the environment, industrial applications, and nuclear knowledge development and management.

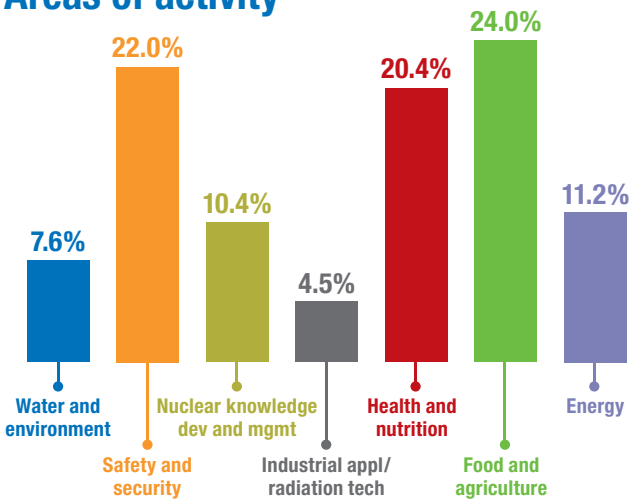
Asia and the Pacific: An overview

The IAEA fosters technical cooperation amongst 41 countries in Asia and the Pacific region, aiming to meet the strategic priorities of the region's Member States in line with their national development plans. It provides assistance to 38 Member States and territories in areas such as health and nutrition, food and agriculture, energy, nuclear knowledge development and management, water and the environment, and industrial applications and radiation technology.

Facts about Asia and the Pacific

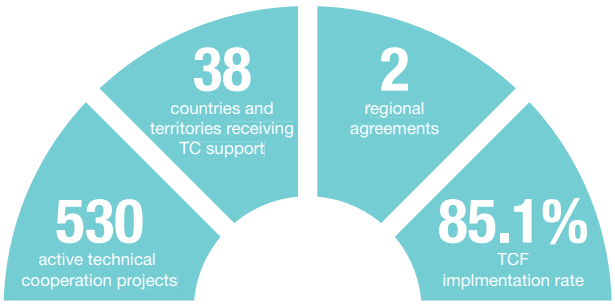


Areas of activity



Total expenditure in Asia and the Pacific in 2018: €25.3 million

IAEA technical cooperation in the Asia and the Pacific Region, 2018



"Our programme contributes efficiently and effectively to the socioeconomic development of the Asia and the Pacific region by supporting the attainment of self-reliance and sustainability of national nuclear institutions.

This sustainability is also attained by reaching out and inspiring the next generation of scientists in the region."

Jane Gerardo-Abaya
Director, Division for Asia and the Pacific
Department of Technical Cooperation

1229 (394)	514 (92)	344 (70)	1661 (532)	687 (160)	801 (304)	86 (24)
Project counterparts	International experts	Scientific visitors	Meeting participants and other project personnel	Fellows and scientific visitors	Participants in training courses	Lecturers

() = female

The Country Programme Framework

At the signing of the Country Programme Framework between Bahrain and the IAEA in May 2018. (Credit: D. Calma / IAEA)

The Country Programme Framework (CPF) serves as a medium-term framework for technical cooperation between the IAEA and individual countries. The CPF and its annexes define mutually agreed development needs and interests to be supported by IAEA technical cooperation activities. These activities are based on national development plans, country specific analyses and lessons learned from past cooperation.

The CPF serves to ensure that projects are focused effectively on agreed needs and priorities. In 2019, the Asia Pacific region has 27 active CPFs.

A prerequisite of the CPF process is dialogue between the IAEA and national stakeholders, including national authorities, counterparts and Ministries, as well as relevant UN organizations, bilateral donors and other stakeholders. The CPF should reflect an understanding between all parties on where nuclear technologies can be used to address national development priorities directly and cost-effectively, aligning, where appropriate, with the UN Sustainable Development Goals.

Three countries signed CPFs in 2018


Bahrain


Bangladesh


Brunei Darussalam

IAEA Technical Cooperation in support of Sustainable Development Goals

Science and technology are vital for the successful achievement of the targets of the UN Sustainable Development Goals (SDGs). In Asia and the Pacific, active IAEA technical cooperation projects are directly supporting development in several key areas:

Zero Hunger. TC projects support countries in Asia and the Pacific to improve food security and agriculture by using nuclear techniques to protect plants from insect pests, and to breed new plant varieties that produce better yields, tolerate drought, and are resistant to disease.

Health and Well-Being. TC projects help countries devise comprehensive cancer control programmes establish capacities in nuclear medicine, radiation oncology and radiology, and support the assessment of nutrition of children and adults.

Clean Water. Isotopic techniques shed light on the age, source, movement and interactions of water above and below ground. TC projects help countries apply these techniques to manage and use their water resources wisely, while protecting and preserving existing water ecosystems for future generations.

Affordable and Clean Energy. TC projects contribute to developing capacity in safety, energy planning and analysis, nuclear regulation and knowledge management. They also foster the efficient and safe use of nuclear power by supporting new and existing nuclear power programmes.

Industry, Innovation and Infrastructure. TC projects support countries' efforts to increase the competitiveness of their industries by using nuclear techniques for non-destructive testing of industrial products and monitoring processes for industrial safety and quality.

Climate Action. Climate change has become one of the biggest environmental challenges worldwide. Experts are working in collaboration with the IAEA and its partners to use nuclear science and technology to understand, monitor, mitigate, control and adapt to the effects of climate change and respond to the Paris Agreement on Climate Change.

Life Below Water. Many countries are using nuclear and isotopic techniques, with the support of the TC programme, to better understand and monitor ocean health and marine phenomena such as ocean acidification and harmful algal blooms.

Life on Land. Isotopic techniques provide accurate assessments of soil erosion and help to identify erosion hot spots, providing an important tool to arrest land degradation and restore soils.

Partnerships for the Goals. Close collaboration between the IAEA, United Nations organizations and other international and civil society organizations contributes to maximize the impact of the IAEA's support and establish synergies for better achievement of Member States' development priorities.

The IAEA works closely in partnership with other UN agencies, research and civil society organizations to optimize the contribution of nuclear science and technology to the attainment of the Sustainable Development Goals.

Some of the staff of the Division for Asia and the Pacific, IAEA Department of Technical Cooperation. (Credit: D. Calma/IAEA)

Food and agriculture

Nuclear technologies can provide competitive and often unique solutions to boost agricultural productivity, help fight hunger and malnutrition, improve environmental sustainability and ensure that food is safe. The IAEA technical cooperation programme in Asia and the Pacific builds expertise in using nuclear techniques in Member States and territories to address challenges affecting food supply, safety and security. IAEA support in the form of capacity building initiatives, expertise and provision of equipment have resulted in tangible achievements. These include improved crop and plant varieties using induced mutation breeding; better livestock reproduction and nutrition; enhanced control of animal and plant pests and diseases, better soil and water management; and improved food safety.

