

Technical Cooperation Report for 2014

Report by the Director General



IAEA

International Atomic Energy Agency

Technical Cooperation Report for 2014

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PREFACE

The Board of Governors has requested the transmission to the General Conference of the attached Technical Cooperation Report for 2014, the draft of which was considered by the Board at its June 2015 session.

The Director General is also hereby reporting in fulfilment of the request contained in resolution GC(58)/RES/12 on “Strengthening of the Agency’s technical cooperation activities”.

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Summary

The *Technical Cooperation Report for 2014* is set out in three parts: A — Strengthening the Agency’s Technical Cooperation Activities; B — TC Programme Resources and Delivery; and C — Programme Activities and Achievements in 2014: Regional Overview. Annex 1 describes examples of project activities and achievements in specific thematic areas, and Annex 2 describes the activities of the Programme of Action for Cancer Therapy. Annex 3 presents the TC programme Fields of Activity, grouped for reporting purposes.

Part A is composed of two sections. Part A.1 provides an overview of the Agency’s technical cooperation (TC) activities in 2014. The first section is devoted to the global development context, and highlights the importance of the post-2015 development agenda, and the value of the Sustainable Development Goals’ programmatic framework for the Agency’s technical cooperation activities. The section then describes how the programme is tailored to respond to the specific needs and priorities of each region, focusing on efforts to develop human resources and build capacities in the peaceful application of nuclear science and technology, including through postgraduate training courses, assistance in drafting legislation, distance learning initiatives and technical cooperation among developing countries. The section also presents a snapshot of TC projects that address radioactive waste management, reflecting the topic of the 2014 Scientific Forum.

Part A.2 focuses on efforts to build a more efficient and effective TC programme, in particular on efforts to strengthen the Country Programme Framework template. The section reviews progress made in 2014 in establishing and operationalizing partnerships with the United Nations and other relevant international and regional organizations. This section closes with an overview of actions undertaken in 2014 to continually

improve the TC programme, notably through training in the Logical Framework Approach, and enhancements to the Project Progress Assessment Report.

Part B of this document presents a summary of financial and non-financial programme delivery indicators. It reviews the resources mobilized for the TC programme through the Technical Cooperation Fund (TCF), and through extrabudgetary and in-kind contributions. Payments to the TCF in 2014 totalled €62.0 million (not including National Participation Costs, assessed programme costs or miscellaneous income), or 89.5% of the TCF target set for the year. New extrabudgetary resources for 2014 came to €18.6 million and in-kind contributions were €0.6 million. Overall, implementation for the TCF reached 78% in 2014.

Part C of this document responds to the operative paragraphs of resolution GC(58)/RES/12, and covers assistance to Member States in the peaceful, safe, secure and regulated application of atomic energy and nuclear techniques in specific fields. It highlights regional activities and achievements in technical cooperation in 2014. Globally, health and nutrition accounted for the highest proportion of actuals¹ through the TC programme in 2014, followed by safety and security, and then by food and agriculture.

Project examples are presented in Annex 1 according to thematic area, covering health and nutrition, food and agriculture, water and the environment, industrial applications, energy planning and nuclear power, radiation protection, nuclear safety and nuclear security, and nuclear knowledge development and management. The activities of the Programme of Action for Cancer Therapy are covered in Annex 2.

¹ Terminology has changed with the implementation of the Agency-wide Information System for Programme Support (AIPS/Oracle). Actuals are the equivalent of disbursements.

The Agency's Technical Cooperation Programme in Figures (as at 31 December 2014)

2014 target for voluntary contributions to the Technical Cooperation Fund (TCF):

€69 221 750

Rate of attainment on payments (pledges) at the end of 2014:

89.5% (89.8%)

New resources for the technical cooperation (TC) programme: **€83.6 million**
Technical Cooperation Fund²: **€64.4 million**
Extrabudgetary resources³: **€18.6 million**
In-kind contributions: **€0.6 million**

TCF implementation rate: **78%**

TC 2014 year-end budget⁴ (TCF, extrabudgetary resources and in-kind contributions):

€113.5 million

131 countries/territories receiving support

13 Country Programme Frameworks (CPFs) signed in 2014

5285 meeting participants and other project personnel assignments

2830 participants in training courses

124 Revised Supplementary Agreements (as at 31 January 2015)

91 CPFs valid as at 31 December 2014

1677 fellowships and scientific visits

3461 expert and lecturer assignments

187 regional and interregional training courses

² Including TCF payments, National Participation Costs and miscellaneous income.

³ Includes donor contributions and government cost-sharing. Please refer to Table A.5 of the Supplement to this report for details.

⁴ Year-end budget is the total value of all technical cooperation activities approved and funded for a given calendar year plus all approved assistance brought forward from previous years but not yet implemented.

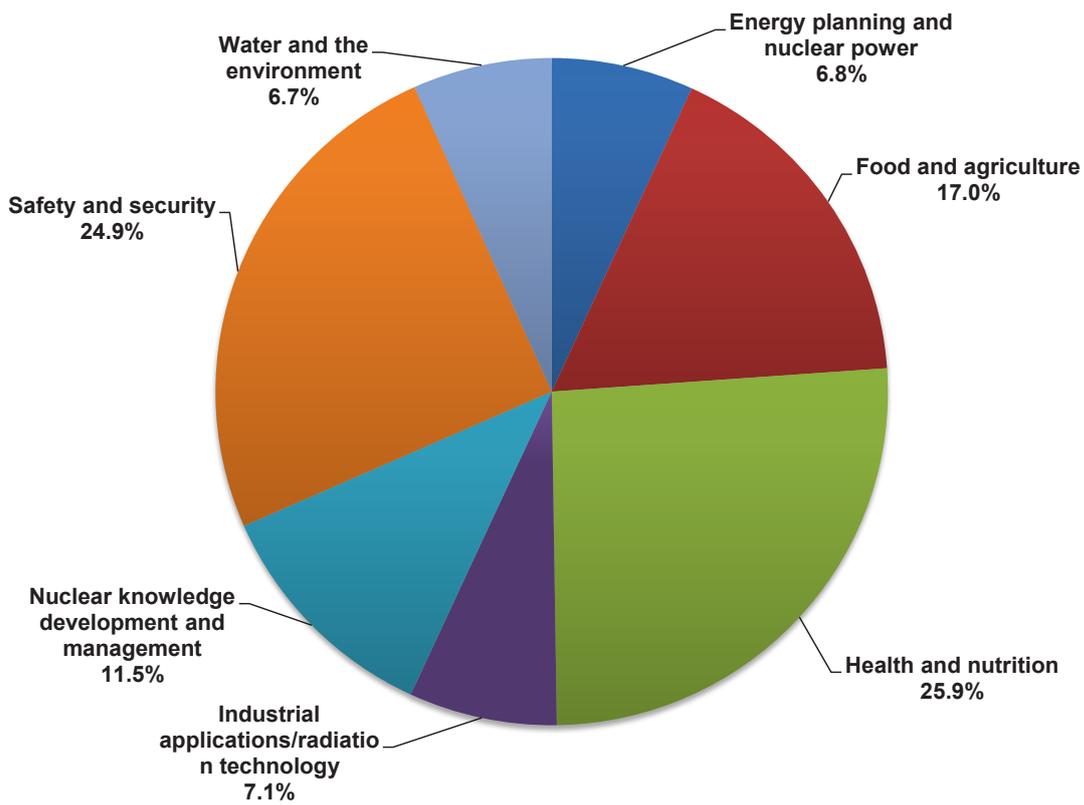


Figure 1: Actuals by technical field for 2014.⁵

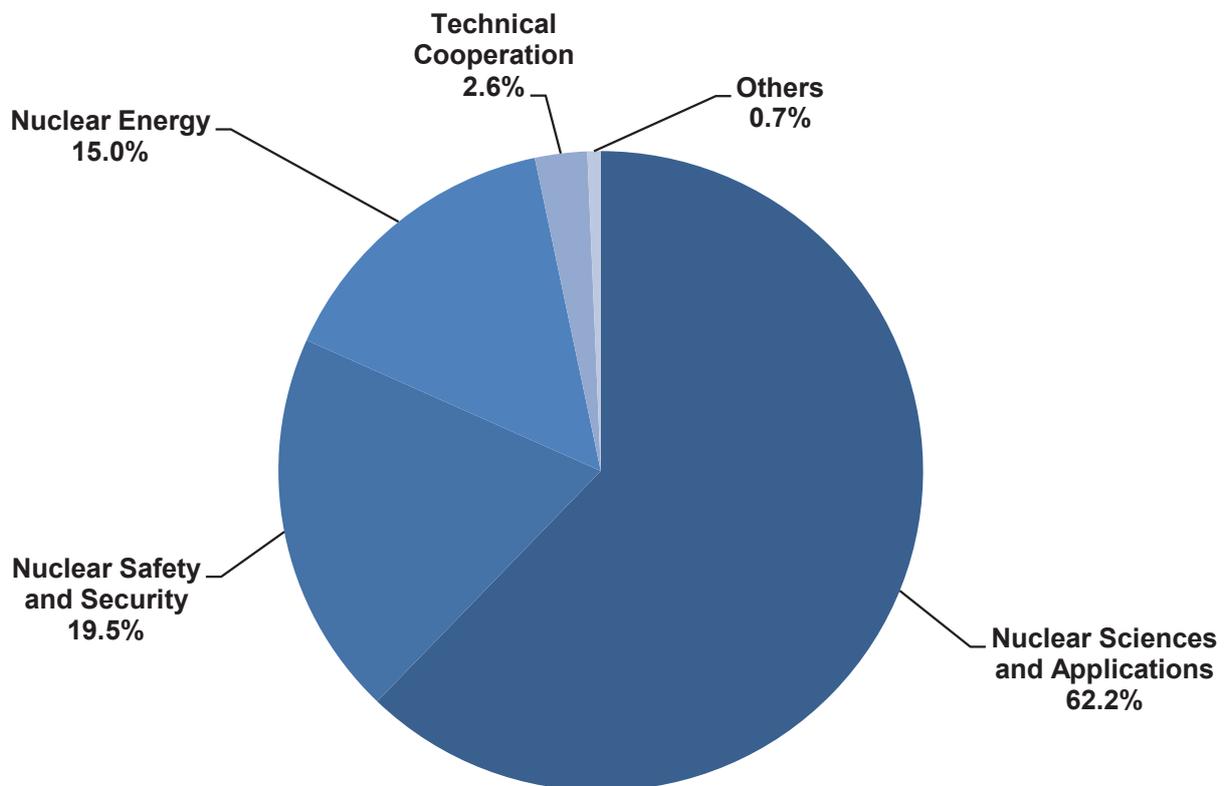


Figure 2: Support by Department to the TC programme based on the primary Technical Officer for each project (shown as percentage of total number of projects).

⁵ Throughout this report, percentages in charts may not add up to 100% exactly due to rounding.

Technical Cooperation Report for 2014

Report by the Director General

This document responds to the request by the General Conference to the Director General to report on the implementation of resolution GC(58)/RES/12.

Part A of the document provides an overview of technical cooperation (TC) activities from 1 April 2014 to 31 March 2015, presents the context for the TC programme in 2014 and describes capacity building in Member States. Reflecting the topic of the 2014 Scientific Forum, Part A also highlights TC activities in meeting the challenges of safe and sustainable management of spent fuel and radioactive waste.

Part B presents a summary of financial indicators and reviews resources for technical cooperation from the Technical Cooperation Fund (TCF), extrabudgetary

resources and in-kind contributions. Part B also offers an overview of programme delivery, with both financial and non-financial indicators.

Part C responds to the operative paragraphs of resolution GC(58)/RES/12 by reporting on assistance to Member States in the peaceful, safe, secure and regulated application of atomic energy and nuclear techniques in specific fields. It presents regional activities and achievements in technical cooperation in 2014.

Annex 1 offers examples of project activities in the various thematic areas: health and nutrition, food and agriculture, water and the environment, industrial applications, energy planning and nuclear power, radiation protection, nuclear safety and nuclear security, and nuclear knowledge development and management.

Annex 2 provides an overview of the activities of the Programme of Action for Cancer Therapy (PACT) in 2014.



A. Strengthening the Agency's Technical Cooperation Activities

A. Strengthening the Agency's Technical Cooperation Activities⁶

A.1. Technical cooperation in 2014: An overview⁷

Global developments in 2014: The context for the TC programme

In September 2015, the United Nations (UN) will hold a summit to adopt the post-2015 development agenda. The Agency has participated actively in discussions on the post-2015 development agenda since 2012, highlighting the importance of including science and technology and, in particular, strong national science, technology and innovation institutions in the sustainable development goals (SDGs) framework. The UN Secretary-General's proposal for a global technology transfer mechanism, and science and technology networks that enable research and development cooperation, is of particular relevance to the Agency.

Agreement on the SDGs is an important opportunity for the Agency, as 13 of the 17 new SDGs relate directly to the Agency's areas of competence. The Secretariat is working on correlating the new global development goals with the Agency's fields of activity (FoAs). The correlation demonstrates the relevance of the Agency's technical cooperation activities to the SDGs, and the value of the SDG programmatic framework for resource mobilization and increased socioeconomic impact, and will support increased harmonization and alignment between the TC programme and the post-2015 development agenda.

Climate change adaptation is a cross cutting goal in the new SDGs, and a universal challenge that faces all IAEA Member States. Programmatic and partnership frameworks are being strengthened in order to better support country programmes in this field.

Responding by region: Tailoring the TC programme to Member State needs⁸

The IAEA's technical cooperation (TC) programme is delivered in four geographical regions: Africa, Asia and the Pacific, Europe (which includes some countries in central Asia) and Latin America (including the Caribbean). The programme is designed to help Member States to use nuclear technology to address development needs, building capacities in areas where nuclear techniques offer advantages over other techniques, or where they can usefully supplement conventional means. Support is tailored to respond to the specific needs of individual countries, subregions and regions. These needs are identified and defined through mid-term national planning mechanisms such as Country Programme Frameworks (CPFs), regional profiles and strategic frameworks, and various other programme planning modalities.

While the TC programme emphasizes forward planning and the development of cohesive national programmes, it is also flexible, allowing it to respond quickly to unforeseen events, such as the outbreak of Ebola virus disease (EVD) in West Africa in 2014.

⁶ Section A responds to section 2, operative paragraph 2 of resolution GC(58)/RES/12 on strengthening TC activities through the development of effective programmes and well defined outcomes; and to section 5, operative paragraph 2 on promoting TC activities supporting the self-reliance, sustainability and further relevance of national nuclear and other entities in Member States, and enhancing regional and interregional cooperation.

⁷ Section A.1 responds to section 2, operative paragraph 4 of resolution GC(58)/RES/12 on contributing to the implementation of the principles expressed in the Istanbul Declaration and the Programme of Action for the Least Developed Countries for the Decade 2011–2020, and to the attainment of the MDGs.

⁸ This section responds to section 3, operative paragraph 1 of resolution GC(58)/RES/12 on strengthening TC activities, including the provision of sufficient resources, based on Member States' needs and priorities, and ensuring that the components of TC projects are readily available.

In 2014, health and nutrition accounted for the highest proportion of TC programme actuals⁹, at 25.9%. This was followed by safety and security at 24.9%, then by food and agriculture at 17.0% (Fig. 1). Distribution varies according to priorities at the regional level – for example, the Europe region has higher actuals in safety and security, at 42.4%.

In Africa, many Member States lack an adequate number of skilled, trained staff. This is a challenge for the development of national nuclear science and technology programmes. Many countries depend on educational institutions and training provided in other regions. In Africa in 2014, the programme focused on effective capacity building and transfer of nuclear technologies for their application in human health, food and agriculture, water resources management, environmental protection, industrial applications, energy planning and consideration of nuclear power, and radiation safety and security.

In the Asia and the Pacific region, the TC programme concentrated on strengthening nuclear safety and security, and on improving human resources and technological capabilities in the areas of human health and food and agriculture. The regional focus on these topics highlights both the increased awareness of Member States of the importance of safety in the peaceful uses of nuclear technology, and their awareness of the great potential that nuclear technology offers in life-sustaining areas such as human health and agriculture. This focus is clearly reflected in the allocation of 67% of the total budget for Asia and the Pacific in 2014 to these areas. The remaining funds were allocated to nuclear knowledge development and management, industrial applications, water and the environment, and energy. A number of countries in the region are also planning for nuclear power.

Nuclear technology is widely used by the Member States of the Europe region, and there is an extensive range of needs for radiation and nuclear safety

infrastructure to ensure the safe and efficient utilization of this technology. Moreover, there is great diversity in the level of economic development of the countries in the Europe region. The TC programme reflects this diversity, in particular the need to assure adequate safety infrastructure and to enhance knowledge in specific areas, depending on the needs of the Member States. The key focus of assistance in this region is to strengthen legislative and regulatory infrastructure for safety by reviewing the existing legal framework and providing expert advice and training. The programme also focuses on supporting quality control (QC) infrastructure for radiation medicine especially in the diagnosis and treatment of cancer, and helping Member States to ensure the safety of nuclear power plants (NPPs), particularly with regard to adequate infrastructure, both for countries introducing nuclear power and for those which have been operating NPPs for decades. In addition, the programme emphasizes protection of the environment, especially in the area of spent fuel and radioactive waste management, nuclear facility decommissioning and uranium legacy site remediation.

In the Latin America region, 2014 saw the conclusion of a three-year effort to prepare the new Regional Strategic Profile (RSP) for 2016–2021, together with its corresponding implementation guidelines. Comprehensive consultations were carried out with Member States, experts, partners and stakeholders of the TC programme in order to identify regional priority needs that could be addressed with nuclear science and technology. The new RSP has already been put to use to tailor the 2016–2017 regional programme to meet the needs of Member States. It will remain a key programmatic reference for project design in upcoming cycles.

The Programme of Action for Cancer Therapy (PACT), which was integrated into the Department of Technical Cooperation in 2014, tailors support to the needs of Member States in several ways. In 2014, activities

⁹ Under AIPS, actuals are the equivalent of disbursements.

to support IAEA Member States in the integration of radiation medicine into national comprehensive cancer control programmes were stepped up, and support to Member States through integrated missions of PACT (imPACT) and specialized expert missions was improved, with regard to both the quality of the mission assessments and subsequent recommendations. Improvements were also made in addressing the systematic consideration of imPACT reports with a view to future technical cooperation support. Ten Member States received imPACT missions in 2014.

The Advisory Group on Increasing Access to Radiotherapy Technology (AGaRT) devised guidance for low and middle income countries (LMICs) that seek to establish or expand radiotherapy services, in particular how to improve the sustainability of radiotherapy investments and, thereby, increase access to such treatment.

Developing human resources and building capacities¹⁰

The Agency delivers technical cooperation to Member States through capacity building, expert advice and the provision of necessary equipment. Human resource development is facilitated through fellowships, scientific visits, training courses, meetings and workshops.

Postgraduate training

Under project RAF/9/048, ‘Strengthening Education and Training Infrastructures and Building Competence in Radiation Safety’, two postgraduate educational courses (PGECs) on Radiation Protection and the Safety of Radiation Sources were held from October 2014 through to March 2015 in Algiers, Algeria (for French-speaking countries), and in Accra, Ghana (for English-speaking countries). Forty young professionals working in national regulatory authorities were trained in radiation protection and the safety of radiation sources. The findings of the post-training evaluation indicate that the majority of these candidates work in national regulatory infrastructures and contribute

to improving the delivery of technical services in the region. In addition, the project supported two train-the-trainers workshops (one in English, one in French) on radiation, transport and waste safety, for 50 radiation protection officers.

A further PGEC was organized in Kuala Lumpur, Malaysia, under project RAS/9/066, ‘Strengthening Education and Training Infrastructure and Building Competence in Radiation Safety’. The six month postgraduate training course contributed to meeting the educational and initial training requirements of graduate level staff earmarked for positions in radiation protection, including health physics, in the Asia and the Pacific region. Thirty young professionals from 19 countries, working in national regulatory authorities and technical support institutions, received training in radiation protection and related safety fundamentals. The project also supported a regional train-the-trainers course on radiation, transport and waste safety. Thirty-six radiation protection officers from 19 countries in the region have enhanced their technical competence in radiation protection matters.

A PGEC also started in October 2014 in Aghia Paraskevi, Greece, under project RER/9/109, ‘Strengthening Education and Training Infrastructures and Building Competence in Radiation Safety’, The course, which continued until March 2015, provided 24 young professionals with a sound basis in radiation protection and the safety of radiation sources. The course also aimed to provide the necessary basic tools for those intending to become qualified experts in radiation protection in later years, and to be involved in radiation protection education and training in their home countries. Candidates had to complete an e-learning segment before attending the PGEC. Under the same project, meetings on establishing national strategy for education and training in radiation transport and waste safety and on analysis of education and training needs were held in Bosnia and Herzegovina (in English) and Kazakhstan (in Russian).

¹⁰ This section responds to section 2, operative paragraph 1 of resolution GC(58)/RES/12 on facilitating and enhancing the transfer of nuclear technology and know-how among Member States.

PGECs were also organized for Latin America and the Caribbean Member States in 2014. The Regional Training Centres in Argentina (Spanish) and Brazil (Portuguese) trained 21 young experts from the region. As a result of a joint initiative to foster cooperation between the Portuguese-speaking countries of Latin America and Africa, fellows from Angola and Mozambique also received training in Brazil.

Project RAF/0/043, ‘Enhancing Human Resources Development and Nuclear Knowledge Management (AFRA)’, supports human resource development in the peaceful use of nuclear science and technology. An increasing number of fellowships for a Masters Degree in Nuclear Science and Technology are being offered to African students by African Member States. In 2014, the fellowship programme of the African Regional Co-operative Agreement for Research, and Development and Training Related to Nuclear Science and Technology (AFRA) supported fourteen candidates from ten Member States, who were selected to participate in a two-year Masters Programme in Nuclear Science and Technology. The fellowships were hosted by the School of Nuclear and Allied Sciences, University of Ghana, and the Department of Nuclear Engineering, University of Alexandria, Egypt, which have both been appointed as AFRA regional designated centres (RDCs) in Professional and Higher Education. This fellowship programme is a significant achievement, and contributes to training a new generation of African scientists who will foster nuclear science and technology for African development.

Legislative and drafting assistance

The IAEA continues to assist Member States, both individually and on a regional basis, to develop national laws for the peaceful uses of nuclear energy and applications of ionizing radiation through several regional TC projects. In total, 54 fellows from all regions attended the Nuclear Law Institute in 2014. Participants received two weeks of intensive training on all areas of nuclear law and in the drafting of corresponding national legislation. The course utilised

interactive and practical teaching methods, and offered a combination of lectures to cover the fundamentals of nuclear law, including facilitated small-group sessions that focused on the implementation of information from the lectures, as well as a number of legislative drafting exercises. By the end of the course, the participants had acquired a solid understanding of all aspects of nuclear law and were able to draft, amend and review national nuclear legislation.

Distance learning

A pilot project for a Virtual University for Cancer Control (VUCC) in East Africa was initiated in 2014. Three e-learning modules were finalized and offered to the first cadre of students through the Virtual University for Cancer Control and Regional Training Network (VUCCnet) e-learning platform. Two training courses were conducted to enhance national cancer control capacities.

In September 2014, the Agency officially launched the Distance Assisted Training Online (DATOL) platform under the framework of the regional TC project RAS/6/064, ‘Building Capacity with Distance Assisted Training for Nuclear Medicine Professionals’. This professional online training platform is intended to support the development of the knowledge and skills necessary for nuclear medicine professionals to conduct high-quality studies and deliver safe, appropriate medical services. The e-learning platform is available through the Human Health Campus – an IAEA-developed resource where health professionals can find organized and dependable professional educational materials.

Two further e-learning modules on Myocardial Perfusion Imaging and PET/CT in Clinical Oncology were developed in 2014 under TC project RAS/0/064, ‘Supporting Nuclear Education and Training through e-Learning and Other Means of Advanced Information Communication Technology (ICT)’. Both modules will enhance and complement education and training for continuous professional development and capacity building efforts in the fields of nuclear oncology and

nuclear cardiology in the Asia and Pacific region, as well as in other regions. The new modules will be launched in 2015.

The development of a knowledge management culture is important for the Latin America region, particularly when taking into account the fact that several countries in the region developed a strong nuclear workforce in the 60s and 70s. These scientists, engineers and technicians have already retired, or will be retiring in the next three to five years. To help preserve, share and transfer their valuable knowledge, the Agency supports ongoing training in managing nuclear knowledge for professionals from nuclear organizations, either through supporting their participation in Schools delivered by the Agency in the region or at international level, or through distance learning. A Spanish language e-learning course on nuclear knowledge management has been developed and will be used as a pilot in the pre-training for the next Nuclear Knowledge Management School in the region.

In Latin America and the Caribbean, TC project RLA/0/048, 'Networking for Nuclear Education, Training, Outreach and Knowledge Sharing', supported the creation of an integrated database on nuclear education to serve students and teachers. This database provides information on courses, careers,

cooperation opportunities, fellowships and educational material from a range of high quality sources. The goal is to become a reference hub in the region for nuclear education and training for both providers and users – a 'virtual campus' in Spanish, Portuguese and English. The database will be completed with a DSPACE platform for the academic field, created as a document repository for training and educational purposes in the nuclear area. This platform will be used by the members of the educational network created through the same project. It will be a valuable tool to preserve and share material that can be used to support nuclear education and training. The cooperation established through the project with the Latin American Network for Education and Training in Nuclear Technology (LANENT) is key to achieving the objectives of the project.

Under the same project, new e-learning material was made available for professionals from Ministries of Energy, electricity utilities/companies and universities that are involved in energy sector planning and development in their respective countries. The material focuses on the analysis of future energy demand for the assessment of energy supply options, including nuclear power, using the IAEA's analytical tool Model for Analysis of Energy Demand (MAED), and has allowed a high degree of training coverage. A new e-learning training course in Spanish, *Radiation Protection for*

LANENT web page.

Dental Radiology, was also launched. This is for self-training of dentists and technical supporting staff, and addresses an important need in the region. Finally, a document, *Status and Trends in Nuclear Education in Latin America and The Caribbean*, was finalized to support implementation of national and regional nuclear education strategies.

Under the framework of the interregional project INT/2/013, ‘Supporting Nuclear Power Infrastructure Capacity Building in Member States Introducing and Expanding Nuclear Power’, the IAEA implemented a pilot e-learning programme in the field of energy planning. The purpose of the e-training course was to develop capabilities in the use of the IAEA’s analytical tool MAED. This is an important step in ensuring Member States’ ability to successfully analyse future energy demands and enables them to accurately assess energy supply options, including nuclear power. The e-learning platform ensures sustainable and widespread access to the knowledge and skills required to ensure the development of a successful energy planning policy at both the national and regional levels.

Technical cooperation among developing countries and networking

The IAEA TC programme places great emphasis on South-South cooperation and technical cooperation among developing countries (TCDC). Member States who have already reached a high level of competence in particular fields are actively involved in regional projects to share their knowledge and experiences. This approach also provides opportunities for networking, bilateral, sub-regional and topical collaboration among countries, regulators and institutions. Intensified technical cooperation among countries supports the joint identification of problems and the formulation of possible solutions, as well as the sharing of technologies, experiences and proven management approaches. For all regional cooperation, TCDC is an essential mechanism to enhance capacity building and technology support activities.

Within the framework of AFRA, TCDC contributes to the region’s self-sufficiency and self-reliance in nuclear science and technology, and significantly contributes to

increasing the effectiveness and sustainability of nuclear technology for development on the continent. In 2014, the AFRA RDCs and project scientific consultants provided a mechanism for coherent, coordinated and effective delivery of training, and for the use of regional expertise and existing facilities in planning and implementing regional activities in different FoAs. TC project RAF/0/038, ‘Promoting Technical Cooperation among Developing Countries in Africa through Triangular Partnerships (AFRA)’, provided a structured framework for the use of experts in the implementation of triangular cooperation activities. Generally, this involved several experts and fellows from technology-advanced countries and developing countries visiting one another to provide or receive training. The number of fellows and experts from the region participating in AFRA projects under the TCDC modality has increased steadily, with approximately 140 regional experts undertaking assignments in the region.

Radioactive Waste: Meeting the Challenge – Science and Technology for Safe and Sustainable Solutions

The 2014 Scientific Forum on ‘Radioactive Waste: Meeting the Challenge – Science and Technology for Safe and Sustainable Solutions’ focused on the management of spent fuel and radioactive waste generated from nuclear technologies. Sessions covered spent fuel and radioactive waste processing, conditioning and storage, and disposal. The TC programme offers Member States assistance in each of these areas.

In Africa, the TC programme is making strong efforts to further develop the management infrastructure for the safe and secure control of radioactive waste. Projects such as RAF/9/051, ‘Strengthening the Regulatory Framework and National Infrastructure for Safe Management of Radioactive Waste and Protection of Public and Environment’, and RAF/9/054, ‘Strengthening Radioactive Waste Management (AFRA)’, tackle current challenges, offering tailor-made solutions based on a harmonized regional approach in line with international standards. RAF/9/051 centres its efforts on strengthening national

regulatory frameworks and infrastructure, whereas RAF/9/054 develops human resource capabilities with a focus on the operators of waste management facilities. In order to ensure effectiveness and maximize the use of available resources, these projects are implemented in a coordinated fashion, sharing resources and complementing each other. Both projects have received technical and financial support from the European Union, Japan, Spain and the United States of America.

