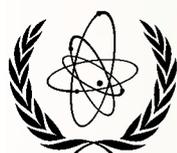


Technical Cooperation Report for 2010

Report by the Director General



IAEA

International Atomic Energy Agency

Technical Cooperation Report for 2010

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PREFACE

The Board of Governors has requested the transmission to the General Conference of the attached Technical Cooperation Report for 2010, the draft of which was considered by the Board at its June 2011 session.

The Director General is also hereby reporting in fulfilment of the request contained in resolution GC(54)/RES/9 on “Strengthening of the Agency’s technical cooperation activities”.

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Summary

This year's Technical Cooperation (TC) Report 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 2010, organized according to region and thematic area.

This year, part A of the Report concentrates on a number of overarching themes: TC activities related to cancer; human resource and capacity building; and safety. Part A also contains an information box on the TC programme's contributions to the achievement of the Millennium Development Goals (MDGs). In addition, Part A offers some key facts and figures on the management of the programme.

The Director General highlighted the IAEA's efforts to address cancer throughout 2010, and this Report reflects that topical focus, describing how the TC programme has helped Member States to fight this growing challenge. Projects around the world are helping to create a new corps of trained professionals who are already on the frontline of the fight against cancer. In Africa, government cost-sharing and partnerships with the private sector are helping to enhance cancer care, while in Asia and the Pacific, improving the quality of radiotherapy, nuclear medicine and diagnostic radiology through the establishment of medical physics programmes have emerged as major areas of technical cooperation in the region. In Europe, the focus is strengthening quality systems in radiation medicine and modernizing existing facilities through government cost-sharing, while in Latin America support to local cancer centres, particularly those that deal with cervical cancer, is contributing to local efforts to control the disease and improve patient survival rates.

Lack of human resource capacity affects the development of many Member States, and the technical cooperation programme addresses the challenge using a range of approaches that take into account the specific needs of the recipient country. While most activities under individual TC projects aim to build human capacity in a particular sector,

additional national and regional projects are devoted specifically to education, training and knowledge management. In Africa in 2010, training was enhanced by the provision of support to information and communications technologies through the establishment of three new telecentres, while in the Asia and the Pacific region, a mentorship programme, designed to support the human resource development needs of countries with nuclear power programmes, was continued in collaboration with the Republic of Korea. An innovative pilot course on drafting legislation, the School for Drafting Regulations was held in Europe in 2010, and will be continued in 2011. In Latin America, meetings were held to support a sustainable increase in the use of research reactors, focusing on networking, exchange of experience, knowledge preservation and the training of human resources. Another area of focus for training in 2010 was strengthening project design capacity in Member States in preparation for the 2012–2013 TC programme cycle.

Ensuring nuclear safety and security is a key factor in all TC projects. The report details specific efforts to implement the IAEA's safety requirements, as well as the support provided to enhancing national nuclear security measures. Many projects focus on legislative assistance, while others concentrate on technical issues. The TC programme is managed and coordinated under Major Programme 6, in close coordination with the other Major Programmes, each of which provide essential and substantive expertise to the TC programme, covering areas such as nuclear energy, non-power nuclear applications, infrastructure development, nuclear safety and security, and safeguards.

The implementation rate for the Office of Internal Oversight Services (OIOS) recommendations since 2002 has reached 68%. OIOS carried out four TC related evaluations in 2010 on: safety of nuclear installations; contribution and role of the FAO/IAEA Agriculture and Biotechnology Laboratory; project planning and achievement of objectives; and National Liaison Officer (NLO) function and structure. Achievements in planning, impact and

sustainability were noted, and common areas for further improvement continued to be identified. Problems in rolling out project results to end users were highlighted, particularly the need to reach farmers.

Part B of this document presents a summary of indicators, reviewing mobilization of resources for TC through the Technical Cooperation Fund (TCF), and presenting extrabudgetary and in-kind contributions. Programme delivery is expressed using both financial and non-financial indicators. Pledges to the TCF totalled \$78.4 million (not including national participation costs (NPCs), assessed programme cost arrears (APCs) and miscellaneous income), or 92.3% of the \$85 million TCF target set for 2010. For the technical cooperation programme as a whole, new resources stood at \$127.6 million, up from the 2009 total of \$112.2 million. The TC programme as a whole disbursed a total of \$114.3 million (including in-kind), and achieved an implementation rate of 76.6% (\$123.2 million in new obligations).

Part C of this document responds to the operative paragraphs of resolution GC(54)/RES/9, dealing with assistance to Member States in the peaceful, secure and regulated application of atomic energy

and nuclear techniques in specific fields. This part highlights activities and achievements in technical cooperation in each of the regions in 2010, describing regional emphases and responses to national priorities.

Programme distribution in 2010 differed considerably between the regions. Food and agriculture accounted for the highest percentage of disbursements in the Africa region, followed by human health. In Asia and the Pacific, the highest disbursements were in the area of nuclear safety, followed by radioisotope production and radiation technology. In Europe, nuclear science took the lead, followed by nuclear safety, and in Latin America, the highest percentage of disbursements was in the field of human health, followed by food and agriculture.

Project examples are presented in Annex 1 according to thematic area, covering human health, agricultural productivity and food security, water resource management, environmental protection, industrial applications, and sustainable energy development.



Meeting of Latin America NLOs, Guatemala, 22–26 March 2010.

The Agency's Technical Cooperation Programme at a Glance

(as at 31 December 2010)

2010 target for voluntary contributions to the Technical Cooperation Fund	\$85 million
Rate of Attainment (on pledges) at the end of 2010	92.3%
New resources for the technical cooperation (TC) programme	\$127.6 million
<i>Technical Cooperation Fund</i> ¹	\$79.7 million
<i>Extrabudgetary resources</i> ²	\$45.6 million
<i>In-kind contributions</i>	\$2.2 million
Adjusted budget ³ for 2010 TC programme	\$160.9 million
TC programme disbursements (including in-kind)	\$114.3 million
Programme implementation rate	76.6%
Countries/territories receiving support	129
Revised Supplementary Agreements	115
Country Programme Frameworks (CPFs) signed in 2010	23
Currently valid CPFs	65

¹Including TCF payments for previous years, NPC, APC, miscellaneous income.

²Please refer to Table A.5 of the Supplement to this Report for details. Table A.5 does not include the \$0.2 million from UNDP (TC receives this money for expenditures already incurred).

³Adjusted 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.

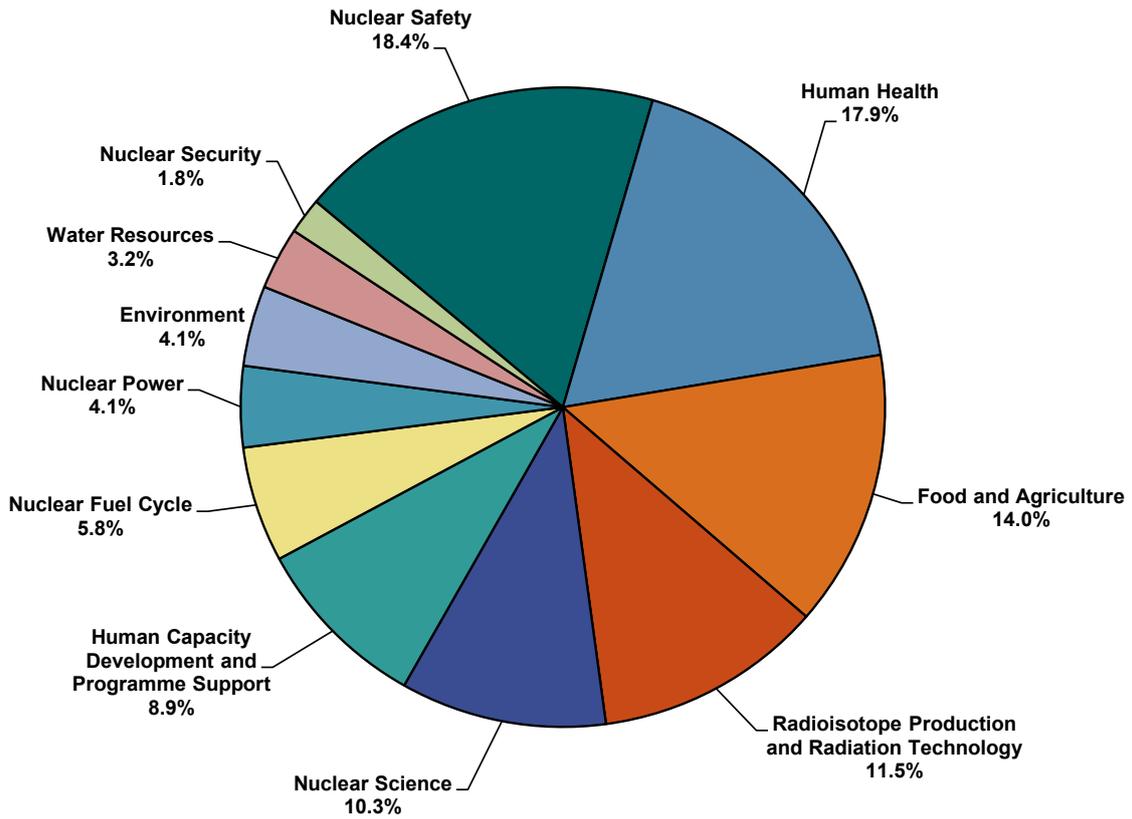


Fig. 1. Disbursements by Technical Field for 2010 (Nuclear safety includes transport safety and safe management of radioactive waste, nuclear fuel cycle includes predisposal and disposal of nuclear fuel waste).⁴