Farmers planting rice in the Philippines.

Philippines: Seaweed-treatment toughens rice crops against typhoons

Researchers in the Philippines have found that an extract of seaweed, when processed with radiation, can make plants more resistant to typhoons and boost rice production by 20 to 30% while using only half of the recommended dose of fertiliser dose. The extract, called carrageenan, comes from algae that is abundant in the sea. This is the first time that researchers — with support from the IAEA — have applied it as a plant growth promoter on a large-scale basis.

Agricultural researchers at the National Crop Protection Center of the University of the Philippines tested the benefits of carrageenan as a plant growth promoter on more than 5000 hectares of rice fields. The IAEA provided the irradiators and trained local experts on their use. In their study, researchers subsequently not only found that sprayed areas treated with carageenan produced crops with higher yield, but also that plants started growing more extensive roots, sturdier stems and more tillers (grain-bearing branches), thus increasing their resilience to typhoons. This is welcome news for farmers in the region at a time when, according to projections by the United Nations' Intergovernmental Panel on Climate Change, rising temperatures will heat the oceans which can then lead to more intense and frequent typhoons.

Yemen: Breeding small ruminants in the highlands

The TC programme has enabled Yemen to continue building capacity in the breeding of small ruminants in the central highlands region under a national project aiming to help farmers improve how they run and manage small ruminant farms. Livestock production in the country, in particular, raising small ruminants,

is one of the main income sources of the rural community, and contributes significantly to their livelihoods. The TC project is contributing to Yemen's national food security by increasing livestock productivity and farmer income.

Thailand: Sterile insect technique boosts fruit exports

Supported by a TC project, Thailand's fruit farmers are using a radiation-based insect pest control technique to rid their farms of the Oriental fruit fly, which for years has devastated crops and livelihoods. The sterile insect technique (SIT) was introduced to Thai fruit farmers in the eastern part of the country by the Department of Agricultural Extension, the Institute of Nuclear Technology, in cooperation with the IAEA and the Food and Agriculture Organization of the United Nations. SIT was used as a key component of an area-wide integrated insect pest management programme.

Scientists use fruit fly traps to capture flies and check whether they are all irradiated. (Photo: N. Jawerth/IAEA)

After adding SIT to their insect control methods, it only took a few years for Thai fruit farmers to meet export standards. The farmers are now exporting as much as 4000 tonnes of high-quality fruits each year, and because they don't need to use pesticides, their products are considered eco-friendly and can be sold in markets not available to them before.

A fruit vendor in Bangkok's renowned floating market.

These new barley varieties, developed using mutation breeding, are more resistant to drought.
(Credit: Kuwait Institute for Scientific Research)

Kuwait: Growing barley in the desert

Kuwait has an arid climate – a hostile environment in which to grow food crops. In recent years, scientists have used technology packages that incorporate nuclear and nuclear-derived techniques to enable crops to be grown in this arid environment.

Supported by the IAEA, Kuwaiti scientists used gamma ray irradiation to successfully develop a new barley variety that is more resilient to drought, salinity and limited water supply. They are also applying a nuclear-based technique developed through a TC project, using cosmic ray neutron sensors, to measure soil moisture and to determine the rate of evaporation.

Malaysia: A 'nuclear package' makes all the difference for rice farmers

An integrated approach that combines planting a new rice variety with the use of biofertilizer and plant growth promoter has increased the yield of rice farmers in Malaysia by up to 40%. This 'nuclear package' consists of a set of products and services developed by Nuclear Malaysia, which aims to help the country's rice farmers cope with low soil fertility and changing weather patterns.

The key components of the 'nuclear package' include: a new rice variety called NMR152 which was developed using nuclear techniques; an organic plant growth promoter and the oligochitosan plant elicitor produced by using irradiation at Nuclear Malaysia; pyroligneous acid, a natural fungicide that is used to inhibit several fungal plant pathogens; and the application of isotopic techniques that can determine the optimal use of fertilizer.

In extensive testing, the new NMR152 rice variety, planted as part of this package, survived periods of drought and submersion in water for eight days while other varieties died. Malaysian Agricultural authorities have now started multiplying the seeds for large scale use.

Health and nutrition

Since the IAEA began its work in human health over 60 years ago, the use of nuclear techniques in medicine and nutrition has become one of the most widespread peaceful applications of atomic energy. The technical cooperation programme supports Member States and territories in the Asia and the Pacific region in addressing challenges related to human health and nutrition. In particular, TC projects support the fight against cancer by enabling countries devise comprehensive cancer control programmes, and by training health professionals in advanced nuclear medicine, radiation oncology and radiology techniques and procedures.

During the groundbreaking ceremony of the Techo Santepheap Cancer Centre. (Credit: C. Brady/IAEA)

Cambodia: First national cancer centre starts operation

In Cambodia, the TC programme supported a major collaborative effort to establish the country's first national cancer centre. The Techo Santepheap Centre, located at the Calmette Hospital in the capital Phnom Penh, was inaugurated on January 2018, and is designed to cover up to 60% of the national demand for cancer diagnosis and treatment.

The Government of Cambodia dedicated €36 million to ensure the centre's completion, and the IAEA contributed around €2 million in expertise related to its design, the commissioning of radiotherapy and nuclear medicine machines, as well as specialized staff training.

The new centre has one radiotherapy machine, with two more planned in the coming years. Plans also call for the installation of a positron emission tomography–computed tomography (PET-CT) scanner and a cyclotron for the production of radiopharmaceuticals to improve medical imaging procedures. In the next five years, Cambodia wants to build two additional cancer centres in the north and west of the country, both with radiotherapy and nuclear medicine facilities.

Mongolia: A comprehensive approach to improve cancer care

Mongolia reportedly has one of the highest cancer mortality rates in the world – up to 22% of all deaths in the country. Through a comprehensive approach, an IAEA technical cooperation project is assisting Mongolia improve delivery of cancer care services to the growing number of patients requiring radiation treatment.

Radiation therapy is an effective method to combat cancer for both curative and palliative

IAEA support is improving the overall health situation in Mongolia.

purposes, and the TC project is providing both radiotherapy equipment and technical training for medical staff, as well as guidance on operational and quality control practices.

The project is a joint effort between the IAEA, Mongolia and numerous other partners, ensuring its successful completion. The National Cancer Centre of Mongolia, as primary counterpart, is responsible for the coordination, implementation and sustainability of the programme; the Nuclear Energy Commission is responsible for the licensing of the new radiotherapy practices; and the Ministry of Health will ensure the national project's strategic alignment with Mongolia's national health policies.