In Asia and the Pacific, the establishment of strong regional capabilities in spent fuel and radioactive waste management is a priority, as a number of Member States in the region are seriously considering the introduction of nuclear power in the near future. The thematic focus of projects ranges from strengthening existing radioactive waste management capabilities (BGD/9/013, ‘Strengthening Radioactive Waste Management Capabilities’) to establishing new radioactive waste management capabilities (KAM/9/002, ‘Building Capacity in Radioactive Waste Management’) and supporting the identification of suitable sites, including subsequent site characterization (MAL/9/013 ‘Identifying Suitable Disposal Sites for Low Level Waste and Disused Sealed Radioactive Sources’ and MAL/9/015, ‘Supporting Site Characterization for the Development of a Low Level Waste Repository and Borehole Disposal Facility’). The storage of spent fuel for the safe operation of the Bushehr NPP was addressed to strengthen national capabilities in power reactor spent fuel management

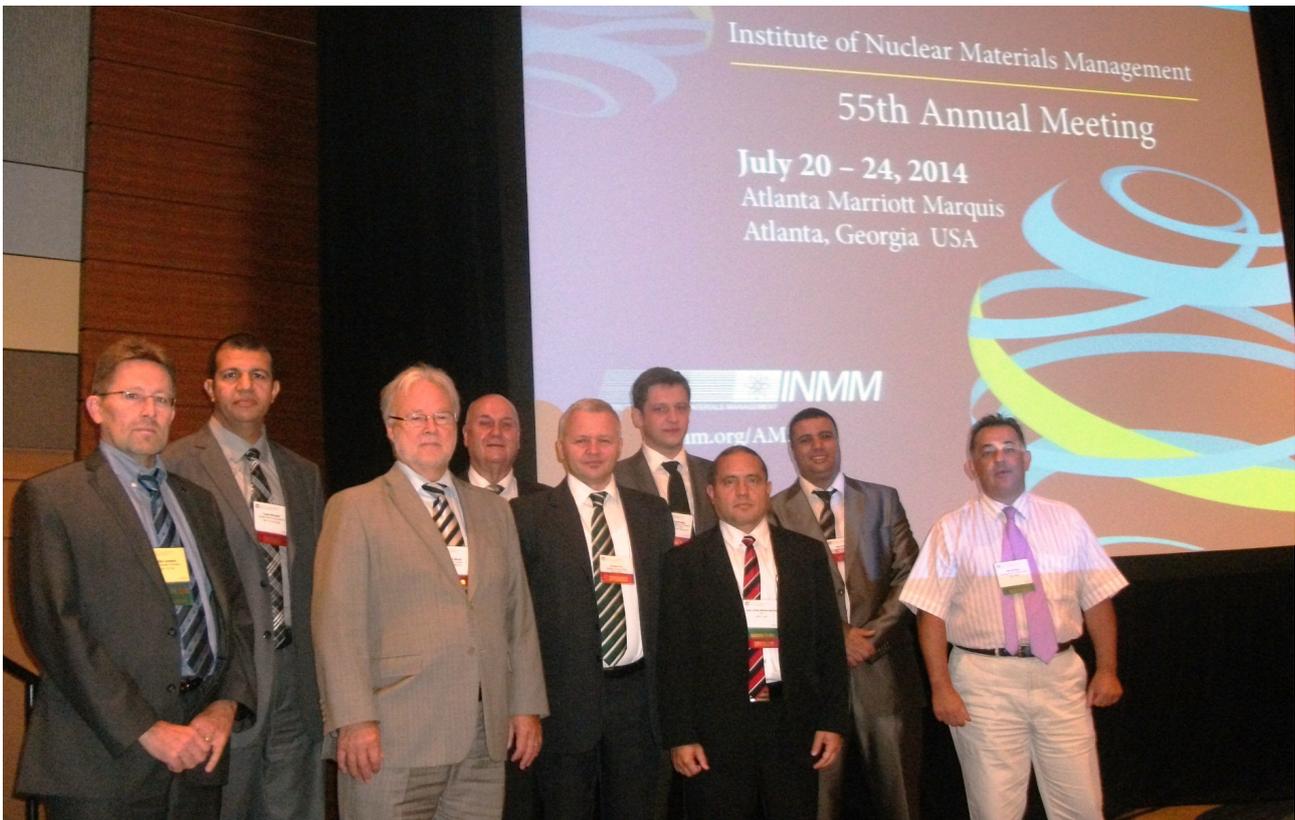
under IRA/2/011, ‘Action Plan for Implementation of Workplan Activities in 2012–2013 and 2014–2015’.

In Latin America, the regional project RLA/9/078, ‘Enhancing the National Regulatory Framework and Technological Capabilities for Radioactive Waste Management’, is successfully combining technology and safety aspects to strengthen national spent fuel (SF) and radioactive waste management (RWM) capabilities across the region. The project gives particular attention to strengthening regulatory infrastructure, and to improving the technical capabilities of national spent fuel and waste management organizations at the operational level. Another area of focus is to improve early detection of, and response to, radioactive orphan sources. In an event organized in 2014 with the cooperation of the Argentinian regulatory body, senior government officers and decision makers gathered to raise awareness of the importance of developing and implementing national policies and strategies on SF and RWM, as well as to promote their participation in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The project has also contributed to removing high activity sources from Honduras, assisting national authorities with the preparation of the licencing and documentation needed to authorize transport of such types of radioactive sources.

In 2014, the ongoing project INT/9/176, ‘Strengthening Cradle-to-Grave Control of Radioactive Sources in



INT/9/176: Transport arrangements to repatriate 5 high-activity radioactive sources from Morocco to France. (Credit: IAEA).



Counterparts and partners of project INT/9/176 participated in the 55th annual meeting of the INMM (Credit: IAEA).

the Mediterranean Region', which is implemented in cooperation with the European Commission (EC), Spain and the US Department of Energy (USDOE), made further progress. For example, in June 2014 Montenegro received assistance to condition over 90 radioactive sources for safe and secure storage. This fieldwork was combined with an interregional training event for participating Member States. Under the same project, 16 trainees from eleven countries in Africa, Asia and the Pacific, and Europe had a unique opportunity to witness and participate in a five-day, hands-on training exercise in South Africa on conditioning high level disused sealed radioactive sources using a mobile hot cell specially fabricated to facilitate this kind of operation. Morocco also benefitted from assistance provided within the framework of the project, as five disused high activity sources (Co-60 teletherapy heads) were safely and securely repatriated to France for long-term management.

The achievements of INT/9/176 were presented at an IAEA side event at the 55th Annual Meeting of the Institute of Nuclear Materials Management (INMM) in Atlanta, Georgia, USA.

A.2. Building a more efficient, more effective technical cooperation programme¹¹

Country Programme Frameworks and Revised Supplementary Agreements

Country Programme Frameworks (CPFs) ensure that the application of nuclear technology is integrated with a Member State's existing development plans, defining mutually agreed priority development needs and interests that can be supported through TC activities. CPFs reflect national development plans, country specific analyses and lessons learned from

¹¹ Section A.2. responds to section 3, operative paragraph 1 of resolution GC(58)/RES/12 on strengthening TC activities, including the provision of sufficient resources, based on Member States' needs and priorities, and ensuring that the components of TC projects are readily available.

past cooperation, and take into account linkages to United Nations Development Assistance Frameworks (UNDAFs). Thirteen CPFs were signed in 2014.

Efforts continued during 2014 to strengthen the analytical content of CPFs. The focus of these strengthening efforts was on preparing tools and training for Member State authorities to develop partnership frameworks for both the CPF and project designs using the logical framework approach (LFA) methodology. The aim is to help Member States build partnerships that provide opportunities for collaboration with relevant technical, operational and financial organizations – partnerships that support country programmes and the achievement of technical cooperation objectives. The effort also seeks to support the TC goal of moving from smaller, more short-term national projects to programmes of larger scope and scale, with greater opportunities for social and economic benefits and longer-term national development impact. It is expected that upcoming CPFs that are agreed to be released may be used more effectively for resource mobilization efforts and longer term country programme partnerships, and by association may help the Agency identify key partner organizations for additional FoAs.

Revised Supplementary Agreements Concerning the Provision of Technical Assistance by the IAEA (RSAs) govern the provision of technical assistance by the Agency, and are required under the Statute and the Revised Guiding Principles and General Operating Rules to Govern the Provision of Technical Assistance by the Agency¹². They must be concluded by Member States participating in the TC programme. Two RSAs

CPFs signed in 2014	
Argentina	Madagascar
Cameroon	Mauritania
Chile	Mauritius
Croatia	Montenegro
Cuba	Mozambique
Lao People's Democratic Republic	Namibia
	Slovakia

were signed in 2014, by Lao People's Democratic Republic and Rwanda. As at 24 March 2015, 124 Member States had signed an RSA.¹³

Maximizing programme impact: Improving interaction with the United Nations system and building partnerships¹⁴

The management strategy for engaging the UN and other international organizations, as well as non-governmental organizations (NGOs) and the private sector, focuses on field level coordination and partnership building in support of the country programme. During the year, efforts were made to operationalize country programmes within UNDAFs. A key step towards this goal could be membership in the United Nations Development Group (UNDG), a possibility currently under review.

An important element of the management strategy for engagement is to align the TC programme with common development priorities. The forthcoming agreement on the post-2015 development agenda and the accompanying SDGs is an important opportunity for the Agency. The 17 new SDGs succeed the eight 2000–2015 United Nations Millennium Development Goals (MDGs) that have guided the UN system and many bilateral programmes and NGOs in coordinated and focused support for national MDG targets and plans. The SDG mechanism is a multidimensional framework of policy, planning, funding and implementation translated at the national level to targets and plans that provide a comprehensive programming framework in relevant Agency FoAs. Many, if not most, of these goals relate directly to

¹² <http://www.iaea.org/Publications/Documents/Infocircs/Others/infocirc267.pdf>

¹³ This paragraph responds to section 1, operative paragraph 1 of resolution GC(58)/RES/12 on adhering to the Statute and document INFCIRC/267; and to operative paragraph 2 on the importance of RSAs.

¹⁴ This section responds to section 5, operative paragraph 1 of resolution GC(58)/RES/12 on consultations and interactions with interested States, the UN system, multilateral financial institutions, regional development bodies and other relevant intergovernmental and non-governmental bodies; and section 5, operative paragraph 3 on developing and facilitating cost-sharing, outsourcing and other forms of partnership in development.

the Agency's TC programme. The link between the new SDGs and FoAs will be the subject of a side event that will be held during the 59th session of the General Conference in 2015 that will demonstrate the relevance of the Agency's technical cooperation activities and projects to the SDGs, and clarify how the SDG framework can provide resource mobilization opportunities and increase the socioeconomic impact of the TC programme. It is expected that the discussion and presentations will facilitate the Board of Governors consideration of these key UN development goals, and open new doors for partnerships including with the private sector. The side event will also showcase the new Technology Bank (the United Nation's technology transfer mechanism), and discuss its implications for cooperation with Member States.

During 2014, a Practical Arrangement (PA) was completed with the United Nations Environment Programme (UNEP). This PA forms a basis for a thematic partnership framework for climate change adaptation that will eventually include the United Nations Framework Convention on Climate Change (UNFCCC), CGIAR and the Global Environment Facility (GEF), and will be the focus of partnership building activities in 2015.

Discussions held mid-year in Kenya on expanding cooperation with United Nations Children's Fund (UNICEF) have led to new interregional and regional projects on human nutrition which aim to address the universal problem of stunting in cooperation with the Scaling Up Nutrition (SUN) movement, and to develop capacities in Africa to assess the body composition of children. It is expected that field collaboration of this kind that leads to joint programmes will provide new opportunities for resource mobilization, as counterpart institutions demonstrate the importance of isotopic studies in understanding human nutritional status and determining the efficacy of fortification and supplementation interventions.

The Agency is also contributing to international efforts to fight the outbreak of the Ebola virus disease (EVD). In cooperation with the World Health Organization (WHO) and, among others, the South African National Institute for Communicable Diseases (NICD), the

Agency is providing assistance to affected countries to increase their ability to diagnose EVD quickly using a nuclear-derived diagnostic technology known as reverse transcription-polymerase chain reaction (RT-PCR).

Cooperation with the EC through various agreements has been key in supporting regulatory infrastructure, emergency preparedness and spent fuel and radioactive waste management in several Member States. Partnership activities aim to encourage constructive engagement, exchange of information, and collaboration on nuclear safety, and to identify and take advantages of synergies between Agency and EC objectives in nuclear safety. Several contribution agreements are in place in support of nuclear safety priorities, in all regions. The main themes addressed are:

- design and operational safety review services for NPPs;
- safety for lifecycle management of spent fuel, radioactive waste and decommissioning;
- lessons learned from the Fukushima-Daiichi nuclear power plant accident (the Fukushima accident) for the regulators, regulatory oversight and effective compliance assurance regime in transport of radioactive material;
- emergency preparedness and response (EPR);
- radioactive waste management;
- strengthening regulatory bodies and improving implementation of safety standards;
- cradle-to-grave control of radioactive sources; and
- coordination of stakeholders on remediation of uranium legacy.

The Agency was also supported by international partners in its efforts to help Member States establish and reinforce existing radiation safety infrastructures. In this regard, the EC, Japan, Spain and the USA continued to provide financial and technical support for safety-related regional projects. Various regional projects on strengthening and harmonizing national

capabilities for response to radiation emergencies, on strengthening radioactive waste management, and on strengthening education and training infrastructure, and building competence in radiation safety, have benefited from this financial and technical support.

In Africa, representatives of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the German Federal Institute for Geosciences and Natural Resources (BGR), as well as authorities from the joint aquifers in the Sahel region, participated in the coordination meeting under the regional project RAF/7/011, 'Integrated and Sustainable Management of Shared Aquifer Systems and Basins of the Sahel Region'. This project covers five major aquifer systems shared by thirteen African Member States, and has received financial and technical support from Australia, Japan, the Republic of Korea, Sweden, and the USA.

In the Asia and the Pacific region, significant initiatives are being taken to strengthen inter-organizational partnerships and cooperation with development organizations, and the Secretariat participates actively in UNDAF processes at the country level. Recognizing the importance of coordinating efforts between different UN organizations in non UNDAF countries, the Secretariat is also engaged in interagency dialogue

for the development of the Strategic Partnership Framework of Malaysia and the United Nations Partnership for Development Framework (UNPDF) of Indonesia.

The Agency, in close collaboration with the International Center for Biosaline Agriculture (ICBA), and through project RAS/5/068, 'Developing Effective Practices for Combating Desertification (ARASIA)', is helping Member States address soil, water, crop and nutrient management issues and enhancing knowledge of good farm management practices under saline conditions. A formal agreement for collaboration is being pursued for research and development on agriculture in marginal environments, especially in saline lands.

In the Europe region, different methods and arrangements for technical and financial partnerships are being utilised in the programme. In addition to agreements in place to support the delivery of PGECS at the Greek Atomic Energy Commission in Athens, and the International Sakharov Environmental University in Minsk, agreements are also in place with the European Society for Radiotherapy and Oncology (ESTRO) and the European Association of Nuclear Medicine (EANM) for the management of training courses in radiotherapy and nuclear medicine.



RAS/5/068: Participants at a regional training course undertaking field work at ICBA, Dubai.

A Mutual Understanding document was signed with the State Atomic Energy Corporation (Rosatom) (Russian Federation) regarding cooperation for capacity building in the area of medical physics in radiation oncology in the Commonwealth of Independent States. The Russian Federation also provides similar capacity building for developing and implementing integrated programmes for the remediation of areas affected by uranium mining in Central Asia.

In the Latin America region, cooperation with traditional partners in the field of radiation safety, such as the Pan American Health Organization (PAHO), the United States Nuclear Regulatory Commission (USNRC), the Spanish Nuclear Safety Council (CSN) and the EC, continued to be crucial for strengthening the capabilities of regulators and end users, and ensuring that radiation sources are used safely and securely.

In 2014, priority was placed on reinforcing traditional partnerships and on developing new strategic partnerships. The main emphasis was on developing alliances that focus on the end users of the results of TC projects, in order to maximize programme impact. In 2014, to make sure that project results reach users and final beneficiaries, collaboration was established with

Texas A&M University (TAMU) National Centre for Electron Beam Research and with the US Department of Agriculture's Animal and Plant Health Inspection Service under RLA/5/066, 'Increasing the Commercial Application of Electron Beam and X-Ray Irradiation Processing of Food'. The aim is to assist Latin American countries to extend the shelf life of certain food commodities, and thus contribute to food security and increased exports.

Cooperation with the US Los Alamos National Laboratory under the Peaceful Uses Initiative (PUI) has also been introduced, in order to accelerate the introduction of linear accelerators for human health applications in the region. The collaboration will support the establishment and delivery of a comprehensive curriculum to train professionals in the region in three key roles that use linear accelerators: radiation oncologists, medical physicists and radiation therapists.

Also in Latin America, the cooperation initiated in 2013 with the Percy Hospital for Army Instruction in France has been consolidated under a project launched in 2014, RLA/9/076, 'Strengthening of National Capabilities for Response to Radiation Emergencies',



Counterparts of the project RLA/5/066 discussing food irradiation techniques in TAMU's Center for Electron Beam Research (Credit IAEA).

with the provision of state of the art training to treat patients suffering acute irradiation syndrome with stem cells. This cooperation is facilitating the transfer of know-how on treating patients suffering from acute irradiation syndrome with stem cells, and is expected to improve existing capabilities in the region to respond to emergency events involving radiation-induced injuries.

Also in Latin America, strategic partners were invited to participate in preparing the design of the projects that will be proposed for the 2016–2017 TC programme. In December 2014, a workshop brought together counterparts from Member States, experts and partners to work on the design of a new project on cradle-to-grave control of radioactive sources in the Caribbean region. The workshop was attended by representatives from the USNRC, the United States Department of Energy (USDOE), the Spanish CSN and the EC in their capacity as strategic programme partners. Their recommendations were presented in an open information session at the close of the design workshop.

PACT strengthened strategic partnerships with cancer control organizations such as WHO, the International Agency for Research on Cancer (IARC) and the Union for International Cancer Control (UICC), with the aim of operationalizing joint efforts at the country level. Several new partnerships were initiated or established, including with Pink Ribbon Red Ribbon (PRRR), the American Cancer Society (ACS), the Harvard School of Public Health, the University of Texas M.D. Anderson Cancer Center (MDACC), the African Development Bank, the East African Development Bank, and the Centre for Global Health amongst others, seeking to

fully leverage the effectiveness of radiation medicine within a comprehensive cancer control approach.

The complementarity of mandates and the close coordination of activities at national, regional or interregional level ensure that Member States benefit optimally from combining the IAEA's expertise in radiation medicine with the experience of other key actors in the fight against cancer.

Supporting gender equality: Women in the TC programme¹⁵

The Agency encourages the participation of women in every area of the TC programme. In line with the Agency's gender policy, TC activities aim to mainstream gender and to enhance gender equality. In 2014, 4020 women from all regions participated in the TC programme as counterparts, fellows, scientific visitors, meeting and training course participants and international experts and lecturers, a slight decline from the 2013 figure of 4049. In addition, there are five women on the Director General's Standing Advisory Group on Technical Assistance and Cooperation, out of a total of 17 members.

¹⁵ This section responds to section 2, operative paragraph 3 of resolution GC(58)/RES/12 on promoting gender equality and advancing gender balance in the TC programme.

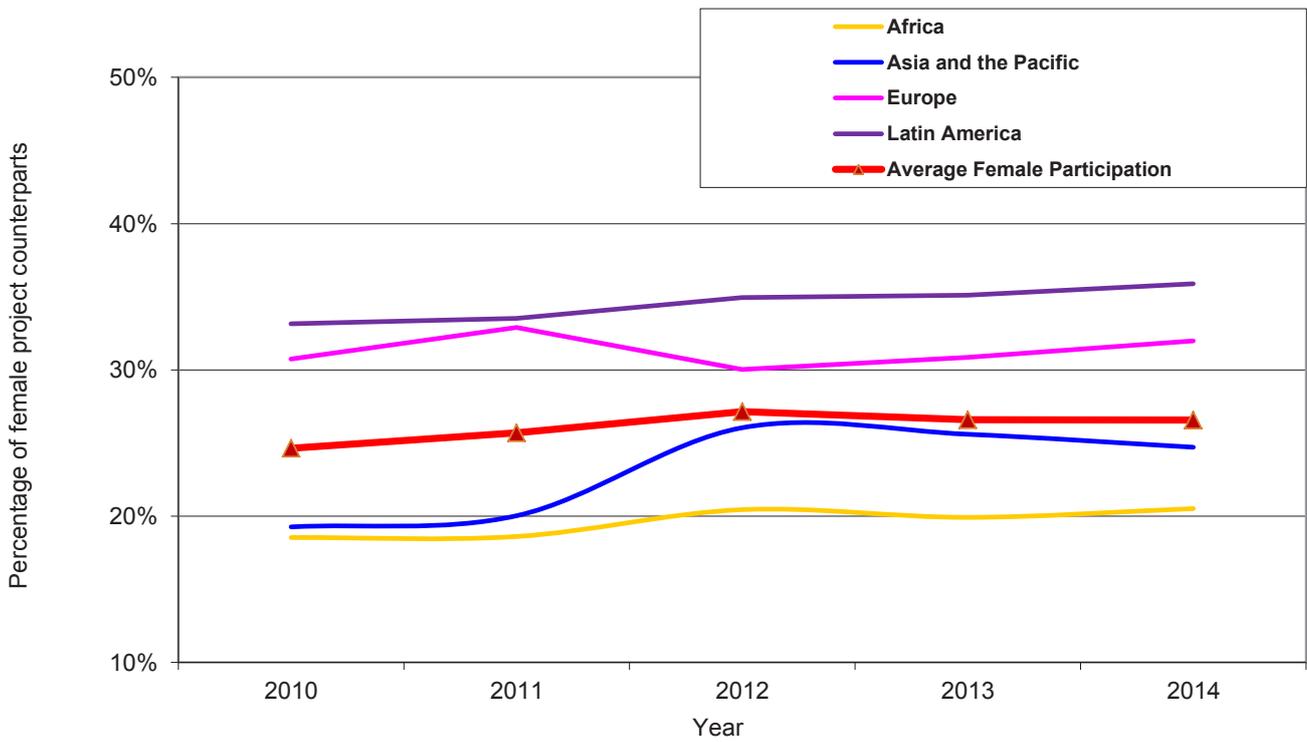


Figure 3: Female project counterparts by region, 2010–2014.

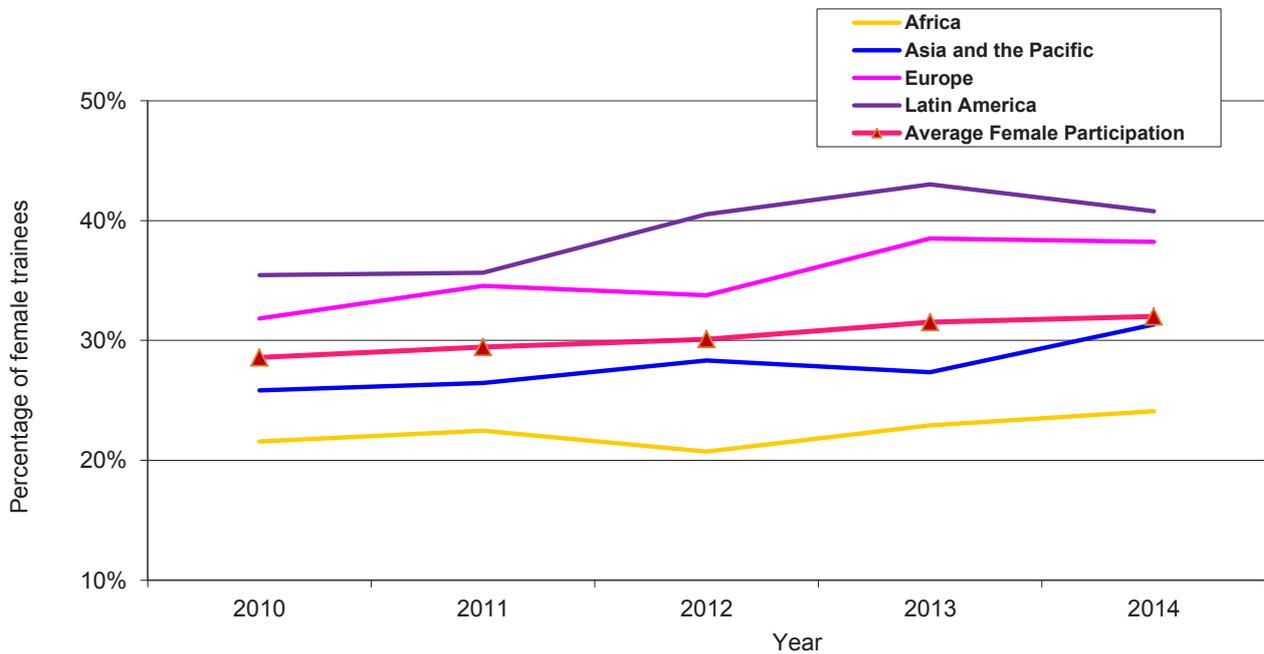


Figure 4: Female participation in training as fellows, scientific visitors, training course participants, meeting participants and other project personnel, 2010–2014.



Counterparts, experts, partners and IAEA staff worked together in the design of a project on cradle-to-grave control of radioactive sources for the Caribbean region for 2016-17 programme for Latin America.

Ensuring continual improvement of the TC programme¹⁶

Preparations for the 2016–2017 TC cycle started in 2014, and the online Programme Cycle Management Framework (PCMF) system was updated.¹⁷ As part of the Secretariat’s ongoing efforts to enhance the quality of the TC programme, support continued to be provided to Member States to ensure that the projects developed for the 2016–2017 TC cycle would be linked to the IAEA’s Medium Term Strategy, and be of high quality, with measurable, attainable and timely objectives. A quality review of 300 national and regional draft TC project designs, representing the areas of highest importance to individual Member States, was conducted in January/February 2015. The primary purpose of the quality review at this particular stage of the project development process was to provide relevant observations and constructive suggestions that would help the project teams to improve the quality of the project designs during the last stage of designing in compliance with the TC programme quality criteria.

The overall observations made during the quality review indicated that the activities of the Department of Technical Cooperation to enhance Member State capacities in the use of the LFA have been beneficial and fruitful. They also helped to identify areas of focus for future capacity building and project design activities.

Training workshops were facilitated at national, subregional and regional levels in Member States as well as within the Secretariat. They contributed to further enhancing the project design capacity of a wide range of TC stakeholders (counterparts, National Liaison Officers (NLOs), Programme Management Officers and Technical Officers) in using the LFA methodology, and in applying the principles and tools for TC project monitoring. Participants received practical guidance on improving the quality of their draft project designs for the 2016–2017 TC cycle.

The ability to demonstrate how the TC programme contributes to promoting and improving the scientific, technological, research and regulatory capabilities

¹⁶ This section responds to section 3, operative paragraph 1 of resolution GC(58)/RES/12 on strengthening TC activities, including the provision of sufficient resources, based on Member States’ needs and priorities, and ensuring that the components of TC projects are readily available; to section 3, operative paragraph 3 on optimizing the quality, the number and the impact of TC projects; to section 3, operative paragraph 4 on providing Member States with information on project development according to the LFA; to section 3, operative paragraph 5 on submission and guidance of reporting; to section 3, paragraph 6 on the two-step mechanism in monitoring the quality of TC projects; and to section 3, operative paragraph 7 on enhancing adherence with the central criterion and all the TC requirements.

¹⁷ This paragraph responds to section 2, operative paragraph 8 of resolution GC(58)/RES/12 on implementing the Programme Cycle Management Framework (PCMF) in phases, and to make it simpler and user-friendly.

of Member States through the development of effective programmes with well-defined outcomes is of increasing importance to both Member States and donors. In 2014, this was re-emphasized in GC(58)/RES/12, which requests an increased focus on results (outputs, outcomes and impact) rather than on inputs and activities. The Department of Technical Cooperation's initiatives in responding to these requirements are well advanced through the development of a framework of regular reporting on the implementation and outcomes of TC projects. The Department is working closely with the Office of Internal Oversight Services (OIOS) on creating the preconditions for the meaningful evaluation of TC projects through a comprehensive outcome monitoring and assessment framework. This involves systematic monitoring of the progress made in achieving the expected outcomes, both during implementation and after project closure. A sound project design that follows the LFA and provides realistic indicators and baseline data is of crucial importance in this context. For the 2016–2017 TC cycle, specific monitoring and evaluation plans to cover the entire project life cycle are being developed for selected TC projects in the thematic area of human health and nutrition. Over the past years, a range of complementary monitoring instruments (Project Progress Assessment Report (PPAR), field monitoring missions, and self-evaluation) have been developed for this purpose. The experience gained and lessons learned during this process will provide the basis for expanding the concept of outcome monitoring to a wider range of suitable projects in subsequent TC cycles.

Monitoring instruments such as the PPAR provide a fundamental input for enhancing the quality of the TC programme through well-defined outcomes. In the Department of Technical Cooperation, the Division of Programme Support and Coordination (TCPC) works closely with the regional Divisions and external stakeholders on continuously reviewing the format and content of the PPAR. In 2014, an inter-divisional ad hoc working group developed a streamlined PPAR template, which is expected to further integrate a comprehensive system of programme and project monitoring and evaluation into the TC programme cycle. Continuous improvement will make the PPAR

an effective mechanism for documenting project progress (including outcomes) and identifying areas for improvement. PPARs also enable Project Management Officers and Technical Officers to provide effective feedback on progress and areas for improvement. Over 350 PPARs were submitted to the Secretariat, reporting on achievements made in 2014. For the TC programme as a whole, they give a valuable snapshot of the status of completion of project outputs as well as a mechanism to identify and communicate lessons learned.

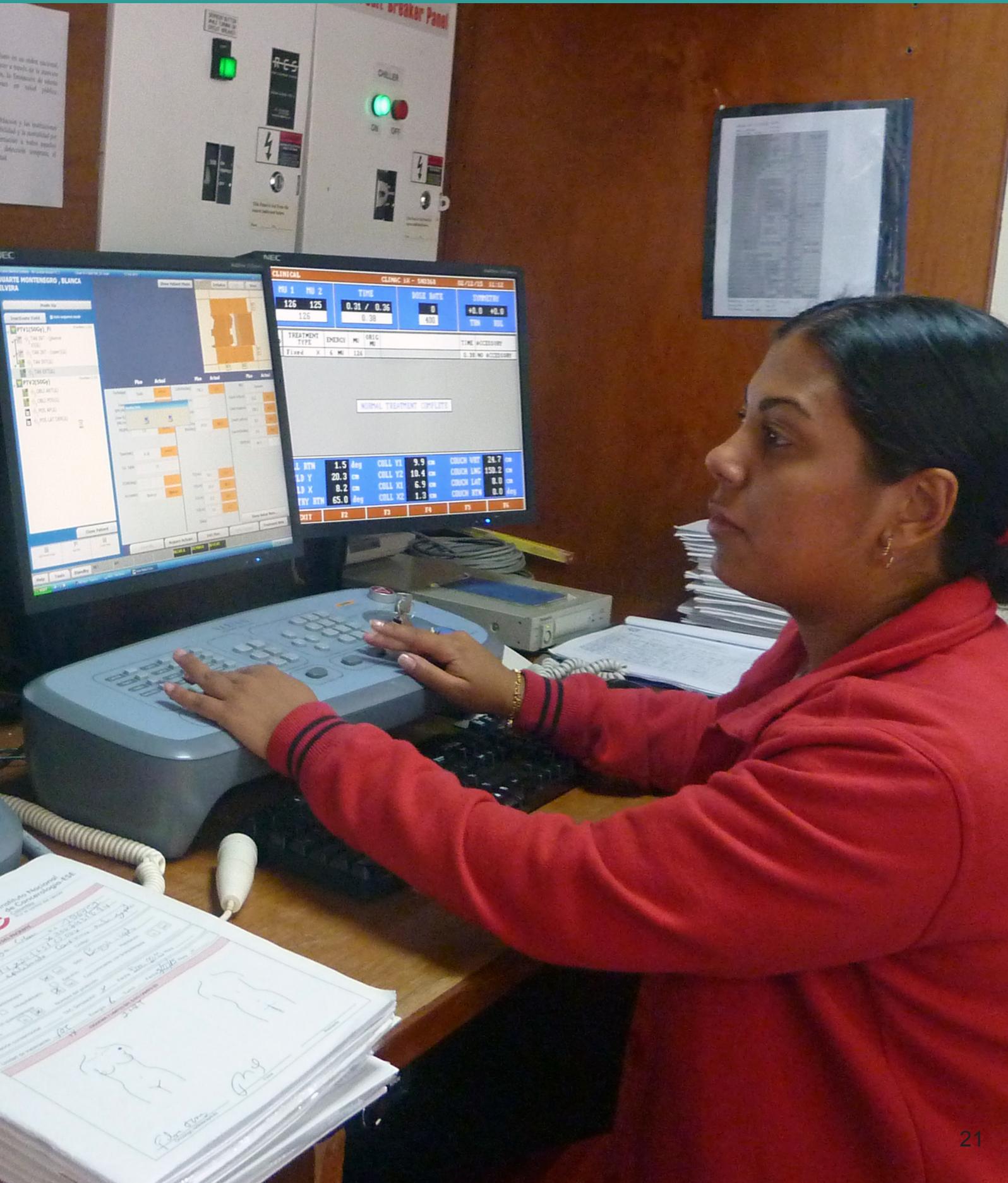
The effective sharing of best practices for the design and management of TC projects constitutes an additional pillar for initiatives to enhance the quality of the TC programme. The Department of Technical Cooperation, through the TCPC Quality Assurance Section, has a Best Practice Mechanism to encourage and support stakeholders in information sharing, continuous learning, innovation and networking. It provides an opportunity for the Member States and project teams to share TC programme and project related real-life experiences. The second round of collection of Best Practices, conducted in 2014, identified the following three best practices:

- Technological transfer on in situ leaching (ISL) mining: A more sustainable alternative for uranium production in Argentina;
- Enabling sustainable uranium production in a global context; and
- Drip irrigation technology for improved tea production for small scale farmers in the United Republic of Tanzania.

