

## IN SUPPORT OF SUSTAINABLE DEVELOPMENT

IAEA Technical Cooperation in Asia and the Pacific



## Promoting Health and Well Being

Countries in Asia and the Pacific are focusing their efforts on enhancing nutrition for improved health, and on using nuclear technologies for the diagnosis and treatment of diseases like cancer.

Much of this support has gone to cancer management programmes, helping countries improve capabilities to fight the growing incidence of cancer in the region through the provision of radiotherapy equipment and specialized training. In addition, several regional projects have focused on nutrition, body composition and food fortification.

In Cambodia, for example, the IAEA has provided expert advice for the planning and implementation of a new radiotherapy and nuclear medicine service at the Calmette Hospital in Phnom Penh. It has also provided long term fellowships in medical physics, radiation oncology and nuclear medicine to prepare staff to provide services for the new medical facility.

To read more about the IAEA technical cooperation programme, visit [www.iaea.org/technicalcooperation](http://www.iaea.org/technicalcooperation).





## Building Competence in Nuclear Medicine

The speed of scientific advances in nuclear medicine today means that continuing education for nuclear medicine professionals is essential to sustain quality services.

The IAEA has several active training programmes for busy medical professionals, using both traditional and online teaching methods. One programme in particular – the IAEA Curricula for Nuclear Medicine Professionals (ICNMP) – is receiving accolades for providing medical professionals in IAEA Member States with the opportunity to maintain a high level of competence in the evolving fields of nuclear cardiology, hybrid imaging, therapeutic nuclear medicine and other specialized fields. ICNMP is a fully accredited study programme, recognised by international academic societies, such as the European Union of Medical Specialties /European Accreditation Council for Continuing Medical Education.

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## Making Food Safe for Consumption

For all countries, including in Asia and the Pacific, food quality is a must. Not only does it ensure local consumer safety, but it also opens export markets where food safety standards, particularly in terms of pesticide residues and other food contaminants, could be more stringent.

Using radiation technology, with support and guidance from the IAEA, many countries now have the analytical capability to detect and monitor food contaminants.

In Qatar, for example, the IAEA has assisted in upgrading key equipment in the country's main food laboratory and has trained its staff in sample preparation and analysis. As a result, the laboratory is now better able to screen foodstuffs intended for export, ensuring conformity with international standards. The upgrade to its laboratory capacity has also enabled Qatar to monitor contamination in goods coming into the country, thus ensuring food safety for the general public.

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## Helping Produce More Food for All

Nuclear science and technology can contribute directly to food security, and helping countries improve agricultural production is an IAEA priority. Together with the Food and Agriculture Organization of the United Nations (FAO), the IAEA has helped Member States generate more than 3200 new food crop varieties using nuclear techniques. These stronger, sturdier, more productive crops have been planted in farm fields across Bangladesh, Cambodia, Islamic Republic of Iran, Myanmar, Thailand and other countries, resulting in increased yield, higher resilience to environmental and pest hazards, and greater food security.

In Bangladesh, for example, the IAEA has helped scientists to develop some 59 new mutant rice varieties which are tolerant to drought and salinity. Many of these rice varieties mature faster and produce higher yields, allowing farmers to harvest multiple times a year. In economic terms, this means more income for farmers and more food for all.

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## Breeding Healthier Livestock

Livestock farming is important to the Asia and Pacific region, both for food production and as a source of income for farmers. In Mongolia, the livestock industry drives the rural economy and contributes significantly to food security. Livestock farming in Mongolia is nomadic in nature, and the incidence of transboundary diseases, such as foot and mouth disease, is quite high.

IAEA technical cooperation projects have supplied Mongolian laboratories with equipment and training to carry out studies in animal production and health. This has enabled the Mongolian government to improve animal nutrition and implement appropriate and timely response measures to deal with disease outbreaks.