Myanmar: Extending quality care to more cancer patients

Cancer is a leading cause of death in Myanmar and opening up more radiotherapy centres and increasing access to these facilities is high on the Government's health agenda. There are now four public radiotherapy centres operating in Myanmar which treats some 300 patients on a daily basis. Three new linear accelerators and a new high dose rate brachytherapy machine were recently installed. Training on the correct use of these complex machines is not, however, available locally. This is where IAEA technical assistance steps in.

Radiotherapy treatment being carried out in the Yangon General Hospital in Myanmar. (Credit; M. Gaspar/IAEA)

Under a TC project, medical physicists and radiologists from Myanmar participate in IAEA-organized trainings and make scientific visits to institutions in countries with more experience in using state-of-the-art radiotherapy equipment. They also send dosimetry measurements to the IAEA's laboratory near Vienna to check the calibration of their radiotherapy machines.

Radiation physics and dosimetry are the cornerstone of safe and effective radiotherapy for treatment of cancer. They are also essential to quality assurance in other radiation medicine disciplines. IAEA support ensures that countries like Myanmar can deliver accurate doses and that appropriate training is given to medical physicists, radiation oncologists and others involved in radiation medicine to achieve optimal outcomes for patients.

Oman: Improving diagnostic capabilities for malaria

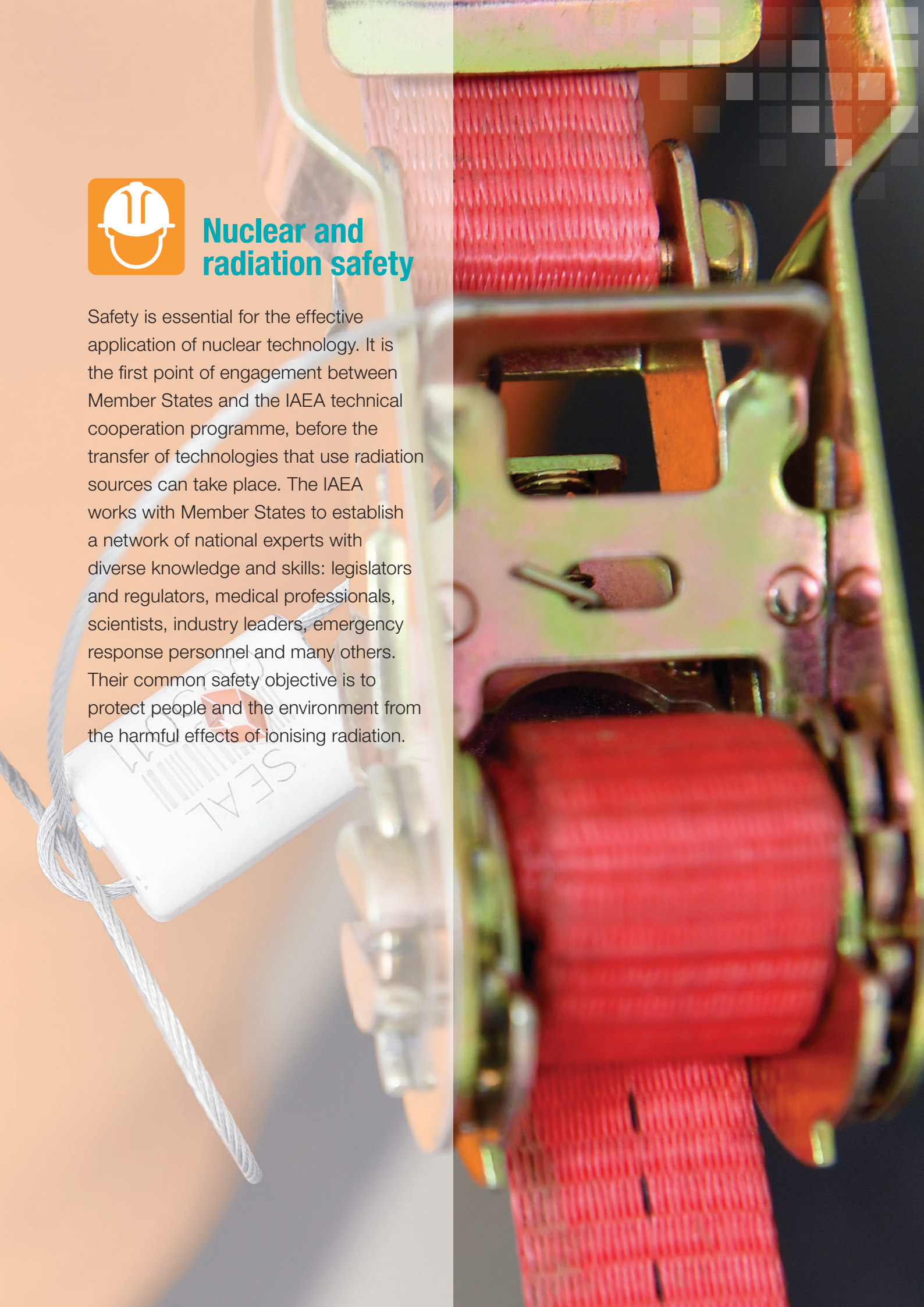
With IAEA support, Oman has developed diagnostic capabilities in the use of molecular and radionuclide techniques for the detection of asymptomatic malaria cases from malaria endemic countries. The country has also acquired capacities to identify drug resistant parasites that are not affected by certain antimalarial drugs.

Of the 324 samples collected from healthy individuals arriving at Muscat International Airport from malaria endemic sites, sixteen individuals were found to harbour the malaria parasite *P. falciprum* and six harboured the malaria parasite *P. vivax.* All individuals had tested negative using conventional diagnostic methods.

Technical staff performing microscopy for detection of genes associated with drug resistance in *P. vivax* in the laboratories of the Biochemistry Department, College of Medicine and Health Sciences, Sultan Qaboos University. (Photo: Sultan Qaboos University)

Nuclear and radiation safety

Safety is essential for the effective application of nuclear technology. It is the first point of engagement between Member States and the IAEA technical cooperation programme, before the transfer of technologies that use radiation sources can take place. The IAEA works with Member States to establish a network of national experts with diverse knowledge and skills: legislators and regulators, medical professionals, scientists, industry leaders, emergency response personnel and many others. Their common safety objective is to protect people and the environment from the harmful effects of ionising radiation.



The IAEA organizes regular training sessions for safety regulators in an effort to constantly improve the regulatory infrastructure in Member States.