A third round will be implemented in 2015, at which stage there will be a solid basis for a thorough review of the initiative, particularly with regard to its impact, and for working with the regional Divisions on looking at how best practices can be effectively disseminated to interested stakeholders.

With a view to ensuring continual improvement to the TC programme, recommendations made by the OIOS have been systematically followed up. In 2014, a total of 29 recommendations for improvement made by OIOS were either closed or implemented.

B. TC Programme Resources and Delivery



B. TC Programme Resources and Delivery

B.1. Financial overview

Resources for the technical cooperation programme¹⁸

At the end of 2014, €62.2 million or 89.8% of the €69.2 million target had been pledged for the 2014 Technical Cooperation Fund (TCF), and €62.0 million in payments had been received. Total TCF resources including National Participation Costs (NPCs), and miscellaneous income amounted to €64.4 million (€62.0 million TCF, €2.2 million NPCs, €0.2 million miscellaneous income), lower than the 2013 figure of €66.3 million. New extrabudgetary resources for 2014 came to €18.6 million and in-kind contributions were €0.6 million.

The rate of attainment on pledges, as at 31 December 2014, was 89.8% for 2014, lower than in 2013 (92.8%). The rate of attainment on payments for 2014, as at 31 December 2014, was 89.5% (reflecting unpaid pledges of €0.2 million), lower than the 92.7% rate for 2013 (Fig. 6).

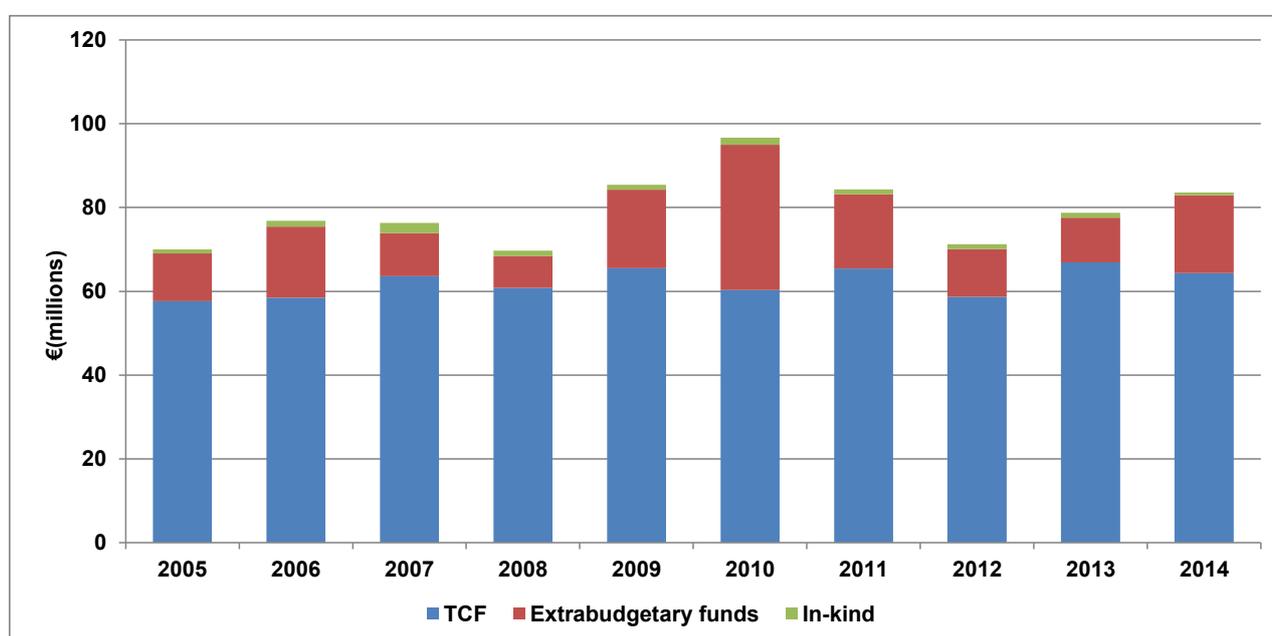


Figure 5: Trends in TC programme resources, 2005–2014.

²¹ This section responds to section 4, operative paragraph 2 of resolution GC(58)/RES/12 on the payment of TCF contributions and NPCs, and payment of APC arrears; and to section 4, operative paragraph 5 on timely payments to the TCF.

Table 1: TC programme resources in 2014

2014 target for voluntary contributions to the TCF	€69.2 million
Technical Cooperation Fund, NPC, miscellaneous income	€64.4 million
Extrabudgetary resources ¹⁹	€18.6 million
In-kind contributions	€0.6 million
Total new resources for the TC programme	€83.6 million

Table 2: Payment of National Participation Costs (NPCs) and assessed programme cost (APC) arrears

	Received in 2014	Outstanding payments
NPCs	€2.2 million	€0.6 million
APCs	€0.00 million (\$0.00 million)	€1.0 million (\$1.2 million)

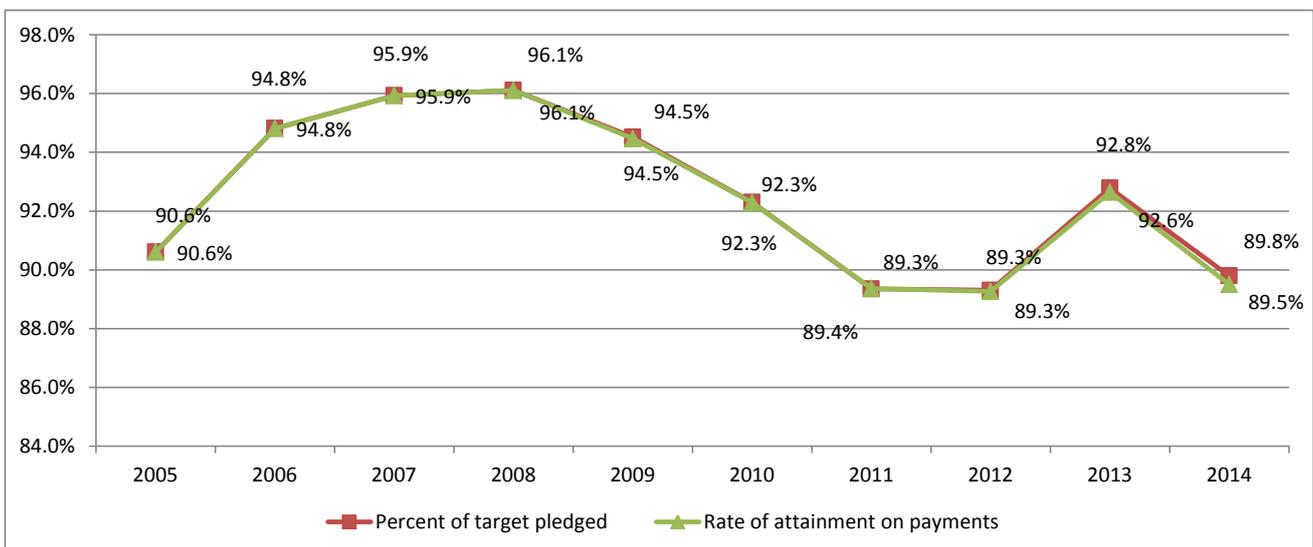


Figure 6: Rate of attainment trends, 2005–2014.

Extrabudgetary and in-kind contributions²⁰

Extrabudgetary contributions from all sources in 2014 (donor countries, international and bilateral organizations, government cost sharing) accounted for €18.6 million. More detail is contained in table 3 (extrabudgetary contribution by donor) and table 4 (government cost sharing). In-kind contributions accounted for €0.6 million in 2014. Of the total extrabudgetary contributions, €9.5 million was received through the PUI mechanism.

¹⁹ Please refer to Table A.5 of the Supplement to this report for details.

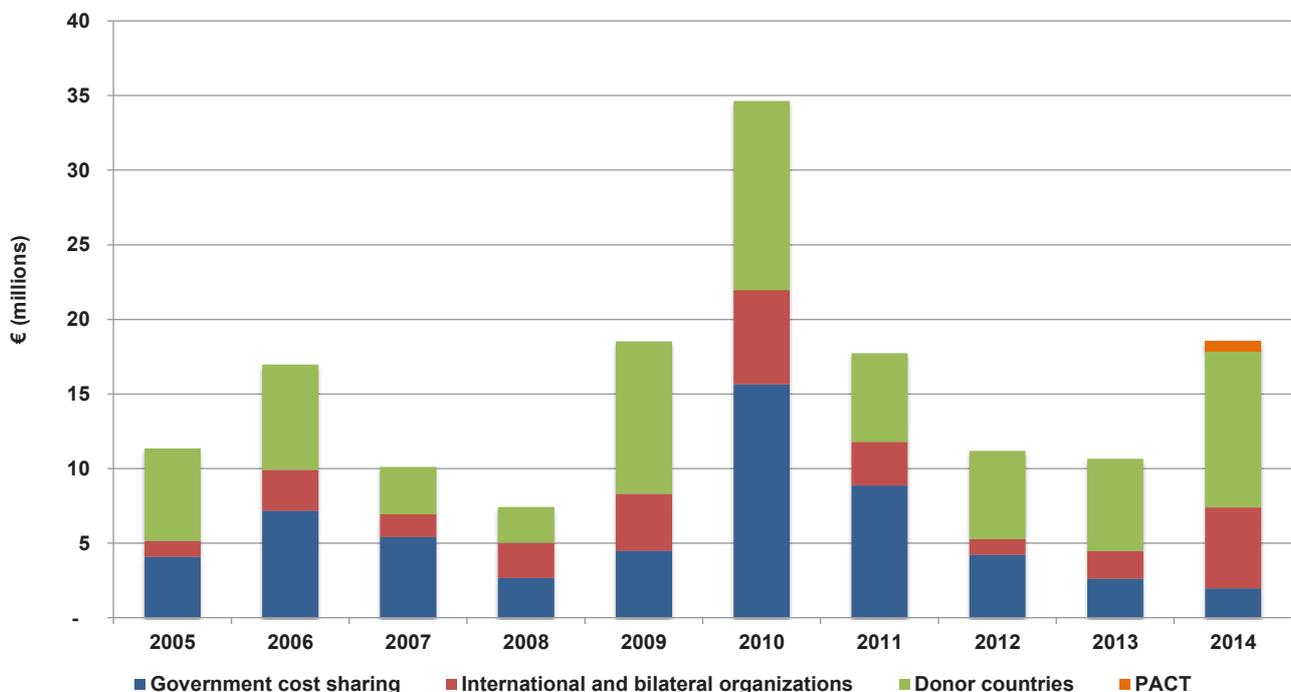
²⁰ This section responds to section 4, operative paragraph 8 of resolution GC(58)/RES/12 on seeking resources to implement footnote-a/ projects; to section 4, operative paragraph 9 on voluntary contributions and the implementation of footnote-a/ projects; and to section 4, operative paragraph 10 on extrabudgetary contributions, including the PUI.

Table 3: Extrabudgetary contributions allotted to TC projects in 2014, by donors (in euros)

Argentina	20 000	Russian Federation	321 640
Australia	20 000	Spain	120 000
Chile	7 270	Turkey	22 110
China	30 366	United States of America	7 948 928
Czech Republic	154 332	AFRA Fund ²¹	817 037
Indonesia	56 000	African Union - PANVAC	17 500
Japan	1 311 496	European Commission	4 589 950
Korea, Republic of	403 612	For PACT ²²	718 760
New Zealand	61 544		

Table 4: Government cost sharing allotted to TC projects in 2014 (in euros)

Albania	50 000	Lithuania	10 000
Costa Rica	67 500	Mongolia	291 000
Croatia	50 000	Montenegro	50 000
Estonia	37 000	Pakistan	218 360
Ethiopia	50 000	Saudi Arabia	374 000
Hungary	23 500	Serbia	100 000
Indonesia	13 783	Sri Lanka	136 709
Israel	400 000	Uzbekistan	16 323
Jordan	32 069	Bolivarian Republic of Venezuela	50 250

*Figure 7: Trends in extrabudgetary contributions by donor type, 2005–2014.*²¹ Please see section C.1 for details.²² Please see section C.6 for details.

B.2. Delivering the technical cooperation programme

Financial implementation

TC programme delivery is expressed in both financial and non-financial terms. Financial delivery is articulated in terms of actuals and encumbrances. Non-financial delivery (i.e. outputs) can be expressed numerically in terms of, for example, experts deployed or training courses conducted.

Financial implementation for the TCF, measured against the budget for 2014 as on 31 December 2014, reached 78.0% (Table 5), somewhat below the figure for 2013.

Table 5: Delivery of outputs under the TCF: financial indicators for 2013 and 2014		
Indicator	2013	2014
Budget allotment at year end ²³	€86 456 641	€77 075 529
Encumbrances + actuals	€72 376 048	€60 126 727
Implementation rate	83.7%	78.0%

Unallocated balance

At the end of 2014, the total unallocated balance²⁴ was brought down to €0.0. In 2014, €4.9 million were received as advance payments for the 2015 TCF. Some €1.2 million of cash is held in currencies which are difficult to use in the implementation of the TC programme.

Table 6: Comparison of the unallocated balance of the TCF (in euros)		
Description	2013	2014
Total unallocated balance	4 933 346	0
Advance payment in 2013 and 2014 for TCF for following year	3 354 848	4 949 610
Non-convertible currencies that cannot be utilized	11 918	12 804
Currencies that are difficult to convert and can only be used slowly	994 455	1 216 383
Adjusted unallocated balance	9 294 567	6 178 797

Human resources and procurement

Human resource indicators show the non-financial delivery of the TC programme. Regarding procurement, a total of 1383 purchase orders were issued in 2014, to a value of € 25.7 million.

²³ 2014 budget allotment at year end includes carry-over from previous years of €16.6 million, already allocated to projects.

²⁴ Total funds not allocated to TC projects.

Indicator	2013	2014	Increase/ (decrease)
Expert and lecturer assignments	3509	3461	(48)
Meeting participants and other project personnel	5331	5285	(46)
Fellowships and scientific visitors in the field	2005	1677	(328)
Training course participants	3041	2830	(211)
Regional and interregional training courses	209	187	(22)

Division	Requisitions	Purchase orders issued	Value
TCAF	411	560	€ 7 826 817
TCAP	328	339	€ 7 175 537
TCEU	139	165	€ 4 237 067
TCLA	231	319	€ 5 117 126
Total	1143	1383	€ 25 751 444

At the end of 2014, 1092 projects were active, and an additional 237 projects were in the process of being closed. During 2014, 146 projects were closed, of which 1 was cancelled.

Programme Reserve projects

Five Programme Reserve projects were implemented in 2014, at the request of Ethiopia, Liberia (2), Myanmar and Sierra Leone.

Project	Actuals end 2014	Encumbrances end 2014	Total
ETH/6/017 - Comparative study to determine zinc and/or iron bioavailability	€1 883	€29 623	€31 506
LIR/5/001 - Enhancing Ebola Diagnostic Capacity using RT-PCR at the Liberian Institute for Biomedical Research (LIBR)	€0	€40 000	€40 000
LIR/5/002 - Strengthening Human Resources for Ebola Virus Disease Diagnostic in Liberia using Nuclear-derived Techniques	€0	€40 000	€40 000
MYA/6/030 - Support for Radiotherapy Capacity Building in Myanmar	€19 869	€0	€19 869
SIL/5/015 - Enhancing Ebola Diagnostic Capacity using nuclear-derived technique at WHO/NICD EVD Lakka Laboratory, Freetown, Sierra Leone	€26 726	€13 274	€40 000



C. Programme Activities and Achievements in 2014: Regional Overview

C. Programme Activities and Achievements in 2014: Regional Overview²⁵

C.1. Africa

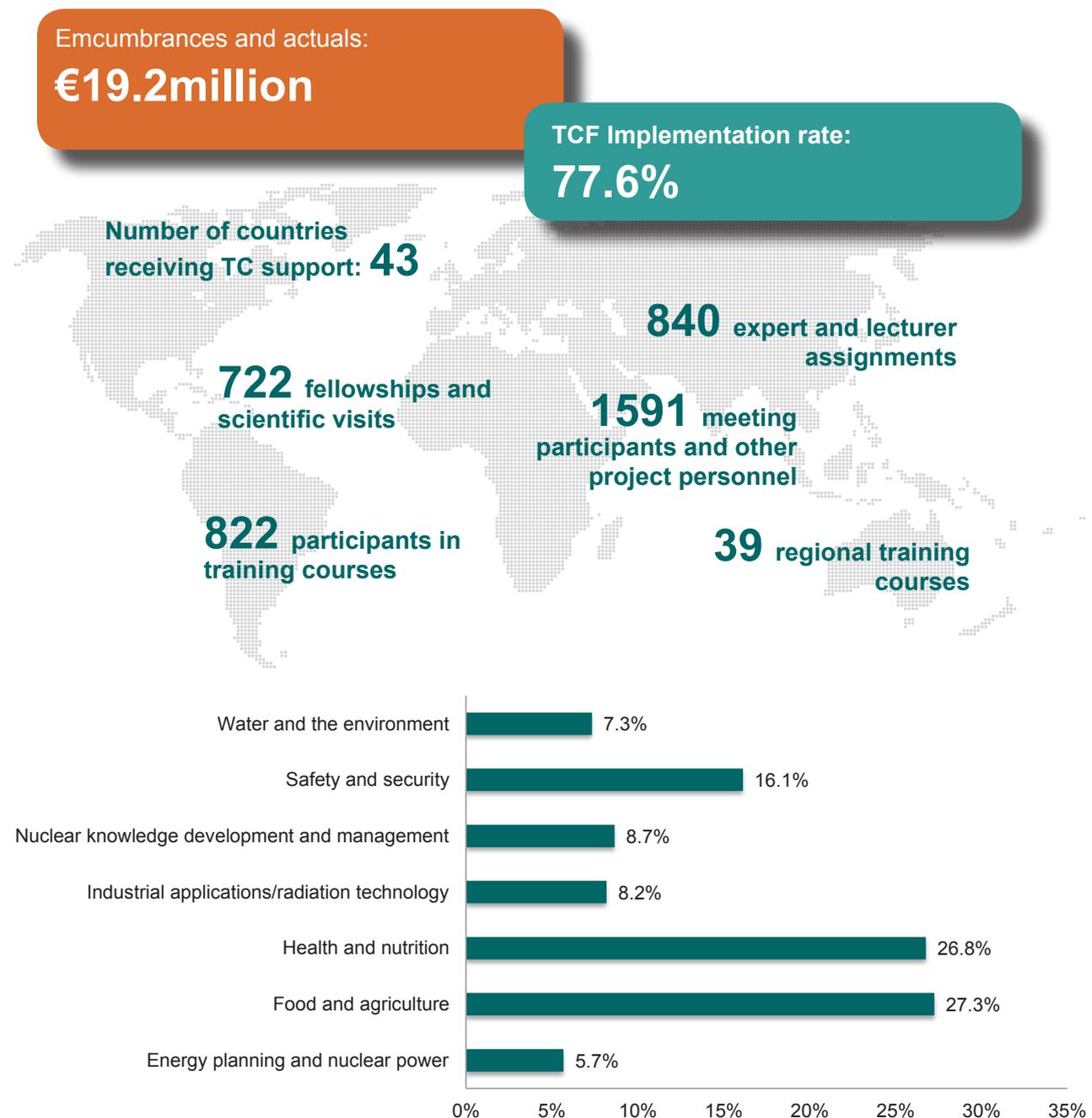


Figure 8: Actuals in the Africa region in 2014 by technical field.

²⁵ Section C responds to section 2, operative paragraph 1 of resolution GC(58)/RES/12 on facilitating and enhancing the transfer of nuclear technology and know-how among Member States; to section 2, operative paragraph 2 on strengthening TC activities through the development of effective programmes and well defined outcomes; and to section 5, operative paragraph 2 on promoting TC activities supporting the self-reliance, sustainability and further relevance of national nuclear and other entities in Member States, and enhancing regional and interregional cooperation.

Regional highlights in Africa, 2014

In 2014, the Agency supported 43 African Member States, of which 25 were least developed countries (LDCs), through its TC programme. Food and agriculture, human health and safety and security accounted for the highest proportion of actuals (Fig. 8). Over 300 TC projects were implemented in the region during the first year of the 2014–2015 TC programme cycle, including 185 new projects launched in 2014. The programme in the region achieved an implementation rate of 77.6% in 2014, despite a number of difficulties and challenges, including the outbreak of the EVD.

The development of CPFs remained an important component in targeted upstream programming throughout 2014, with intensive consultations and interaction between the Member States and the

CPF signed in Africa in 2014

Cameroon	Mauritius
Madagascar	Mozambique
Mauritania	Namibia

By the end of 2014, the Agency was involved in the UNDAF process in 13 countries in the Africa region, and was forming linkages and become involved in the UNDAF process in other African Member States. In 2014, the IAEA signed three new UNDAFs for Cameroon, Madagascar and Sierra Leone.

Recognizing the importance of advocacy work and support mobilization, the Agency participated in various important international processes relevant to the Africa region in 2014. In support of efforts related to non-proliferation and the peaceful uses of nuclear



Signing of the new CPF for Cameroon.

Secretariat. Six new CPFs were signed over the course of the year, by Cameroon, Madagascar, Mauritania, Mauritius, Mozambique and Namibia, and by the end of 2014, 33 Member States of the Africa region had valid CPFs.

In 2014, the Agency worked with Member States in the region to further enhance partnerships, mobilize extrabudgetary resources, strengthen regional cooperation, and build human and institutional capacity for the sustainable application of nuclear technology for development.

technology in Africa, the Agency took part in the Third Conference of State Parties to the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) in Addis Ababa, and prepared a document on the status of nuclear science and technology in Africa that was circulated at the conference.

The Agency was also present at the First Ministerial Meeting of the Tokyo International Conference on African Development (TICAD) in May 2014, which was co-organized by the Government of Japan, the African Union Commission, the UN, the UNDP and the World Bank Group, and took place in Yaoundé, Cameroon.

In addition, high level briefings were provided to United Nations Country Teams (UNCT) in Ethiopia, Nigeria and the United Republic of Tanzania during the course of the year, to raise awareness of the technical cooperation work of the Agency in sister UN organizations. This proved to be a useful approach to build understanding – in Nigeria, for example, number of the UN agencies present at the briefing expressed interest in the work of the Agency and in opportunities for future collaboration. Advocacy work of this sort strengthens partnership outreach and collaboration, facilitates the coordination and optimization of complementary activities, and supports a more streamlined international response to Africa's development challenges.

The Agency continued the implementation of a large scale project on water resource management in the Sahel region, covering five major aquifer systems shared by thirteen African Member States. A coordination meeting was held in Vienna in 2014, bringing together 85 representatives from the participating countries, the Joint Authorities for the shared aquifers, and partners from UNESCO and the German BGR. Over 3000 samples have been taken which will be used to develop databases to support the shared aquifer diagnostic analysis (SADA) and the preparation of strategic action programmes. The data will eventually be used,

inter alia, for training purposes and for water balance modelling of selected shared aquifers in the riparian states. The project has received support through the PUI funding mechanism from Australia, Japan, the Republic of Korea, Sweden and the USA.

The Agency joined international efforts to fight the outbreak of EVD in West Africa by providing specialized diagnostic equipment to help Sierra Leone in its efforts to combat the outbreak. The IAEA assistance supplements Sierra Leone's ability to diagnose EVD quickly, using a diagnostic technology known as reverse transcription-polymerase chain reaction (RT-PCR). The IAEA and the Food and Agriculture Organization of the United Nations have been at the forefront of developing RT-PCR, a nuclear-derived technology which allows EVD to be detected accurately within a few hours. Early diagnosis of EVD, if combined with appropriate medical care, increases the victims' chance of survival and helps curtail the spread of the disease by making it possible to isolate and treat patients earlier.

The assistance to Sierra Leone initiates broader IAEA support to African Member States to strengthen their technological abilities to detect zoonotic diseases – diseases that can be transmitted from animals to humans. Activities to enhance capacity for the



Experts in Sierra Leone working with the equipment provided by the Agency.

diagnosis of EVD under high bio-safety conditions have been initiated with PUI funding under an ongoing project, and a new off-cycle TC project was approved by the Board of Governors in March 2015. The latter project, RAF/5/073 ‘Strengthening Africa’s Regional Capacity for Diagnosis of Emerging or Re-emerging Zoonotic Diseases, including EVD, and Establishing Early Warning Systems,’ aims to strengthen national and regional capacities for monitoring wildlife and livestock for EVD and other dangerous viral haemorrhagic diseases such as Marburg virus disease and Crimean-Congo haemorrhagic fever, allowing a better anticipation of risks of outbreaks in the human populations. The project supports also the establishment of early warning systems and regional networks, in order to allow the implementation of appropriate preventive and control measures as early as possible.

A lack of skilled staff and well trained human resources is still a common constraint in African Member States, and the sustainability of training and education in nuclear science and technology needs to be strengthened in the region. Assistance is being provided to Member States through different national and regional projects to promote the sustainability of national nuclear institutions (NNIs) and to develop human resources in the continent.

Through a new TC regional project RAF/0/042, ‘Promoting the Sustainability and Networking of National Nuclear Institutions for Development’, participating Member States have received support from the Agency to develop and implement national strategies and business plans for the production of quality goods, the provision of services to the public and private sectors, and the generation of income. This will ensure the sustainability and relevance of nuclear research and development institutions in the Africa region.

Regional cooperation

The African Regional Co-operative Agreement for Research, and Development and Training Related to Nuclear Science and Technology (AFRA) continues to be the principal framework for promoting TCDC in

Africa and for enhancing regional cooperation among its 36 States Parties.

Within the framework of the formulation of the 2016–2017 TC programme, the proposed AFRA regional project designs have been aligned with the major themes of the AFRA Regional Strategic Cooperative Framework (RCF), and with the Common African Position on the post-2015 Development Agenda (CAP) endorsed by the Assembly of the African Union. This was discussed during an AFRA meeting held in Vienna, November 2014, which included a session titled ‘Aligning the AFRA-RCF with the CAP’s Development Agenda for Enhanced Relevance and Integration’. This contributed to align AFRA’s regional priority needs with those of the CAP and to enhance its processes for programme delivery, including new measures to enhance performance and accountability. The new AFRA Programme continues to place a high priority on enhancing human resource development and on strengthening existing infrastructure in the region.

To support AFRA’s efforts in partnership building and resource mobilization, the Agency facilitated a series of meetings in 2014 between the AFRA Chair, the African Group, and the Permanent Missions in Vienna. The aim was to share information on AFRA’s policy, programme, success stories and achievements. In 2014, the total contribution of AFRA State Parties to the AFRA Fund was approximately one million US dollars. This is a significant increase compared to previous years. These contributions have been allotted to AFRA projects to support the implementation of unfunded activities. The AFRA Fund was also used to partly support Agency activities to combat Ebola.

In May 2014, the 25th AFRA Technical Working Group Meeting (TWGM) took place in Maseru, Lesotho in conjunction with the annual meeting of NLOs. During the meeting, AFRA celebrated its 25th anniversary, marking the occasion with a public exhibition and a scientific forum on human health, and food and agriculture.

The 25th Meeting of AFRA Representatives took place in September 2014 on the margins of the 58th

Annual Session of the IAEA General Conference. The meeting brought together representatives of AFRA State Parties, including Ambassadors, Ministers and other senior officials. This meeting adopted the AFRA Annual Report for 2013 and endorsed several recommendations emanating from the 25th TWGM on policy and programme-related matters. An exhibition and a panel discussion on the contribution of AFRA to the achievement of the United Nations Millennium Development Goals were organized to further celebrate AFRA's 25th anniversary.

Preparations for the 2016–2017 TC programme cycle²⁶

Member States have submitted 35 regional and 266 national concepts in preparation for the 2016–2017 TC programme cycle. Of those, 25 and 200 respectively have been recommended for design. Emphasis is being placed on proposals related to food and agriculture, cancer control and radiation safety. Two training events on the LFA – one in English, one in French – were provided by the Secretariat, to improve the quality of project designs.



Logical Framework Matrix training: Project Designated Team Members and counterparts working on the designs at a practical session. (Credit IAEA).

Table 10: Voluntary contributions to the AFRA Fund, 2014 (in euros)²⁷

Botswana	8355	Mauritius	7051
Burkina Faso	1287	Morocco	102 481
Cameroon	5725	Namibia	9388
Chad	3989	Niger	2541
Cote d'Ivoire	9915	Nigeria	50 000
Democratic Republic of the Congo	1954	Seychelles	4143
Egypt	124 646	South Africa	435 719
Ghana	5096	Sudan	26 038
Lesotho	1430	Zambia	549
Madagascar	3151	Zimbabwe	13 579

²⁶ This section (and in C.2, C.3 and C.4) responds to section 3, operative paragraph 1 of resolution GC(58)/RES/12 on strengthening TC activities, including the provision of sufficient resources, based on Member States' needs and priorities, and ensuring that the components of TC projects are readily available; to section 3, operative paragraph 3 on optimizing the quality, the number and the impact of TC projects; to section 3, operative paragraph 4 on providing Member States with information on project development according to the LFA; to section 3, operative paragraph 5 on submission and guidance of reporting; to section 3, paragraph 6 on the two-step mechanism in monitoring the quality of TC projects; and to section 3, operative paragraph 7 on enhancing adherence with the central criterion and all the TC requirements.

²⁷ These contributions have been allotted to TC regional projects (AFRA), and to RAF/0/042 in support of the Agency's efforts to fight the Ebola virus disease.