The improved research and diagnostic capacities of Mongolian laboratories and veterinarians have reduced animal losses across the country's vast expanse of pastures, thus improving the economy as a whole.

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## Supporting Industrial Development

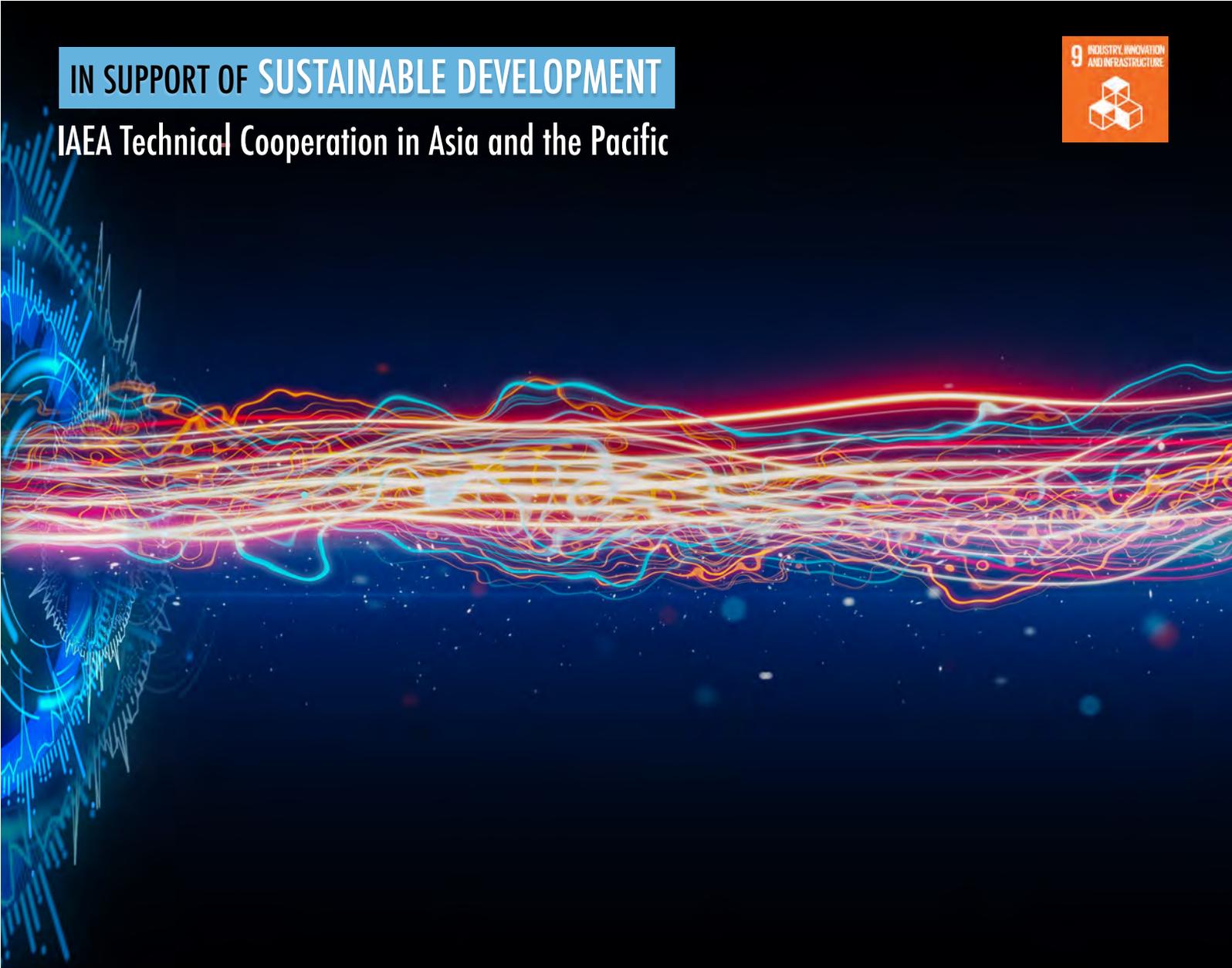
Radiation technology contributes to industrial development in many sectors, particularly in manufacturing and food processing. Many countries have increased the competitiveness of their industries by using radiation technology for non-destructive testing (NDT) during product safety and quality testing. Other countries use irradiation techniques to improve the durability of various industrial products, ranging from car tyres to pipelines, and from medical devices to cables.