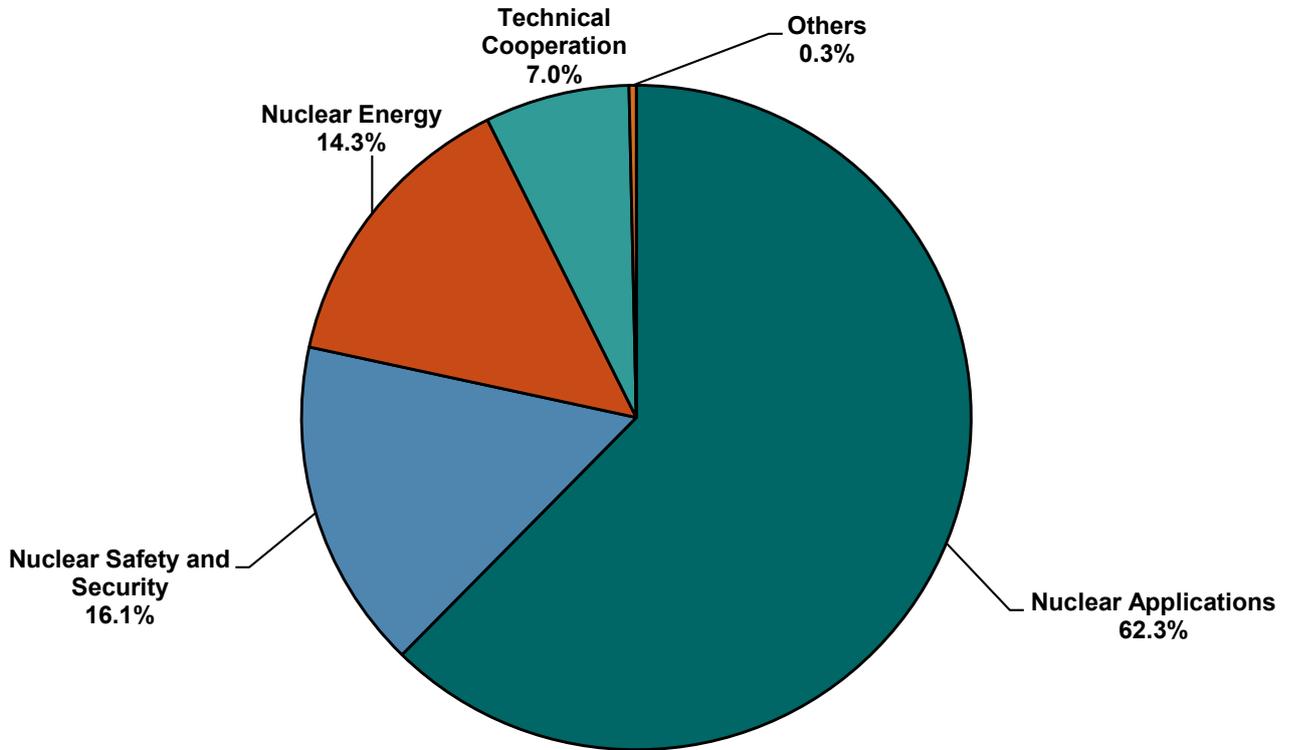


Fig. 2. Technical Department support for TC programme implementation according to Department of primary technical officer for each project. Pie chart does not represent financial contributions.

⁴ Throughout this report, percentages in charts may not add up to 100% exactly due to rounding.

Technical Cooperation Report for 2010

Report by the Director General

1. This document responds to the request by the General Conference to the Director General to report on the implementation of resolution GC(54)/RES/9.

2. Part A of the document provides an overview of technical cooperation activities from 1 April 2010 to 31 March 2011. It concentrates on efforts to address cancer, develop human resource capacity, and strengthen safety. It also offers some key facts and figures on the management of the programme in 2010.

3. Part B presents a summary of financial indicators, reviewing mobilization of resources for

TC through the Technical Cooperation Fund, and presenting extrabudgetary and in-kind contributions. Part B also offers an overview of programme delivery, with both financial and non-financial indicators.

4. Part C responds to the operative paragraphs of resolution GC(54)/RES/9, dealing with assistance to Member States in the peaceful, safe, secure and regulated application of atomic energy and nuclear techniques in specific fields. It highlights activities and achievements in technical cooperation, presenting regional programme achievements, with examples of specific project activities according to thematic area.

A. Strengthening the Agency's Technical Cooperation Activities⁵

A.1. Technical cooperation: the 2010 overview⁶

5. In 2010, the technical cooperation (TC) programme delivered support to 129 countries and territories. The programme disbursed a total of \$114.3 million, with an implementation rate of 76.6%. 3890 expert and lecturer assignments were carried out, 4964 participants attended meetings, 2962 people took part in 222 training courses and 1838 benefited from fellowships and scientific visits.

6. Member State support to the TC programme in 2010 was reflected in financial terms in a rate of attainment of 92.3% on pledges. Extrabudgetary support reached \$24.9 million, against the 2009 figure of \$18.4 million. Government cost-sharing in 2010 accounted for over \$20.5 million.⁷ \$0.2 million was received from the United Nations Development Programme (UNDP) for two regional projects in Africa.

7. 2010 was the second year of the 2009–2011 TC programme cycle, and 9 new, off-cycle core projects were initiated. One Programme Reserve project was carried out in Kazakhstan for a total of \$50,000. During the course of the year, 384 projects were closed (6 cancellations). Active projects at the end of 2010 totalled 890, with an additional 210 in closure.

8. Considerable effort went into pre-planning for the preparation of the 2012–2013 TC programme cycle throughout 2010. By 31 July 2010, the deadline for the submission of proposed national programmes, 117 Country Programme Notes had been received, containing 807 national project concepts in all. 280 regional and 28 interregional project concepts have also been submitted in the form of consolidated Programme Notes. The Secretariat has provided extensive training on the project design process.

A.1.1. Focusing on cancer

9. The Director General selected cancer as a key focus area for 2010. Technical cooperation projects on cancer account for a significant amount of activity in the human health field, itself the second largest topical area of the TC programme. In Africa,



A training session on the project design process.

⁵ Section A relates to operative paragraph 20 of resolution GC(54)/RES/9 on strengthening TC activities through the development of effective programmes and well defined outcomes.

⁶ This document relates to operative paragraph 29 of resolution GC(54)/RES/9 on reporting on the implementation of the resolution GC(54)/RES/9, highlighting significant accomplishments and indicating goals and priorities.

⁷ Please refer to Table A.5 of the Supplement to this Report for details.

the 2010 programme on cancer and other diseases where radiotherapy and nuclear medicine provide effective health service options was aided by significant contributions from beneficiary Member States and their development partners, including the private sector. Mauritania, Niger, and Nigeria were particularly good examples of cooperation, with Mauritania fast-tracking the development of its first radiotherapy centre, Nigeria contributing \$2.0 million in government cost-sharing for the training of 33 professionals, and Niger allocating a site and mobilizing funds for the construction of a radiotherapy facility.

10. In Asia and the Pacific, cancer is also a significant health problem. While national TC projects in many countries have been supporting the establishment of radiotherapy centres as well as the development of nuclear medicine procedures and techniques for early detection of the disease, a number of regional events organized under RAS/6/060, 'Supporting Comprehensive National Cancer Control', covered a wide range of topics, relating to screening and prevention of cervical cancer; breast cancer screening; controversies around prostate cancer; role of diet in cancer prevention; role of primary prevention in cancer; tobacco control; and an overview of early detection programmes in Asia and challenges in evolving cancer registry system in developing countries.

11. Furthermore, some national and regional TC projects are also supporting the development of nuclear medicine procedures and techniques for early detection of the disease. Improving the quality of radiotherapy, nuclear medicine and diagnostic radiology through the establishment of medical physics programmes is a major area of focus in the region. In 2010, regional approaches to the training of medical physicists continued, with the aim of further improving safe operating practices and technical standards through the establishment of a common quality assurance/quality control (QA/QC) programme.

12. In Europe, special attention was given to QA/QC in cancer diagnosis and treatment in 2010.

Within the regional project RER/6/019, 'Improving Clinical Practice in Radiation Oncology (Phase II)', a workshop to train radiation technology trainers was conducted jointly between the IAEA and European Society for Therapeutic Radiology and Oncology (ESTRO). On completion of the training, participants were enabled to train new radiation technologists in their home countries in the field of radiotherapy technology and radiotherapy quality assurance.

13. In Latin America, activities have focused on training and updating the knowledge of radiation oncologists, medical physicists, radiation therapy technicians and nurses, and a registry of the qualifications and experience of professional staff in the field of cancer treatment has been created. Clinical treatment protocols for the most common types of cancer have been prepared, validated and disseminated, and guidelines for the proper selection and maintenance of radiation oncology equipment have been prepared. The TC programme has also contributed to the establishment and upgrade of radiotherapy centres through the procurement of equipment for treatment and QA/QC, usually with government cost-sharing financial support from the participating countries. Quality audits of oncology centres in the region are carried out upon request, and the programme has contributed to the establishment of a quality culture in radiation oncology and radio diagnostics. Public outreach to decision makers and the general public has increased political and financial support for cancer control and treatment efforts, as well as providing potential patients with adequate information and guidance. A significant number of these actions have been jointly implemented with the cooperation of PAHO, the Latin American Association for Radiation Oncology (ALATRO), and more recently with ESTRO in the case of training courses on cancer treatment.