C.2. Asia and the Pacific

Emcumbrances and actuals:

€16.5 million

TCF Implementation rate:

75.5%

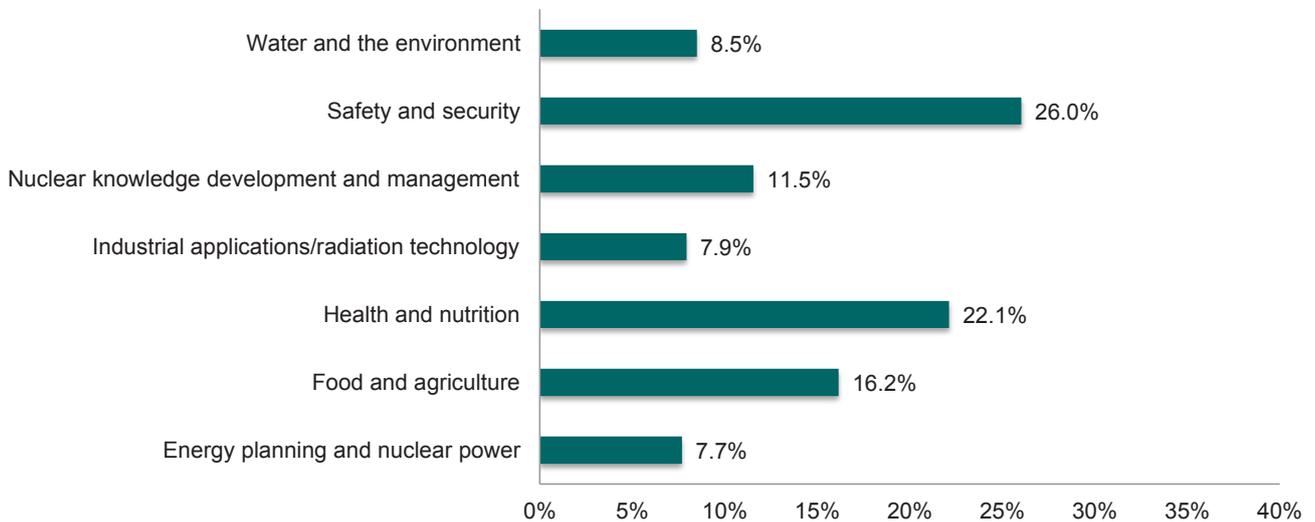


Figure 9: Actuals in the Asia and the Pacific region in 2014 by technical field.

Regional highlights in Asia and the Pacific, 2014

In 2014, the Agency supported 33 countries and territories in the Asia and the Pacific region. Safety and security, health and nutrition, and food and agriculture accounted for the highest proportion of actuals (Fig. 9). The programme achieved an implementation rate

of 75.5% in the region in 2014, reflecting a number of challenges including late payment of NPCs and deteriorating security situations in a number of Member States.

In May 2014, the Lao People's Democratic Republic signed its first CPF. Its national TC programme, currently being developed for the 2016–2017 TC

cycle, will be based on this document, ensuring strong government commitment and promoting sustainability. By the end of 2014, 24 Member States of the Asia and the Pacific region had a valid CPF.

At the international level, the Agency strongly promotes increased coordination between Member States and other UN organizations. In 2014, the Agency participated in the development of the Strategic Partnership Framework of Malaysia and the UNPDF of Indonesia.

Regional cooperation

In 2014, Cambodia and Fiji became parties to the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific (RCA), bringing the number of States Parties to 16. The RCA programme comprised 25 active projects. These included: five projects on food and agriculture; eleven projects on human health; four projects on industry; four projects on water and the environment, including the Fukushima marine benchmark studies project (RAS/7/021) and one project on RCA management. All projects are being well implemented according to their work plans. Furthermore, Lead Country Coordinators have worked closely with the RCA Programme Advisory Committee and the Secretariat throughout the project design phase to guarantee that project designs submitted for the 2016–2017 TC cycle are aligned with the RCA Strategic Priorities for 2012–

CPFs signed in Asia and the Pacific in 2014

Lao People's Democratic Republic

2017, and with TC quality criteria and the guidelines for the preparation of the new TC programme.

During the 43rd RCA General Conference Meeting, held on the margins of the 58th IAEA General Conference, working groups on the RCA's Medium Term Strategy for 2018–2023, the Future Role of the RCA Regional Office (RCARO), and the possible Amendment of the RCA Agreement, presented their progress. Agreements were reached on follow-up actions to continue the enhancement of RCA management and implementation.

The Co-operative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology (ARASIA) has been extended for six years until 2020 and the Guidelines and Operating Rules for the ARASIA programme have been revised and adopted.

Preparations for the 2016–2017 TC programme cycle

Member States have submitted a total of 195 national project designs for the coming TC cycle which are being reviewed by IAEA staff before they will be submitted for approval to the Board of Governors in November 2015. Preparations for 86 regional non-agreement and agreement (RCA and ARASIA) project designs, as well as for two interregional project designs, are underway.



43rd RCA General Conference Meeting held in Vienna, Austria, 19 September 2014.



RCA Project Design Meeting for the 2016–2017 TC programme, 24–28 November 2014.

C.3. Europe

Emcumbrances and actuals:

€10.4 million

TCF Implementation rate:

77.1%

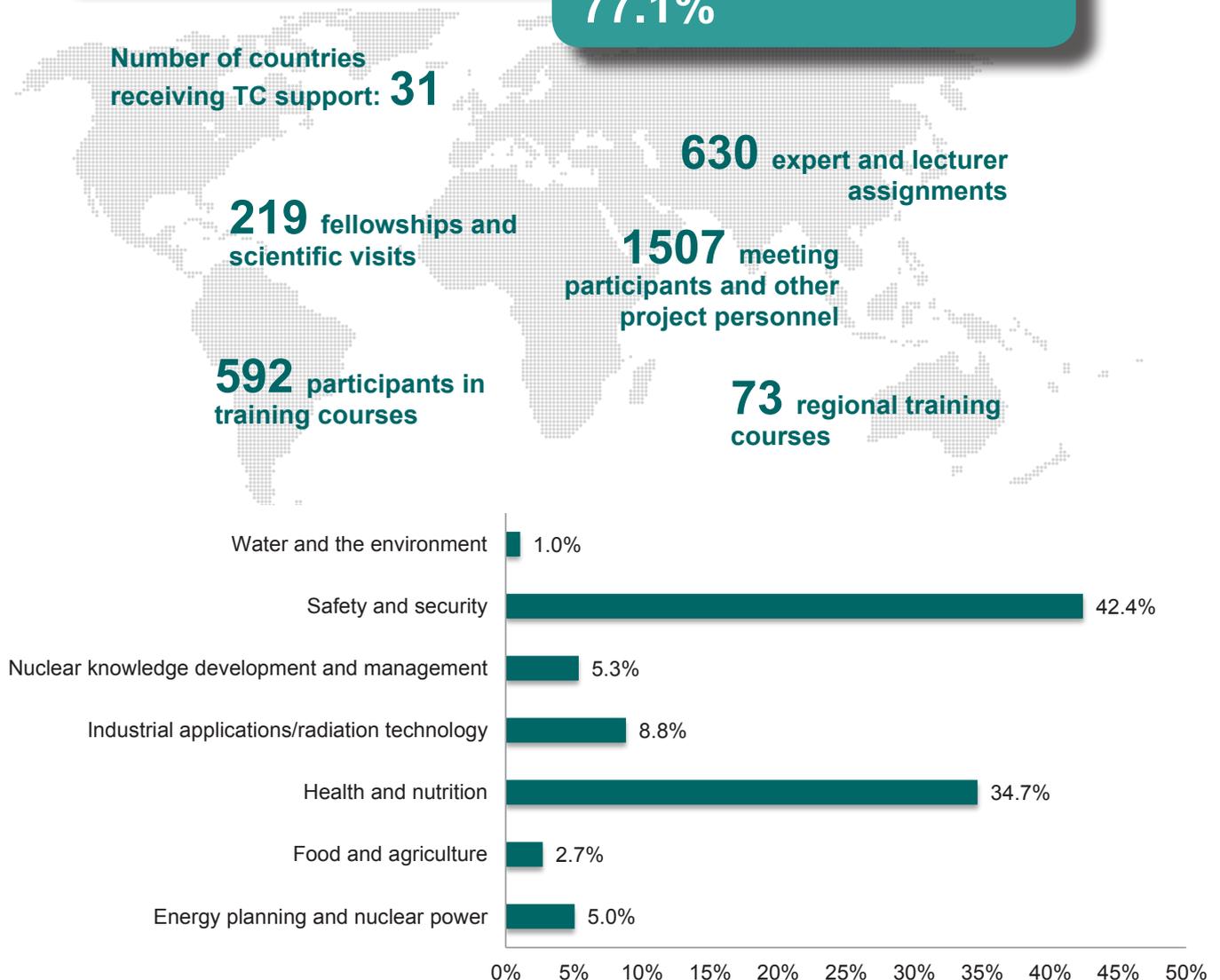


Figure 10: Actuals in the Europe region in 2014 by technical field.

Regional highlights in Europe, 2014

In 2014, the Agency supported 31 Member States in the Europe region through its TC programme. Safety and security and health and nutrition accounted for the highest proportion of actuals (Fig. 10). A major area of emphasis for the TC programme in the Europe region in 2014 was the maintenance of appropriate levels of

safety and security in all aspects of the peaceful use of nuclear technology. The programme focused on four priorities: nuclear and radiation safety; nuclear energy; human health; and isotope and radiation technology applications.

A total of 142 projects were active in 2014, including 82 new projects. The programme in the region achieved an implementation rate of 77.1% in 2014.

Three new CPFs for Croatia, Montenegro and Slovakia were signed in 2014, and by the end of the year, 20 Member States of the Europe region had valid CPFs. CPFs for Azerbaijan, Bosnia and Herzegovina, Georgia and Tajikistan were prepared for signature in early 2015.

CPFs signed in Europe in 2014	
Croatia	Slovakia
Montenegro	

The United Nations Partnership Framework (UNPF) Strategic Prioritization Retreat took place in Tbilisi, Georgia, in October 2014. The UNPF is the name which has been decided for the new 2016–2020 UNDAF, and it is expected to be finalized early 2015.

The IAEA has participated in the UNDAF 2016–2020 development process in Belarus, and the IAEA contribution is reflected in the document. The signature of the new UNDAF document is expected in early 2015.

A UNDAF Strategic Planning Retreat for 2016–2020 was held in Skopje, The former Yugoslav Republic of Macedonia, in December 2014. The new UNDAF for The former Yugoslav Republic of Macedonia (Partnership for Sustainable Development: UN Strategy for 2016–2020) is expected to be finalized during the third quarter of 2015.

For countries developing nuclear power programmes, joint activities continued on making adjustments to current activities and on moving forward to prepare or update integrated work plans (IWPs) for Belarus, Kazakhstan, Poland and Turkey. These IWPs will serve as the basis for new TC projects in 2016 and beyond.

Regional cooperation

The Europe regional programme provides an excellent forum for Member States at all levels of economic development to collaborate and share knowledge and experiences, and to promote best practices, for example in the area of safety and nuclear power, and technology advancements and innovations.

There were no significant changes in regional priorities in 2014. Updates to the Europe Regional Profile for

2014–2017 were agreed with Member States, and the document is being used to develop the 2016–2017 programme for the region.

A key component of the regional programme is to assist Member States in strengthening their regulatory infrastructure for safety. Activities in this area were implemented in 2014 through, inter alia, a two-week School for Drafting Regulations, and a PGEC on Radiation Protection and Safety of Radioactive Sources.

The cooperation with ESTRO continued in 2014. This allowed the Agency to provide five training courses for over 130 radiation medicine professionals through projects RER/6/029, ‘Improving Radiotherapy Services through Strengthened Knowledge of Radiation Oncologists and Radiation Therapists’, and RER/6/031, ‘Strengthening Medical Physics in Radiation Medicine’. The training was made available to participants in both English and Russian to ensure comprehensive coverage of the needs of Member States in the region.

The Annual Agreement has also been concluded with the EANM. Under project RER/6/026, ‘Strengthening Single Photon Emission Computed Tomography/Computed Tomography (SPECT/CT) and Positron Emission Tomography (PET)/CT Hybrid Imaging Applications for Chronic Disease Diagnosis’, the IAEA provided support for around 40 nuclear medicine practitioners from Member States in the region to participate in six selected EANM training courses.

Preparations for the 2016–2017 TC programme cycle

For the 2016–2017 TC programme in Europe, 131 national and 51 regional project concepts were received. After a thorough assessment based on the priorities outlined in CPFs and in the Europe Regional Profile, as well as TC quality criteria, 91 national project concepts and 31 regional project concepts were proposed for further development and consideration. The final programme to be proposed for approval will aim to maximize complementarities between national and regional projects.

C.4. Latin America and the Caribbean

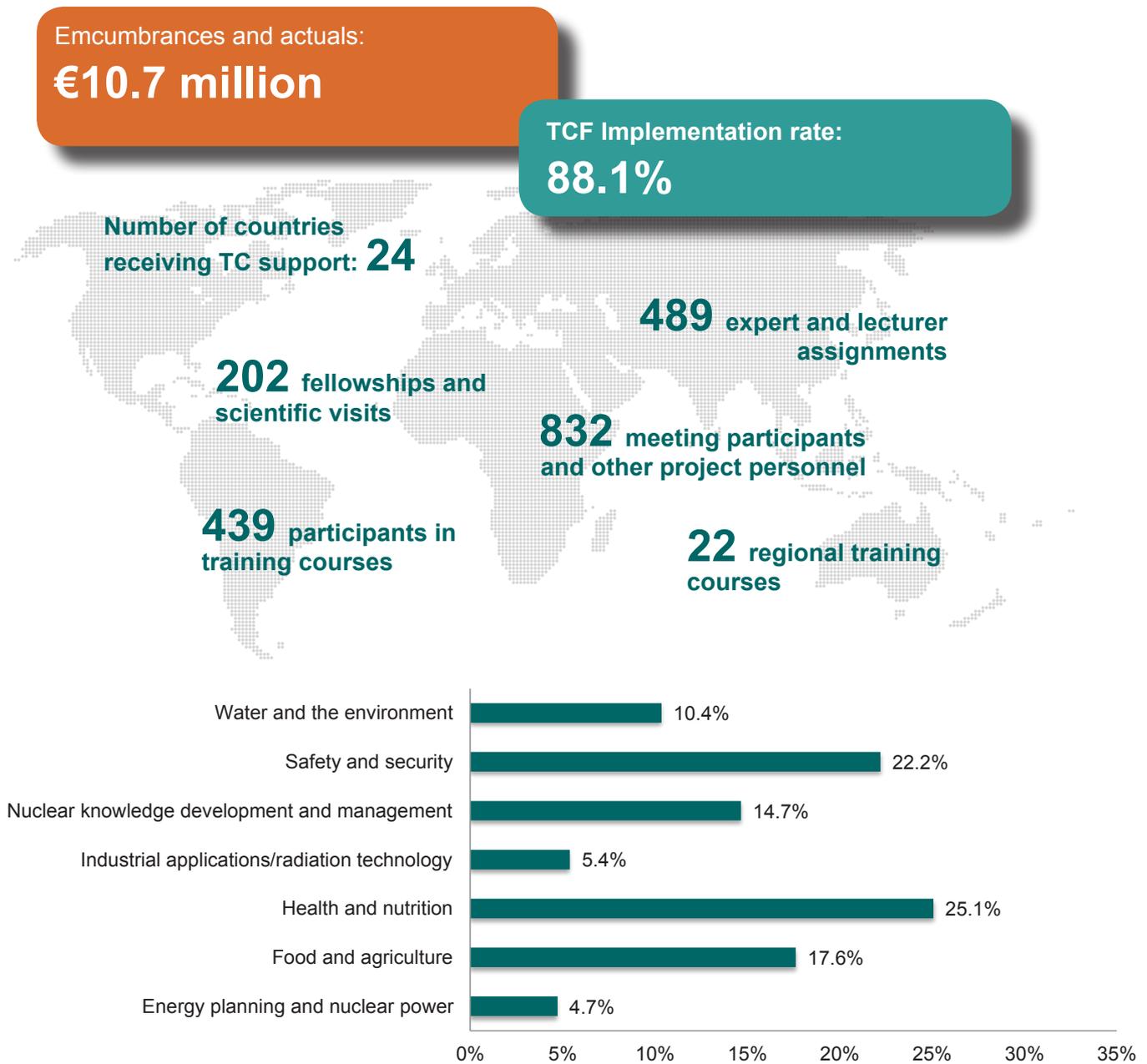


Figure 11: Actuals in the Latin America region in 2014 by technical field.

Regional highlights in Latin America and the Caribbean, 2014

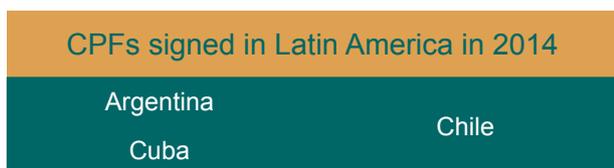
In 2014, the Agency supported 24 Member States in Latin America and the Caribbean, of which one is a least developed country, through its TC programme. Health and nutrition, safety and security and food and agriculture accounted for the highest proportion

of actuals (Fig. 11). Particular attention was paid to supporting the use of stable isotope techniques for body composition, building competencies in food irradiation technology, and enhancing understanding of the processes that influence groundwater management and affect the marine environment. The programme also focused on improving medical responses to

radiological emergencies, and notable advances were made in standardizing bio-dosimetry methodologies, and in implementing national occupational dose registries in Member States.

The programme achieved an implementation rate of 88.1% in 2014, a positive increase compared to the 81% implementation rate at the end of the first year of the previous TC cycle. This is a result of applying quality standards and ensuring strong tracking and monitoring of the implementation of the projects carefully designed for the 2014–2015 TC cycle.

Currently, 14 Member States of the Latin America and Caribbean region have valid CPFs – three of these were signed in 2014 by Argentina, Cuba and Chile. Colombia and Uruguay have also finalized the first drafts of their respective CPFs, which will be signed in 2015.



The Agency is interacting with UNCTs to ensure that the resident UN agencies are well informed of the nature and scope of the IAEA’s TC programme. In 2014, the Agency followed the implementation of the UNDAFs signed by the IAEA in Belize, Cuba, Dominican Republic, Jamaica, Mexico, Nicaragua, Panama and the Plurinational State of Bolivia. The IAEA is also working with the UNCTs of Argentina, Brazil, Colombia, El Salvador, Guatemala, Panama, Paraguay, Uruguay and Bolivarian Republic of Venezuela where UNDAF rollout was in 2014 or earlier, in order to include the Agency’s input in the corresponding updated process. Cooperation with the UNCTs of the new Member States of the region – Bahamas, Dominica and Trinidad & Tobago – is also underway so that CPFs take into account available UNDAFs. National consultative processes with all the sectors using nuclear applications and regulatory infrastructures have begun.

In 2014, training was provided for NLOs and the Co-operation Agreement for the Promotion of Nuclear

Science and Technology in Latin America (ARCAL) National Coordinators newly designated by their Governments. The training focused on providing knowledge and tools to apply the TC programme’s results based management approach, as well as on the Agency policies and rules related to the project planning, implementation, monitoring and evaluation process.

Relationships with partners improved steadily in 2014 in terms of quality and relevance, bringing financial benefits to the programme. Efforts to intensify engagement with European Union (EU) institutions continued. Cooperation between the EU and the IAEA in Latin America and the Caribbean is well established in the fields of nuclear and radiation safety, spent fuel and radioactive waste management, emergency preparedness and response (EPR), and nuclear security. The collaboration with the PAHO, the USNRC, the US Department of State and the Spanish CSN to support regional projects to strengthen national regulatory infrastructures across the region is considered highly important, and of significant added value.

In addition, new partners were involved in support of sustainable development in the region. For instance, cooperation with the TAMU National Centre for Electron Beam Research was successfully integrated in regional cooperation, specifically in the field of food irradiation, in 2014.

Regional cooperation

ARCAL continued to be an important mechanism for technical cooperation among its 21 States Parties (out of 25 Member States in the region) and for enhancing regional cooperation. The Agreement celebrated its 30th anniversary in 2014. A celebratory event, including a panel discussion, was organized in the margins of the 58th IAEA General Conference in September 2014. The event served as an opportunity to present the new Regional Strategic Profile (RSP) for 2016–2021, which will be a key reference document to pave the way to strengthened regional cooperation. The final assessment of the 2007–2013 RSP was completed in 2014 and the new document was endorsed by the ARCAL States Parties in May 2014. The new Profile

defines and prioritizes areas of regional cooperation in the peaceful application of nuclear science and technology such as food security and agriculture, human health, environment, energy, radiation technology and radiation safety.

In 2014, ARCAL conducted strategic communication and outreach activities to disseminate the activities and achievements of regional projects, specifically those implemented with key partners. This has increased the visibility of the TC programme in support of counterpart institutes and Member States in the region. Lessons learned from these experiences will be incorporated into project designs for the next cycle and

counterparts in 2014 in order to help Member States to design high quality, results based projects.

The first project design training event was held in Montevideo, Uruguay, from 29 September to 3 October 2014. This workshop provided training to more than 30 potential counterparts of national projects from 17 countries from across the region. To facilitate the learning process, two or three project proposals were selected per thematic area for applying the LFA.

The second training session, a national workshop, took place in October in Rio de Janeiro, Brazil. For the first time, the Division for Latin America and the Division for Africa joined forces and organized



XV Meeting of the Board of Representatives of ARCAL in September 2014 (Credit IAEA).

used to raise awareness among national authorities and potential partners of the benefits of nuclear technology for development.

Eight regional projects proposed by ARCAL were initiated in 2014, half of them approved for a four-year period, allowing larger scope for impact. Within this cycle, efforts have continued to improve the quality and effectiveness of the ARCAL programme, with the adoption of communication and partnership strategies.

Preparations for the 2016–2017 TC programme cycle

The formulation of each TC cycle is of paramount importance if it is to be successfully implemented. Five separate project design workshops were organized for

training exclusively for Portuguese-speaking countries, benefiting the Member States of both regions. Fifteen national counterparts from Latin America and four counterparts from Africa participated.

A further project design review meeting was held in Vienna in October, focused on reviewing and enhancing regional project design proposals submitted by ARCAL and Member States from the region. Forty participants worked in six thematic groups in order to enhance the project proposals derived from the regional priorities identified in the 2016–2021 Regional Strategic Profile for Latin America and the Caribbean.

English speaking Member States from the Caribbean received design support through a workshop organized in Vienna in November. This workshop was of special

importance as it provided an opportunity for new Member States to work on their designs side-by-side with the IAEA project team. Participants also had the opportunity to visit some relevant IAEA facilities and laboratories.

In December, a workshop to develop a model design for cradle-to-grave projects was held in Vienna. This event attracted eleven participants from ten Member States from the Africa, Asia and the Pacific, Europe and Latin America regions. The model design was subsequently used to prepare two project proposals: one for the Greater Caribbean region for countries that are new to the TC programme or have basic cradle-to-grave needs; and another one for building on the achievements of the current project INT/9/176, ‘Strengthening Cradle-to-Grave Control of Radioactive Sources in the Mediterranean Region’, which will be open to all IAEA Member States, for introducing advanced methods and techniques for cradle-to-grave control of radioactive sources.

Eleven regional projects proposed by ARCAL were selected for design for the 2016–2017 TC cycle. These projects will strengthen cooperation between the IAEA and relevant ARCAL country institutions in the critical areas identified as regional priorities in the 2016–2021 RSP. Emphasis has been placed on designing high quality projects, in line with the TC Quality Criteria, and the Guidelines for the preparation of the new TC programme, and in ensuring a truly collaborative process, with the full involvement of all stakeholders as well as experts from the region in the different thematic areas.



Design meeting, Vienna, Austria 13-17 October, 2014. (Credit: IAEA).

C.5. Interregional projects

Interregional projects deliver TC support across national and regional boundaries and address the common needs of several Member States in different regions. They are categorized as transregional, global, capacity building or joint activities. In 2014, encumbrances and actuals under interregional projects totaled €2.8 million. As of March 2015, 17 interregional projects are active, with a further five in closure.

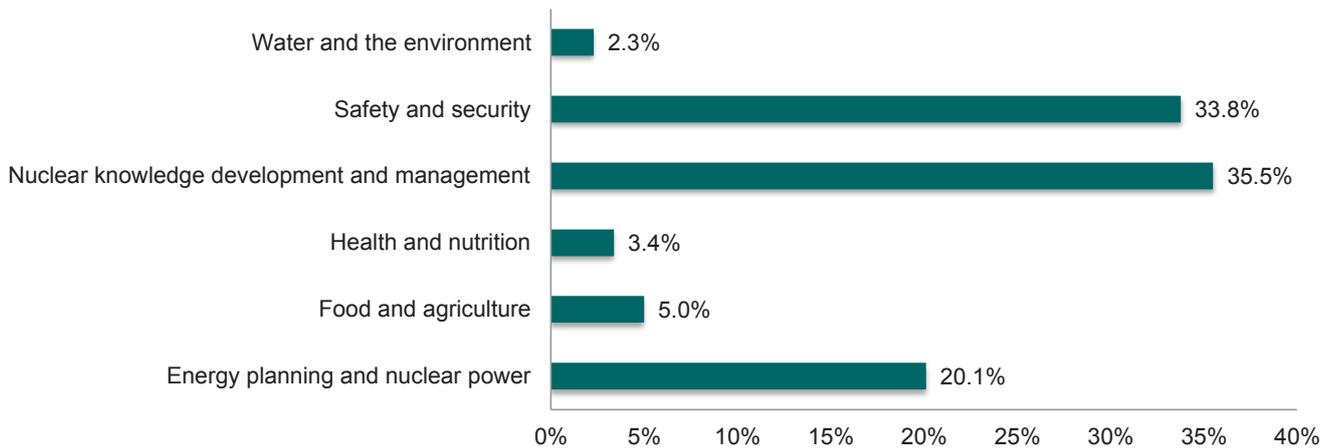


Figure 12: Interregional actuals in 2014 by technical field.

The interregional project for nuclear newcomer states INT/2/013, ‘Supporting Nuclear Power Infrastructure Capacity Building in Member States Introducing and Expanding Nuclear Power’, enhances and harmonizes human resources capabilities for the introduction of nuclear power. The project started in 2014 in cooperation with several partners, including Argonne National Laboratory, and has supported a number of interregional training courses in Finland, the Republic of Korea, Japan, the USA and other countries. It gives countries starting nuclear power programmes an opportunity to share their experiences at the same level of infrastructure development. The course focuses on management and leadership, and a centrepiece of the programme in 2014 was the cooperation with Massachusetts Institute of Technology (MIT) International Nuclear Energy Leadership Programme (INLEP) for executives in developing countries to share experiences with executives from operating countries and develop an understanding of the importance of leading for nuclear safety.

Under interregional project INT/9/174, ‘Connecting Networks for Enhanced Communication and Training’, a web based platform CONNECT was launched on 28 October 2014. The platform is hosted by the Secretariat, and provides a way to connect existing and planned IAEA networks, and to encourage increased participation by the network members. The CONNECT project is the result of successful cooperation between the Agency, its Member States, and the EC. The EC has focused on developing e-learning content materials and enhancing CONNECT, while the IAEA’s TC programme, in close collaboration with the IAEA’s Waste Technology Section, has worked on building Member State capacity in the nuclear field through workshops and the development of structure and content.

CONNECT aims to promote the prompt exchange of ‘good practices’ in spent fuel and radioactive waste management by encouraging the direct sharing of approaches and experience between practitioners. It is

anticipated that this will eventually lead to the transfer of network system support responsibilities to Member States, allowing the network to be self-sustaining by the end of the project. Another INT/9/174 objective is to improve the effectiveness of IAEA spent fuel and radioactive waste management expert missions, workshops and training courses, by facilitating access to high quality training support materials. It will also allow course participants to be better prepared before they undergo face-to-face training.

The Agency strengthens Member State capabilities in the field of uranium exploration, resource augmentation and production through the interregional project INT/2/015 ‘Supporting Uranium Exploration, Resource Augmentation and Production Using Advanced Techniques’. In 2014, industry experts discussed the concept of ‘social licence to operate’ and how it is understood by different stakeholders during a workshop on social licensing and stakeholder communications in uranium exploration and mining. Experts shared good practices and reviewed case studies of what had worked well, and what had not, in the social licensing process. The workshop experimented with how social media could foster transparency and participation: presentations, discussions and photos were posted on a dedicated Facebook page throughout the meeting, attracting a growing number of followers from around the world.

The IAEA continued to support International Centre for Synchrotron Light for Experimental Science and Applications in the Middle East (SESAME), which is now successfully operating its 800 MeV booster, through INT/0/086, ‘Building Human Capacity for the Construction, Operation and Use of SESAME’. The project, which supports human capacity development for the installation, commissioning, safe operation and utilization of the SESAME facility as an international centre of excellence for research and applications

in the Middle East, has provided expertise for the construction and installation of the booster, and the planning and implementation of the beamline and magnets. SESAME’s scientific results continue to be disseminated through international fora, and its outreach includes support to the potential user community. Capacity building continues through fellowships to European Organization for Nuclear Research (CERN) (Switzerland), ELETTRA (Italy), ALBA (Spain), Synchrotron SOLEIL (France), Brookhaven National Laboratory (USA), and Daresbury Laboratory (UK).

The ongoing project INT/9/176, ‘Strengthening Cradle-to-Grave Control of Radioactive Sources in the Mediterranean Region’, garnered a high degree of visibility over the course of 2014, and was presented at the 55th Annual Meeting of the Institute of Nuclear Material Management in Atlanta, Georgia, USA. The project has been described earlier in section A.1.

Table 11: Active interregional projects

Project number	Project title	First year of approval
INT/0/086	Building Human Capacity for the Construction, Operation and Use of SESAME	2012
INT/0/087	Supporting Human Capacity Building in Developing Member States (Phase II)	2012
INT/0/089	Developing Human Resources and Supporting Nuclear Technology	2014
INT/0/090	Overall Action Monitoring and Reporting – EC-IAEA Contribution Agreement 2013/313-757.	2013
INT/1/056	Supporting Non-Highly Enriched Uranium (HEU) Molybdenum-99 Production Capacity for Nuclear Medicine Applications)	2012
INT/2/013	Supporting nuclear power infrastructure capacity building in Member States introducing and expanding nuclear power	2012
INT/2/014	Supporting Member States to Evaluate Nuclear Reactor Technology for Near-Term Deployment	2012
INT/5/150	Responding to the Transboundary Threat of Wheat Black Stem Rust (Ug99)	2009
INT/5/151	Sharing Knowledge on the Use of the Sterile Insect and Related Techniques for Integrated Area-Wide Management of Insect Pests	2012
INT/5/153	Assessing the Impact of Climate Change and its Effects on Soil and Water Resources on Polar and Mountainous Regions	2014
INT/6/054	Strengthening Medical Physics in Radiation Medicine	2009
INT/6/056	Supporting Quality Management Audits in Nuclear Medicine Practices (QUANUM)	2012
INT/6/057	Establishing a Joint IAEA/ICTP International Post-Graduate Medical Physics Education Programme	2014
INT/7/018	Supporting Capacity Building in Marine Environmental Protection	2009
INT/9/174	Connecting Networks for Enhanced Communication and Training	2012
INT/9/175	Promoting safe and efficient clean-up of radioactively contaminated facilities and sites	2012
INT/9/176	Strengthening Cradle-to-Grave Control of Radioactive Sources in the Mediterranean Region	2012

C.6. Programme of Action for Cancer Therapy (PACT)

PACT highlights in 2014

In 2014, PACT intensified the promotion of global partnerships in cancer control with a view to enhancing the effectiveness of the radiation medicine services in LMICs by helping integrate them within a comprehensive cancer control approach. PACT's activities in 2014 around advocacy and partnership have increased the Agency's global visibility as a key player in cancer control, while streamlining these activities into the TC project delivery mechanism. This has been demonstrated inter alia by increased partner support and recognition, and the mobilization of extrabudgetary resources of €719 000 for PACT activities.