Regional project: Strengthening radiation safety infrastructure

Activities carried out in 2018 through regional TC projects have strengthened the radiation safety infrastructure of several countries in the Asia and the Pacific region.

The activities aimed to improve governmental regulatory infrastructure and included the following: an advisory mission to Kuwait; a workshop on staffing and training of regulators in Qatar; a training course for regulators on developing a programme for inspection and enforcement in Mongolia; and a training course for new regulators in the Philippines on how to establish a registry for radiation sources and on the methodology to fully utilize the Regulatory Authority Information System (RAIS).

Disused radiation sources need to be disposed of properly.

A participant carries out a practical exercise to improve her training delivery skills (Photo: Ministry of Health, United Arab Emirates)

Other activities included enhancing radiation protection in the medical sector, as it is a priority for the participating Member States, and the most common application of radioisotopes in countries in the region. In 2019, over 70 staff from 17 Member States working in interventional radiology had their training skills enhanced, enabling them to train their peers in turn. Several participating Member States implemented national training activities as a result, in which several radiologists and radiographers from private and public hospitals were trained. In addition, regional courses train counterpart institutions to prevent accidents in radiation therapy.

Regional project: Enhancing radioactive waste management in the Asia and the Pacific region

The IAEA, through its technical cooperation programme, builds capacities in the Asia and the Pacific region to strengthen radioactive waste management infrastructure.

In 2018, under a project called 'Enhancing the Radioactive Waste Management Infrastructure in the Asia-Pacific Region', 32 national personnel were trained on options for managing disused sealed radioactive sources. The training included a practical demonstration of conditioning procedures. The practical skills the participants acquired will enable waste categorization, technical conditioning procedures and pre-disposal considerations in their home countries.

Interregional project: Improving safety awareness among least developed countries

Activities have begun under an interregional project that seeks to contribute to the development of least developed countries (LDCs) by building human and institutional capacities in nuclear science and technology. The project kicked off in 2018 with an interregional meeting amongst National Liaison Officers and national experts from LDCs to identify high priority development goals that could be supported by the TC programme, and to discuss effective modalities for the formulation, implementation and monitoring of the TC programme to ensure that it addresses their specific needs and priorities.

Establishing a legal framework for radiation safety

In January 2019, the Parliament of Papua New Guinea passed the Radiation Safety and Control Act which was developed with the IAEA's support. The Act establishes the national legal framework for radiation safety and addresses the long-standing challenge of radiation sources being used in medicine and industry without an adequate legal framework for safety being in place.

The IAEA has been assisting Papua New Guinea since 2016 to establish an effective national regulatory infrastructure for the control of radiation sources in accordance with applicable international standards. The TC programme has also recently assisted Brunei Darussalam, Indonesia, Lao People's Democratic Republic, Nepal and Thailand in establishing and strengthening their respective legislative frameworks, including reviews of draft comprehensive nuclear laws and competence awareness raising activities for senior officials, with Nepal in the final stages.

This mother and child will be among those benefitting from Papua New Guinea's new legal framework on radiation safety.

Energy

A number of countries in the Asia and the Pacific region are embarking on nuclear power programmes. The region also has the highest number of reactors under construction for the expansion of nuclear energy for power generation. The Agency is supporting the development of national infrastructure for several Member States using the IAEA Milestones approach.

Construction progresses on Bangladesh's first nuclear power plant. (Credit. L. Gil/IAEA)

Bangladesh: Construction of first nuclear power plant begins

Bangladesh plans to produce 9% of its electricity from nuclear power and reduce its dependence on fossil fuels by the middle of the next decade. A nuclear power plant being built in Rooppur, about 160 kilometres northwest of the capital, will have the capacity to generate 2400 megawatts of electricity.

Since Bangladesh expressed interest in embarking on a nuclear power programme, the IAEA has been assisting the country through its technical cooperation programme. This support includes assistance with reviewing nuclear laws, preparing for adherence to international legal instruments, developing and reviewing regulations, assessing sites and developing a radioactive waste management system.

United Arab Emirates: Moving to the final phase of the IAEA's Milestones approach

The IAEA continues to provide assistance to the United Arab Emirates as the country prepares for the operation of the first of four units of the Barakah nuclear power plant, which started construction in 2012. The United Arab Emirates nuclear power infrastructure, developed according to the IAEA Milestones approach, has undergone continuous review by the IAEA through several peer review missions.

The latest Integrated Nuclear Infrastructure Review mission in July 2018 looked at Milestone 3, making recommendations and suggestions on areas where further actions would benefit the United Arab Emirates.

The United Arab Emirates launched its nuclear power programme in 2008 and is committed to working with the IAEA to ensure the highest standards of nuclear safety and security.

Nuclear knowledge development and management

Building, collecting, maintaining, sharing, preserving and utilizing knowledge is important for gaining the necessary technical expertise and competencies required for nuclear power programmes and the application of other nuclear technologies. The IAEA also collaborates with Member States to maintain and preserve nuclear knowledge and preserve institutional memory.

CLP4NET: Maximizing the educational impact of IAEA's cyber learning platform

The Division for Asia and the Pacific has embarked on a systematic approach to fully utilize the potential of the IAEA's Cyber Learning Platform for Nuclear Education and Training (CLP4NET). It has created project-specific pages within the cyber platform that should help increase the efficiency and relevance of training courses. It regularly conducts satisfaction surveys for participants and lecturers and uses the online platform to disseminate documents for participants.

The CLP4NET is an online platform that allows users to find educational resources easily. The platform hosts a learning environment that supports instructor-led courses and disseminates self-study, e-learning resources to a wider audience. CLP4NET aims to facilitate sustainable education in the nuclear sector by using the web to deliver high quality e-learning resources and learning environments, delivered in a way that is cost-effective, scalable and easy to use.

The use of the IAEA's platform is provided as a cost-free service to all IAEA Member States.