Addressing cancer in Africa

Mauritania's radiotherapy centre was inaugurated in November 2010, the final product of a successful cooperation between Mauritania and the IAEA's technical cooperation programme that started in 2009 under MAU/6/002, 'Planning the Establishment of a Radiotherapy and Nuclear Medicine Centre'. The fast-track construction of the radiotherapy centre was possible due to the demonstrated political will and Government commitment. Mauritania opted for a public private partnership approach, so the building of the premises and the supply of equipment were carried out by a private firm. The IAEA provided expert advice on safety issues throughout the construction phase, and supported the development of the human resources needed to serve in the centre. In addition, Mauritania received joint IAEA and WHO support to ensure the integration of the national oncology centre within a comprehensive national cancer control programme. The centre is the first of its kind in the country and will cater for patients who suffer from various types of cancers, using the most modern methods in radiotherapy. Before the establishment of the centre, cancer patients had to travel abroad to receive treatment.

Nigeria's government cost-sharing enabled the training, through the IAEA, of 33 professionals in various disciplines including radiation oncology, nuclear medicine, medical physics, and radiotherapy technology and nursing under NIR/6/021, 'Upgrading and Strengthening Radiotherapy Centres' and NIR/6/022, 'Expansion of Nuclear Medicine Services in Nigeria'. Outside the TC mechanism, Nigeria has invested significant resources of its own, particularly in purchasing radiotherapy and nuclear medicine equipment. Nigeria has also invested extensively in the construction and refurbishment of radiotherapy and nuclear medicine centres, in some cases with significant private sector contributions. The training provided under the two TC projects will provide some of the core staff essential to delivering more effective services in selected hospitals and will also provide the basis for future in-country training in some topical areas. With IAEA assistance, Nigeria has established a national training programme for radiotherapy technicians. The country has set itself a goal of establishing or strengthening 10 radiotherapy and nuclear medicine centres in the coming five years.

In Niger, the Government has allocated a site and mobilized funds for the construction of the country's first national radiotherapy centre under NER/6/006, 'Establishing a Radiotherapy Facility'. The project aims to improve healthcare for cancer patients by introducing radiotherapy into routine use at the Maternity Issaka Gazobi Centre in Niamey. Currently, the country relies on overseas referrals of cancer patients, which is extremely costly and unsustainable. Civil work on the facility, which is in compliance with international standards and norms for the safety of radiation sources, is in its final stage, and personnel training is ongoing. The Government is strongly committed to the project and has contributed \$1.6 million towards the purchase of radiotherapy equipment. The project is also supported by the Italian Government and the Principality of Monaco, the latter resources mobilized by the Programme of Action for Cancer Therapy (PACT).

A.1.2. Developing human resources and building capacities

14. Personnel with nuclear skills and capacities are essential for the successful introduction and application of nuclear technology for socioeconomic development, but the lack of skilled staff and trained human resources is a significant constraint in many Member States. Consequently, human capital development and enhancement is a high priority for the TC programme. Equally, in countries where nuclear technology is soundly established and where a wide range of nuclear applications are in use within various scientific and technological fields, its future should not be taken for granted. New generations must be encouraged to take over and to contribute with fresh ideas and innovative solutions to longstanding problems. A solid nuclear education, training centres and programmes are driving forces for adapting nuclear technologies to the current and future needs of the world.

15. Information and communications technologies (ICT) are considered by the IAEA as one of the major tools to achieve the Millennium Development Goals (MDG) adopted by the United Nations Millennium Summit in 2000. In order to enhance training and promote the application of ICT technologies in Africa, the IAEA organized two regional training courses, under the regional project RAF/0/026, ‘Sustaining the Regional Capability for the Utilization of Information and Communications Technologies for Human Resource Development (AFRA V-6)’. New telecentres were established in Kenya, Ghana and Senegal, and one in South Africa was upgraded.

16. In the Asia and the Pacific region, in addition to the sector specific regional training courses, fellowship training and mentoring provided in 2010, several regional and national events were held to help Member States design and implement new strategies and mechanisms to enhance skills retention, succession planning and sharing of knowledge and

experience with the younger generations. These events also aimed to attract talented young scientists and technicians to a career in nuclear technology in preference to other competing career options. This effort was of particular benefit to countries that are seriously contemplating the introduction of nuclear technology for electricity generation. In particular, a mentorship programme started in 2009 in collaboration with the Republic of Korea continued in 2010. The programme, designed for senior managers and decision makers from developing countries, aims to enable participants to acquire sound knowledge and information needed for decision-making purposes, and has also benefitted managers and decision makers from other regions. Particular efforts were also made to help several countries to develop and implement national strategies for human resource development, including education in the field of nuclear power engineering.

17. In the same region, particular attention was given to building human capacity in least developed countries (LDCs), as well as in new Member States. Accordingly, decision makers in new Member States were sensitized about building human capacities and training managers and scientists, in order to enable them to design and submit project concepts for consideration in the 2012–2013 TC programme cycle. Long term training in the human health sector is being provided to LDCs to create a sufficient number of specialists in cancer management and radiation safety.⁸

18. In Europe, most activities implemented under individual TC projects aim to develop human resources and provide training in specialized subjects, but several national and regional projects are specifically devoted to education, training and knowledge preservation. In Belarus, for example, BYE/0/006, ‘Developing Human Resources and a Training System for the Nuclear Power Programme’, is helping the country to set up an integrated approach to building nuclear power infrastructure. A

⁸ This relates to operative paragraph 24 of resolution GC(54)/RES/9 on examining the specific characteristics and problems of the developing countries and LDCs.

major accomplishment in 2010 was the development and supply of a computer based training system on the basics of nuclear power plant (NPP) policies, management and technology. Further assistance was provided in human resource development, workforce planning, and in the development of a strategy for sustaining human resources for the nuclear power programme. In Georgia, local capabilities in energy system analysis and planning, including the use of nuclear energy, were strengthened under GEO/0/003, 'Supporting the Development of a National Infrastructure for the Potential Application of Nuclear Energy'. The Agency also provided software and computer equipment to support efficient use of energy planning analytical tools.

19. In Armenia, the Yerevan State University and the State Engineering University of Armenia received support to improve the training of young specialists in nuclear engineering and reactor physics, including delivery of computational and laboratory equipment under ARM/0/006, 'Developing and Implementing an Integrated Human Resource Management Improvement System in the Armenian Nuclear Power Sector'. Activities in the Czech Republic under CZR/0/006, 'Upgrading Safety, Self-Reliance and Sustainability of National Nuclear Institutions', focused on training new specialists in the regulatory authority and research institutions, mainly through long-term, hands-on fellowships.

20. Knowledge management was the focus of KAZ/0/003, 'Nuclear Knowledge Management and Preservation in Kazakhstan', which supports capacity building and infrastructure development for this purpose. The project involved over 10 national parties, including the regulator, nuclear R&D institutions, educational organisations, uranium mining and fuel cycle companies, and government nuclear energy planners. The key outcome of the project was the establishment of a national concept for nuclear knowledge management, together with the creation of the portal of the Kazakhstan Atomic Energy Committee, which is designed to be a national information and resource tool. In Kyrgyzstan, a national International Nuclear Information System

(INIS) centre has been set up at the Kyrgyz Russian Slavonic University in Bishkek under KIG/0/002, 'Establishing a National INIS Centre', facilitating access to a vast amount of digitalized nuclear technological and scientific information.

21. In the FYR of Macedonia, scientific textbooks and laboratory equipment were provided through MAK/0/005, 'Upgrading the Training Laboratory for Nuclear Science (Phase II)', to support appropriate training courses in nuclear physics methods and techniques with a particular emphasis on medical sciences and environmental preservation. A firm foundation has also been laid to ensure sustainable education and training in radiation protection in Tajikistan under TAD/0/003, 'Establishing a National Educational and Training Centre on Radiation Protection'. Expert advice was provided to the national authorities to establish a national strategy on education and training for radiation safety, and a 'train the trainers' course was conducted in Dushanbe that brought together 50 radiation protection specialists from various professional environments using ionizing radiation.

22. At the regional level, a series of workshops under RER/0/028, 'Improving Educational and Training Capabilities in Nuclear Science and Applications' were held in Croatia, Lithuania and Montenegro to enhance knowledge on 'The Role of Nuclear Physics Centres in Establishing Collaboration with End-User', 'Synergy of Nuclear Sciences and Medical Physics: Education and Training of Medical Physicists in the Baltic States', and 'Promotion and Outreach of Nuclear Science', respectively. Each meeting stressed the need for well-educated and trained staff as fundamental to the development of nuclear techniques and methodologies and their safe, effective and efficient use.

23. Meetings were also held in Latin America under RLA/0/037, 'Supporting a Sustainable Increase in the Use of Research Reactors in the Latin American and Caribbean Region through Networking, Exchange of Experiences, Knowledge Preservation and Training of Human Resources (ARCAL CXIX)'. A meeting on 'Instrumentation and Control of Research Reactors'

in Argentina drew 47 participants from Argentina, Brazil, Chile, Jamaica, Mexico and Peru. Under RLA/0/038, ‘Supporting the Introduction of Nuclear Energy (ARCAL XCV)’, meetings concentrated on governmental and regulatory frameworks, regional cooperation between countries in the region with NPPs, and the establishment of safety infrastructure for national nuclear power programmes. A further meeting focused on a joint IAEA/International Centre for Theoretical Physics (ICTP) School of Nuclear Energy Management.