Key activities in 2014 included contributing to the policy dialogue on the post-2015 development agenda, to ensure that the role of nuclear science and technology in combatting non-communicable diseases and cancer are recognized and appropriately reflected in future development goals. Significant outreach and advocacy efforts were made to position the Agency as a key actor in the global cancer debate and to increase resource mobilization and strategic partnerships opportunities. Cancer-related bankable project documents were prepared for Lesotho and Namibia.

PACT strengthened its relations with two key partners, WHO and IARC – both these global institutions play a critical and complementary role, actively taking part in imPACT review missions and in supporting PACT activities related to comprehensive cancer control in LMICs. Furthermore, multi-stakeholder work plans for comprehensive cancer control projects were initiated with WHO, IARC and other development partners to address national cancer control priorities in selected common Member States.

The integration of PACT into the Agency's TC programme was successfully finalised, resulting inter alia in more closely coordinated cancer control activities at country level through the systematic

imPACT review missions in 2014

Costa Rica	Mozambique
Croatia	Panama
Fiji	Peru
Georgia	Rwanda
Lao People's Democratic Republic	Uzbekistan

reflection of cancer control relevant considerations in new CPFs, UNDAFs and relevant TC projects. The coordination of PACT and cancer-related TC activities at national and regional levels was strengthened.

Departmental working groups were established to facilitate the planning and implementation of TC and PACT cancer-related projects and activities and to define respective roles and responsibilities to ensure programmatic efficiencies and effectiveness. Internal coordination with other Departments has also been strengthened, including through the establishment of a working group composed of PACT, the TC regional Divisions, the Division of Human Health and the Division of Radiation, Transport and Waste Safety to optimize in-house coordination mechanisms in cancer control and enhance internal communication.

Advocacy and partnership

The Agency participated in the side event 'Investing in Our Future' of the US-Africa Leaders' Summit in the USA, and the 8th Stop Cervical, Breast and Prostate Cancer in Africa (SCCA) Conference in Namibia, organized by the forum of African First Ladies Against Breast and Cervical Cancer.

In addition, PACT participated as speakers or panellists in important cancer-related global events including: the World Health Assembly in Switzerland, WHO Regional Committee Meetings for the Eastern Mediterranean, European and Western Pacific Regions; the International Symposium on Partnerships to Fight Cancer organized by the American Association of Physicists in Medicine (AAPM) in the USA; the

Gulf Region Conference on Cancer Burden in Saudi Arabia, the World Oncology Forum in Switzerland; and the World Cancer Leaders' Summit and the World Cancer Congress in Australia, which highlighted the urgent need to prioritize investments in cancer control to counter the rising economic and social impact of cancer.

Strategic partnership discussions were conducted with the ACS, African Development Bank, Australian Nuclear Science and Technology Organisation (ANSTO), Clinton Foundation, Dana-Farber Cancer Institute, East African Development Bank, GAVI Alliance, GlaxoSmithKline, Harvard School of Public Health, International Finance Corporation, Islamic Development Bank, Merck, Open Society Foundation, Organisation for International Economic Relations, United Kingdom's Royal College of Pathologists, University of Texas MDACC and the World Bank.

A major highlight of these efforts was the signing of a Partnership Agreement between the IAEA and PRRR, an initiative of the George W. Bush Institute. PRRR is a leading public-private partnership aimed at catalysing the global community to reduce deaths from breast and

cervical cancer in sub-Saharan Africa. Subsequently, PACT participated in the annual PRRR Steering Committee Meeting hosted by the Bill and Melinda Gates Foundation in the USA.

Preparations for the 2016–2017 TC programme cycle

ImPACT report findings and recommendations were considered during the development of CPFs and also used to systematically inform relevant TC concepts and designs for the 2016–2017 TC programme cycle. In particular, relevant national project concepts were reviewed to ensure that cancer-control recommendations were appropriately reflected and to facilitate future Agency support.

Table 12: Extrabudgetary contributions to PACT, 2014

Donor	Amount (EUR)
France	20 000
Korea, Republic of	15 180
OPEC Fund	247 635
Roche African Research Foundation	431 270
Others	4 675
Total	718 760

List of frequently used abbreviations

AFRA	African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology	LMIC	low and middle income countries
Agency	International Atomic Energy Agency	NPCs	National Participation Costs
APCs	assessed programme costs	NPP	nuclear power plant
ARASIA	Co-operative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology	PUI	Peaceful Uses Initiative
ARCAL	Co-operation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean	RCA	Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology
CPF	Country Programme Framework	SDG	sustainable development goal
EVD	Ebola virus disease	TC	technical cooperation
IAEA	International Atomic Energy Agency	TCF	Technical Cooperation Fund
imPACT	integrated missions of PACT	UNDAF	United Nations Development Assistance Framework



Annex 1. Achievements in 2014: Project Examples by Thematic Sector



Annex 1. Achievements in 2014: Project Examples by Thematic Sector



Health and nutrition

Regional highlights

All African Member States have identified human health as a priority area for development and for cooperation with the IAEA, due both to the challenges of communicable diseases such as malaria and HIV/AIDS, and to the increase in non-communicable diseases such as cancer or diseases associated with inadequate nutrition. A shortage of human resources and technical capabilities in the region hampers national and regional efforts to fight cancer and improve nutrition, and activities related to human health and nutrition were therefore a priority for the TC programme in 2014. The Agency supported counterpart institutions in building human and technical capabilities to detect and treat cancer more efficiently and effectively, and to use nuclear techniques to strengthen national nutrition programmes. By paying due attention to maternal and infant health and nutrition, the TC programme continued to support efforts in the region to achieve the MDGs.

Member States in the Asia and the Pacific region re-emphasized the importance of human health nuclear applications in 2014, in particular those related to the diagnosis and treatment of diseases, as well as the safe

use of ionizing sources and the adoption of quality assurance practices.

In the Europe region, Member State interest in ESTRO courses for radiation oncologists and radiation therapy technologists remained strong. Regional projects RER/6/029 ‘Improving Radiotherapy Services through Strengthened Knowledge of Radiation Oncologists and Radiation Therapists’, and for medical physicists RER/6/031 ‘Strengthening Medical Physics in Radiation Medicine’, as well as other regional activities, contributed to strengthening human capacities in radiation medicine.

Member States in the Latin America region continued to be strongly committed to enhancing their radiation oncology and nuclear medicine capabilities for early diagnosis and for the effective treatment of cancer and cardiovascular diseases. The goal is to achieve results within a framework of quality assurance, through education and training of available human resources and by modernising the clinical infrastructure of the national institutions responsible for health care and services. Resource mobilization was accorded high priority in the region in 2014, and as a result supplementary PUI funding was received for an ARCAL regional project

on human resource capacity building in radiation therapy, with emphasis on the introduction of linear accelerators. Additional funds were also mobilized from the USA for several fellowships.

Radiation oncology in cancer management

In Tunisia, the Government – with Agency support – has established three radiotherapy centres equipped with new generation linear accelerators in Tunis, Sousse and Sfax. In 2014, under the framework of project TUN/6/014 ‘Implementing Stereotactic Radiotherapy’ the Agency delivered a complete stereotactic radiotherapy system for Salah-Azaiez Institute. This has made possible the introduction of non-conformal radiotherapy for treatment of cancers of the brain and lung.

In Algeria, the radiotherapy service of the Central Army Hospital (HCA) has been completely renovated with the installation of a new generation linear accelerator, a 3D treatment planning system (TPS), medical radiophysics equipment and a new 16-slice scanner dedicated to radiotherapy. Under ALG/6/017 ‘Improving Conformal Radiotherapy for the Treatment of Oro-Laryngo Cancer, Phase II’, TC assistance has been provided to the HCA through fellowship training, scientific visits and expert missions. The goal is to enable the counterpart institution to improve the relationship between the dose delivered to target volumes and critical organs through the use of conformal radiotherapy with intensity modulated radiation therapy (IMRT). The introduction of IMRT treatment and, in particular, the development of a quality assurance procedure, has contributed to considerable progress in cancer treatment.

The Agency continued its collaboration with the Government of Ghana to consolidate and expand radiotherapy facilities under GHA/6/017, ‘Establishing a Nuclear Medicine, Medical Imaging and Radiotherapy Centre for Cancer Prevention, Treatment, Research and Development’. There has been a steady increase in the number of patients being treated at the Korle Bu Teaching Hospital, Accra, especially for brachytherapy; the primary beneficiaries being women with cervical cancer. A second facility at the Komfo

Anokye Teaching Hospital in Kumasi began treating patients in early 2004. About 500 patients per annum are receiving treatment, and patient numbers are increasing with each year. Currently new registrations stand at 1500 per year.

In Ethiopia, the Agency provided technical advice – and will provide staff training – as the country expanded its national cancer control services. Ethiopia is strongly committed to these services, and has established a national task force, chaired by the First Lady of Ethiopia, to spearhead the initiative. The Government has also allocated national funding of \$12.05 million. Under ETH/6/015, ‘Expanding Radiotherapy and Nuclear Medicine Services for the Diagnosis, Curative and Palliative Treatment of Cancer Patients and the Efficient Diagnosis and Treatment of Other Diseases’, the Agency assisted Ethiopia in the consolidation of existing radiotherapy and nuclear medicine services at the Tikur Anbessa Specialized Hospital, Addis Ababa, and in the establishment of cancer centres in another five regions of the country namely Gondar, Awassa, Jimma, Mekele and Harar, for the diagnosis and treatment of cancer patients. In particular, the Agency provided technical inputs for the architectural designs of the planned five cancer centres and for the costing of the equipment and personnel training required for the planned expansion.

In collaboration with WHO and IARC, the Agency organized a Regional Training Course on Priority Actions for Cancer Control Planning Based on imPACT Review Experience under TC project RAF/6/046, ‘Supporting Comprehensive Cancer Control’. The course, held in October 2014 in Vienna, brought together 43 participants from 27 African Member States. The training focused on identifying priorities for the development of cancer control components; and on the transfer of knowledge regarding the different tools available for developing national strategies and plans based on the imPACT review.

In Cambodia, the Agency provided support towards the establishment of the first National Cancer Centre through TC project KAM/6/001, ‘Improving Access to Radiotherapy and Establishing a Plan for Nuclear Medicine Services’. While the Government proceeded

with building the new health care facility, the TC programme supported the implementation of a training programme for the centre's professional medical staff. In 2014, two radiation oncologists, one medical physicist and one nuclear medicine physician received training with IAEA assistance, and fellowship arrangements were launched for a radiopharmacist. Altogether the programme for the five professionals envisages 14 person-years of training, leading to academic degrees in their respective areas of expertise.

In Europe, the regional project RER/6/030 'Building Capacity for Medical Physics in Radiation Oncology in the Commonwealth of Independent States', has been providing training opportunities for medical physicists from Russian-speaking countries, enabling them not only to improve skills and knowledge in medical radiotherapy physics, but also to interact with colleagues and to exchange experience on practices and lessons learned. In 2014, a group fellowship for five junior medical physicists was organized, and four regional training courses were held with the participation of over 80 medical physicists, all hosted by the Association of Medical Physics in Russia Federation, at the N.N. Blokhin Russian Cancer Research Center in Moscow.

Bulgaria has established its first medical transplantation centre with the support of BUL/6/010, 'Creating a Medical Centre for the Treatment of Radiation-Exposed People by Bone-Marrow Transplantation'. The centre is now fully operational and can carry out treatment for people accidentally exposed to ionising radiation, and for patients with malignant blood conditions.

Bosnia and Herzegovina has identified the expansion of radiotherapy centres as a national health priority. Several TC projects have helped to establish the infrastructure for radiotherapy physics at the Clinical Centre of Sarajevo University. The year 2014 saw the completion of the project BOH/6/013, 'Strengthening Radiotherapy Physics Units to Meet the Requirements of International Standards', which mainly provided support to regional centres in Tuzla, Banja Luka, Mostar and Zenica to upgrade their radiotherapy physics units by training the staff and providing dosimetry and QC equipment. As a result of the project, the quality of radiotherapy treatment in Bosnia and Herzegovina has

improved, and treatment planning modalities can be performed by the radiotherapy physics units in different centres in line with international standards.

In Romania, project ROM/6/016, 'Upgrading Radiotherapy Practice at the Oncology Institute through the Introduction of New Techniques', has supported the upgrade of radiotherapy facilities through strengthened 3D conformal radiotherapy in the Institute of Oncology in Bucharest. Project activities focused on developing human resources and providing expert missions including a Quality Assurance Team for Radiation Oncology (QUATRO) peer review. The project has permitted the radiotherapy service to move from 2D to complex 3D techniques, using newly installed equipment. In addition, a necessary foundation for implementing a national quality assurance audit programme for treatment planning systems has been established, based on IAEA Technical Report Series 430, *Commissioning and Quality Assurance of Computerized Planning Systems for Radiation Treatment of Cancer*. As well as the Institute of Oncology, all the radiotherapy centres participating in the project have improved their radiotherapy treatment capacities.

Significant efforts were made to improve the quality of radiation therapy by strengthening the knowhow of medical professionals within the framework of ARCAL regional project RLA/6/072, 'Supporting Capacity Building of Human Resources for a Comprehensive Approach to Radiation Therapy'. Thirty-one physicians and medical physicists were trained in 3D conformal radiotherapy. In addition, 33 radiation oncology radiographers received a refresher course focusing on the technical aspects of 3D radiotherapy, ensuring the best possible quality in patient treatment. Ten medical physicists and engineers received training in acceptance testing, commissioning and maintenance of radiotherapy equipment, including linear accelerators, brachytherapy, treatment planning, simulation and dosimetry. This highly specialized training will support the installation, upgrading and expansion of new radiotherapy equipment in the trainees' home countries

The San Felipe General Hospital in Honduras has procured, installed and commissioned a TPS with the



RLA/6/072: Training technicians to use a linear accelerator for cancer treatment (Credit: IAEA).

support of HON/6/003, ‘Strengthening the External Radiotherapy Service at the San Felipe General Hospital’. Medical staff were trained to perform image-based planning, using a three-dimensional TPS, and clinical treatment protocols were revised and updated. In addition, quality assurance procedures for clinical and medical physics, including dosimetry, were established. These achievements have improved capacities at the hospital and are expected to have a positive impact on the quality of radiotherapy delivered. The number of patients that undergo radiotherapy has increased by 35% since the start of the project and the average waiting time to start radiation treatment has been reduced from 40 to 12 days.

In Argentina, efforts continued to strengthen capacities in advanced radiotherapy through ARG/6/015, ‘Developing Human Resource Capabilities in the Area of Advanced Radiotherapy’. Physicists and medical personnel received hands-on training in accelerator physics and technology, and on technical issues related to a proton therapy centre. The project is designed to contribute to efforts to establish a professional team able to carry on and support a centre for advanced radiotherapies in Argentina.

Nuclear medicine and diagnostic imaging

Nuclear medicine, diagnostic imaging and radiotherapy are used to improve cancer diagnosis and treatment. The utilization of image based radiotherapy with evidence-based guidelines improves the survival rate of cancer patients and matches the increasing call for high quality radiotherapy in the coming decades.

The Bab El Oued General Hospital in Algeria received assistance through ALG/6/016 ‘Improving Clinical Nuclear Medicine and Radiotherapy Procedures’, in the form of training, advisory services and procurement to support its increasing use of therapeutic nuclear medicine. The hospital’s Department of Nuclear Medicine has acquired a cyclotron for the production of radioisotopes, and will acquire a single photon emission computed tomography–computed tomography (SPECT-CT) system, which uses both morphologic and functional images to upgrade the sensitivity and specificity of nuclear medicine investigations. Additional training has been provided for the co-registration of anatomic images to improve diagnostic quality in nuclear medicine.

The Agency helped Niger to initiate nuclear medicine services in 1995, with the establishment of in vitro activities, radioimmunology of thyroid hormonal

factors, and tumour factors. The project increased the access of patients to diagnosis and monitoring of different medical conditions. Under NER/6/007 ‘Strengthening Nuclear Medicine Capacities through the Improvement of Quality and Range of Techniques at the Existing Nuclear Medicine Centre’, the IAEA helped Niger to acquire a new gamma camera, which was successfully installed in Niamey in September 2014. It is expected that the diagnostics and clinical applications of the machine will help to reduce the burdens of non-communicable diseases, including cancer, in Niger.

Mauritania inaugurated its first Nuclear Medicine Centre at the National Oncology Centre, Nouakchott on 28 November 2014, just four years after a radiotherapy service was opened at the same centre. The Government allocated funds for the construction works and purchase of equipment through a turn-key approach. Specialized long term training for nuclear medicine physicians, medical physicists, radiopharmacists and nuclear medicine technologists has been provided through IAEA-supported fellowships in Algeria, Egypt, France and Morocco under the national projects MAU/6/003, ‘Establishing a Nuclear Medicine and Radiotherapy Centre within the Framework of a National Cancer Programme (Phase2),’ and MAU/6/004, ‘Developing National Capacity for Nuclear Applications in a Medical and Training Context for Sustainable Improvement of

Human Health’. The IAEA deployed a series of expert missions throughout the construction of the premises and the testing of the equipment in order to ensure that the necessary safety standards for such operations would be met. The ultimate goal of the capacity building programme was to ensure the availability and ability of local staff to safely and effectively operate the equipment installed at the nuclear medicine centre.

With the support of the AFRA project RAF/6/048, ‘Strengthening Medical Physicists’ Capacities to Ensure Safety in Medical Imaging, with an Emphasis on Paediatric Imaging Safety’, the information leaflet *Safe Medical Imaging: Why You Need a Medical Physicist* was published and some 20 000 copies shipped to 39 African countries. This was followed by a regional workshop in Dar es Salaam, United Republic of Tanzania, in November 2014 to raise awareness on the medical physicist roles in ensuring safety in medical imaging, jointly organized by the Government of the United Republic of Tanzania, IAEA and WHO. The event was attended by senior officials of the Ministries of Health from 23 African countries. Both the information leaflet and the workshop had the same objective, namely to raise awareness of the need to recruit medical physicists to serve in nuclear medicine and diagnostic radiology centres in Africa in order to enhance patient safety. The final output of the workshop was a comprehensive set of recommendations, adopted



The opening of Mauritania’s first ever nuclear medicine centre with IAEA support will lead to comprehensive services in diagnosing, treating and managing cancer and other diseases in the country and the surrounding region.

by senior representatives of the Ministries of Health, regarding the professional recognition, involvement, roles and responsibilities, harmonization of education and training of medical physicists in the region.

Several activities were carried out to strengthen regulatory and radiation standards for laboratory services and to establish national QC standards in radiation medicine. The TC programme promoted strong regional cooperation in this area, and sought to further strengthen existing national and regional health centres. Under the regional project RAS/6/077, 'Strengthening the Effectiveness and Extent of Medical Physics Education and Training (RCA)', the IAEA established a repository and remote clinical training programme in the area of radiation therapy, diagnostic radiology and nuclear medicine called the Advanced Medical Physicist Learning Environment (AMPLE). AMPLE will host standards and recommendations for education and clinical training centres in the region. The programme will be piloted in selected countries including, but not limited to, the Philippines and Thailand with the collaboration of relevant regional professional bodies.

The rising demand for nuclear medicine, diagnostic imaging and radiotherapy is reflected in the Asia and the Pacific region by an increasing amount of national TC projects in this field such as Pakistan's PAK/6/022, 'Developing and Implementing an Intensity Modulated Radiotherapy Programme', which will enable a hospital in Abbottabad to upgrade its facilities from 2D to 3D conformal radiotherapy, thus supporting its endeavours to increase the standard of care provided to cancer patients in the country. In Afghanistan, under AFG/6/016, 'Establishing Radiotherapy and Radiology Services in Aliabad Hospital', activities to build capacity to prepare counterparts for the eventual establishment of the first radiotherapy centre in the country are underway. In Yemen, an advanced dual head gamma camera has been provided along with the needed laboratory accessories, as well as long term training (Master of Science) in nuclear medicine physics through project YEM/6/009, 'Strengthening the Existing Nuclear Medicine Centre at Al-Thawra Hospital in Sana'a'.

Training was provided to Member States in the European region in 2014 on the use of hybrid nuclear medicine technologies to improve the management of patients affected by chronic diseases. This was supported through RER/6/026, 'Strengthening Single Photon Emission Computed Tomography/Computed Tomography (SPECT/CT) and Positron Emission Tomography (PET)/CT Hybrid Imaging Applications for Chronic Disease Diagnosis'.

In Latin America, the ARCAL project RLA/6/063, 'Improving Management of Cardiac Diseases and Cancer Patients by Strengthening Nuclear Medicine Techniques in Latin America and Caribbean Region', contributed to the improved management of patients with cardiac diseases and cancer in the region, strengthening nuclear medicine techniques with training. From 2009–2014, some 463 professionals were trained in nuclear cardiology, positron emission tomography–computed tomography (PET-CT), sentinel lymph node scintigraphy, radio-guided surgery, nuclear oncology, radionuclides therapies and hybrid imaging techniques. Additionally, 87 expert missions were carried out in the participating Member States, which contributed to raise awareness of the clinical applications of nuclear medicine.

Before the implementation of PAR/6/014, 'Strengthening Nuclear Medicine for Diagnosis and Therapy', nuclear medicine services in Paraguay were only available in private centres. With the support of the project, the Health Science Research Institute will become the first public health institution to provide such services in the country. The project has helped to strengthen nuclear medicine clinical applications and has improved the quality of diagnostic services and radiopharmaceutical products provided by the Institute. A gamma camera has been procured and is currently being installed, and personnel have been trained in the areas of radiopharmacy, medical physics, nuclear medicine and radiation medicine, as well as in QC and preventive maintenance of instruments. This project will contribute to make nuclear medicine services accessible to patients with cancer or cardiac diseases who do not have the resources to seek treatment in private hospitals. It will thus help improve patient access and care in the country.

Radioisotopes, radiopharmaceuticals and radiation technology

Important advances were made in 2014 in the ARCAL regional project RLA/6/074, 'Supporting the Development of Regionally Produced Radiopharmaceuticals for Targeted Cancer Therapy'. The project aims to provide a set of rules, procedures and technical information that are ready to be used to initiate clinical studies of radiopharmaceuticals to evaluate their efficacy, quality and safety in targeted cancer therapy. Regional experts worked together in 2014 to issue state of the art protocols for the preparation of radiopharmaceuticals based on monoclonal antibodies and peptides. Workshops were organized in Peru and Brazil to train 28 specialists from 12 countries on the agreed protocols to label biomolecules with yttrium-90, iodine-131 and lutetium-177.

In Cuba, CUB/6/021, 'Designing and Conditioning the Positron Emission Tomography/Computed Tomography (PET/CT) Facilities', has initiated the set-up of the cyclotron facility, and production of fluorine-18 labelled fluorodeoxyglucose (also known as F-18-FDG, which is used in nuclear medicine PET

imaging) will begin in 2017. A PET-CT camera will also be commissioned. Extensive staff training support was provided to the Isotope Centre (CENTIS) and the National Institute of Oncology and Radiobiology for the production and clinical applications of 18FDG using PET-CT. Advice was also provided on the design of the facilities.

Dosimetry and medical physics

The United Arab Emirates received support under project UAE/6/005, 'Establishment of Secondary Standards Dosimetry Laboratory', in its effort to establish its first secondary standards dosimetry laboratory (SSDL) for industrial and medical uses of measurement devices. The project supplied expert advice, provided the calibration system and supported the training of the laboratory staff. With this capability, the United Arab Emirates will be able to carry out the calibration of radiation measuring instruments, measure personal and area dosimetry and determine high dose dosimetry for industrial and medical applications in the country. With the fast progress of the United Arab Emirates' nuclear power programme, the SSDL will be important in providing traceability of measurements



RLA/6/074: Regional training course on radiopharmaceuticals (Credit: Eleazar Aliaga/IPEN, Peru).

of ionizing radiation to recognized standards. Such traceability can add confidence vis-a-vis the protection of workers, the public, patients and the environment.

In Bulgaria, the technical infrastructure of the national calibration laboratory has been upgraded to assure its safe and reliable operation with support from BUL/6/011, ‘Modernising the Secondary Standard Dosimetry Laboratory (SSDL) at the National Centre of Radiobiology and Radiation Protection to Meet the International Requirements for Accreditation’. More accurate dosimetry measurements improve the confidence of workers and public in the safe use of nuclear techniques. The calibrations provided by the SSDL of Bulgaria to end users are traceable to international standards.

Equipment has been supplied to Honduras through RLA/9/071, ‘Establishing Sustainable National Regulatory Infrastructures for the Control of Radiation Sources in Haiti, Belize, Jamaica and Honduras’, to support the establishment of a national dosimetry system for workers exposed to ionizing radiation. The service will be operated by the National Autonomous University of Honduras following the signature of a cooperation agreement with the Secretary for Natural Resources and the Environment, which hosts the regulatory authority for radiation safety.

Nutrition

Nutrition deficiency, particularly in children and women, is an area of great concern in many African countries. Vitamin A deficiency affects 190 million children below the age of six worldwide, and occurs most frequently in Africa and Southeast Asia. The isotope dilution technique is the preferred method for determining vitamin A status and assessing the efficiency and effectiveness of vitamin A intervention programmes aimed at improving vitamin A status. However, infection, inflammation, and intestinal diseases may affect the accuracy of this technique to assess the vitamin A body burden, and additional studies are needed to validate the accuracy of the isotope dilution technique against other techniques that assess vitamin A status. The IAEA is helping African Member States to build capacity to apply the isotope dilution technique locally, thus supporting the long term sustainability of the assessment activities.

Under the regional project RAF/6/047, ‘Using Stable Isotope Techniques to Assess the Vitamin A Status of Children Susceptible to Infection’, assistance has been provided to Botswana, Burkina Faso, Cameroon, Ethiopia, Morocco, Senegal, Sudan, Uganda, United Republic of Tanzania, and Zambia on techniques and methods to determine vitamin A status, and to assess



BUL/6/011: Preparations for calibration in an SSDL.



the efficiency and effectiveness of national public health programmes. On-going efforts by the Agency through this AFRA project will provide key information to stakeholders on how vitamin A intervention programmes affect vitamin A status in children from three to five years of age, and how infections and inflammation affect vitamin A status or the validity of stable isotope techniques.

The WHO recommends exclusive breastfeeding for the first 6 months of an infant's life for optimal growth and cognitive development. In the Asia and the Pacific region, RAS/6/073, 'Using Stable Isotope Techniques to Monitor Situations and Interventions for Promoting Infant and Young Child Nutrition', which started in 2014, aims to improve infant and young child feeding practices up to the age of two, and to contribute to the reduction of non-communicable diseases in later life, by using stable isotope technique, the only technique that can provide reliable information on exclusive breastfeeding. In Latin America, RLA/6/071, 'Evaluating Breast Milk Intake and Body Composition of Infants and Mothers, Measured by Deuterium Dilution, as Indicators of Good Feeding Practices and Nutritional Status', also builds capacity Member

States to assess breastfeeding practices and infant body composition using stable isotope techniques, in support of breastfeeding promotion campaigns. Data has been collected from 254 mother-infant pairs from nine Member States, when the infants were 3 months and 11 months old.

At the other end of the human lifespan, quality of life and capacity for independent living are influenced by muscle mass and function. RLA/6/073, 'Improving the Quality of Life of Older People through Early Diagnosis of Sarcopenia', builds capacity in the use of nuclear applications to set criteria for the diagnosis of sarcopenia (loss of skeletal muscle mass), and for assessing the impact of interventions designed to slow this process. During 2014, the local situation regarding knowledge, prevention, diagnoses and treatment of sarcopenia of each of the 12 participating country was assessed. A regional training course was held in October in Mexico on the use of nuclear techniques for the assessment of body composition and energy expenditure, the assessment of physical performance, evaluation of independence in daily living activities, and screening for depression and cognitive impairment. Data collection is expected to start early in 2015.



Food and agriculture

Regional highlights

The African Union declared 2014 to be the Year of Agriculture and Food Security in Africa, and for many African Member States food and agriculture are high priority development areas. Increasing populations put soil and water resources under stress, and more unpredictable weather associated with climate change adds extra risks to well-known insect pests and plant and animal diseases. The application of nuclear science and technology in food and agriculture, in combination with non-nuclear and traditional techniques, can result in better crops and animal production.

Food and agriculture is also a priority area for Member States in the Asia and the Pacific region. In 2014, cooperation with the International Rice Research Institute (IRRI) continued within the framework of RAS/5/065, 'Supporting Climate-Proofing Rice Production Systems (CRiPS) Based on Nuclear Applications'. Twenty-one fellows from 11 countries in the Asia and the Pacific region took part in group fellowship training, exploring both phenotyping and integrated plant mutation breeding in addition to 'best fit' soil and water management practices.

The agriculture and livestock sectors play a significant role in the economy of several countries in the Europe region, which continues to be threatened by external economic and ecological factors, such as the

introduction of exotic pests. In 2014, the TC programme continued to provide agricultural productivity support to Member States from across the region by facilitating the establishment of early warning systems for fruit pests, and fruit pest eradication.

In the Latin America and Caribbean region, the key priorities – both national and regional – for cooperation with the Agency in the field of agricultural productivity and food security are agricultural water and soil management, enhancing food safety and increasing insect pest control. Regarding agricultural water and soil management, national projects continued to support the evaluation of soil fertility loss by water erosion; helping to quantify the impact of agriculture in greenhouse gas production; supporting palm oil production; improving phosphorus use efficiency and agricultural sustainability; and introducing integrated environmental management systems. In the field of insect pest control, the programme continued to strengthen technical capacities for using the sterile insect technique (SIT) to control the Mediterranean fruit fly, which will benefit the export of fruits and horticulture products. It also supported the biological control of stable flies to reduce the damage and economic impact on livestock farms, as well as developing a progressive control programme for the New World Screwworm, which affects several countries in the region.

In the field of food safety, projects in the Latin America region contributed to the enhancement of capacities for analysing and controlling contaminants and residues

of veterinary medicines and pesticides in foodstuffs of animal origin; strengthening national networks of laboratories involved in chemical risk analysis; and supporting the tracing and confirmation of authenticity of food origins. Activities are ongoing to create an enabling environment for the introduction of electron beam and X ray technologies for food irradiation, in collaboration with key partners and the private sector at both strategic and implementation levels.