Irradiation also improves industrial sustainability by helping lower environmental impact, for example, through the treatment of flue gases at coal-fired power plants and through the identification of pollution pathways in the air.

In Malaysia, industrial testing using nuclear technology has contributed to the competitiveness of the country's manufacturing sector. With the IAEA's assistance, Malaysia, like other countries in South-East Asia, can offer services for NDT using nuclear methods to manufacturers in neighbouring countries.

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## Supporting Industrial Uses of E-Beam

Radiation technology has important industrial applications. For example, electron beam (e-beam) accelerators can be used in the manufacture of industrial products, and for the treatment of wastewater.

In the Philippines, a fully operational e-beam facility, brought online with IAEA help, is allowing the country to develop new industrial capacities and to improve the production of cables, metal tubes and pipes.

In China, the IAEA is supporting the use of electron beam accelerators to treat wastewater using more environmentally friendly methods. The beams of high energy produced by accelerators can minimise contaminants and unwanted odours in water that other conventional methods cannot remove.

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## Protecting Monuments and Structures

Following the April 2015 earthquake in Nepal, the IAEA launched a project to help Nepalese authorities test the integrity of critical buildings and structures using nuclear techniques, including radiography and non-destructive testing (NDT) methods.

The project helped Nepal to identify and assess damage to important structures, including public buildings and temples which were affected by the earthquake. At the same time, the IAEA provided important insights and recommendations to the Nepalese authorities on further actions to enhance the safety of public buildings.

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## Promoting Nuclear Science Education

Education is fundamental to improving people's lives and ensuring sustainable development. This is the basic tenet of Sustainable Development Goal 4 : Ensure inclusive and quality education for all and promote lifelong learning.

An IAEA-developed Compendium of teaching materials has enabled educators in several Asian countries to increase the understanding of science and technology of thousands of secondary school teachers and students. The Compendium combines unique teaching strategies and materials to introduce science and technology in secondary education systems and school curricula. The Compendium has been tested successfully in Indonesia, Jordan, Malaysia, the Philippines, Sri Lanka, Thailand and the United Arab Emirates. The IAEA now plans to support efforts to institutionalize nuclear science education in secondary schools.

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## Understanding Soil Erosion

Soil erosion is a global phenomenon affecting some 1.9 billion hectares of land worldwide. Erosion carries away the soil's most fertile layer, and much of the fertiliser, leaving land that is no longer usable for agriculture.

Nuclear techniques can help to precisely pinpoint the source and causes of soil erosion. Viet Nam has used these techniques extensively to better understand soil erosion so that it can be avoided and prevented, and necessary measures can be taken to reverse its effects and return degraded land to productive fields. In Viet Nam's Lam Dong province, a joint project by the IAEA and the Food and Agriculture Organization of the United Nations (FAO) measured soil erosion rates at 27 sites using nuclear techniques. The subsequent adoption of appropriate agricultural conservation practices such as intercropping, creating basins near coffee trees to trap water, and the building of terraces led to a 45% reduction in soil erosion in the region.

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## Monitoring Marine Ecosystems

Red tides, more correctly known as harmful algal blooms (HABs), are one of the most serious periodically occurring events facing marine coastal areas. HABs are an accumulation of algae that produce natural toxins, which collect in shellfish. This can result in contaminated seafood entering the food chain, and adversely affecting both the marine ecosystem and human health.

Early detection is key in HAB control, and several countries in Asia and the Pacific are using isotopic techniques as a potent tool in the fight against this ocean menace.