24. At the global level, the IAEA and the World Nuclear Association (WNA) are founding supporters of the World Nuclear University (WNU), a partnership committed to enhancing international education and leadership in the peaceful applications of nuclear science and technology. Since 2004, the two organizations have cooperated in the organization of WNU programmes. In 2010, INT/0/083, ‘Support for Human Capacity Building in Developing Member States’, enabled the participation of representatives from Member States in two WNU training events. Eleven participants received Agency support for their participation in the 6th annual WNU Summer Institute, a six week leadership development programme held annually at Christ Church, Oxford, UK, that provides cutting-edge presentations on the full range of topics relevant to the future of nuclear technology. In addition, the WNA organized in 2010 the first annual three week School of Radioisotopes (RI School), hosted by the Korea Atomic Energy Research Institute and the Korea Institute of Nuclear Safety. The RI School is a training programme for young professionals in managerial roles related to radioisotope application and production. The TC programme supported the attendance of 11 participants at this event. The Agency is involved in the development of the course curricula for both the Summer Institute and the RI School.

Building capacities in project design⁹

25. As part of the preparations for the 2012–2013 TC programme cycle, 16 training workshops were held to strengthen project design capacity in Member States, streamlining the language and approach used. A training package for TC programme planning and design, using the Logical Framework Approach (LFA), as well as orientation materials for Agency staff, was prepared. Extensive internal training on the preparation of Programme Notes, project design and use of the LFA was delivered to technical and country officers and orientation workshops were held for National Liaison Officers, National Liaison Assistants, counterparts and regional experts in all regions. In total, 436 participants were trained, 366 of whom were from Member States. The training was managed by TC’s Division for Programme Support and Coordination in close coordination with the Regional Divisions. The overall evaluation of the workshops was very positive, with requests that they become regular, ongoing activities.

Survey of IAEA Fellows, 2005–2008¹⁰

26. A survey of IAEA fellows from 2005 to 2008 was carried out in 2010 to assess the impact and quality of the IAEA fellowship programme. Nearly 40% of the fellows reached participated in the survey, rating the quality and the impact of the programme on their career, their home institute, the TC project with which the fellowship was associated, and their home country. The results were overwhelmingly positive. The fellows also suggested improvements that were taken into account in the introduction of the new InTouch Platform.¹¹ These included making the training programme available before the start of the fellowship, and enabling searches of the resource institution roster to locate training capacity in a specific field of activity.

⁹ This section relates to operative paragraph 13 and 16 of resolution GC(54)/RES/9 on strengthening TC activities and on providing MSs with adequate information on project development according to the logical framework methodology.

¹⁰ This section relates to operative paragraph 15 of resolution GC(54)/RES/9 on ensuring that the components of TC projects are readily available to Member States.

¹¹ <http://intouch.iaea.org>

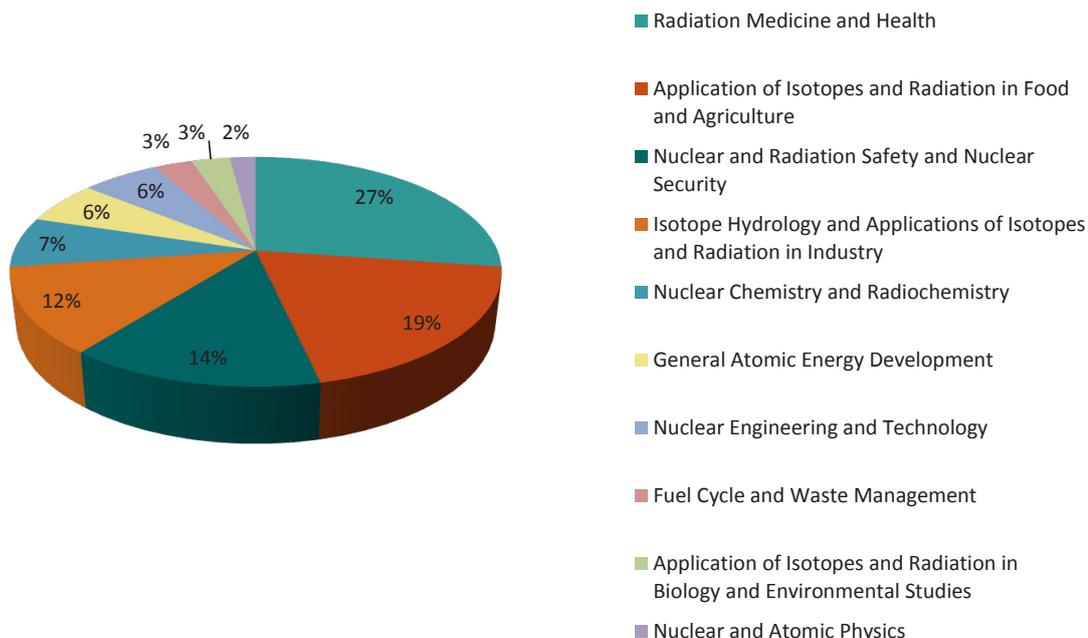


Fig. 3. Main fields of training of fellows, 2005–2008.

27. Noteworthy results from the survey included a positive response of 97.7% to a question of recommending participation in the IAEA fellowship programme to colleagues, with a further qualitative response that indicated reasons for participation. These included personal development, capacity enhancement, career development, networking, financial improvement and institutional development. The survey demonstrated the positive impact of the fellowship programme, and offered a fresh perspective from the fellows themselves.

A.1.3. Enhancing nuclear safety worldwide

28. The IAEA's Safety Requirements GS-R-3, *Management System for Facilities and Activities*, and the companion Safety Guide GS-G-3.1, *Application of the Management System for Facilities and Activities*, set state of the art standards for improving the safety management of organizations operating nuclear facilities and activities. These standards are also intended to foster a strong safety culture through the development and reinforcement of good safety attitudes, taking into account the relationship between individuals, technology and the organization. The TC programme provides extensive support for the implementation of GS-R-3 requirements, primarily within the operating organizations. Assistance in

radiation protection and radiation safety is provided to Member States through dedicated regional projects covering the following areas: strengthening regulatory infrastructure; occupational exposure control; medical exposure control; protection of the public and the environment from radiation practices; nuclear and radiological emergencies; and education and training.

29. In Africa, support to radiation safety was provided through a well balanced portfolio of regional projects tackling all thematic safety areas. As three tangible achievements, the regional programme has contributed to the conclusion of regional partnerships and cooperation among participating countries, enabled networks of regulatory bodies and other safety and security institutions in Africa, and empowered Member States through the widespread promotion of self-assessment exercises. Activities related to research reactor safety addressed a range of issues, including improvements to regulatory supervision, enhancements to the performance of the safety committees in operating organizations, establishment and implementation of systematic ageing management programmes, and the establishment of decommissioning plans.

30. Under RAF/9/038, 'Promoting Self-

Assessment of Regulatory Infrastructures for Safety and Networking of Regulatory Bodies in Africa’, Member States were helped to implement IAEA self-assessment methodology and tools, with the goal of enhancing and improving the performance of their regulatory infrastructures. The project also focussed on comprehensive capacity building that will lead to significant improvements in the performance of national regulatory bodies and will support the activities of the Forum of Nuclear Regulatory Bodies in Africa (FNRBA). In developing sound legal and institutional frameworks for radiation safety, activities aimed mainly to help Member States meet the requirements of Milestones 1 and 2¹² in *Milestones in the Development of a National Infrastructure for Nuclear Power* (IAEA publication NG-G-3.1) and to ensure compliance with the International Basic Safety Standards. Further assistance was provided through RAF/9/040, ‘Strengthening National Capabilities for Response to a Radiological and Nuclear Emergency’, which developed Member State capabilities for monitoring and control of hazards and radiological risks, and contributed to national plans for radiological emergency preparedness and response.

31. In Asia and the Pacific, efforts in 2010 focused on helping Member States to strengthen their safety and security infrastructure for the safe utilization of ionizing radiation as well as the operation of NPPs and other nuclear installations. Expert missions, workshops and training courses were arranged to improve operational safety, reduce occupational radiation exposure, enhance the required nuclear safety regulatory regime and managerial competencies, improve plant performance, strengthen radiation emergency response capabilities, and establish a safety culture in nuclear facilities. In addition, the widespread use of nuclear applications in health, agriculture, and industry in many countries in the region makes the management of low and intermediate radioactive waste a priority. TC activities in this area in 2010 aimed to ensure the

safe and secure storage and disposal of radioactive waste in accordance with international standards, to study the feasibility of innovative conditioning facilities, and to upgrade infrastructure for the management of radioactive waste.

32. Legislative assistance was also provided to Member States in establishing or updating their comprehensive national legal frameworks, with a particular emphasis on the needs of countries embarking on nuclear power programmes. Under RAS/0/056, ‘Providing Legislative Assistance’, national nuclear laws were reviewed upon request of Member States, and a training course on nuclear law provided Member States with a comprehensive overview of the main aspects of international and national nuclear law governing the safe, secure and peaceful use of nuclear material and radioactive sources.

33. Under RAS/9/045, ‘Strengthening National Regulatory Infrastructure for the Control of Radiation Sources’, Member State competencies in the use of the IAEA-developed Self-Assessment Tool (SAT) were developed. This may be considered as a means of regular internal audit, complementing external appraisals carried out by the Agency using an international team. The project has enabled Member States to improve their legislative and regulatory framework for radiation protection and the safety of radiation sources, including establishing or strengthening regulatory controls in accordance with the principles, requirements and recommendations of the International Basic Safety Standards.