Crop production

Rice is the preferred food crop in Zanzibar, in the United Republic of Tanzania, and the Rice Development Strategy of the island's Ministry of Agriculture and Natural Resources aims to increase rice production by developing irrigation systems, training farmers and introducing improved varieties of rice. With the support of project URT/5/029, 'Improving Rice and Barley Production through the Application of Mutation Breeding with Marker Assisted Selection', the TC programme has helped counterparts to use mutation breeding to produce a new variety of rice known as 'SUPABC', which was released in 2011. The seeds were originally irradiated at the IAEA/FAO Plant Breeding and Genetics Laboratory in Seibersdorf, Austria. SUPABC is proving to be a hit with farmers and consumers – it is very high-yielding with a potential yield of seven tonnes per hectare, and it tastes good and has a pleasant aroma.

In Colombia in 2014, TC project COL/5/024, 'Supporting Mutagenesis and Functional Genomics Applied to the Improvement of Rice', focused on hands-on training in the identification and analysis of plant disease resistance, deoxyribonucleic acid (DNA) sequencing for genomics studies, the identification of mutated genes, genome-wide expression profiling by ribonucleic acid (RNA) sequencing, and bioinformatics analysis of data. Together with the provision of equipment, the training will enable the national counterparts to make advances in increasing the genetic variability of rice, to generate seed rice with resistance and tolerance to various biotic and abiotic stress conditions, and to transfer these new mutant traits to other elite varieties in national breeding programmes. It is worth noting that, through the activities in 2014, the foundation has been laid to establish the counterpart



COL/5/024: Experimental field with rice mutant lines (Credit: IAEA/ Stephan Nielen).

institute in Colombia as a service provider for genomics analysis in regional TC projects.

Agricultural water and soil management

The introduction and adaptation of irrigation, especially small scale irrigation, is a key factor in increasing crop production while saving freshwater. It reduces vulnerability to food deficits and contributes to income generation for resource-poor farmers in semi-arid areas. In Africa, project RAF/5/071, 'Enhancing Crop Nutrition and Soil and Water Management and Technology Transfer in Irrigated Systems for Increased Food Production and Income Generation', is exploring a new and innovative way of managing irrigation water through information dissemination using mobile technology. As the use of mobile phones in Africa has increased significantly over the last decade, farmers are using their phones to gain information about everything from markets to weather. The project initiative will allow the delivery of integrated data on weather, soil moisture data and crop types to the mobile phone. This means that real-time information on when and how much irrigation is required by a crop can be obtained by farmers through the click of the button, to improve the productivity of high value crops. Kenya has been selected as the first pilot study for this initiative.

A new soil and plant diagnostic laboratory in Seychelles

– the first of its kind in the country – has been established with the support of TC project SEY/5/006, ‘Implementing Nutrient and Water Management Practices Using Nuclear and Related Techniques to Enhance National Vegetable Production through Sustainable Agricultural Management’. The project has also sponsored long term fellowship training, leading to the production of a Master’s thesis on developing and implementing adaptation measures to reduce the effect of soil salinity in the coastal zones, which is an output of a current project SEY/5/007, ‘Increasing Crop Production through Effective Management of Soil Salinity in the Coastal Area using Nuclear and Related Techniques’. SEY/5/007 is also being supported by the GEF/Small Grants Programme, which is providing extension services to the farming communities, based on IAEA experts’ recommendations, and the ICBA, which is providing technical advice and expert services on saline agriculture.

As a result of this project, the laboratory capacity has been enhanced and it is now capable of analysing 400 soil samples per month compared to the 30 samples it could process before. The laboratory has published several leaflets to raise awareness, resulting in an increasing number of requests for recommendations and soil analytical services from farmers and gardeners.

Following successful completion of the Master’s thesis, and because of its impact on the farming community, the authoring fellow was awarded a PhD scholarship by the University of Aberdeen which will be linked directly to the project. The University will support the characterization and modelling of the soil/crop interaction under a saline environment and will carry out yield comparisons of a number of vegetable crops in saline/sodic environments. It will also help determine the impact of various management practice and mitigation measure on the yield of selected crops.

In Asia, Member States continued to receive support to quantify soil erosion losses and identify the exact source of land degradation on area-wide scale through the regional RCA project RAS/5/055 ‘Improving Soil Fertility, Land Productivity and Land Degradation Mitigation’, which is building capacities for soil and land use studies using isotopic techniques such as fallout radionuclides (FRNs) and compound specific stable isotope (CSSI). A regional data base of CSSI and FRNs was developed for the first time by collating soil, environmental, management and land use data from 13 participating Member States, including Australia, Bangladesh, China, Indonesia, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Sri Lanka, and Viet Nam. This will



RAS/5/055: Degraded area identified by nuclear techniques as a major source of erosion in need of priority attention in a catchment (Australia).



COS/5/029: Laboratory capacity to monitor pesticide residues and contaminants has been improved (Credit: CICA, Costa Rica/Juan Chin).

help farmers to improve crop, soil and agricultural water management, and will provide political decision makers with evidence-based data to enable them to make informed decisions on adaptation and strategies options at both national and regional levels. As an example of country-specific successes, by measuring soil erosion rates and identifying its exact source within a catchment of Loess Plateau and North Eastern China sites using the FRN and CSSI nuclear techniques, China was able to reduce its erosion rates between 16 to 80% depending on conservation measures that included terracing hill slopes, vegetated hill slopes, contour cultivation and no tillage.

Relevant authorities in the Latin American region are receiving new data sets that will allow them to identify hot spots of land degradation for better agricultural planning and strategy through RLA/5/064, ‘Strengthening Soil and Water Conservation Strategies at the Landscape Level by Using Innovative Radio and Stable Isotope and Related Techniques (ARCAL CXL)’. Important results have already been achieved in the first year of the project. For example, three training courses in three countries have already been completed, and a critical pool of around 20 scientists has been formed. This group has been trained in the use of stable isotopes, and in nuclear and related conventional techniques.

The first steps have been taken under the same project to establish regional analytical facilities in Brazil. This will benefit not just the South America region, but the entire Latin American and Caribbean region, enabling it to become independent from centres for analytical service outside the region. Institutional progress has also been made regarding the shipment of soil samples within the region, which essential to ensure successful regional cooperation in soil analysis for improving soil conservation strategies. The project’s success to date has also attracted the attention of donors, which has made it possible to extend the reach of the project with extrabudgetary funds.

Good agricultural practices in the Cartago region of Costa Rica have been strengthened through COS/5/029, ‘Strengthening of Good Agricultural Practices (GAP) for Food Safety and Security and Environmental Protection’, which has improved the capacity of the region’s laboratories to monitor pesticides residues and emerging contaminants in food, soil and water. A local network of farmers, regulators and university researchers has been established to support the implementation of training activities and the transfer of technology to monitor food and environmental contamination, and GAP implementation. The project has generated interest from farmers wishing to adopt new practices. It has contributed to improving soil and water quality in vegetable production.

Livestock production

In Algeria, TC assistance through training, advisory services and the provision of equipment under ALG/5/027, 'Strengthening Animal Health and Livestock Production to Improve Diagnostic and Reproductive Capacities in Animal Breeding and Support Expertise for the Feasibility Study of a Biosafety Laboratory, Level 3', has helped to strengthen the capacities of the National Institute of Veterinary Medicine in several fields. These include monitoring dairy performance (identification, recording and data processing), morphology evaluation and supervision, and support to dairy cattle breeding programmes including the certification of kinship by bovine DNA typing and management of genetic defects on reproduction. As a result of the assistance provided, the National Institute of Veterinary Medicine was accredited by the national accreditation body, Organisme Algérien d'accréditation (ALGERAC). This will contribute to improving diagnostic and reproductive capacities for the establishment of a Level-3 Biosafety Laboratory

Rapid population growth in Cameroon has increased the demand for animal products, which can only be met through good breeding and animal production strategies. Almost 50% of meat and over 90% of milk consumed in the country is from cattle. In 2004, a TC project established an artificial insemination (AI) centre for cattle in Bambui. AI is now carried out regularly around Bamenda, with a positive response and good cooperation from cattle owners. In order to extend AI to other breeding areas in Cameroon, and to neighbouring countries like Central African Republic, Chad and Nigeria, and to allow bull offspring testing, the use of frozen semen will be a prerequisite. With the support of CMR/5/018, 'Improving Productivity of Indigenous Breeds and Animal Health', a microbiology laboratory was installed to allow for the QC of the semen produced. This will enhance milk and meat production substantially. In parallel, control of transboundary animal diseases is vital. The National Veterinary Laboratory (LANAVET) has been furnished with radioimmunoassay, enzyme-linked immunosorbent

assay (ELISA) and molecular diagnostics and genetic screening equipment to be used in both AI and disease control programmes.

Insect pest control

In Angola, sleeping sickness, a parasitic disease spread by tsetse flies, is ravaging the country, threatening a third of the population. The disease is endemic in seven Northern provinces. Sequential aerosol technique (SAT) has been used to control the tsetse fly *Glossina morsitans centralis* in the area of Luina, which is shared with Namibia and Zambia. However the technique is not practicable in mountainous environments. For this reason, the SIT is being studied for its feasibility to control of *G. morsitans centralis* in the central area of Angola, taking into account the strategic plan of action of the Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC), which recommends undertaking tsetse control in isolated areas without any risk of reinvasion. In line with this objective, TC project ANG/5/012, 'Supporting Feasibility Studies for using Sterile Insect Techniques as part of Area-Wide Integrated Pest Management for Control of Tsetse Flies *Glossina morsitans centralis*', has been launched. Odour-baited traps and insecticide-impregnated screens of appropriate attractive colours are being used for initial large-scale tsetse suppression. The project is using a participative approach, involving rural communities in taking care and maintaining the traps, under the control of the administrative and traditional authorities in each area.

In Europe, recent data collected under TC project RER/5/020, 'Supporting Fruit Fly Pest Prevention and Management in the Balkans and the Eastern Mediterranean', indicates that the efficacy of the SIT in the Neretva pilot area was 55% for peaches, 92% for mandarins and 94% for figs when compared to non-SIT areas, in terms of the number of fruit fly larvae per kilogram of fruit. The project has supported the hands-on training of key experts from the 'regional fruit fly network' in taxonomy and identification of fruit fly pest species that are exotic to the Balkans and the Eastern Mediterranean. The project has received significant support from PUI funds and the Croatian Ministry of Agriculture.



RER/5/020: Traps for fruit fly monitoring.

Honduras is implementing SIT with the support of HON/5/006, ‘Using Sterile Insect Technique (SIT) to Obtain Recognition as a Mediterranean Fruit Fly Free Area in the Aguan River Valley’, to ensure that the complete Aguan River Valley is a Mediterranean fruit fly free area. The Medfly trapping network was strengthened through the project with the establishment of five monitoring routes and systems. Five domestic quarantine stations were technically supported, a Sterile Medfly Emergence and Release Centre was built, and weekly releases of sterile flies were carried out for six months; and staff of the National Service for Agricultural Health (SENASA) were trained in medfly eradication, quarantine measures and fruit fly monitoring. It is expected that with the sterile fly release activities carried out in 2014, the process of recognizing the area as free of the Mediterranean fruit fly will soon take place. This recognition will benefit more than 1300 small producers of citrus, tomato, peppers and tropical fruits who live in the area. Several transport companies, fruit processors and exporters will also benefit from the economic impact of the project.

The technical capacity of the authorities in Panama responsible for controlling the Mediterranean fruit fly and other species of fruit flies has been improved with the support of PAN/5/020, ‘Strengthening Technical Capacity to Control Mediterranean Fruit Fly Using the

Sterile Insect Technique (SIT)’. As a result, an outbreak of *Anastrepha grandis*, an exotic fruit fly, was detected, a sanitary border established, and the establishment of this pest avoided. This has protected products and enabled increases in exports of fruits and horticultural products, opening up new markets and providing benefits to the farmers and the country.



PAN/5/020: Examining fruit flies in Panama (Credit: IAEA).

Food safety

Due to a high burden of diseases and the inevitable use of agrochemicals, food safety is a critical issue for economies in Africa, with contamination caused by both chemical and microbial hazards. Laboratories in the region require support if they are to ensure effective hazard identification and conduct residue monitoring programmes using nuclear and related analytical techniques.

The livestock sector in Botswana contributes significantly to the country’s economy through foreign exchange earnings from the export of beef and beef products, which must meet international food standards, including the absence of unacceptable chemical contaminants and residues of veterinary drugs. Botswana lacked a laboratory capable of conducting veterinary drug residue analyses, and had to sub-contract such analyses to an external reference laboratory at a high cost in order to meet market requirements.



BOT/5/006: IAEA trained Botswana National Veterinary Laboratory staff provide training to African scientists on the instrumentation for monitoring veterinary drug residues in food.

Through BOT/5/006, ‘Establishing a Laboratory for Monitoring Residues of Veterinary Drugs in Food of Animal Origin to Protect Public Health and Enhance International Trade through Utilization of Nuclear and Related Analytical Techniques’, an established veterinary laboratory capable of undertaking analysis of some veterinary drug residues and other chemical contaminants to support local livestock products is now available in the country. Important contributions have been made to Botswana’s food safety programme, especially regarding the quality of beef exports to the EU. The reliance on outsourcing tests has been reduced, with further reductions envisaged in the future by cutting down on costs and turnaround times. The laboratory’s capacity to operate state-of-the-art instrumentation has increased by 80%. Up to 14 analytical methods have been validated (a 52% increase in availability of in-house fit-for-purpose analytical methods) and 12 analytical methods/techniques have been accredited. In addition, a pool of trained scientists capable of establishing and validating analytical methods for residues and conducting routine testing is now available in-house.

Algeria, Botswana, Cameroon, Egypt, Ethiopia, Mauritius, Namibia, Nigeria, Sudan, Tunisia, Uganda, United Republic of Tanzania, and Zimbabwe are benefitting from TC assistance under RAF/5/067, ‘Establishing a Food Safety Network through the Application of Nuclear and Related Technologies’.

The project has thus far enhanced the application of nuclear techniques in food safety control programmes in Member States, including the use of radio receptor assay techniques to identify veterinary drugs, pesticides and mycotoxins of relevance to the Member States. Rapid screening tools have been procured and used in training programmes in Mauritius, Nigeria, Tunisia and United Republic of Tanzania. The project supports sub-regional laboratory networking for residue/contaminant monitoring, and is expected to lead to stronger and more effective surveillance networks for chemical and microbial hazards using nuclear related and non-nuclear techniques to support public health and promote trade.

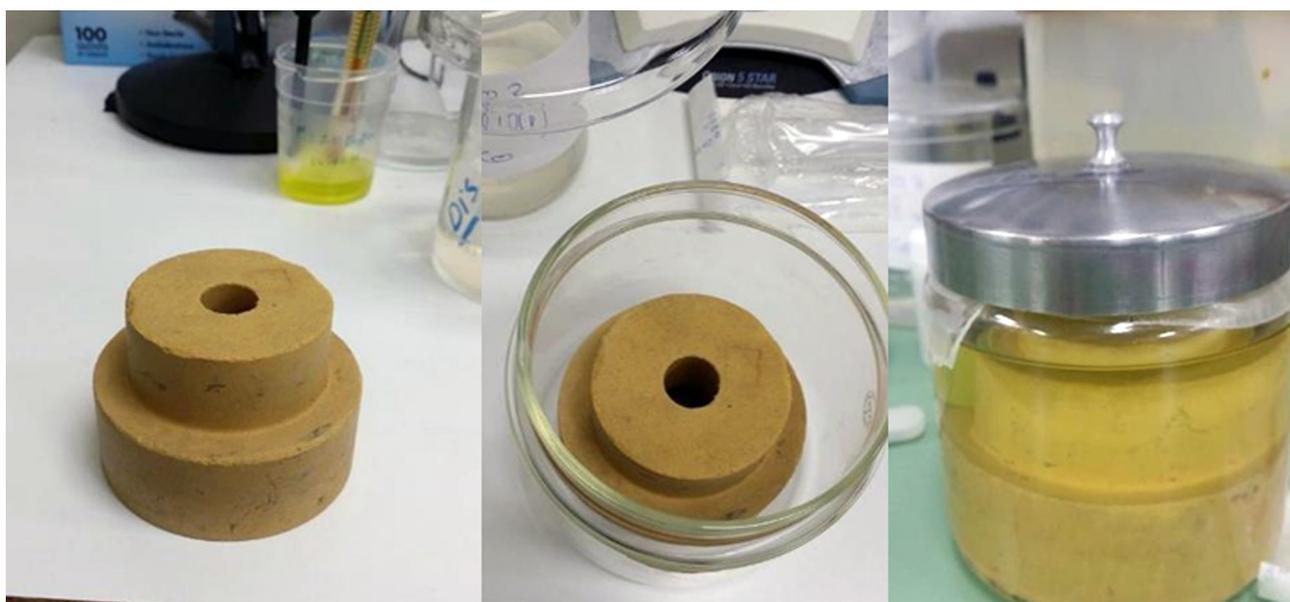
Qatar is highly dependent on imported food and therefore prioritizes the management of food safety to ensure the highest level of consumer protection. The technical capability of the Central Food Laboratory, operated by the Supreme Council of Health (SCH) is being supported through QAT/5/004, ‘Upgrading the Central Food Laboratory’, which focuses on enhancements to the laboratory so that it can analyse food and drinking water to ensure it is free from radioactive contamination and in compliance with permitted radioactivity levels established by national regulations. Through the project, the laboratory was equipped, and staff were trained to analyse drinking water with a liquid scintillation counter.

TC project MAK/5/007, 'Assessing and Enabling the Implementation of Food Irradiation Technologies', addresses the availability of methods in the former Yugoslav Republic of Macedonia for the detection of irradiated food, as practised in the European Union. The project has also contributed to establishing a network of stakeholder institutions, increasing awareness on irradiation technologies in general and on food irradiation in particular. National capacity for the application of irradiation in the food and agricultural commodity sectors has been improved, as well as capacities for training and education on food irradiation technologies, radiation protection, QC and legislation.

Ecuador is addressing the problem of contamination by agrochemicals and pesticides used in palm oil production project through ECU/5/027, 'Improving Food Security and Environmental Sustainability by Monitoring Wetlands as Indicators of Good Agricultural Practice in Palm Oil Production'. The project has provided the ecotoxicology laboratory for pesticides residues in food and water with a Ultra Performance Liquid Chromatography- fluorescent (UPLC-FL) detector and a gas chromatography-tandem mass spectrometry (GS-MS/MS) – these are analytical techniques that involve the use of stable isotopes. Training in laboratory practices for the monitoring of pesticides

associated with current agricultural practices in palm oil production has also been provided. Throughout 2014, the counterpart institute has been using passive samplers (a membrane filter placed in a water course which collects a broad range of contaminants over time) as an effective screening tool and has carried out regular water sampling campaigns. The results of the sample analysis will be presented at a national stakeholders meeting that will provide information on the risks associated with current agricultural practices in palm oil production, and will encourage the implementation of Good Agricultural Practices among growers to minimize the impact of pesticide.

In Panama, PAN/5/022, 'Determining Pesticides and Inorganic Pollutants in Vegetables and Studying the Adsorption and Migration Through Nuclear Technologies in Zones of High Pollution Incidents to Guarantee Safe Food for Consumers', is contributing to the strategy of the National Directorate of Plant Health from the Ministry of Agricultural Development for controlling and reducing the impact of organic pollutants and pesticides during vegetable production process. The project is strengthening the development of technical capacities that will help authorities to educate non-compliant producers about the maximum residue limits of contaminants allowed in vegetables.



QAT/5/004: Producing spike samples from water contaminated with radium-266.



Water and the environment

Regional highlights

Environmental monitoring, and the efficient management of water resources, complements human health and food and agriculture activities, and African Member States have taken a comprehensive approach to tackling these issues. Although in general at very early stages, environmental monitoring and water resources management programmes using nuclear and isotopic techniques are becoming more common. The TC programme supports Member States in Africa in improving the control of pollutants in air and water, and supports the management of water resources used in agriculture, industry or energy generation. The programme has a particularly strong focus on the sustainable management of water resources in areas such as the Sahel, where every drop counts.

In the Asia and the Pacific Region, the Agency continues to assist Member States in the area of water management, promoting hydrochemical and isotope techniques to monitor drinking water quality, and to determine groundwater salinity levels. Nuclear applications were also used to study the effects of climate change on groundwater resources, enabling a more targeted water management policy in the region. This includes the application of isotopic techniques such as FRNs and CSSI to quantify soil erosion losses and identify the exact source of land degradation. A regional data base of CSSI and FRNs has been developed for the first time, collating soil, environmental, management and

land use data, thus providing farmers with information needed to improve soil and water management.

Latin America and the Caribbean have one third of the world's renewable water and a significant volume of ground water resources. These resources are intensively used as a source of energy in hydroelectric and geothermal power generation, food, chemical and textile industries, livestock and aquaculture production among others. Water insecurity is, however, a key issue for the region, as potable drinking water is not available to all people, even in urban areas. Very limited quantities of sewage from cities receive any kind of treatment, so waste water is a source of pollution. The effective management of water and environmental resources is therefore central to sustainable development in the region.

Water resource management

The regional report of the Nile Basin project RAF/8/042 'Adding the Groundwater Dimension in the Nile River Basin' has been finalized, following a technical working session with all nine participating countries in Kisumu, Kenya. The technical session had a positive outcome as it was the first time the riparian countries had a chance to work together, share isotopic data and analyse information at the regional and sub-basin levels.

The Sahel project, RAF/7/011, 'Integrated and Sustainable Management of Shared Aquifer Systems

and Basins of the Sahel Region’, held its first coordination meeting in Vienna in 2014, bringing together 85 representatives from the region. Most importantly, the eight trans-boundary shared aquifer/river-basin authorities participated. Among the key outputs of the meeting was the identification of a group of professionals with knowledge and experience in isotope hydrology in each country. More intensive assistance to countries that have not yet undertaken sampling, as well as further networking and collaboration with joint authorities, needs to be explored, particularly with regard to the Illumedun Aquifer.

Malawi has established its first national radioanalytical laboratory at the Malawian Bureau of Standards (MBS) in Blantyre, with the support of MLW/1/001, ‘Establishing a National Radio-analytical Laboratory for Monitoring Naturally Occurring and Anthropogenic Radionuclides in the Environment’. The new national laboratory will serve as a reference centre for the Ministry of Mines in its efforts to monitor the uranium mining industry.

Bahrain has set up a new Gamma-ray Spectrometry Laboratory under BAH/0/001, ‘Establishing a Gamma Spectrometry Laboratory for Environmental

Radioactivity Monitoring’. The laboratory addresses the needs of Bahrain to monitor and assess radioactivity in the environment as a whole, including the marine environment, and to establish a radiation base line for different environmental parameters for the country. Technical capabilities for radioactivity measurements in the country were also enhanced through the project.

Groundwater is Kuwait’s only natural water resource, and resources in the northern part of the country have frequently shown high concentrations of nitrate and sulphate. As the consumption of these high nitrate and sulphate constituents in water may have adverse health effects, Kuwait is studying the source of these pollutants through isotopic techniques for better water resource management. The Agency is supporting Kuwait’s efforts to establish a database with information on groundwater recharge mechanisms, dynamics and pollution for the formulation of better protection measures from these polluting sources through K UW/7/004, ‘Managing Groundwater Resources Using Stable and Radioactive Isotopes’. The project has helped Kuwait to utilize a gamma spectrometry system to perform the necessary analyses – gamma spectrometry has been identified as one of the main methods to determine isotope concentrations in water samples.



The IAEA helps Member States to better manage precious water resources (pictured taken in Niger) (Credit: IAEA).

Due to its climate, Eastern Georgia faces a large deficit of 1040 million cubic meters of water for irrigation and domestic use. TC project GEO/7/001, 'Supporting Environmental Isotope Assessment to Improve the Sustainable Management of Groundwater Resources', supports environmental isotope assessment for optimized groundwater use in the Alazani-Iori Valleys of the Shiraki Plain region. Personnel have been trained through scientific visits and fellowships, and new field equipment for mapping, geophysical prospecting, monitoring and sampling campaigns has been provided. Through the project, the inspection and selection of relevant sampling points (monitoring wells, gauging stations, etc.) was completed.

A water and soil sampling campaign has been implemented in Nicaragua within the framework NIC/8/012, 'Applying Nuclear Techniques for the Development of a Management Plan for the Watershed of the Great Lakes'. The data collected was analysed to assess erosion and sedimentation rates in the uplands of the lakes' watershed, using fallout radionuclides. As a result of the analysis, present and potential critical zones of erosion were identified and the outline for a watershed management plan was prepared.

In Mexico, a sampling campaign for chemical and isotopic analysis of groundwater was carried out with the support of MEX/7/010, 'Characterizing the Sources for Water Supply in the Central Region of Veracruz'. The results have enabled the expansion of the hydrological and meteorological network in the region. In addition, the behaviour of precipitation and water bodies was analysed, a first water circulation model was developed, and future scenarios were elaborated and analysed.

TC project BOL/7/004, 'Characterizing and Setting Up a Management Plan for the Viacha Aquifer Through Application of Traditional Techniques Complemented by Hydro chemical and Isotopic Techniques', supported training on subsurface hydrology for two fellows from the Plurinational State of Bolivia in 2014. The training covered 12 thematic blocks in hydrology, hydrogeology, hydraulics, hydrochemistry, isotopic techniques, modelling of groundwater flow and transport, groundwater contamination and management

of water resources. In addition, support was provided for the procurement of consumables needed for the activities conducted by the Municipal Supplier of Potable Water of Viacha (EMAPAV), and guidance was given for the sampling campaigns conducted by the Ministry of Environment and Water. The project is contributing to the hydrogeological characterization of the Viacha aquifer, which will enable the development of a management plan to ensure the rational and sustainable use of the aquifer.

The capacities of technical staff of Jamaica's Water Resource Authority (WRA) in the application of isotope techniques in hydrology, particularly as regards groundwater origin, have been improved through JAM/7/001, 'Evaluating Groundwater Recharge Origin, Dynamics and Pathways in the Upper Rio Cobre Hydrologic Sub-Basin'. The infrastructure at WRA has also been strengthened and the awareness of national authorities of the potential of isotopic techniques has been increased. WRA performed four sampling campaigns before December 2013 and an interim report has been issued, based on the first set of data.

In Ecuador, ECU/7/006, 'Determining Recharge Areas and Groundwater Dynamics for a Sustainable Exploitation in the Eastern Valleys of the Metropolitan District of Quito Using Nuclear Techniques', aims to establish the hydrogeological characterization of the eastern aquifers of the city of Quito and to determine the recharge sites, preferential flows and the storage time of aquifers, using isotopic techniques to validate preliminary assumptions of water dynamics. Based on the results obtained, a comprehensive evaluation will be necessary to protect the recharge areas, demarcate urban expansion and manage the volumes of reserve in a sustainable manner, taking into account the rates of replacement with meteoric water.

TC project BRA/7/010, 'Sustainable Water Resources Management in a Uranium Production Site', aims to facilitate improved water resources management in a centre of uranium production. In 2014, the project team completed all the sampling, chemical analysis and isotopic analysis for all planned campaigns. In addition, some of the watershed characterization and

quantitative analysis of surface water-ground water interaction has been completed. Personnel have been trained in hydrology analytical and modelling techniques, including flow and transport modelling. The last sample collection was completed in December 2014, and the analyses and water quality diagnoses will be completed in 2015.

Analytical capacities for measuring lead-210 and caesium-137 in sediments and soils through gamma spectrometry have been established at the University Simon Bolivar in Bolivarian Republic of Venezuela under the TC project VEN/7/004, 'Use of Agro-environmental Radioactive Soil Tracers (i.e. 137Cs and 210Pb) for Assessing and Managing Sedimentation Processes Impacting Reservoirs'. The project has supported the first assessments of sedimentation processes impacting the Maticora water reservoir, where two sampling campaigns have been conducted to measure sedimentation rates and its recent evolution.

Marine, terrestrial and coastal environments

In Montenegro, the Centre for Ecotoxicological Research and the Hydrometeorological Institute have been implementing an air quality surveillance programme since 1998. Many measurements have shown quantities of atmospheric air pollutants exceeding permitted values, but the determination of the metal content in aerosols was difficult due to a lack of appropriate analytical equipment. TC project MNE/1/001, 'Strengthening the Technical and Institutional Capacity for Implementing Environmental Monitoring Programmes', was completed in 2014. It put a comprehensive air quality monitoring programme into operation and supported the preparation of an underground water map of a selected region in Montenegro. With the assistance provided by the Agency, Montenegro now has accredited rapid quantitative methods available for trace elements analysis in environmental samples. Montenegro's Environmental Protection Agency can produce reports according to the guidance of European Environment Agency, EUROSTAT and the European Environment Information and Observation Network. In addition, the geological survey has gained the capacity to produce

systematic hydrogeological maps of underground water.

Seafood tainted with algal toxins remains a major public health and socioeconomic problem for Member States in the Asia and the Pacific region, which includes small island developing states which rely on seafood as a major source of protein and economic growth. Member State competencies in applying the receptor binding assay method for paralytic shellfish poisoning (PSP) toxins as a regulatory and monitoring tool are being strengthened through RAS/7/026, 'Supporting the Use of receptor Binding Assay (RBA) to Reduce the Adverse Impacts of Harmful Algal Toxins on Seafood Safety', which supports Indonesia, Malaysia, Marshall Islands and Thailand, with experts from Institut Louis Malarde, French Polynesia; the Cawthron Institute, New Zealand; and the Intergovernmental Oceanographic Commission (IOC) of UNESCO, Denmark, and online participation from the National Oceanic and Atmospheric Administration, U.S.A.

The project INT/5/153, 'Assessing the Impact of Climate Change and its Effects on Soil and Water Resources on Polar and Mountainous Regions', aims to improve understanding of the impact of climate change on fragile polar and mountainous ecosystems at the local and global scale to support their enhanced conservation and management. Since then, a strong momentum for collaboration has been fostered amongst UN organizations including FAO, UNEP, United Nations University and UNESCO, and with the EC and the International Centre for Integrated Mountain Development (ICIMOD), as well as with the participating Member States of Argentina, Austria, Belgium, Brazil, Canada, Chile, China, Finland, Germany, Japan, Kyrgyzstan, Norway, Peru, the Plurinational State of Bolivia, Russian Federation, Spain, Sweden, Switzerland, Tajikistan, U.K., United Republic of Tanzania, U.S.A. and Uruguay.

Thirteen benchmark sites, ranging inter alia from Antarctica to the Andes, from Svalbard to Central Asia, and from Caucasus to the Alps, have been established. A knowledge gap analysis and quantification of 'Impact of Climate Change on Land-Water-Ecosystem Quality in Polar and Mountainous Regions- Gaps in knowledge:



INT/5/153: Scientists examine organic matter in soil from King George Island, Antarctica. (Credit: IAEA).

Reference Document’, based on the development of a database of 769 scientific publications published since 2000, has been produced.

UNEP and its collaborating centre GRID-Arendal, which serves as the polar centre of UNEP, is working closely with the Agency on the science-policy interface and communication level, mainstreaming the project results into other relevant activities and initiatives, in particular UNEP’s mountain portfolio. To date, this includes strategies and protocols for climate change impact assessment in polar and mountainous regions; as well as capacity building on the use of FRNs and compound-specific stable isotope techniques for precision soil conservation.