ANENT: New features improve long-term sustainability of web portal

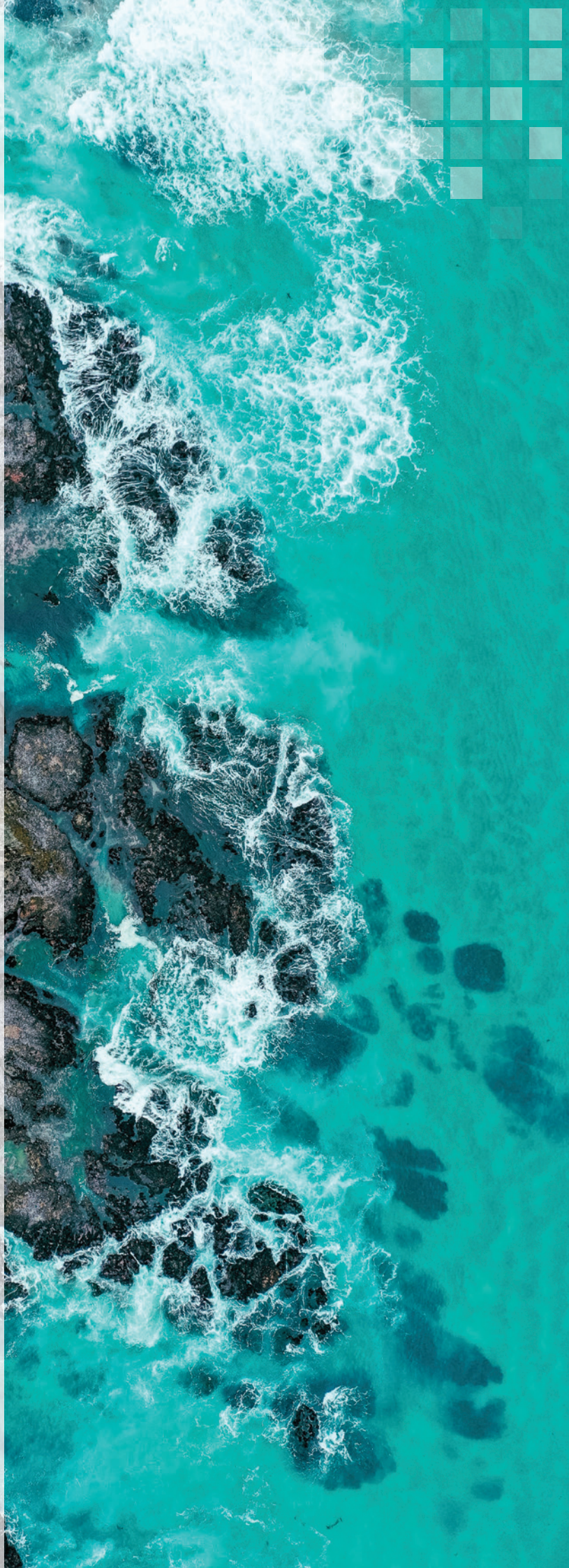
New features added to the web portal of the Asian Network for Education in Nuclear Technology (ANENT) in 2018 will provide the network and its users with improved accessibility, security, cost-benefits and long-term sustainability.

ANENT is a regional partnership, supported by the IAEA under a regional technical cooperation project. It supports cooperation in capacity building, human resource development and knowledge management in nuclear science and technology in the Asia and the Pacific region. ANENT has currently 21 members.

In 2018, the learning management system was moved from a physical server to a cloud-based server hosted under the IAEA cloud, allowing for a more cost effective and centralized point of data storage. Also in 2018, a new Learning Object Repository (LOR), was developed and deployed. The LOR enables the hosting of a variety of educational, training and outreach materials from Member State organizations and educational institutions, including training materials of the Division for Asia and the Pacific regional projects, and has various benefits, such as long-term access and preservation of institutional and organizational knowledge.

Water and the environment

Nuclear science and technology can help countries manage and make the most of their natural resources as well as understand and protect the environment. In Asia and the Pacific, IAEA technical cooperation projects help Member States apply isotope techniques to manage their water resources wisely. The projects also promote the use of isotopic techniques to identify and study the sources, extent, quality, interactions and transport of the water cycle. Other TC projects help Member States measure pollutants and environmental radioactivity in the air, land and oceans, and support the ability of countries to manage and protect marine resources and coastal zones.



Nuclear techniques contribute to national efforts to improve the efficient use of scarce water resources.

Qatar: Leaving ample water for future generations

In Qatar, an IAEA technical cooperation project to improve the productivity of Ikhlas and Berhi date palm varieties is also tackling the challenge of ensuring the efficient and sustainable use of the country's water resources.

Through the TC project, a field initiative was piloted to test and demonstrate best practice technologies and the use of advanced nuclear techniques, such as the cosmic-ray neutron sensor, for better water management and efficient water use.

Isotopic techniques not only help uncover important clues in soil and water for optimizing water use, they also provide an insight into the origin, age and movement of groundwater, and can identify potential sources of groundwater contamination. This information is essential for the sustainable management of water resources.

Qatar is one of the ten most water-scarce countries in the world, and one of the most important challenges the country expects to face over the next few decades is how best to manage its water resources in a way that supports sustainable development.

Islamic Republic of Iran: Assessing the impact of deforestation using nuclear techniques

The northern part of Iran is well-known for its Hirkani Forests, located along the southern coast of the Caspian Sea. But high demand for wood has drastically decreased the forest area, leading to soil erosion and soil nutrient losses.

A forest in the north of Iran.

With IAEA support Iran was – for the first time – able to use nuclear techniques to assess land degradation caused by deforestation. Use of these techniques allowed Iran's Organization of Forests, Rangelands and Watershed Management to gather precise data on land degradation, and to implement appropriate conservation management practices in the affected region. At the same time, national training improved Iran's capacity to precisely measure land degradation caused by deforestation.

Project results facilitate the selection of the most environmentally friendly agroforestry practices to conserve soil resources. The research outcomes have been included in a national soil and sediment management plan which aims to control and mitigate the impact of deforestation in northern Iran.