In Oman, for example, the IAEA has helped establish a reference laboratory to assess and combat the impacts of HAB biotoxins on marine ecosystems and to provide early warning of possible HAB episodes to local fishing authorities.

IAEA assistance has enabled the countries in the region to improve their HAB management capabilities, using radiotracers in a biochemical techniques called receptor binding assay (RBA) for the detection of biotoxins in seafood.

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## Protecting Marine Ecosystems

Oceans contain vast ecosystems brimming with marine life and are a vital resource for people who rely on the sea for their livelihood and day-to-day nutrition. To sustainably manage and protect oceans and support coastal communities, many countries are using nuclear and isotopic techniques to better understand and monitor ocean health and marine phenomena like harmful algal blooms.

The IAEA also assists these countries in using nuclear techniques to measure ocean acidification and provides objective information to scientists, economists, and policymakers so they can make informed decisions.

In Indonesia, for example, the IAEA is helping the country observe and analyse ongoing changes in coral ecosystems. This assistance has resulted in the creation of an isotopic database for the reconstruction of ocean temperature dating back hundreds of years. This data will be useful in predicting future changes in coral environments and in adopting measures in response to these changes.

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## Monitoring Air Pollution

The IAEA helps countries to develop sustainable programmes for monitoring air pollution using nuclear analytical techniques. Countries belonging to the Cooperative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology (ARASIA) are pooling their resources to gather data on air particulate pollution patterns in urban areas. These include Iraq, Jordan, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Yemen.

The resulting database, developed from gathered information, has provided valuable information on the causes, sources and movement of air pollution. This information has helped policymakers decide on appropriate measures to address the pollution. The IAEA has also helped ARASIA Government Parties to establish a network for studying the environmental impacts of atmospheric aerosols. The network aims to collect atmospheric aerosol samples in the region for analysis and evaluation.

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## Assessing Pollution in Freshwater Bodies

Water resource contamination is a shared problem among many countries in Asia and the Pacific. Industrial, urban and animal waste pollute fresh surface waters, affecting health and livelihoods in the region.

In Sri Lanka, the IAEA has helped the Marine Environment Protection Authority (MEPA) launch an environmental pollution monitoring programme to assess existing pollution levels in the Negombo Lagoon. Using radiometric dating of sediment core samples extracted from the bottom of the lake, MEPA scientists were able to trace the history of the lake's pollution through the years, thus gaining a better understanding of human activities that have contributed, or are contributing, to the pollution.

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## Ensuring Access to Clean Water

Fresh water is a vital natural resource. Access to freshwater is essential for human and economic development and for people's quality of life.

Across Asia and the Pacific, the IAEA supports the use of isotope hydrology techniques to help countries understand and assess their groundwater resources. Whether in the forests of Myanmar, the flood basins of Bangladesh, or the deserts of Kuwait, these techniques help authorities to study the different components of the water cycle and determine how much water is available.

In Kuwait, for example, the IAEA has assisted in the study and understanding of the water dynamics of two aquifers in the country's southern region. This assistance has made it possible for Kuwait to formulate appropriate water management strategies for the sustainable use of the aquifers.

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## Building Partnerships in Science

The IAEA works with key partners to make nuclear science and technology widely available for sustainable development. It collaborates with governments, international organizations and leading non-governmental organizations in partnerships which support policymaking and scientific research.

One example of this partnership is the Synchrotron Light for Experimental Science and Applications in the Middle East (SESAME). Located in Allan, Jordan, SESAME hosts a 'third-generation' synchrotron light source and an international science centre. The synchrotron light source is a giant machine that generates intense light beams for advanced scientific and technological research. SESAME aims to facilitate international scientific research in the Middle Eastern region.

As the region's first major international research centre, SESAME will contribute to regional scientific, technical and economic development, and will be a focal point for scientific collaboration.

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