In Belarus, support to environmental monitoring continued through BYE/7/004, ‘Strengthening Capacity to Assess Behaviour of Transuranium Elements in the Chernobyl NPP Exclusion Zone and Adjacent Areas’. The project is strengthening the capacities of the Polesse State Radiation-Ecological Reservation to study the behaviour of transuranium elements and their content in main agricultural products.²⁸

Staff from the Institute of Radiation Safety and

Ecology of the National Nuclear Centre of Kazakhstan have received training for radioecology measurements, dose assessments through KAZ/9/012, ‘Supporting the Transfer of Lands of the Former Semipalatinsk Nuclear Test Site for Economic Use’. The project has also supported the procurement of equipment that the institute needs to improve safety investigations in the test site.

Activities were initiated in 2014 under RLA/7/020, ‘Establishing the Caribbean Observing Network for Ocean Acidification and its Impact on Harmful Algal Blooms, using Nuclear and Isotopic Techniques’. The project, which focuses on the Greater Caribbean, aims to establish a network that will facilitate the adoption and implementation of programmes to mitigate and adapt to the impact of climate change in the region. Activities include training and practical exercises to measure the marine carbonate system and the acidity of seawater, identification of foraminifera in view of their use in the measurement of paleo-climate parameters, taxonomy and species identification of toxic algae, as well as isolation and culture techniques. The training was carried out at the University of Copenhagen as part of the Agency’s collaboration with UNESCO/IOC.

²⁸ This paragraph responds to section 2, operative paragraph 6 of resolution GC(57)/RES/11 on to work actively to render assistance and radiological support to the most affected countries in mitigating the consequences of the Chernobyl disaster and rehabilitating the contaminated territories.



Industrial Applications

Regional highlights

Nuclear technologies can be used in many applications. The relevance and importance of nuclear technologies increases as African Member States develop stronger industrial, medical, agricultural or research sectors. Proper maintenance and repair services are also in increasing demand, and effective response are needed in sectors such as nuclear medicine. The TC programme helps African Member States to build human and technical capacities to answer to local demands in a sustainable and effective manner.

In the Asia and the Pacific Region, Member States continue to underline the importance of the industrial applications of nuclear technology. These include life and stress assessments of ageing NPPs to ensure the structural integrity of vital plant components through non-destructive testing, as well as enhancing the productivity of petroleum refining technology with gamma scanning techniques and radiotracers. Other applications in the region include using ionizing radiation and nanomaterials for environmental remediation, and evaluating the performance of reactors through advanced radioisotope techniques.

Research reactors

Through TC project RAF/4/022, 'Enhancing Research Reactor Utilization and Safety (AFRA)', the TC programme supports annual meetings of the Regional Advisory Safety Committee for Research Reactors in Africa (RASCA). This Committee was established in

2009 with the main purpose of ensuring a high level of safety in research reactors (RRs) in the Africa region. RASCA meetings act as a regional forum for exchange of information, networking, and sharing of experiences in safety issues of common interest. There is a particular focus on the interface between safety and security, and on design provisions for protection against internal and external events.

In the Democratic Republic of the Congo, expert advice and practical support in establishing effective regulatory functions and licensing RRs, including regulatory inspections of reactor facilities to ensure safety, was provided to the country's regulatory body, the National Committee for Protection against Ionizing Radiation. The country's operational radiation protection programme was improved through expert guidance and the provision of equipment. The reactor safety committee also received guidance to enhance its function in advising reactor management on safety matters. Between 2013 and 2014, six expert missions were carried out and five national staff were trained through fellowships in Slovenia and Austria. All activities were supported through ZAI/1/004, 'Formulating and Consolidating the Decommissioning Process of the Research Reactor Facilities of CREN-K while Ensuring Safety in Accordance with IAEA Safety Standards'.

In Europe, TC project RER/1/007, 'Enhancing Use and Safety of Research Reactors through Networking, Coalitions and Shared Best Practices', continued to provide an important vehicle for maintaining research

reactor (RR) networks. In 2014, such support was particularly needed for two recently established entities: the Commonwealth of Independent States RR Coalition and the TRIGA RR Network.

The Agency has been helping Jordan since 2009 through both national and regional projects to build human resource capacity for the safe operation of a RR. TC project JOR/1/006, 'Building Capacity for the Construction, Commissioning, Safety and Utilization of the Jordan Research and Training Reactor (Phase II)', with PUI support from Indonesia, is assisting in the establishment of Jordan's Research and Training Reactor, which is planned to be fully functional by June 2016. This will be the first reactor to be built in Jordan, and it will be utilized for training, research and the production of radioisotope for medical uses. The reactor will also be able to produce radioisotopes for industrial applications such as iridium-192, cobalt-60 and sodium-24, as well as any other isotopes required for research and agriculture purposes. The reactor will be able to irradiate silicon crystals to produce doped silicon semiconductors, which are widely used in various industrial fields, especially for high quality semiconductor power devices.

The IAEA is cooperating with the Mexican National Institute for Nuclear Research through project MEX/2/016, 'Evaluating the Effects of Extended Power Uprate for Applied License Renewal of LVNPP', to improve the reliability and utilization of the Institute's RR. The core of the reactor was recently converted from high-enriched to low-enriched fuel. The current efforts, with support from the PUI, aim to enable full use of the capabilities of the installation with the new core configuration. The programme of improvements to the RR and service laboratories is expected to be concluded in 2015.

Peru's RP-10 RR, managed and operated by the Peruvian Institute of Nuclear Energy (IPEN), is being improved with the support of PER/4/023, 'Modernizing and Improving the Utilization of the RP10 Reactor', through the purchase of low enriched uranium and contracting for the fabrication of new fuel elements. The Project and Supply Agreement was approved by the Board of Governors in March 2014 following

approval by Peru and the USA.

Participation in training courses offered by the Eastern European Research Reactor Initiative (EERRI) in 2014 was supported by two regional and six national projects (RAS/1/018, 'Developing Human Resources for Safe Operation and Application of Nuclear Research Reactors in ARASIA Member States'; PAK/2/004, 'Ensuring Long Term Safety of KANUPP, Phase-II'; MEX/2/016, 'Evaluating the Effects of Extended Power Uprate for Applied License Renewal of LVNPP'; GHA/2/002, 'Establishing Nuclear Power Infrastructure for Electricity Generation (Phase II)'; RAS/0/073, 'Supporting Human Resource Development and Nuclear Technology'; URT/1/008, 'Supporting nuclear technology education and training'; SAF/0/005, 'Supporting Human Resources Development and Nuclear Technology'; and PAK/9/037, 'Strengthening Infrastructure for Radiation, Transport and Waste Safety').

Radioisotopes and radiation technology for industrial applications

In South Africa, the IAEA has contributed to the completion of the first accelerator mass spectrometry (AMS) facility on the continent at the iThemba Laboratory for Accelerator-Based Sciences (iThemba LABS), Gauteng, through the national project SAF/0/004, 'Completing the High-Energy Analysis System for Accelerator Mass Spectrometry at iThemba LABS (Gauteng)'. The establishment of the AMS was also strongly supported by the South African government and by national funding institutions, which provided the major part of the financial support required. The AMS was inaugurated in July 2014 and is now being used to perform radiocarbon dating. Considerable progress continues to be made in setting up sample preparation facilities for cosmogenic isotopes, which is of high importance for many isotopic applications, such as climate change studies. The iThemba LABS AMS positions South Africa among the world leaders in accelerator-based research: it will be used for biomedical, archaeological and palaeoscience research, as well as for postgraduate training for Master's and doctoral degrees.



On 12 November 2014, the Lebanon Atomic Energy Commission and the Central Bank of Lebanon signed a memorandum of understanding centred on the development of analytical protocols based on the use of nuclear and other complementary techniques to perform quality-control testing on banknotes and coins.

A ten day training event at the Agency’s Laboratories in Siebersdorf was supported under RAF/1/004, ‘Supporting Radioisotope Technology as a Diagnostic Tool for Plant Process Performance Optimization and Troubleshooting (AFRA)’. Participants had the chance to troubleshoot and perform diagnostic experiments using an existing test rig. The World Conference on Radiotracers and Industrial Applications held in Marrakech, Morocco, in October 2014 provided an excellent outreach for South-South technical exchange between Africa and Asia, as experts who attended had a chance to network and share information on tracer techniques.

Lebanon has implemented several national TC projects (including LEB/1/006, ‘Establishing an In Air Proton Induced X ray Emission Beam Line for

Analysis of Archaeological and Biological Samples’, LEB/1/007, ‘Studying the Feasibility of Establishing a Nuclear Research Reactor and Developing Human Resources for Nuclear Technologies’, and LEB/1/008, ‘Upgrading the Capabilities of the Lebanese Atomic Energy Commission for Surface Elemental, Chemical and Structural Analysis of Biological and Organic Materials’) to strengthen nuclear analytical techniques that can reveal new details about consumer goods, geological formation, ancient artefacts, archaeology samples, paints and currency notes and coins etc. These techniques are now being used as a tool by the Central Bank of Lebanon to develop QC testing for bank notes and coins, in order to prevent counterfeit or forged currency from circulating in the country’s money supply.



UAE/1/001: Investigations into the archaeological findings of the Al-Dor Temple in Umm Al- Quwains confirm that the temple was built using calcite based plaster, not gypsum, and the origin of the mortar that was used to build the temple was also identified.

TC project UAE/1/001, ‘Enhancing Analytical Capabilities for Environmental and Archaeological Applications’, has enhanced the technical capability of the United Arab Emirate’s first National X-ray Centre for Material Analysis. The Centre can now analyse historical artefacts and manuscripts, environmental samples such as heavy metals and forensic samples, and can characterize and test new materials. The project contributed to the transfer of knowledge and expertise related to the use of the X-Ray Fluorescence Laboratory in the X-ray Centre through scientific visits, fellowships and workshops.

TC project RER/1/014, ‘Preventive Maintenance in Ensuring the Safety and Efficiency of the Radiation Facilities’, has made a significant contribution to enhancing the safe operation of irradiation facilities in the Europe region by providing hands-on training in validation and control for gamma radiation processing, and in supporting the harmonization of applications with international standard ISO11137. The knowledge gained during the training activities, sharing of best practices and harmonized approaches for control

strategies and preventive maintenance will contribute to a reduction in the probability of incidents and accidents.

In Cuba, the TC programme is supporting the revitalization of irradiation services through two national projects, CUB/1/011, ‘Improving the Impact of Irradiation Technology’, and CUB/1/012, ‘Enhancing Irradiation Services’, with the goal of increasing the availability and quality of products from the biotechnological, pharmaceutical and food industries. The projects support specialized training and expert advice for the management of irradiation facilities, including plant construction, installation, control processes and operation of similar irradiators. In 2014, one of the main activities focused on providing guidance to convert Cuba’s Food Industry Research Institute (IIIA) into a multipurpose irradiation institute. Additionally, support has been provided to strengthen the dosimetry laboratories at the National Centre for Plan and Animal Health (CENSA) and at the Centre for Technology Applications and Nuclear Development (CEADEN).



Strengthening laboratory infrastructure at CEADEN, Cuba, to support irradiation services. (Credit: IAEA).



Energy planning and nuclear power

Regional highlights

Concerns over security of energy supply, climate change and environmental impacts are making energy accessibility, availability and affordability one of the biggest development topics in Africa. The TC programme offers tailored assistance to its African Member States to develop national and regional human resource capabilities and to put in place the necessary technical capacities for establishing energy planning programmes. Some Member States also receive targeted assistance related to the effective management of uranium and other resources, including mining activities.

Member States in Asia and the Pacific continued to support the development of nuclear power in 2014, and have taken concrete preparatory steps in this direction. Agency assistance provided through national and regional projects has strengthened national capabilities for the development of national nuclear power infrastructures in embarking countries such as Bangladesh, Malaysia and Viet Nam as well as supporting countries operating NPPs. For example, the Agency has provided comprehensive technical cooperation support to Viet Nam, within the framework of VIE/2/012, ‘Developing Nuclear

Power Infrastructure Phase III’. With this support, and with reference to the IWP for 2011–2015, the country is taking considerable steps to meet the requirements of Phase 2 preparations in developing a national nuclear power infrastructure. The project has provided significant capacity building support and has strengthened coordination among national institutions involved in the nuclear power programme. The project is also supporting the establishment of policies and strategies related to human resource development.

In the Europe region, support to countries embarking on nuclear power has been provided through national and regional projects, including RER/2/011, ‘Enhancing Energy Planning, Nuclear Power Infrastructures and Nuclear Safety Oversight for Countries Considering, Developing or Expanding Nuclear Power Programmes’. In Belarus and Poland the two-track support approach is established with national projects to support the nuclear energy programme implementing organization (NEPIO) on the one hand, and on the other, projects to strengthen the regulatory framework to ensure the safe and secure deployment of nuclear power. Turkey does not have a national project to support the NEPIO, and therefore some support activities are being delivered through RER/2/011, with extrabudgetary contributions from Turkey. Turkey’s regulatory authority has

received support under TUR/9/017, ‘Enhancing the Turkish Atomic Energy Authority’s Capabilities for Regulatory Oversight of Construction, Commissioning and Operation of New Nuclear Power Plants’, which is a fully government-funded footnote-a/ project.

In Latin America, the status of key operational safety areas has been assessed in the NPPs of Mexico and Brazil through Operational Safety Review Team (OSART) missions. To strengthen national capabilities, personnel from both NPPs have been participating as observers in similar peer review missions in other regions, to learn from the experience of other NPPs. These activities are supported by RLA/9/080, ‘Enhancing Nuclear Power Plant Life Management and Safety Culture Practices’, which aims to ensure the safe operation of the Latin American NPPs. The project has also ensured that comprehensive and reliable information is made available to plant managers and decision makers, including regulatory authorities, on how to implement a proper plant life management (PLiM) programme.



Visiting a new reactor as part of an OSART mission. (Credit: IAEA).

Energy planning

Many African countries have begun revisiting the nuclear option over recent years with a view to establishing long term sustainable energy supplies. Recognizing the long lead times associated with the establishment of nuclear power programmes, several countries have launched energy demand and supply assessments.

The regional project RAF/2/010, ‘Developing, Expanding and Reinforcing Energy Planning Capabilities including Nuclear Power (AFRA)’, was initiated in 2014 as a joint project on energy planning and nuclear power in the Africa region. The five-year project aims to assist participating Member States in assessing viable energy options, including nuclear power, using an energy planning approach and tools developed by the Agency. The energy planning component of the project builds on support provided under the previous projects RAF/0/028, ‘Strengthening Planning Capabilities for Sustainable Energy Development (AFRA VI-1)’, and RAF/2/009, ‘Planning for Sustainable Energy Development’. The current project will support the strengthening of the energy planning capabilities of the AFRA Member States, and the development of regional energy plans based on a sub-regional power pool approach.

To complement and sustain this effort, national academic institutions have been included in the project. Training courses have been arranged to enhance the energy planning analysis skills of energy professionals, with a special focus on energy data collection, statistics, development of sub-regional power pool models, and exploring the possible synergies of a closer sub-regional cooperation to support the achievement of sustainable energy objectives, including affordability, accessibility and environmental protection. National teams received tools, methodologies and training on relevant software packages to enable them to conduct energy planning studies for their countries and sub-regions. These studies can help in the formulation of energy sector development plans to support the socioeconomic development goals of the participating countries.

In the Seychelles, the Agency has trained a national team and helped them to develop their own energy planning models within the framework of SEY/2/001, 'Ongoing Building Capacity on Energy Planning for the Energy Commission and the Preparation of an Energy Master Plan for the period 2014-2030 to Improve Energy Security'. The project has helped the Seychelles Energy Commission to develop long term energy demand projections and to optimize alternative energy supply and utilization scenarios.

In Cambodia, the development of a national energy study was assisted under the national TC project KAM/2/001, 'Developing National Capability in Energy Planning and Economics'. In 2014, the Agency provided support to the Ministry of Mines and Energy in presenting the energy planning study to national decision makers. In addition, a national training event was conducted to transfer knowledge and provide hands-on training on the use of IAEA's Energy Balance Studio. As an outcome, local capacity is now in place to organize national energy data in a systematic manner, facilitating planning for energy developments in Cambodia.

In Sri Lanka, in response to government plans to adopt the IAEA Model for Energy Supply Strategy Alternatives and their General Environmental Impacts (MESSAGE) as an energy planning tool, the Agency built upon earlier training in MESSAGE basics delivered to the Ceylon Electricity Board to conduct a two-week advanced course. The follow-up training organized in 2014 in the framework of SRL/2/008, 'Supporting Energy Planning and a Pre-Feasibility Study for Nuclear Power and Human Resources Development in Nuclear Power Engineering', helped address some special features of MESSAGE that were needed to capture the complex characteristics of the Sri Lankan energy system that cannot be tackled efficiently by the Wien Automatic System Planning Package (WASP) methodology currently being employed for national energy planning. In addition to lectures on energy system analyses, planning and policies, future energy scenarios and MESSAGE methodology, the training included demonstrations of various advanced and complex applications of MESSAGE, and provided guidance to participants on developing a MESSAGE

model for Sri Lanka and applying it for scenario analyses.

Jordan is planning to establish NPPs and has carried out studies related to energy planning and economics under the framework of national TC projects JOR/2/007, 'Developing Nuclear Infrastructure for the Construction and Operation of a Nuclear Power Plant', and JOR/2/009, 'Developing Nuclear Infrastructure for the Construction and Operation of a Nuclear Power Plant (Phase II)'. Several Jordanian fellows were trained in various energy planning tools, and expert missions were also carried out.

In Oman, a study on energy planning was finalized and published by the country with the support of OMA/2/001, 'Developing Sustainable Energy Strategies and Assessing the Potential of Nuclear Power for Socio-economic Growth'. The project provided support on the Model for Financial Analysis of Electric Sector Expansion Plans (FINPLAN) methodology. This included data input, financing challenges for large energy projects, and incorporating new instruments, concepts and practices of Islamic financing and their application to large energy projects. Upon national request, the evaluation of sustainable energy strategies for addressing climate change issues using the Agency's MESSAGE energy model was also addressed. Long term fellowships were used to strengthen human capacity and develop expertise for the evaluation of energy projects.

In the Latin America region, the IAEA is providing support to Nicaragua to carry out studies and assessments for sustainable energy production. In 2014, staff of the Ministry of Energy received expert advice and training in finance modelling for power projects through TC project NIC/2/001, 'Building Capacity to Carry Out Financial and Environmental Studies'.

Activities to strengthen national capacity for energy planning were implemented in 12 LDC Member States: Angola, Benin, Burundi, Cambodia, Chad, Lesotho, Madagascar, Malawi, Mali, Mozambique, the United Republic of Tanzania and Uganda. In addition, 13 countries (Algeria, Egypt, Malaysia, Mauritius, Nicaragua, Niger, Oman, Philippines, Romania, Saudi

Arabia, Seychelles, The former Yugoslav Republic of Macedonia and Tunisia) received technical support to enhance their planning expertise for sustainable energy development.

Introduction of nuclear power

Newcomer countries are faced with many challenges once they decide to pursue a civilian nuclear power programme, not the least of which is the type of reactor to select. To assist newcomers, the Agency supported the conduct of a number of workshops and training sessions in 2014. In March, a workshop on Reactor Technology Assessment was carried out at the Nuclear Power and Energy Division, Bangladesh Atomic Energy Commission (BAEC), in Dhaka, Bangladesh, under BGD/2/013, 'Developing National Infrastructure for the first Nuclear Power Programme Phase II'. In April, as part of the interregional project INT/2/014, 'Supporting Member States to Evaluate Nuclear Reactor Technology for Near-Term Deployment,' a week-long training course was given in the Republic of Korea. Twenty-two participants from eighteen Member States learned about nuclear reactors and the IAEA methodology for assessing various types that are available now or will be in the near term. Additionally, a three-day workshop on the same topic, Reactor Technology Assessment, was conducted under the auspices of ALG/2/009, 'Supporting the Implementation of the Nuclear Power Programme', in October at the Algeria's Atomic Energy Commission (COMENA) in Algiers.

An interregional workshop on Design, Technology and Deployment Considerations for Small and Medium-sized Reactors (SMRs) took place in June 2014, funded by INT/2/014, 'Supporting Member States to Evaluate Nuclear Reactor Technology for Near-Term Deployment'. The workshop facilitated capacity building in reactor technology identification, assessment and selection for newcomer countries. The workshop was attended by 33 participants from 22 Member States, mostly embarking countries.

In Africa, the nuclear power component of RAF/2/010, 'Developing, Expanding and Reinforcing Energy Planning Capabilities including Nuclear Power

(AFRA)', was initiated during an earlier project RAF/0/033, 'Increasing Awareness at Decision Making Level about the Requirements and Challenges Related to the Feasibility of a Nuclear Power Programme', and supports regional efforts to develop nuclear power infrastructure in line with national strategies and plans. The current project aims to address common regional priority needs and concerns related to nuclear energy, including the requirements for comprehensive studies to explore the feasibility of nuclear power options and technologies. A regional workshop on governmental and regulatory infrastructure for a nuclear power plan, and national policies and strategies for safety, including the role of coordination, was organized in 2014 for countries considering the introduction of nuclear power as part of their national energy strategy. The workshop provided an overview of the requirements for the development of the safety infrastructure for nuclear power. It contributed to enhancing the understanding of national decision makers regarding the national commitments and responsibilities necessary to achieve the safe and secure implementation of a nuclear power programme.

Bangladesh received comprehensive support for the development of national nuclear power infrastructure within the framework of BGD/2/012, 'Establishing Infrastructures for the Introduction of a Nuclear Power Plant', and BGD/2/013, 'Developing National Infrastructure for the first Nuclear Power Programme Phase II'. Five advisory and expert missions were conducted that contributed to the development of capacity to plan and manage a nuclear power programme. The projects also supported efforts to establish a national nuclear technology training centre by procuring PC-based simulators and training equipment. The BAEC is continuing to focus on strengthening the organization of NPP project management. Bangladesh is also developing a national strategy and plan for human resource development.

Throughout 2014, capacity building activities in the United Arab Emirates were supported under UAE/2/003, 'Supporting the Development of National Nuclear Power Infrastructure for Electricity Generation, Phase II'. Opportunities to participate in IAEA review missions such as OSART provided an opportunity for



BYE/2/004: Computer based training centre, Belarus.

personnel from the United Arab Emirates regulatory body to gain more in-depth understanding of nuclear safety in NPPs. Expert missions and preparatory review missions were also organized within the framework of the project to support the United Arab Emirates' efforts to further strengthen its regulatory infrastructure in preparation for the commissioning of its first nuclear power plant in 2017.

In Croatia, the project team produced a comprehensive study that analysed the technical, economic and financial viability of nuclear power for Croatia within the evolving regional electricity markets. The findings of the study, carried out under CRO/2/003, 'Identifying and Managing Financial, Economical and Energy Risks for Nuclear Power Plant Projects in Small Economies – Case Study', will be used to inform decision makers and the public about the possible role for nuclear power in meeting the country's future electricity needs.

In Belarus, in line with the State Human Resources Development Plan developed with TC support, the education base for the national nuclear power programme was further strengthened in 2014 with the provision of new modules of the computer-based training system already installed in eight Belarusian

educational institutions. In addition, intensive individual training was undertaken through scientific visits to operating NPPs and to the experienced nuclear regulatory authorities of countries with NPPs.

Nuclear power reactors

Long term operation (LTO) and ageing management are vital for NPPs. National codes and approaches differ in details, which can result in significantly different LTO results. Under RER/2/010, 'Strengthening Capabilities for Nuclear Power Plant Lifetime Management for Long Term Operation', three workshops were held in 2014 to share experiences and harmonise the approaches across the Europe region in condition-based and proactive maintenance, ageing management programmes including concrete, buried piping and flow-accelerated corrosion, as well as digital instrumentation and control modernization and implementation. Although only in its first year of implementation, the project is proving to be a successful response to demand in the region, as there are many older NPPs in operation.

LTO is also being tackled in Armenia with the support of ARM/2/003, 'Aging Management and Preparation for Long Term Operation of Nuclear Power Plant Systems, Structures and Components'. Two expert missions were



Participants at a workshop held in Niamey, December 2014, during a site visit to the School of Mines, Industry and Geology (EMIG).

provided in 2014, and NPP personnel have undertaken scientific visits to other countries with successful LTO and ageing management programmes. In September, a sixth technical meeting for the coordination of international assistance to the Armenian nuclear power plant (ANPP) was held at the plant to scrutinize LTO-related needs and pre-agree on follow up actions. The aim is to improve support for the prolonged operation of the ANPP for the period 2016–2026, when a new unit is planned to be put in operation at Metzamor (the site of the current plant).

Nuclear fuel cycle

Africa supplies some 20% of the world’s uranium, and some estimates expect that this share, and the overall production tonnage from the region, will increase markedly in the next twenty years. Niger and Namibia already occupy the fourth and fifth positions in the

ranks of global producing countries, and Niger has nearly 50 years of continuous experience in successful uranium mining. Some 20 countries in the region are in the process of assessing the potential socioeconomic contribution that uranium and related minerals such as rare earths and phosphates can make to sustainable development over the medium and long term. Under the regional TC project RAF/2/011, ‘Supporting Sustainable Development of Uranium Resources’, project leaders from across the African region gathered in Vienna at the first ever Leadership Academy workshop on sustainable uranium production to discuss and exchange experiences concerning effective leadership qualities, and how these qualities can decisively affect the success or failure of projects in uranium exploration, mining and processing.



Radiation protection, nuclear safety and nuclear security

Regional highlights

Nuclear and radiation safety is one of the priority areas for technical cooperation in Africa. To this end, the Agency engages with other international actors to promote strong technical and financial partnerships aimed at enhancing safety infrastructure in the continent. For example, these projects are supporting the implementation of regional projects focused on enhancing existing safety infrastructure and national capabilities to comply with the IAEA Safety Standards. The EC targets the safe management of radioactive waste (RAF/9/054, 'Strengthening Radioactive Waste Management (AFRA)'), the improvement of regional capacities and capabilities for response to radiation emergencies (RAF/9/052, 'Strengthening and Harmonizing National Capabilities for Response to Radiation Emergencies'), safety in the use of RRs (RAF/4/022, 'Enhancing Research Reactor Utilization and Safety (AFRA)'), and the development of human resources through capacity-building activities (RAF/9/048, 'Strengthening Education and Training Infrastructure, and Building Competence in Radiation Safety (AFRA)'). Three of these projects are AFRA projects, and have also received technical and financial support from Japan, Spain and the USA. Other projects such as RAF/9/051, 'Strengthening the

Regulatory Framework and National Infrastructure for Safe Management of Radioactive Waste and Protection of Public and Environment', or RAF/9/053, 'Strengthening Technical Capabilities for Patient and Occupational Radiation Protection in Member States', focus on enhancing safety infrastructure both at the regulator and end-user levels and have also received strong support from Japan, Spain and the USA.

In 2014, Member States in Asia and the Pacific region continued to develop their regulatory infrastructure for safety, with Agency support through national and regional TC projects. With new Member States joining the TC programme, particular attention was given to ensuring that they would develop adequate national radiation safety infrastructures to ensure the safe and secure handling of radiation sources. Additionally, Member States received support to develop national and regional action plans for the transport safety of radioactive material – a new thematic safety area for the region. The EC contributed to the implementation of five regional projects in the region in 2014, aimed at enhancing the capacity and capability of the region's Member States to comply with the IAEA Safety Standards. Support was provided for implementing regulatory infrastructure for safety (RAS/9/062, 'Promoting and Maintaining

Regulatory Infrastructures for the Control of Radiation Sources’), and in other thematic safety areas dealing with occupational radiation protection (RAS/9/064, ‘Strengthening the Transfer of Experience Related to Occupational Radiation Protection in the Nuclear Industry and Other Applications Involving Ionizing Radiation’), emergency preparedness and response (RAS/9/068, ‘Strengthening and Harmonizing National Capabilities for Response to Nuclear and Radiological Emergencies’), transport safety of radioactive material (RAS/9/067, ‘Strengthening an Effective Compliance Assurance Regime for the Transport of Radioactive Material’), and radiological protection of the public and environment (RAS/9/069, ‘Harmonizing Approaches and Measures for Radiation Protection of the Public and the Environment in Line with the International Safety Standards’). In 2014, 243 persons from the Asia and the Pacific region improved their qualifications through six workshops and seven training courses supported by the Agency. Special attention was paid to supporting networking and devising national and regional action plans for transport safety of radioactive materials as a new thematic safety area for the region, with due attention to national development differences across the region.

In Europe, nuclear and radiation safety, as well as nuclear security, remains a top priority for the region. TC projects covered various areas, including radiation protection of patients (RER/9/132, ‘Strengthening Member State Technical Capabilities in Medical Radiation Protection’) and workers (RER/9/116, ‘Strengthening Occupational Radiation Protection Systems’), operational safety of research reactors (RER/1/007, ‘Enhancing Use and Safety of Research Reactors through Networking, Coalitions and Shared Best Practices’) and power reactors (RER/9/131/, ‘Improving Operational Safety of Nuclear Power Plants’), decommissioning (RER/9/120, ‘Supporting Decommissioning Implementation for Facilities Using Radioactive Material’) and waste management (RER/9/107, ‘Strengthening Radioactive Waste Management Capabilities’), and regulatory aspects (RER/9/111, ‘Establishing a Sustainable National Regulatory Infrastructure for Nuclear and Radiation Safety’, and RER/9/130, ‘Strengthening and

Harmonizing National Capabilities for Response to Nuclear and Radiological Emergencies’, etc.).

Similar support was provided in Latin America and the Caribbean through a number of regional initiatives covering the entire range of priorities in radiation protection and nuclear safety. Several of these projects benefit significantly from the participation of bilateral and multilateral partners, who contribute not only financial resources but also technical expertise to Member States.

Governmental regulatory infrastructure for radiation safety

The regional TC project RAF/9/042, ‘Sustaining the Regulatory Infrastructure for the Control of Radiation Sources’, supported regional training courses in 2014 on Effective and Sustainable Regulatory Control of Radiation Sources in Mauritius (for English-speaking participants) and in Tunisia (for French-speaking participants). Senior regulators in Member States were informed on how to implement an effective and sustainable regulatory system that is consistent with the IAEA Safety Standards. As a result, the regulators of the African Member States now have the necessary tools to enhance the effectiveness of their regulatory bodies. The project also supported the first Regional Training Course on Regulatory Enforcement in August 2014. This group event, held in Sudan, trained regulators on how to implement a graded approach on enforcement decisions, commensurate with the severity of non-conformance and the conformance history of the authorized party, in accordance with IAEA Safety Standards.

Seventeen African Member States received assistance to attend the annual Nuclear Law Institute training session through regional project RAF/0/044 ‘Providing Legislative Assistance for the Preparation of Nuclear Related Law’. By the end of the training session, participants had acquired a solid understanding of all aspects of nuclear law and were able to draft, amend or review national nuclear legislation. In addition, the Agency reviewed draft nuclear related law legislation for two Member States (Kenya and Libya) to enable them to improve their legislation with a view to

submitting a comprehensive document to the national legislative body for adoption. Togo, a new Member State, visited the Agency to receive support for drafting their first nuclear related law to establish an appropriate legal framework.