34. Supported by RAS/9/047, ‘Strengthening Radiological Protection of Patients and in Medical Exposure’, details of radiation doses to patients in a number of countries have been published in reputed journals. In many cases, it was the first time that countries have had the opportunity to assess patient doses and dose management. The publication of the results was a proof of value and was motivating to the personnel involved. The value of the results

¹² Milestones in the Development of a National Infrastructure for Nuclear Power identifies Milestone 1 as “Ready to make a knowledgeable commitment to a nuclear power programme” and Milestone 2 as “Ready to invite bids for the first NPP”. This NE Series Guide serves as a reference for Member States considering or launching nuclear power programmes and covers a wide range of issues to be addressed.

was further evident from the media attention they received, which gave visibility to the IAEA in the area of radiation protection of patients and protection in medical exposure.

35. Under RAS/9/058, ‘Supporting Education and Training in Radiation Protection’, educational courses in the field of radiation protection continued to be provided through the two regional centres: Universiti Sains Malaysia in Penang, Malaysia (for courses in English) and the Atomic Energy Commission of Syria, Damascus, Syrian Arab Republic (for courses in Arabic).¹³ Fifty-four radiation protection officers from the Member States of Asia and the Pacific were trained during 2010. The courses offered by the regional centres have enhanced regional capacities in radiation protection significantly.

36. In Europe, RER/9/096, ‘Strengthening the National Infrastructures for the Control of Radiation Sources (TSA-1), (Phase II)’, aims to reinforce the national regulatory infrastructure of participating countries with particular emphasis on the control of radiation sources. In 2010, several expert missions were launched to install and start

the SAT. This software is used to review the status of the national regulatory infrastructure against the recommendations and guidance of relevant IAEA safety standards. In May 2010, the first ‘School for Drafting Regulations’ took place in Vienna to assist participants from countries in the Balkan region in drafting national implementing regulations in accordance with IAEA standards on regulatory control for radiation sources, including regulations for authorisation, inspection, and enforcement, safety and security of radioactive sources, import and export controls, as well as thematic areas such as transport, waste, and occupational, medical and public exposure. National experts with legal and technical backgrounds were tutored by Agency staff and international experts in revising or producing regulations compliant with IAEA safety standards and other applicable national or regional legislation. This successful pilot event will be repeated in 2011, targeting Baltic and CIS countries.

37. Under RER/9/099, ‘Strengthening the Effectiveness of Regulatory Authorities and Advanced Training in Nuclear Safety’, a series of workshops were organized throughout the year aimed to reinforce the capabilities of national



Participants in the innovative pilot course on drafting legislation (School for Drafting Regulations) for Europe Region held in Vienna in 2010 under RER/9/096

¹³ Relates to operative paragraph 6 of resolution GC(54)/RES/9 on identifying regional resource centres.

nuclear safety in licensing, review and assessment of safety report submittals, oversight of licensees' management systems and human resources and competence management at regulatory bodies. The latter was organized in cooperation with the EU Joint Research Centre at Karlsruhe (Germany).

38. Under RER/3/008, 'Strengthening Safety and Reliability of Nuclear Fuel and Nuclear Materials in Nuclear Power Plants, Including Water-Cooled Water-Moderated Power Reactor Components and Piping', the Agency organized a workshop in cooperation with the OECD Nuclear Energy Agency and the Halden Reactor Project (HRP) to analyse nuclear fuel issues during steady states and transient conditions. The workshop was complemented with a tour to several facilities at the reactor site, including fuel material shops and laboratories. The workshop represented a noteworthy opportunity for the participants to get acquainted with the latest open information on fuel behaviour investigations carried out at the HRP.

39. Under RER/4/032, 'Enhancing the Sustainability of Research Reactors and Their Safe Operation Through Regional Cooperation, Networking and Coalitions' further activities on sustaining and developing sub-regional coalitions and networks of research reactors were undertaken, namely with regard to the East European Research Reactor Initiative, the Eurasia Research Reactor Coalition and the Baltic Research Reactor Network. A regional workshop on the application of the Code of Conduct of the Safety of Research Reactors was held in 2010. In collaboration with the Africa and Asia and Pacific regions, an initial meeting of the newly established Mediterranean Research Reactor Network was held with the participation of 14 countries of the Mediterranean basin.

40. A Joint IAEA/World Health Organization (WHO) regional workshop on reducing risks from indoor radon was held in Geneva, in cooperation with the European Commission, under RER/9/094 'Upgrading National Capabilities in Controlling Public Exposure'. The workshop provided a platform to identify the extent of work currently

being carried out or planned by Member States to develop national radon strategies and to discuss the various components of such strategies.

41. The 10th Joint IAEA-FORATOM Workshop, 'Implementing a Successful Management System', organized by the IAEA and the European Atomic Forum (FORATOM), took place 17-19 November 2010 under RER/9/098, 'Improving Safety Management Systems and Operation Feedback'. The workshop focused on the practical implementation of IAEA safety standards on management (primarily GS-R-3) and brought together over a hundred representatives ranging from top management to practitioners from some 35 organizations in Europe, North America and the Middle East.

42. Radiation safety of workers, patients and members of the public remains a priority issue for technical cooperation activities in Latin America. Under HON/9/002, 'Creating a Regulatory National Operative Authority for Protection and Radiological Security', a control system in Honduras was improved with the implementation of the first national inspection programme, focused on Category 1 and 2 sources. With the assistance of RLA/9/064, 'Strengthening National Regulatory Infrastructures for the Control of Radiation Sources (TSA1)', the National Regulatory Authority in Nicaragua was restored and procedures for authorization were introduced. Regional updated guidelines were completed for inspection and approval of medical and industrial practices. A major achievement in 2010 was the establishment of the first Regulatory Authority Body in Jamaica's history, with a Parliamentary mandate and supported by the Prime Minister.

43. As a strategy to encourage safety culture in nuclear and radiological practices, the creation of a Regional Network for the Optimization of Occupational Exposures in Latin America was supported under RLA/9/066, 'Strengthening and Updating Technical Capabilities for the Protection of Health and Safety of Workers Occupationally Exposed to Ionizing Radiation (TSA2)'. The Steering Committee comprises Argentina, Brazil, Costa Rica,

Peru and Uruguay. To ensure compliance with the principle of justification of practices, assistance was provided under RLA/9/067, 'Ensuring Radiological Protection of Patients and During Medical Exposures (TSA3)', to issue regional guidelines for doctors on diagnostic imaging (with the participation of WHO and PAHO), and to put into practice guidelines on the release of patients following radionuclide therapy.

44. Under RLA/9/062, 'Strengthening the National Infrastructure and Regulatory Framework for the Safe Management of Radioactive Waste in Latin American Member States (TSA4)', technical documents were developed on safety assessments of radioactive waste storage facilities, national policies and strategies, and licensing of storage facilities. These have had a significant positive impact on national waste management systems and protection of the public and environment.

45. Capabilities to deal with radiation emergencies were strengthened under RLA/9/061, 'Strengthening National Systems for Preparedness and Response to Nuclear and Radiological Emergencies (TSA5)'. Practical tools for preparedness in radiological emergency were prepared and disseminated. National training programmes were delivered to emergency first response teams in areas of medical response to radiation injuries and research reactor emergency response. Assistance was also provided to the Latin America Biological Dosimetry Network.

46. The first Regional Profile on education and training on radiation protection was concluded as a base to implement a national strategy for building competence in radiation, transport and waste safety in Member States in accordance with the International Basic Safety Standards under RLA/9/065, 'Supporting Radiation Protection Infrastructure Through Education and Training'.

A.1.4. Supporting nuclear security

47. Agency assistance provided through regional TC projects is instrumental in strengthening Member State capacities for the prevention, detection of and response to incidents involving nuclear and other radioactive material. Projects also support

basic awareness, knowledge and understanding of the international legal framework, specific human resource development, response procedures and can provide equipment needed to combat illicit trafficking in nuclear and other radioactive materials.

48. Training courses provided under these projects offer a basic understanding of physical protection and demonstrate a systematic methodology to design and evaluate physical protection systems for nuclear facilities that are effective against the threat of sabotage and theft of nuclear materials. These training opportunities assist national authorities in developing and implementing physical protection principles and requirements with reference to system engineering, facility analysis and coordination between the authorities in charge of nuclear security function.

49. The TC programme in the Asia and the Pacific region continued to support the implementation of the IAEA's Nuclear Security Plan (2010–2013) through a regional project RAS/9/060, 'Developing Human Resources in Nuclear Security'. This led to the improvement of nuclear security infrastructures and the institutionalization of mechanisms to stop illicit trafficking of nuclear and radioactive materials. Training and sensitization were also provided to the personnel of the law enforcement agencies in several Member States. In 2010, Front Line Officers (FLO) and Mobile Expert Support Teams (MEST) from the region were trained in the use of radiation detection equipment to monitor, detect and identify nuclear and other radioactive material. RAS/9/060 has strengthened Member State capacities in 2010 through the provision of assistance in the prevention of, detection of and response to incidents involving nuclear and other radioactive material. The project has also improved basic awareness, knowledge and understanding of the international legal framework, specific human resource developments, response procedures and the equipment needed to combat illicit trafficking in nuclear and other radioactive materials.

Contributing to the achievement of the Millennium Development Goals¹⁴

MDGs | end poverty and hunger | universal education | gender equality | child health | maternal health | combat HIV/AIDS | environmental sustainability | global partnerships | MDGs

Technology is vital for the full and successful achievement of the Millennium Development Goal (MDG) targets. Through the technical cooperation (TC) programme, Member States are addressing national development priorities in fields where nuclear techniques offer advantages over other approaches, or where nuclear techniques can usefully supplement conventional means.