Pacific Islands: Developing expertise in breeding crops for climate change

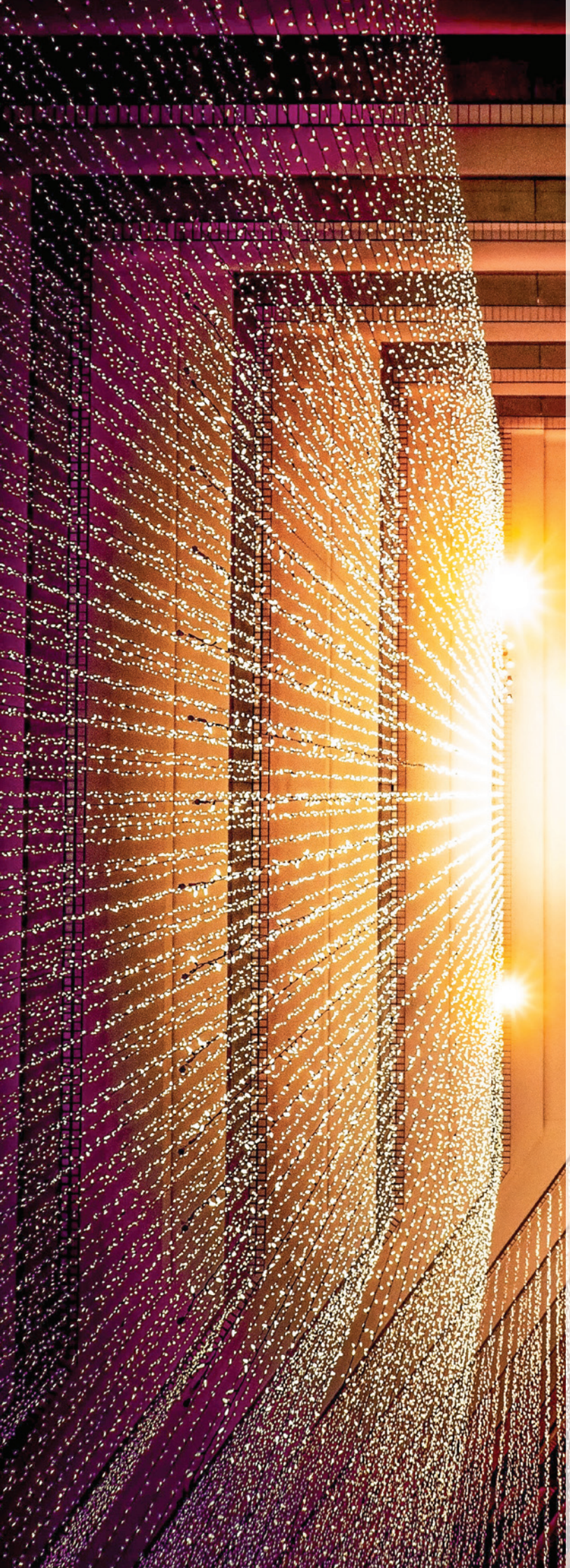
The five Pacific islands of Fiji, Marshall Islands, Palau, Papua New Guinea and Vanuatu that are members of the IAEA are gaining expertise in the use of mutation breeding to develop climate-change resilient crops. All are active participants in a regional technical cooperation project that aims to increase capacities in using mutation breeding to develop improved crop varieties. The focus is on developing enhanced mutant lines for yam, sweet potato, coconut, breadfruit and taro – cash crops that are important to the economies of Pacific island countries.

As part of the TC project, training courses provided hands-on experience in mutation breeding to the participants, as well as in supportive biotechnologies for vegetable crops and fruit trees native to their islands.

Sweet potato is an important cash crop in the Pacific islands.

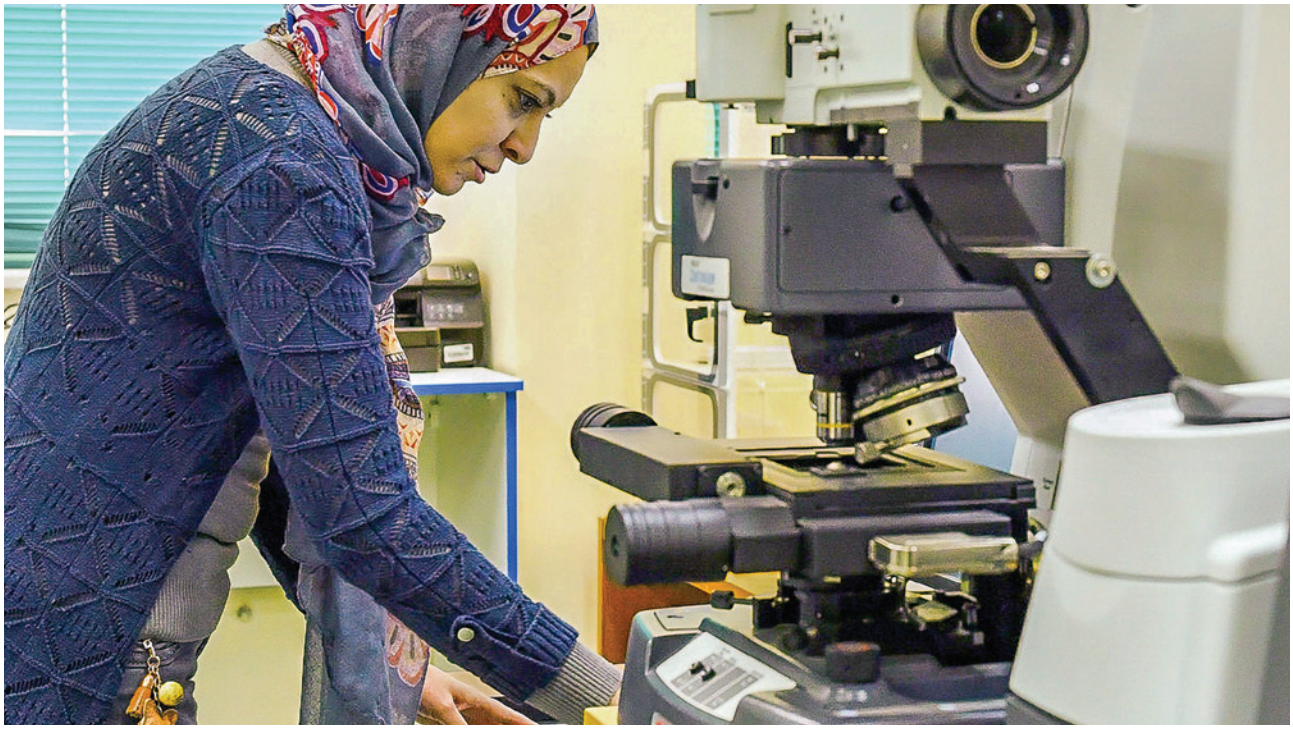
The courses also include training on the application of in-vitro mutagenenis to Pacific crops, as well as regional marker applications for crop improvement.

Knowledge acquired from these courses enables participating scientists to bring the technology home and helps Pacific island countries to create enhanced mutant varieties of crops with increased resilience to climate change.



Industrial applications and radiation technology

Nuclear science and technology play a major role in bringing innovation, safety and efficiency to industrial processes by optimizing processes and improving resource-efficient production. Making radiation technologies available to Member States and assisting them in their peaceful use are an important part of the IAEA's work. Technical cooperation projects provide advice, assistance and capacity-building support to Member States in the use of irradiation facilities and electron beams, as well as x-ray technology for varied applications, including tracking pollutants, wastewater treatment, sterilization of medical products, disinfestation of food grains, carbon dating and preservation of cultural heritage artefacts.



A scientist from Egypt working at the infrared beam lab inside the SESAME facility. (Credit: D. Calma/IAEA)

Jordan: SESAME enables research cooperation in advanced technology

Inaugurated in 2017, the International Centre for Synchrotron Light for Experimental Science and Applications in the Middle East, SESAME, is fulfilling its mission of fostering scientific and technological research in the region. In 2018, SESAME enabled scientists from the region to cooperate on advanced technology research projects in areas such as biology, archaeology, medical and material sciences.