Morocco confirmed at the 58th IAEA General Conference that it has enacted a nuclear law which brings together the current functions of two institutions: the Centre for Radiation Protection and the Ministry of Mines, which will be merged into one independent regulatory institution. The TC projects MOR/9/015, 'Strengthening Regulatory Infrastructure for Sustainable Radiological Protection of Workers, the Public and the Environment', and MOR/9/016, 'Improving Quality Management Systems for Regulatory Body Activities for Sustainable Radiological Protection of Workers, Patients, the Public and the Environment', were pivotal in supporting the Government of Morocco through the process of promulgating the law.

Assistance was provided for the establishment and development of national infrastructure for radiation safety in Cambodia and Nepal through the national projects KAM/9/001, 'Establishing a National Radiation Safety Infrastructure' and NEP/9/001, 'Developing and Establishing National Infrastructures for Radiation Safety'. Training in the essential elements of regulatory infrastructure and control of radiation sources was provided through fellowships. Personal dosimetry systems, including a set of thermoluminescent dosimeters and a reader, were procured for both countries. This should improve the occupational radiation protection and work place monitoring in these least developed countries.

In Romania, project ROM/9/032, 'Strengthening Regulatory Capabilities to Respond to New Challenges in the Nuclear Field and to Achieve a High Level of Expertise', supplements national efforts for the training of the staff of the Romanian National Commission for Nuclear Activities Control. Training covers nuclear safety, radiation safety, the management of spent fuel and radioactive waste, and EPR. IAEA experts participated in the review of safety assessment reports for siting a disposal facility in Saligny, and made recommendations related to the Preliminary Decommissioning Plan for

Cernavoda NPP. In addition, five national workshops and one national training course were organized. During the workshop Development and Regulatory Review of the Safety Case for Institutional Radioactive Waste and Radioactive Waste Generated from Fuel Fabrication, the participants received information about the methodology for the General Safety Guide No. GSG-3 *The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste* and the safety assessment framework tool for use at the Magurele Radioactive Waste Treatment Facility.

Armenia has established a national programme in anticipation of future challenges in nuclear energy, as well as for strengthening nuclear safety, operational reliability and radiation protection for ANPP. Project ARM/9/025, 'Upgrading National Nuclear Regulatory Infrastructure', supports the upgrade of national infrastructure and the establishment of mechanisms required for the licensing of safety modifications of ANPP, lifetime extension and the construction of new NPP units in Armenia. In 2014, the IAEA provided support to the Nuclear Radiation and Safety Center (NRSC) through scientific visits to other technical support organizations (Czech Republic, France and Russian Federation) as well as via conference participation (WVER Regulator). Additional radiation monitoring equipment was also provided to the NRSC within the project.

In Latin America and the Caribbean, the regional project RLA/9/079, 'Enhancing Governmental and Regulatory Safety Infrastructure to Meet the Requirements of the New IAEA Basic Safety Standards', plays a key role in supporting countries in the region to enhance their regulatory infrastructure for radiation safety. A key project activity is to provide a Spanish-version of the Agency's Self-Assessment of Regulatory Infrastructure for Safety (SARIS), to assess the status of implementation of the new International Basic Safety Standards (GSR-3) and to build an IT tool that will help regulators plan, perform and follow up regulatory inspections. This project benefits from the active participation of the Spanish CSN and the USNRC.

Also focusing on establishing sustainable national regulatory infrastructure in countries with urgent needs, project RLA/9/071, ‘Establishing Sustainable National Regulatory Infrastructures for the Control of Radiation Sources in Haiti, Belize, Jamaica and Honduras’, has been instrumental in supporting participating Member States, as well as new IAEA Member States, in this area. Through the project, Jamaica is continuing to enhance the operational capabilities of its regulatory body until the Jamaican Parliament passes a comprehensive nuclear law that establishes a comprehensive framework for the use of nuclear technology and gives legal standing to the current regulatory infrastructure. A high level Honduran delegation visited the Agency to discuss the country’s progress in consolidating achievements already made and fostering additional improvements. The project is implemented in close cooperation and partnership with the USNRC.

Supporting safety in nuclear power plants and research reactors

Under the national TC project EGY/9/042, ‘Strengthening the Regulatory Inspection of Nuclear and Radiological Installations’, assistance was provided to the recently established Egyptian Nuclear and Radiological Regulatory Authority (ENRRA) in training and qualifying regulatory body Inspectors. The project has contributed to improving the inspection of nuclear and radiological installations and the regulation of nuclear and radiological facilities in Egypt. Assistance was also provided – and will be continued – to qualify and train members of the ENRRA inspection unit to carry out regulatory inspections throughout the whole lifetime of a facility, especially NPPs. This includes siting, design and construction, commissioning, operations, decommissioning and closure.

Radiation protection of workers, patients and the public

In Africa, the development of national strategies and programmes for the safe management of radioactive wastes, public exposure and naturally occurring radioactive materials (NORMs) are urgently needed at the regional level. Many problems in the region, such as incomplete implementation of laws and regulations,

difficulties in staffing regulators and operators with adequately skilled professionals, the historical legacy of radioactive waste, the lack of adequate processing, storage and disposal facilities, and NORM and orphan source issues, have common causes and characteristics, and resources can be optimized by tackling these challenges using a regional approach.

The regional TC project RAF/9/051, ‘Strengthening the Regulatory Framework and National Infrastructure for Safe Management of Radioactive Waste and Protection of Public and Environment’, builds on previous efforts initiated under RAF/9/045, ‘Strengthening Regulatory Frameworks and National Infrastructures for the Control of Public Exposure and Radioactive Waste Management’, to improve the regional safety profile with regard to the public, the environment and waste management. The project aims to further improve waste management and radiation safety in Member States in order to mitigate the risks of public and environmental exposure. The project will support the establishment of national regulations for the control of public exposure in accordance with the IAEA Safety Standards, and regulations and programmes to deal with NORMs and orphan sources will also be developed.

Following the first project coordination meeting in the United Republic of Tanzania in July 2014, a workshop on guidance for environmental impact assessment for planned exposure was organized in English and French. A further technical workshop was held to assist participating Member States to develop tailored model regulations for the safe management of radioactive waste. Expert missions have also been provided to some Member States to review their national regulations or provide support in the development of safety cases for predisposal management of radioactive waste (for example, in Mauritania and Mauritius). The project is benefitting from strong donor support from Japan, Spain and the USA.

Improved cooperation between radiation regulatory authorities, health professionals and authorities, and professional societies of different medical radiation applications is recognized as critical for better patient care and safety in medical practice. The regional project RER/9/132, ‘Strengthening Member State Technical



RER/9/132: Participants at workshop on practical approaches to justify and optimize radiation protection in medicine, Prague, December 2014.

Capabilities in Medical Radiation Protection’, aims to strengthen Member States’ capabilities in medical radiation protection, in particular with regard to the establishment of national systems for safety in medical exposure that are in line with the revised International Basic Safety Standards, and well incorporated in larger systems for ensuring good medical practice. Participants at a workshop in December 2014 exchanged experiences on practical approaches to justify and optimize radiation protection in medicine, and on planning collaborative actions among radiation protection authorities, health authorities and professional societies to further facilitate implementation of national programmes on medical exposure control and patient safety.

Significant gaps exist in Member States in Latin America in terms of effective and sustainable implementation of occupational and medical radiation protection programmes that are in line with international safety requirements. Over 100 professionals in Latin America received hands-on training on the radiation protection of patients and workers in 2014, with the support of RLA/9/075, ‘Strengthening National Infrastructure for End-Users to Comply with Regulations and Radiological Protection Requirements’. In addition,

significant work has been done to advance the elaboration of national education and training strategies and action plans on radiation safety.

A national project in Nicaragua, NIC/9/005, ‘Strengthening Occupational and Medical Radiation Protection through Improving Human Resource Capabilities and Infrastructure of the Radiation Physics and Metrology Laboratory (UNAN-Managua) and Establishing a National Dose Register’, has provided training and equipment to consolidate the National Dose Register and begin the introduction of the safety culture concept into the country.

Transport safety²⁹

In the Latin America region, TC project RLA/9/079, ‘Enhancing Governmental and Regulatory Safety Infrastructure to Meet the Requirements of the New IAEA Basic Safety Standards’, provided support for the establishment of the Latin American and Caribbean Transport Network. This regional network is expected to contribute to strengthened safety and security in the transport of radioactive materials, and to promote a coordinated approach among Member States in implementing and enforcing transport regulations.

²⁹ This section responds to section 4, operative paragraph 6 of resolution GC(58)/RES/12 on the shipment of radioactive materials and IAEA Regulations for the Safe Transport of Radioactive Material.



Representatives of the Gulf Cooperation Council Member States participated in workshops and discussions at the IAEA's headquarters in Vienna, March/April 2014.

Emergency preparedness and response

The Cooperation Council for the Arab States of the Gulf (CCASG) has undertaken a significant effort to establish a coordinated regional emergency preparedness and response (EPR) capability for nuclear and radiological emergencies. An expert review of the development and implementation of the regional radiological and nuclear emergency preparedness plan (RNEPR) has been carried out with the support of the regional TC project RAS/2/015, 'Supporting the Introduction of Nuclear Power for Electricity Generation and Seawater Desalination'. Participants from the six CCASG countries reviewed and discussed the final RRNEPR, taking into consideration lessons learned from the Fukushima accident. The execution of the RNEPR is the responsibility of the CCASG Emergency Management Center in Kuwait, which is the organization responsible for preparedness and response to radiological and nuclear events in the region. The RNEPR aims to coordinate and harmonize the response of the participating Member States to any nuclear or radiological emergency in the region, and is the first of its kind in the region.³⁰

In Georgia, personnel have been trained in operating up-to-date radiation monitoring systems through GEO/9/009, 'Enhancing the Capabilities of Remote Radiation Monitoring Stations'. A communication system for radiation data transmission at the stations

was established and the staff at the central and satellite stations were trained to handle the new system.

TC project RLA/9/076, 'Strengthening of National Capabilities for Response to Radiation Emergencies', aims to strengthen medical capabilities for responding to radiation emergencies in selected countries in Latin America, and to establish capacity building centres (CBC) on EPR and ensure compliance with international emergency response standards at the country level. In 2014, the procedure to activate the Latin American Biological Dosimetry Network in case of emergency situations was updated and harmonized. A syllabus for the School of Radiation Emergency Management has been developed, and a practical demonstration of stem cell therapy has been made by French experts working on a real emergency case at a potential CBC. French and Brazilian experts worked together to treat an overexposed patient with Mesenchymal Stem Cell therapy and a group of medical doctors from the potential capacity building centres of the region were trained in the Hospital Percy, France, on stem cell production, surgical treatment and stem cell therapy. The EU and the Government of France are participating actively in the project as technical, strategic and financial partners.

A regional workshop on the application of the revised IAEA Safety Standards in emergency exposure situations was conducted in May 2014 in

³⁰ This paragraph responds to section 2, operative paragraph 5 of resolution GC(58)/RES/12 on providing assistance and support services to Member States, and to identify and implement the lessons learned from the Fukushima accident.

Vilnius, Lithuania, with the support of RER/9/130, ‘Strengthening and Harmonizing National Capabilities for Response to Nuclear and Radiological Emergencies’. Thirty-one participants were introduced to recent IAEA EPR guidance, and had the opportunity to discuss management problems and other challenges to the achievement of compliance with the advanced EPR requirements. Experts also presented examples of how to ensure adequate EPR capabilities at the local, regional and national levels.

Radioactive waste management, decommissioning and environmental remediation

In Europe, four meetings and one training course were carried out to provide information about best practices in radioactive waste management under regional project RER/9/107, ‘Strengthening Radioactive Waste Management Capabilities’. Considerable efforts were made in 2014 to help regulators and operators establish technically sound and safe practices for predisposal management of radioactive waste, and to reach common understanding in this area.

In the same region, Member States affected by past open-mine uranium extraction improved their practical competencies for environmental remediation activities in two sequential regional training courses with the support of RER/7/006 ‘Building Capacity for Developing and Implementing Integrated Programmes for Remediation of the Areas Affected by Uranium Mining’. Three expert missions were implemented, with the goal of improving the training curriculum developed by the hosting organization, the Central Institute for Continuous Education and Training in Obninsk, Russian Federation. Representatives from five target countries – Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan and Ukraine – increased their knowledge of the management of complex reclamation projects. Activities under the project were co-financed by the Russian Federation.

Also in Europe, two workshops were held in 2014 to discuss long term surveillance programmes and site-specific monitoring for remediated uranium production legacy sites (UPLS), with the support of RER/9/122,

‘Supporting Safe Management of Uranium Production Legacy Sites’. In addition, a regional training course on human and environmental risk assessment for UPLS was held in Vienna to train UPLS operators and regulators in using the dose and safety assessment software ERICA and NORMALYSA.

With the support of SLO/9/015, ‘Strengthening Regulatory Capabilities of the Nuclear Safety Administration’, and SLO/9/016, ‘Supporting Radioactive Waste and Spent Fuel Management for the Implementing Organization’, five Slovenian regulators and operators visited the Belgian Nuclear Research Centre SCK•CEN to learn about spent fuel and radioactive waste disposal, development of spent fuel and waste acceptance criteria, influence of biosphere, geology and hydrology. The hosts also provided information on safety assessments and the regulatory review process, based on Belgium’s experiences. The visit offered a unique mixture of hands-on and lecture-based training for both regulators and operators, and has provided the counterparts with necessary information on the development and review of a safety case, as well as on the licensing process for a spent fuel and radioactive waste disposal facility.

The regional project RLA/9/078, ‘Enhancing the National Regulatory Framework and Technological Capabilities for Radioactive Waste Management’, is successfully strengthening national spent fuel (SF) and radioactive waste management (RWM) capabilities in Latin American and the Caribbean Member States. In 2014, high level governmental decision makers were made aware of the importance of implementing national policies and strategies on SF and RWM, and as a result, four Member States developed and approved national SF and RWM policies and strategies. Three of these countries are preparing their accession to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Through the project, a number of regulatory authorities have received technical advice to strengthen and update their regulatory framework on RWM, and the licence process for the central storage facilities of four Member States has been concluded. The project also contributed to the removal of high activity sources from Honduras by assisting in the preparation of the



RLA/9/078: A practical exercise at the central storage facility of Managua, Cuba at the 'Regional Workshop on management of Radioactive Waste and Disused Radioactive Sources', October 2014.

licencing documentation needed to authorize the transport of such types of radioactive sources.

In 2014, multiple activities were concluded under BRA/9/057, 'Strengthening the Regulatory System to Ensure Alignment of the Safety of Nuclear Fuel Cycle Facilities to the Best International Practice'. The project objective is to strengthen the Brazilian nuclear fuel cycle facility regulatory system by aligning it with international best practices in all relevant safety issues. Activities included an IAEA-USNRC joint workshop on the regulatory processes involved in decommissioning and remediation of nuclear fuel cycle facilities, and an expert mission on regulatory oversight and operational safety of underground uranium mines. A workshop on occupational radiological protection of uranium dioxide reconversion plants also took place, with the goal of providing participants with practical information based on IAEA safety standards and current best practice in occupational radiological protection.

In Cuba, the management of radioactive waste in the country has been improving. In line with national efforts in this area, the project CUB/9/018, 'Strengthening

Technological Capabilities for Conditioning and Long-Term Storage of Radioactive Waste and Disused Radioactive Sources', aims to strengthen national capabilities and the waste management programme so that the storage facility complies with all regulatory requirements, and has the necessary technical and safety conditions to guarantee the adequate preservation and retrievability of waste for future final disposal. Technical capabilities for the conditioning and safe long term storage of radioactive waste and disused radioactive sources were strengthened through staff training, advisory missions and the improvement of physical infrastructure.



Nuclear knowledge development and management

The AFRA Network for Education in Science and Technology (AFRA-NEST) contributes to foster sustainable human resource development and nuclear knowledge management. It aims to satisfy the needs of Member States in the region with higher education in the priority areas of non-power and power applications of nuclear energy.

In 2014, arrangements were finalized for Ghana to host the Cyber Learning Platform for Nuclear Education and Training for the African region. The network uses this platform to encourage senior nuclear professionals to share their experiences and knowledge. Nigeria also hosted the first meeting of AFRA-NEST National Coordinators, with the aim of updating an inventory of the existence and topical scope of educational, training and research institutions related to nuclear science and technology in the region. The meeting also developed a prioritized action plan, based on the Education Capability Assessment and Planning (E-CAP) toolkit for establishing national Networks for Education in Science and Technology (NESTs). AFRA-NEST integrates all available higher education capabilities in Africa, as well as the industries and nuclear professional associations, in synergy with existing IAEA and other regional/international nuclear educational institutions.

Member States in Asia and the Pacific continue to support the development of nuclear power and have taken

concrete preparatory steps to ensure the sustainability of nuclear knowledge management. Agency assistance provided through national and regional projects has strengthened national capabilities for the development of national nuclear power infrastructures in embarking countries such as Bangladesh, Malaysia and Viet Nam, as well as supporting countries operating NPPs.

A general strategy to establish the competencies needed for nuclear physics research work and to provide suitably trained staff and appropriate laboratory equipment to Samarkand State University, Uzbekistan, has improved educational approaches and standards at the University, as a result of UZB/0/006, 'Improving the Standards of Education in Applied Nuclear Science'.

Educational capacity at Kabul University's Department of Physics has been enhanced under project AFG/0/004, 'Development of Nuclear Physics Laboratory for Bachelor and Master Students'. The Department has received a complete set of training instruments for nuclear science experiments, and two scientists have been trained at the Agency's Laboratories in Seibersdorf, enabling them to deliver training at both Bachelor and Master levels.

TC project RAS/0/065, 'Supporting Sustainability and Networking of National Nuclear Institutions in Asia and the Pacific Region', aims to enhance the use of



RAS/0/065: The Compendium aims to encourage high school students, like these students in Malaysia, to pursue careers in science, technology, engineering and mathematics.

well-established networks for knowledge sharing and education. The IAEA, in collaboration with a specialist advisory group comprising experts from Australia, Finland, India, Israel, Japan, Republic of Korea and the USA, has developed A Compendium of Resources and Activities for Secondary School Teachers and Students on Nuclear Science and Technology. This collection of extra-curricular programmes and activities for secondary school teachers and students aims to increase nuclear curiosity, awareness and knowledge among students.

The pilot phase of the Compendium was launched in October 2014 in Indonesia, Malaysia, Philippines and the United Arab Emirates. These countries have active nuclear programmes in various fields, including nuclear energy, and have been carrying out a range of activities to increase awareness and appreciation of nuclear science and technology. Pilot activities are carried out in 22 schools selected by the national authorities and will engage thousands of students and their teachers in the current and next school year. These students are potentially the next generation of nuclear professionals in the Asia and the Pacific region.



RAS/0/065: DG Amano visits the students of San Francisco High School, Philippines, one of the pilot schools for the outreach programme.

Annex 2. Programme for Action for Cancer Therapy



Annex 2.

Programme for Action for Cancer Therapy



imPACT review missions and follow up

PACT conducted comprehensive cancer control capacity and needs assessments, known as imPACT review missions, in 10 Member States: Costa Rica, Croatia, Fiji, Georgia, Lao People's Democratic Republic, Mozambique, Panama, Peru, Rwanda and Uzbekistan. These review missions address the whole spectrum of cancer control: cancer control planning, cancer information and registration, prevention, early detection, diagnosis, treatment and palliative care, as well as relevant civil society activities. Since PACT's inception, a total of 69 Member States have received an imPACT review mission. Conducted in collaboration with WHO and IARC, imPACT review missions provide Member States with a situation analysis of the national cancer control capacity and recommendations for the development or strengthening of comprehensive national cancer control programmes.

The effectiveness of these missions has been enhanced through the systematic participation of TC Programme Management Officers and radiation safety experts. The structure and timeliness of imPACT reports were improved with a view to facilitate the implementation of expert recommendations at the country level. Specifically, the reports now include information

on relevant agencies to support Member States to implement report recommendations and initiate follow-up actions. During each imPACT review mission the importance of compliance with international quality assurance and radiation protection standards was highlighted.

Fiji: The comprehensive cancer control capacity and needs assessment in Fiji was conducted in March 2014. Fiji has no radiotherapy services and the Ministry of Health sends radiotherapy patients (on a cost share basis) every year to Australia, India or New Zealand. According to the Minister of Health Dr Neil Sharma, 'Fiji intends to establish a radiotherapy facility beginning with a basic radiotherapy facility followed by a gradual expansion to meet the growing demand for cancer treatment. The future centre will serve to consolidate the cancer care and management services for better care of patients and their families. The imPACT review will help us develop the priority cancer control interventions, including the establishment of a radiotherapy facility that will have the desired health outcomes.'

Georgia: An imPACT review mission was conducted in July and August 2014 in response to a request from the Georgian Ministry of Labour, Health and Social Affairs and the National Centre for Disease Control

and Public Health for assistance with the development of the National Cancer Control Action Plan, which is based on the National Cancer Control Strategy for 2013–2018. All cancer treatment modalities are available in Georgia: radiation oncology with four operational radiotherapy units, surgical oncology and medical oncology (at secondary and tertiary health care levels). Georgia expects the imPACT review to assist in guiding the expansion of national radiotherapy services and to ensure their full integration into a comprehensive cancer care and population health system.

Mozambique: A comprehensive cancer control capacity and needs assessment was conducted in Mozambique in August 2014. Key challenges related to the development and implementation of a comprehensive cancer control plan are: (i) human resource needs for different disciplines related to cancer care and control; (ii) capacity requirements in infrastructure, equipment and workforce at the tertiary level to ensure access to timely and efficient treatment for early detection programmes; and, (iii) lack of radiotherapy services. The IAEA representatives in the imPACT review mission team were received by senior officials of Mozambique, including the Minister of Health and the Minister of Energy. The team was also received by the First Lady of Mozambique, and raised awareness of the need to have a radiation safety law in place, as well as the need to strengthen the current national radiation safety infrastructure to ensure the safe use of radiation sources, such as those used in radiotherapy.

Lao People's Democratic Republic: A comprehensive cancer control capacity and needs assessment for Lao People's Democratic Republic was conducted in April 2014. The Ministry of Health established the seventh Five-Year Health Sector Development Plan 2011–2015, which includes the establishment of a cancer centre with radiotherapy and chemotherapy facilities in Vientiane. National authorities are committed to fight cancer and a strong dedication among cancer care health professionals was observed.

Rwanda: An imPACT review mission to Rwanda was conducted in November 2014. The Ministry of Health established the Non-communicable Disease

National Strategic Plan (July 2014 – June 2019), which also addresses cancer. At present, four hospitals are delivering cancer care. There is a national plan to allocate resources to all cancer care components (including radiation therapy) at eleven provincial hospitals and one centre of excellence.

Uzbekistan: An imPACT review mission to Uzbekistan was conducted in March/April 2014. The Ministry of Health has developed a National Strategy for Prevention and Control of Non-communicable Diseases 2014–2020 and an Action Plan. A project seeking to upgrade the national radiotherapy capacity is underway which, once completed, is expected to result in 16 regional centres.

Panama: An imPACT review mission to Panama was conducted in February 2014. Panama developed plans and programmes for non-communicable diseases and a National Cancer Control Plan for the period 2010–2015. Public and private institutions provide cancer treatment, and the National Oncology Institute is dedicated to cancer. Furthermore, the country has a well-functioning palliative care programme. Following the mission, recommendations on cancer registration, palliative care, radiation protection and radioactive source control are being implemented.

Peru: An imPACT review mission to Peru was conducted in June/July 2014. Peru has many elements in place to advance its cancer control efforts. The Government is committed to fight cancer and has developed a national cancer control plan ('Plan Esperanza') for 2012–2016 which seeks to improve access to oncology services. Further to the mission and its recommendations, a proposal for a TC project to strengthen human resource capacities in the areas of nuclear sciences and application for cancer prevention, diagnosis and control is under development.

Croatia: A comprehensive cancer control capacity and needs assessment to Croatia was conducted in September/October 2014. A full range of cancer care services are available where needed and national centres of excellence exist. Recommendations in the imPACT report focus on guidance for the advancement of cancer control and the expansion of cancer treatment facilities in the country.

Costa Rica: A comprehensive cancer control capacity and needs assessment to Costa Rica was conducted in December 2014. Radiotherapy capacities had been assessed in a previous mission in 2013. The comprehensive National Cancer Prevention and Control Plan 2012–2017 includes activities concerning the whole cancer control continuum, from prevention to palliative care.

PACT Model Demonstrations Site (PMDs) support at country level

The PACT Model Demonstrations Sites Ghana, Mongolia, Nicaragua, Sri Lanka, United Republic of Tanzania and Viet Nam were supported through expert missions and the provision of training and equipment. For example, Ghana's and United Republic of Tanzania's cancer control plans were reviewed, progress assessed and priority cancer control areas for each country identified. The United Republic of Tanzania advanced in a palliative care project and its Ocean Road Cancer Institute received five paediatric care beds funded through the UN Women's Guild, Vienna.

In Viet Nam, counterparts launched a project on the early diagnosis of breast and cervical cancer to systematically raise public awareness of cancer-related signs and symptoms, and diagnosis at earlier stages to ensure timely treatment and follow up. The implementation of a cervical and breast cancer diagnosis project in Nicaragua was supported through an evaluation of mammography services and of related staff training in May 2014. An expert mission was conducted in November 2014 to assess the current status of Mongolia's radiation oncology and medical physics. The country also received extrabudgetary funds in 2014 to upgrade radiotherapy TPS hardware and software at the National Cancer Centre in Ulaanbaatar.

Virtual University for Cancer Control (VUCC)

A critical barrier to providing cancer care in LMICs is the profound shortage of health professionals. According to WHO, 57 countries worldwide are experiencing a critical shortage of health professionals,

including 36 in sub-Saharan Africa. In order to achieve sustainable cancer control capacity in developing countries, and in Africa in particular, a dramatic surge in the number of professionals trained locally or regionally is needed across the various areas of cancer control. Additionally, measures must be put in place to strengthen local recruitment and ensure retention of graduates from national training programmes.

To address this need, PACT is supporting the establishment of a Virtual University for Cancer Control (VUCC), in collaboration with WHO, IARC, the UICC, the US National Cancer Institute (US NCI) and the African Organisation for Research and Training in Cancer (AORTIC). The project seeks to support and enhance national programmes to build human resource capacity in cancer control. VUCCnet, a web-based e-learning platform, will make educational materials more easily accessible for trainees – and is further intended to support the establishment of training and mentorship networks. The project has received financial support from the Roche Africa Research Foundation, as well as the USA.

In the pilot phase of the project, Ghana, Uganda, United Republic of Tanzania and Zambia comprise the initial cadre of first-phase countries. South Africa and Egypt have agreed to operate as mentor countries to the project, as both have considerable educational capacity and can provide access to institutions focused on training cancer professionals.

To date, a number of milestones have been achieved. Three courses have been developed and deployed to the e-learning platform, including Cervical Cancer Prevention and Early Detection, *Cancer Skills Package for Community Health Workers and Palliative Care*. Since January 2014, five hundred students across the pilot countries have accessed these courses on the VUCCnet platform. Additional courses are in development, and the initial full curriculum is anticipated to be comprised of 10 modules spanning the cancer control continuum.

Upon completion of the first phase of the project, it is envisioned that VUCCnet will have a governance structure that will be implemented through coordination among participating countries within the region. This

coordination mechanism is expected to provide an opportunity to harmonize regional policies for health care credentials and facilitate standardization of the path that aspiring African health professionals must take to reach certification.

Training for health professionals

In addition to the VUCCnet initiative, PACT is also active in providing and facilitating training for health professionals. In many cases, the human resource and training needs identified through the imPACT Review process have led to targeted and specific training for relevant professionals in LMICs. In collaboration with partners such as the Korea Institute of Radiological and Medical Sciences (KIRAMS) and the US National Cancer Institute, more than 150 health professionals from around the globe have received cancer-related training.

PACT has facilitated two training courses conducted to enhance national cancer control capacities: *Developing a Radiotherapy Plan within the National Cancer Control Programme*, in Ljubljana and *Priority Actions for Cancer Control Planning Based on imPACT Review Experience*, in Vienna.

Advisory Group on Increasing Access to Radiation Technology (AGaRT)

PACT, with the support of the Division of Human Health and the Division of Radiation, Transport and Waste Safety, created the Advisory Group on Increasing Access to Radiation Technology (AGaRT) in low and middle income countries in 2009.

AGaRT was designed to act as a platform of collaboration between regional radiation oncology experts (radiation oncologists and medical physicists) from LMICs and the radiotherapy equipment vendors to address the needs in, and shortage of radiotherapy services in LMICs.

The fifth meeting of the AGaRT convened in Vienna in October 2014. Group members developed *Guidelines to Ensure Basic Radiotherapy Solutions with Guaranteed Long Term Functionality for LMI Countries*, which provide advice to countries embarking on the process of

establishing or expanding their radiotherapy services.

The Guidelines establish best practices for facility maintenance, life cycle costing, comprehensive procurement processes and ongoing professional training, as well as describe the radiotherapy package recommended for a basic radiotherapy clinic. Once published, the Guidelines are expected to support LMICs in improving the sustainability of their radiotherapy investments and, therefore, contribute to increased access to affordable and appropriate radiotherapy treatment.

Annex 3. TC programme Fields of Activity, Grouped for Reporting Purposes³¹

Nuclear Knowledge Development and Management

- Capacity building, human resource development and knowledge management (01)
- Building national nuclear legal infrastructures (03)

Industrial Applications/Radiation Technology

- Reference products for science and trade (02)
- Research reactors (08)
- Radioisotopes and radiation technology for industrial applications (18)

Energy Planning and Nuclear Power

- Energy planning (04)
- Introduction of nuclear power (05)
- Nuclear power reactors (06)
- Nuclear fuel cycle (07)

Food and Agriculture

- Crop production (20)
- Agricultural water and soil management (21)
- Livestock production (22)
- Insect pest control (23)
- Food safety (24)

Health and Nutrition

- Prevention and control of cancer (25)
- Radiation oncology in cancer management (26)
- Nuclear medicine and diagnostic imaging (27)
- Radioisotopes, radiopharmaceuticals and radiation technology for health care applications (28)
- Dosimetry and medical physics (29)
- Nutrition for improved health (30)

Water and the Environment

- Water resources management (15)
- Marine, terrestrial and coastal environments (17)

Safety and Security

- Governmental regulatory infrastructure for radiation safety (09)
- Safety of nuclear installations, including siting and hazard characterization (10)
- Governmental regulatory infrastructure for nuclear installations safety (11)
- Radiation protection of workers, patients and the public (12)
- Transport safety (13)
- Nuclear security (14)
- Emergency preparedness and response (16)
- Radioactive waste management, decommissioning and environmental remediation (19)

³¹ The field of activity number is shown in parentheses.



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