End poverty and hunger: The IAEA's contribution to ending poverty and hunger includes improving food security through crop improvement by mutation induction, and using nuclear techniques to enhance livestock productivity through improved breeding, nutrition and disease control. Isotopic techniques are used to support better soil and water management. The IAEA partners with the Food and Agriculture Organization of the United Nations (FAO) to achieve these goals.



Universal primary education: Hunger and malnutrition affect the learning abilities of children. Through its Joint Division with FAO, the IAEA works to address food insecurity, ultimately contributing to a child's ability to benefit from education. Projects on nutrition, safe potable water and child health also support the participation of children in education.



Gender equality: The IAEA's gender equality policy mainstreams gender considerations into the Agency's programmes and promotes gender equality in the Secretariat and in Member States. Gender equality in higher level education is supported through the TC programme by human resource development and training for female technicians and scientists. Female participation in all TC training activities is facilitated by innovative approaches such as distance learning.



Child health: The IAEA supports neonatal screening for sickle cell disease, hypothyroidism and cystic fibrosis, as well as oncology projects that address childhood cancers. TC projects also help to combat child malnutrition and support breastfeeding programmes. Water management projects help to address child mortality from preventable water-borne diseases.



Maternal health: Numerous TC projects focus on female health issues, in particular cervical cancer. Advances in technology are making it possible to target cancers more precisely, and associated awareness-raising on the part of national governments is encouraging more screening.



Combat HIV/AIDS: The IAEA has joined forces with WHO, the African AIDS Vaccine Programme and UNAIDS to combat HIV/AIDS by providing equipment and training to local laboratories. Training has focused on developing an effective vaccine against HIV. The use of sensitive nuclear techniques in molecular biology helps in the evaluation of vaccine efficacy and in the early detection of drug resistant strains of HIV.



Environmental sustainability: The IAEA helps Member States to use nuclear technologies to better understand and manage their natural resources. Isotopic techniques are applied to understand the source, extent and behaviour of water resources, as well as their vulnerability to pollution. Nuclear technology is used to evaluate soil degradation, and to assess the effectiveness of soil and water conservation strategies, to characterize indigenous livestock breeds and in managing and protecting marine resources, as well as in efforts to address climate change.



Global partnerships: The IAEA works in close partnership with Member States, other United Nations agencies, research organizations and with civil society in order to maximize the contribution of nuclear science and technology to the achievement of development priorities.

¹⁴ This relates to operative paragraph 23 of resolution GC(54)/RES/9 on the attainment of the MDGs.

A.2. Enhancing the effectiveness and efficiency of the technical cooperation programme¹⁵

A.2.1. Managing the TC programme

50. The TC programme is managed and coordinated under Major Programme 6 (Management of Technical Cooperation for Development), in close coordination with the other Major Programmes, each of which provide essential and substantive expertise in the areas of non-power nuclear applications, nuclear energy, infrastructure development, nuclear safety and security, and safeguards. The programme is flexible and adaptable, so that it can respond to the changing needs of Member States and the challenges that often accompany new developments. The programme's operational environment, including research, scientific and technological advances, global finances and politics, evolves constantly. The programme addresses Member State needs primarily in the areas of development, energy and nuclear safety. These areas overlap to some extent, and compliance with relevant safety guidelines and safeguards is integrated into all TC activities.

51. The programme operates in four geographical regions: Africa, Asia and the Pacific, Europe and Latin America. Within each region, it helps Member States to address their specific needs, taking into consideration existing capacities and different operational conditions. This requires careful, coordinated analysis at the level of the Secretariat and an intensive dialogue with Member State counterparts. The programme aims to leverage the differences among Member States in the same region by facilitating cooperation between them. For example, the capacities of technically advanced countries can be used to address the needs of less advanced countries.

A.2.2. Country Programme Frameworks and Revised Supplementary Agreements

52. Country Programme Frameworks (CPFs), prepared by Member States in collaboration with the Secretariat, define mutually agreed priority development needs and interests to be supported through technical cooperation activities. CPFs reflect national development plans, country specific analyses and lessons learned from past cooperation, and also take into consideration the United Nations Development Assistance Frameworks (UNDAFs). This ensures that the application of nuclear techniques is integrated with existing development initiatives and plans, and supports the identification of areas where such techniques might be usefully deployed. Signed, valid CPFs facilitate national pre-planning (upstream) work and provide a context for the preparation of the 2012–2013 TC programme.

53. Twenty-three new CPFs were signed in 2010, by Belize, Benin, Botswana, Chad, China, Ecuador, Estonia, Ghana, Hungary, Jamaica, Kazakhstan, Kenya, Malawi, Malaysia, Mexico, Nepal, Oman, Pakistan, Philippines, Seychelles, Singapore, Syria and Zimbabwe. Sixty-five CPFs are currently in place, with 41 in preparation.

54. Revised Supplementary Agreements (RSAs) are required under the Statute and INFCIRC/267. They govern the provision of technical assistance by the IAEA, and have been signed by 115 Member States. It is very important that Member States participating in the TC programme have an RSA in place, as these contain essential provisions, including safety standards and measures, peaceful use undertaking and safeguards, physical protection, and the transfer of title to equipment and materials.¹⁶ New Member States are being supported in the preparation of their RSAs.

¹⁵ Section A.2. relates to operative paragraphs 9 and 13 of resolution GC(54)/RES/9 on enhancing the effectiveness and efficiency of the TC programme and on strengthening TC activities.

¹⁶ This relates to operative paragraph 14 of resolution GC(54)/RES/9 on adhering strictly to the provisions of the Statute and the guiding principles and policies contained in INFCIRC/267.

A.2.3. Improving interaction with the United Nations system¹⁷

55. Although specialized and non-resident agencies are not obliged to use the harmonized programme cycle of the United Nations Development Group (UNDG) Executive Committee agencies, the Agency is committed to strengthen engagement in UNDAF joint programming, in order to achieve better national development outcomes and to leverage synergies among UN organizations. With these objectives in mind, the Agency took part in the UNDAF process in 48 countries in 2010, resulting in the signature of five UNDAFs (Azerbaijan, Georgia, Kazakhstan, Tajikistan, Uganda), and ensuring that TC programme activities are reflected in the UNDAF Action Matrix. As of the end of 2010, 14 UNDAFs have been signed by the Agency in total. Engagement in the UNDAF process also supports upstream preparation of the technical cooperation programme (planning and country programming), as well as monitoring, self-assessment and independent evaluation.

56. Close contacts were established in all four regions with the Directors of UNDP Regional Bureaux and several UN Country Coordinators in 2010. Senior TC staff were invited to participate in the regional Cluster Meeting of the UNDP Regional Bureau for Asia and the Pacific in Dhaka in November 2010, which greatly facilitated interaction at the policy levels between the Agency and UN Coordinators. This increased interest in the Agency's mandate and services was reflected in the UN Secretary General's report on the UN Resident Coordinator System to the UN Economic and Social Council.¹⁸

57. The Department of Technical Cooperation initiated a round of talks in 2010 with the UN Industrial Development Organization (UNIDO)'s

Cleaner and Sustainable Production Unit and its Water Management Unit and the IAEA's Industrial Application and Chemistry Section to consider how nuclear technologies can be applied to contribute to national industries and Cleaner Production Centres. The talks were held with the intention of increasing the programme's socioeconomic impact, improving its orientation to national development priorities and reaching end users better. UNIDO's strength is its direct contact and cooperation with industries, private sector companies, and small and medium enterprises in developing countries and countries in transition.

58. In-house cooperation with the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (NAFA) was also strengthened in 2010 with the joint development of two pilot projects for which FAO cooperation will be sought in the Asia region. These are (1) to demonstrate the socioeconomic impact of mutation breeding and (2) to 'climate proof' rice production systems. TC also facilitated contacts between NAFA and the Working Group on Agriculture of the Greater Mekong Subregion, which resulted in NAFA participating in the conference "Modernizing the Greater Mekong Subregion through Improved Food Safety and Traceability Systems in the Context of Regional Trade" (funded by the Asian Development Bank), for which a joint collaboration with FAO is also envisaged in future ensuing activities.

59. Strengthened in-house cooperation with the Programme of Action for Cancer Therapy (PACT) resulted in the establishment of two regional projects, in Africa and in the Asia and the Pacific region, to support the development of national cancer control efforts in Member States. These projects have seen the strong participation of WHO regional offices in cancer control needs assessment reviews and high level regional meetings and workshops.

¹⁷ Section A.2.2. relates to operative paragraph 21 of resolution GC(54)/RES/9 on continued consultations and interactions with interested States, the United Nations system, multilateral financial institutions, regional development bodies to ensure coordination of activities and resources.

¹⁸ Functioning of The Resident Coordinator System, Including Costs and Benefits : Report of The Secretary-General, UN Doc. E/2010/53, published on 30/4/2010.

A.2.4. Increasing the impact of the technical cooperation programme

Enhanced programme planning¹⁹

60. 2010 saw considerable effort devoted to planning the 2012–2013 TC programme cycle. As part of the continuing focus on improving the quality of the programme at all levels, Member States were asked to submit Programme Notes rather than individual project concepts during the first phase of preparations. Country Programme Notes (CPNs) provide a single document overview of national programmes with national expectations and commitments from the country perspective. They contain information on the consultation process and the identification of priorities, and are structured in such a way that they encourage Member States to conceptualize projects within a consistent, integrated framework. This avoids the previous, scattered, concept-by-concept approach, and leads to more strategic and cohesive national and regional programmes that are aligned to national and regional development needs and the technical support offered by the Agency. CPNs also contain important information about a country's regulatory infrastructure, ensuring that safety requirements are taken into consideration in the development of each project, and helping to identify gaps which will have to be addressed before a project can be considered. CPNs also lay the foundations for effective monitoring, self-assessment and independent evaluation later on. Comprehensive review criteria were developed to ensure the quality of the programme/project concepts and design.