Synchrotrons are particle accelerators that produce intense light with properties similar to laser beams. Under controlled conditions, researchers can use this intense light to look at materials with great precision, even at the structure of a single cell. They are used for advanced scientific research, but also have a variety of other applications.

Since 2000, the IAEA has been supporting the SESAME, and provided extensive, continued support to train SESAME staff and build expertise to commission and run the facility safely for more than 10 years. This included the training of 66 technical and scientific fellows in beamline technologies, and over 30 expert missions to SESAME to support the safe installation, and testing of the facilities. The IAEA also facilitated the networking of SESAME staff with experts from other synchrotron facilities in Europe, the United States and Japan.

Sri Lanka: Non-destructive testing improves industrial processes

The IAEA has played an important role in assisting Sri Lanka to promote nuclear technologies, particularly non-destructive testing (NDT) techniques, for use in industrial applications.

Sri Lanka has built significant experience in the area of non-destructive testing.

Non-destructive testing is used in industry to evaluate the integrity and properties of materials or components without causing damage to the tested object. It is used in fields as diverse as industry, art and archaeology, and emergency response.

The IAEA supported the establishment of important institutes such as the Sri Lankan Gamma Centre, the National Centre for Non- Destructive Testing and the Nuclear Medicine Unit at the University of Peradeniya.

In Sri Lanka, gamma irradiation applications are used mainly in the health care and food processing sectors. Applications include the sterilisation of disposable medical and surgical products, and decontamination of food items such as spices, dried vegetables and health supplements. Sri Lanka has built significant experience in the area of non-destructive testing over two decades, and its companies provide inspection services to both the public and private sector.

China: Using electron beams to treat waste water

China recently inaugurated its first facility to treat industrial wastewater that uses electron beams. This was made possible in part by a coordinated research project that the IAEA ran to facilitate the transfer of technology from countries more advanced in the field. A technical cooperation project built upon this research, supporting the development of an efficient and environmentally sound process to treat industrial wastewater containing toxic and refractory pollutants with ionizing radiation processing.

The new plant in Jinhua city, 300 kilometres south of Shanghai, will treat 1500 cubic meters of wastewater per day, mostly from the textile dyeing industry. Textile dyeing accounts for a fifth of all industrial wastewater pollution generated worldwide. Despite advances in conventional wastewater treatment technology in recent years, radiation remains the only technology that can treat the most stubborn colourants in wastewater.

Other countries with significant textile manufacturing industries, such as India, Bangladesh and Sri Lanka, are also considering the introduction of the technology with IAEA assistance.

A modern wastewater treatment plant can effectively remove the most stubborn effluents using electron beams.

South-South cooperation

South-South cooperation is the exchange of knowledge and resources between developing countries in the economic, social, cultural, environmental or technical domain. Triangular cooperation involves two or more developing countries in collaboration with a third party, typically a developed-country government or multilateral organization that contributes to the exchanges with its own knowledge and resources. South-South cooperation and triangular cooperation have strengthened the impact of the work of the IAEA in transferring nuclear technology for peaceful purposes to Member States.

Viet Nam, Lao People's Democratic Republic and Cambodia: Triangular cooperation for development

The Agency is supporting activities to enable South-South cooperation between Viet Nam and its neighbouring countries Cambodia and Lao People's Democratic Republic. A roadmap to guide the development of collaboration has been established, and priority areas for cooperation agreed.

The three countries identified concrete activities for triangular cooperation and outlined implementation arrangement that could be supported through TC projects and supplement the respective national resources. Under the ongoing cooperation and through projects supported by the IAEA, Viet Nam is supporting Cambodia on radiation safety and the Lao People's Democratic Republic on non-destructive testing.

Viet Nam provides a significant contribution on a bilateral basis for implementing the prioritized activities.

Delegates from Viet Nam, Cambodia, and Lao People's Democratic Republic meet at the IAEA. (Photo: IAEA)

Singapore: Facilitating regional technical cooperation

Since 2000, Singapore has been working with the IAEA to provide technical cooperation to developing Member States in order to ensure the safe and peaceful application of nuclear technologies. This already fruitful relationship has been formalised by a Memorandum of Understanding which lays the groundwork for future technical assistance across a wide range of areas, including nuclear medicine, nuclear safety, public education, industry, and the environment. The Singapore-IAEA Third Country Training Programme (TCTP) allows IAEA Member States to attend training events hosted by Singapore, with the aim of providing the participating countries with the human resources necessary to meet their respective needs.

Regional cooperative agreements play key role in South-South cooperation

Cooperation among developing countries in the application of science and technology is supporting them in achieving their development objectives, according to a report recently released by the IAEA. A special edition of the United Nations Office for South-South Cooperation (UNOSSC) South-South in Action series, published jointly with the IAEA, highlights the important role that the IAEA's regional cooperative agreements play in south-south cooperation in the nuclear field.

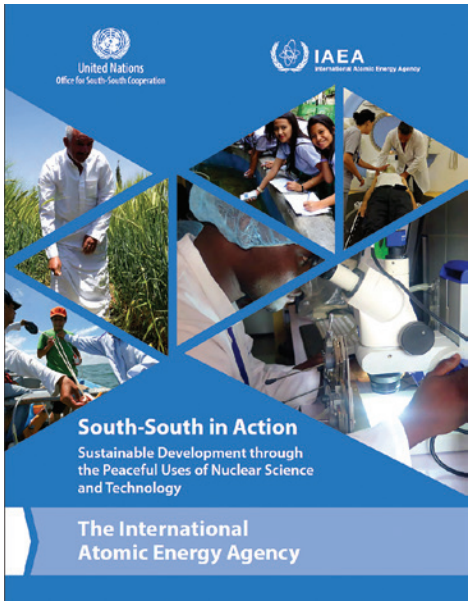
In Asia and the Pacific, two regional cooperative agreements under the auspices of the IAEA provide a permanent framework for dialogue and collaboration among countries in the region, namely the Regional Cooperative Agreement for Research,

Experts from Indonesia meet with counterparts from Africa as part of a South-South cooperation initiative. (Photo: IAEA)

Development and Training Related to Nuclear Science and Technology for Asia and the Pacific (RCA) and the Cooperative Agreement for Arab States in Asia for Research, Development and Training Related to Nuclear Science and Technology (ARASIA).

Of the more than 100 projects implemented by RCA to date, many featured South-South or triangular cooperation approaches. During the 2018 annual RCA coordination meeting, RCA State Parties identified the further integration of South-South cooperation into future programmes as a priority for action.