61. An analysis of the Periodic Progress Reporting (PPR) mechanism was conducted and improvements proposed to make it more effective. Changes include a stronger focus on the progress and achievement of outputs during the life of a project and the assessment of outcomes and consolidation of lessons learned at

the closing of the biennium.

Improvements to the Programme Cycle Management Framework (PCMF) IT platform²⁰

62. The PCMF IT platform was updated to support the Programme Note approach, and new help files and short training videos were also posted to help Member States. Other enhancements to the platform included:

- The creation of an overview level for national, regional and interregional programmes under which concepts for each programme are collected.
- A revised workflow that supports Country, Regional and Interregional Programme Notes, and includes nuclear safety in the review process. An enhanced set of review criteria were introduced at a number of steps of the concept workflow. A new mechanism for the transfer of concepts to project designs was created. The project design section of the site was enhanced to match the additional data introduced in the Programme Notes.
- A number of enhancements were made to the capture of information for the Logical Framework Matrix (LFM), including the addition of baseline details at the performance indicator level and funding source details for footnote-a/ inputs.
- Inclusion of the new 30 Field of Activity (FoA) codes for concept classification, complemented by a new role and coordination function, FoA Focal Point. This role was included in the concept workflows to coordinate the technical reviews of project concepts.

¹⁹ This section relates to operative paragraph 16 of resolution GC(54)/RES/9 on providing MSs with adequate information on project development according to the logical framework methodology.

²⁰ This section relates to operative paragraph 27 of resolution GC(54)/RES/9 on continuing to implement the Programme Cycle Management Framework.

- A 'Feedback Note' was created to return consolidated review comments on project concepts to Member States.

Encouraging balanced gender participation

63. TC activities strive to further gender equality

by including gender considerations in the TC programme, providing guidance in the CPF Guidelines, and encouraging the participation of women as experts, trainees and fellows. In 2010, 4396 women from all regions participated in the TC programme, either as counterparts, trainees, meeting

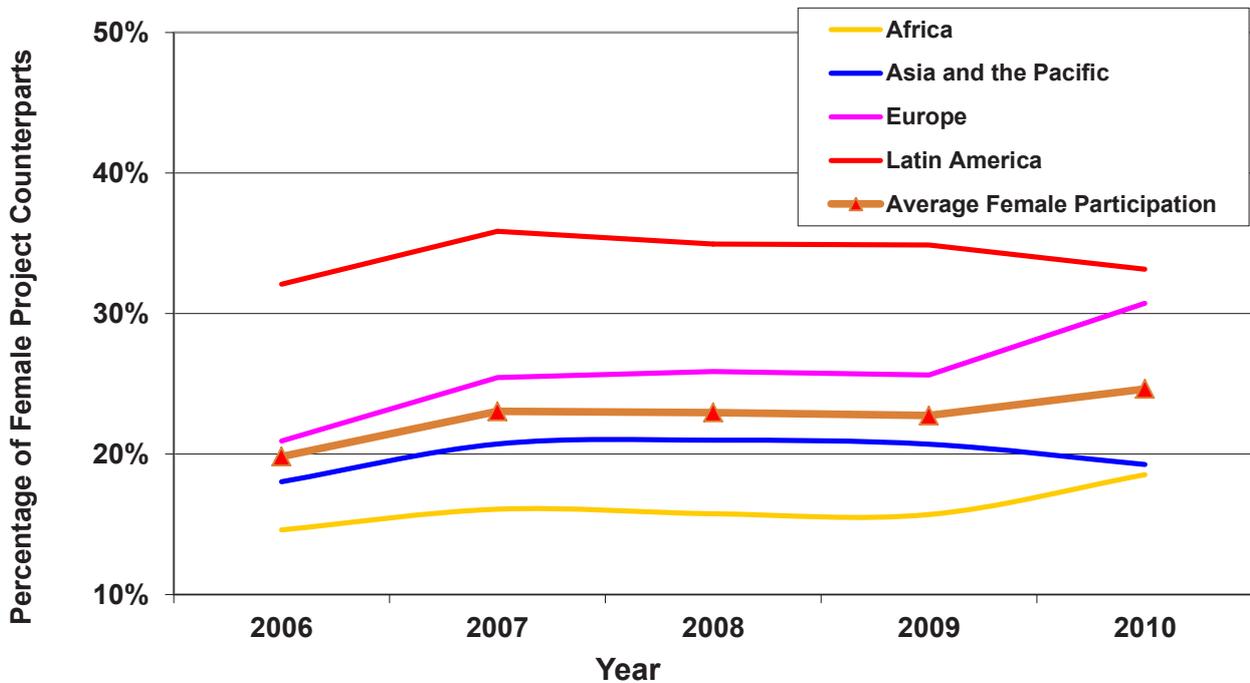


Fig. 4. Female project counterparts by region.

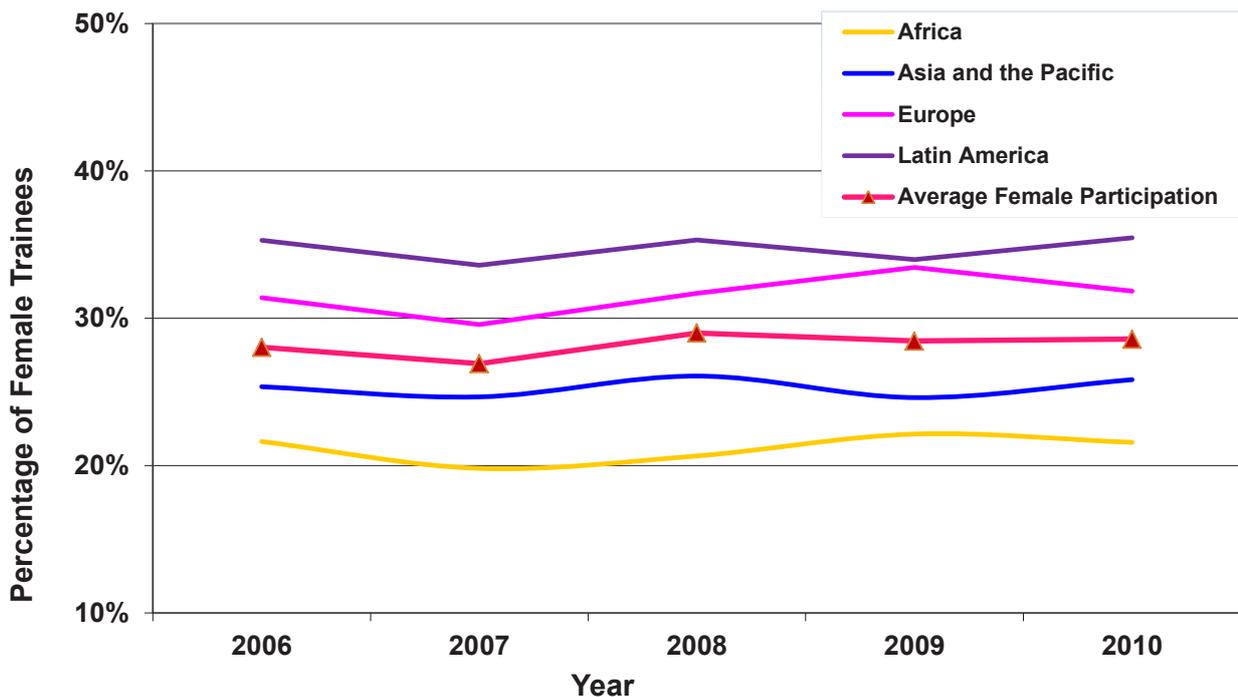


Fig. 5. Female participation in training, 2006–2010.

participants, experts or lecturers, a significant increase from 3334 in 2009, 3555 in 2008 and 3553 in 2007.

Enhancing outreach²¹

64. The Secretariat increased its focus on outreach to Member States in 2010 through a series of informal meetings and briefings. A Seminar on Technical Cooperation provided Permanent Missions with a comprehensive overview of the TC programme. TC also contributed to a session of the Scientific Forum on “The IAEA’s Role in Combating Cancer”.

65. Several new outreach products, including new project success stories and a CD of technical cooperation publications from 2007 to 2010, were produced in 2010. Over 17 000 outreach products were distributed, including more than 11 000 copies of project success stories, 2000 brochures and 750 CDs. A suite of outreach materials were prepared to celebrate the 25th anniversary of the Cooperation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL), including a folder, five success stories, posters, an outreach video, two leaflets and a brochure, *Contribution to Sustainable Development 1984–2009*.

66. TC activities and achievements were also promoted through other channels including the IAEA and TC websites, and via press notes and radio interviews. Twenty-seven web stories were produced during 2010, including stories on CPF signings, visits to projects and regions, and project successes such as the first cervical cancer treatment facility in El Salvador. The IAEA web site also publicized TC with a ‘TC in Focus’ campaign, which featured articles, interviews with NLOs, and a very successful photo essay on TC project success stories, which received over 100 000 views. A new initiative in 2010 saw an emphasis on the use of social media to raise awareness of TC activities and successes, including presenting TC success stories on Facebook, providing Member States with PCMF training videos on YouTube, and reaching out to a new audience through Twitter.