ARASIA State Parties have cooperated closely on a number of projects related to investigating pollution in urban environments, enhancing the use of salt-affected soils and saline water for crop and biomass production, enhancing wheat and barley productivity, and harmonizing radiation practices. In 2018, two Resource Centres in nuclear medicine were established to further enhance South-South collaboration. These play a key role in strengthening human resources and enhancing institutional capacity, providing clinical training and technical support services that will include the implementation of quality management programmes, quality assurance and quality control procedures, and acceptance-testing of nuclear medicine equipment, among others.



Looking to the future

There is a great need for innovative techniques to address the challenges of the future, and to ensure that nuclear knowledge is passed on to the next generations. Today's students are tomorrow's scientists, leaders and decision makers. The following stories show how the IAEA strives to inspire the next generation to consider science, technology, engineering and mathematics (STEM) as a career for peaceful purposes; and to demystify nuclear science and technology for young minds and educators.

Regional project: Teaching science and technology to secondary school students

From 2018, numerous train-the-trainer sessions have been undertaken under a TC project aiming to introduce the systematic teaching of nuclear science and technology to secondary school students in Asia and the Pacific.

The goal is to reach one million students in the region by 2021, opening their eyes to the benefits of nuclear science and technology for socioeconomic development. The initiative – the first time that the Agency has formally engaged with the secondary education teaching community – is being organized around seven training courses, each designed to provide teachers with innovative and diverse methods for teaching young students about nuclear applications.

United Arab Emirates: Inspiring the next nuclear generation

High school students from three schools in the United Arab Emirates had the rare honour of presenting their science projects at the IAEA Ministerial Conference on Nuclear Science and Technology in November. The students from the Jamila Bu Haired School, the Universal American School of Dubai and the Umm Alarab School were winners of a nationwide competition to inspire high school students in the United Arab Emirates to explore the peaceful applications of nuclear technology.

Supported by a regional IAEA technical cooperation project, the national 'Nuclear Science for Development Student Competition' encouraged interest in nuclear science by inviting students between the ages of 14 and 18 to submit proposals that would demonstrate how nuclear and isotopic technologies might address challenges in three domains: improvement of health, protection of the environment and water resources, and generation of clean energy.

Winning students from the United Arab Emirates' nuclear science for development competition visit the IAEA headquarters as part of their prize.

Regional Cooperative Agreements

Two regional cooperative agreements are in place in the Asia and Pacific region to promote, coordinate and implement technical cooperation projects between the IAEA and the State Parties to these Agreements.

These are the following:

ARASIA (Cooperative Agreement for Arab States in Asia for Research, Development and Training Related to Nuclear Science and Technology)

Entry into force: 29 July 2002

State Parties: Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates, and Yemen

Secretariat: Atomic Energy Commission of Lebanon

RCA (Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific)

Established: 1972

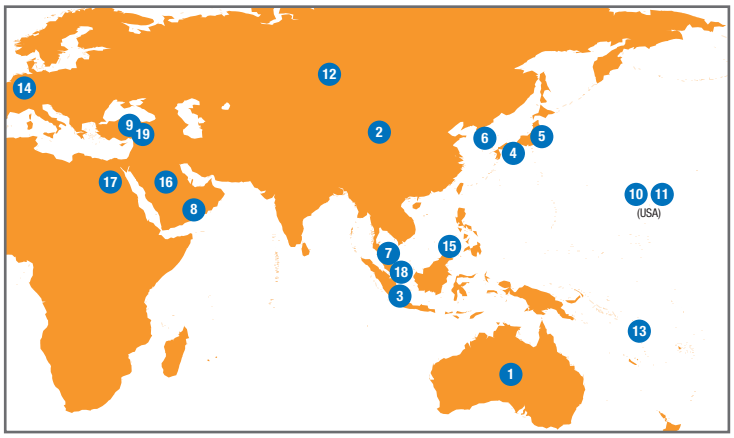
State Parties: Australia, Bangladesh, Cambodia, China, Fiji, India, Indonesia, Japan, Republic of Korea, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Palau, Philippines, Singapore, Sri Lanka, Thailand, and Viet Nam.

RCA Regional Office (RCARO), Republic of Korea

Delegates from ARASIA (Photo: IAEA).

Delegates from RCA. (Photo: RCARO)

Partner organizations of technical cooperation for the Asia and the Pacific Region, 2019



Nr	Organization	Agreement type	Headquarters
1	University of Tasmania, Australia (UTAS)	Practical Arrangements	Australia
2	China Atomic Energy Agency	Practical Arrangements	China
3	Ministry of Research, Technology and Higher Education of the Republic of Indonesia	Practical Arrangements	Indonesia
4	Consortium of Universities and Institutions in Japan	Practical Arrangements	Japan
5	Osaka University Graduate School of Medicine and Osaka University Hospital	Practical Arrangements	Japan
6	RCA Regional Office (RCARO)	Practical Arrangements	South Korea
7	Singapore General Hospital Pte Ltd (SGH)	Practical Arrangements	Singapore
8	Dubai Health Authority, Dubai Hospital, Department of Nuclear Medicine (DHA-DH)	Practical Arrangements	United Arab Emirates
9	King Hussein Cancer Centre (KHCC)	Practical Arrangements	Jordan
10	Texas A&M Engineering Experiment Station	Practical Arrangements	USA
11	National Oceanic and Atmospheric Administration	Practical Arrangements	USA
12	ROSATOM	Agreement	Russia
13	Pacific Community (SPC)	Agreement	New Caledonia
14	OPEC Fund for International Development (IFAD)	Agreement	Austria
15	Asian Development Bank (ADB)	Cooperation Framework Agreement	Philippines
16	Kuwait Cancer Control Centre	ARASIA RRC	Kuwait
17	American University of Beirut Medical Centre (AUBMC)	ARASIA RRC	Lebanon
18	Singapore	Memorandum of Understanding	Singapore
19	SESAME	Memorandum of Understanding	Jordan

Member States and territories of Asia and the Pacific Region

Afghanistan
Australia
Bahrain
Bangladesh
Brunei Darussalam
Cambodia
China
Fiji
India
Indonesia
Iraq
Iran, Islamic Republic of
Israel
Japan
Jordan
Korea, Republic of
Kuwait
Lao People's Democratic Republic
Lebanon
Malaysia
Marshall Islands
Mongolia
Myanmar
Nepal
New Zealand
Oman
Pakistan
Palau
Papua New Guinea
Philippines
Qatar
Saudi Arabia
Singapore
Sri Lanka
Syrian Arab Republic
Thailand
United Arab Emirates
Viet Nam
Yemen
Vanuatu
Territories under the jurisdiction of the Palestinian Authority

IAEA
International Atomic Energy Agency
Atoms for Peace and Development

For more information on the IAEA technical cooperation programme in Asia and the Pacific, please contact:

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