67. The TC exhibition was displayed at several meetings and events in Vienna. This included two International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) Dialogue Forums on Nuclear Energy Innovations, a Workshop on Long-range Nuclear Energy Programme Planning, Africa Day, World Cancer Day and the 54th General Conference TC service desk.



Participation at the Seminar on Technical Cooperation, 2010.

²¹ This section relates to operative paragraph 17 of resolution GC(54)/RES/9 on updating on the progress of the TC programme implementation in between annual reports.

A.2.5. Evaluating technical cooperation: The OIOS reports

68. The OIOS review of the implementation status of recommendations from TC programme evaluations carried out between 2002 and 2009 notes that of 195 accepted or partially accepted recommendations made since 2002, 133 (68%) were fully implemented, with actions to implement the remaining in progress. 95% of recommendations from 2002 to 2006 have been implemented. The implementation rates decrease for recommendations issued in 2007, 2008 and 2009 (76%, 27% and 3% respectively). Follow up activity in early 2011 has considerably increased the implementation rate.

69. OIOS carried out four programme evaluations in 2010. These were: Safety of nuclear installations; Contribution and role of the FAO/IAEA Agriculture and Biotechnology Laboratory; Project planning and achievement of objectives; and NLO function and structure. Achievements in planning, impact and sustainability were noted, and common areas for further improvement continued to be identified. Problems in rolling out project results to end users were highlighted, particularly the need to reach farmers. Interestingly, this latter issue had been raised in a 2008 evaluation of TC projects on sustainable intensification of crop systems.

70. The evaluation noted that TC projects in the area of safety of nuclear installations were relevant to Member State needs, in line with Country Programme Frameworks, and effective in producing the expected results: enhancing core competencies associated with the safety of nuclear installations. The report, however, identified problems in the area of commitment, differences between ministries, changes in leadership and staff, and communication among the implementing partners and between Agency staff and project counterparts.

71. With regard to the evaluation of the role of the FAO/IAEA Agriculture and Biotechnology laboratory, the report noted that assistance received through TC projects was very positive, relevant and of high quality. Most counterparts reported that they

had achieved the majority of their intended outputs, and that professional practices had improved as a result of TC projects. However, the evaluation identified difficulties in rolling out the benefits of research to end users, such as farmers, and also noted difficulties in the timing of placing of fellows. Sustainability presented a mixed result, particularly as regarded benefitting the end user, and brain drain was identified as a major obstacle.

72. In the evaluation of project planning and achievement of objectives, the report found that TC projects were relevant to Member State needs, that project planning information was well disseminated, and that Agency inputs were effectively used for the transfer of technical know-how and the enhancement of national scientific skills. Although most intended TC project objectives were achieved, the report pointed out that some could not be satisfactorily achieved, usually for reasons related to poor timing of policy decisions and weak national commitment. Sustainability was however achieved in many instances, and appeared to be linked to project focus on the creation of key national institutions, inclusive planning involving multiple stakeholders, and collaboration among regional peers through regional TC projects.

73. The evaluation of the NLO function and structure found great regional variation in the application of the NLO guidelines, but noted that as the Guidelines were enacted only two years ago, it is too early to expect major changes. Issues of concern identified included the seniority of the person holding the NLO position, limited experience in project management, limited English language proficiency, insufficient knowledge of the Agency's planning processes, strategies and policies, and an absence of critical qualifications in a significant number of NLOs. The report noted that the national institution that hosts the NLO has the duty to fully support and ensure that NLO functions are accomplished successfully, and that decision-makers in Member States, including their Permanent Missions, should be fully aware of the importance and nature of the NLO's work, and the resources necessary for carrying it out.

B. TC Programme Resources and Delivery



B. TC Programme Resources and Delivery

B.1. Financial overview

74. As of 31 December 2010, pledges against the 2010 Technical Cooperation Fund (TCF) target totalled \$78.4 million²² or 92.3% of the \$85.0 million target. The rate of attainment on payments, at the end of December 2010, was 87.9%, reflecting unpaid pledges for 2010 of \$3.7 million. This increased to 90.8% at the end of March 2011, thereby meeting the minimum rates of attainment requirement set by the Board of Governors in 2004. Total TCF resources, including payments for previous years, national participation costs (NPCs), assessed programme cost arrears (APCs) and miscellaneous income, amounted to \$79.7 million. Total resources and net new obligations for the 2010 TC programme

were high, showing a substantial increase from 2009 figures (Fig. 6), mainly due to extrabudgetary contributions and projects (see B.1.3).

B.1.1. Technical Cooperation Fund²³

75. New resources for the TCF in 2010, including TCF payments for previous years, NPCs, APCs and miscellaneous income, reached \$79.7 million. This decrease from the 2009 figure of \$86.1 million is largely because most NPCs were paid in 2009 in the first year of the 2009–2011 TC cycle. New resources also fell in 2010 because the rate of attainment on payments decreased from 94.5% in 2009 (figure updated 31 December 2010) to 90.8% in 2010 (figure updated 31 March 2011). The rate of attainment on pledges, as of 31 December 2010, was 92.3% for 2010, against 94.5% for 2009 (updated as per 31 December 2010).

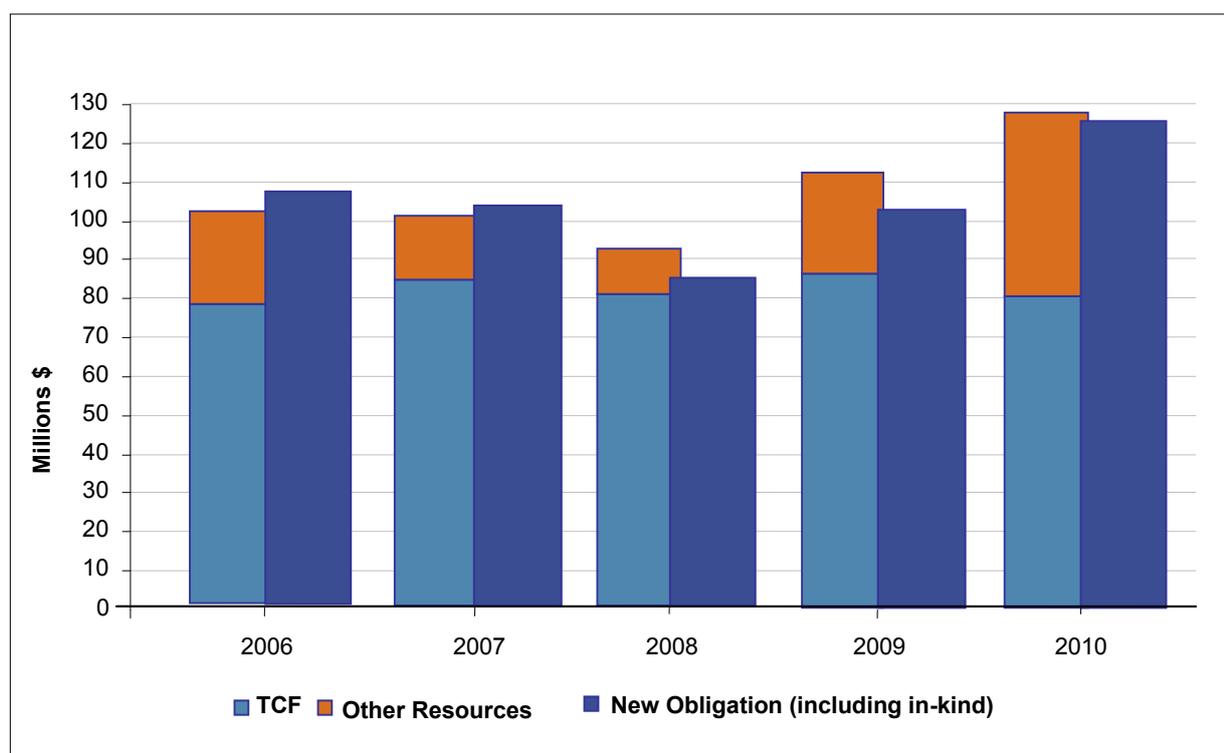


Fig. 6. TCP resources and new obligations between 2006 and 2010.

²² Not including TCF payments for previous years, national participation costs (NPCs), assessed programme costs (APCs) and miscellaneous income.

²³ Section B.1.1. relates to operative paragraph 7 of resolution GC(54)/RES/9 on timely payments to the TCF.

B.1.2. Payment of national participation costs and assessed programme costs arrears²⁴

76. Payments of NPCs totalled \$0.8 million out of a total of \$1.2 million, leaving outstanding payments of some \$0.4 million. Some \$0.2 million was also received through payments of outstanding arrears in APCs. As at 31 December 2010, the amount of arrears still outstanding for APCs was some \$2.2 million.

B.1.3. Extrabudgetary contributions and in-kind contributions²⁵

77. Extrabudgetary contributions from Member States and international organizations accounted for around \$24.9 million in new resources, some \$1.6 million of which came from Nuclear Security Fund resources used to implement activities through TC projects. An additional \$20.5 million was provided

by Member States to support activities in their own country (government cost-sharing). Figure 7 presents the extrabudgetary resources received over the past ten years, broken down by donor type. In-kind contributions accounted for \$2.2 million in 2010.

Trends in extrabudgetary funding

78. Extrabudgetary resources in 2010 show a significant increase from 2009. Extrabudgetary contributions from all sources (donor countries, international and bilateral organizations, government cost-sharing) increased, in particular from donor countries (\$3.0 million from Russia and \$10.3 million from the USA of which \$1.9 million was provided from the Peaceful Uses Initiative to be utilized for nuclear power infrastructure) and international organizations (\$7.5 million from the European Commission, mainly for the safe removal of spent fuel).

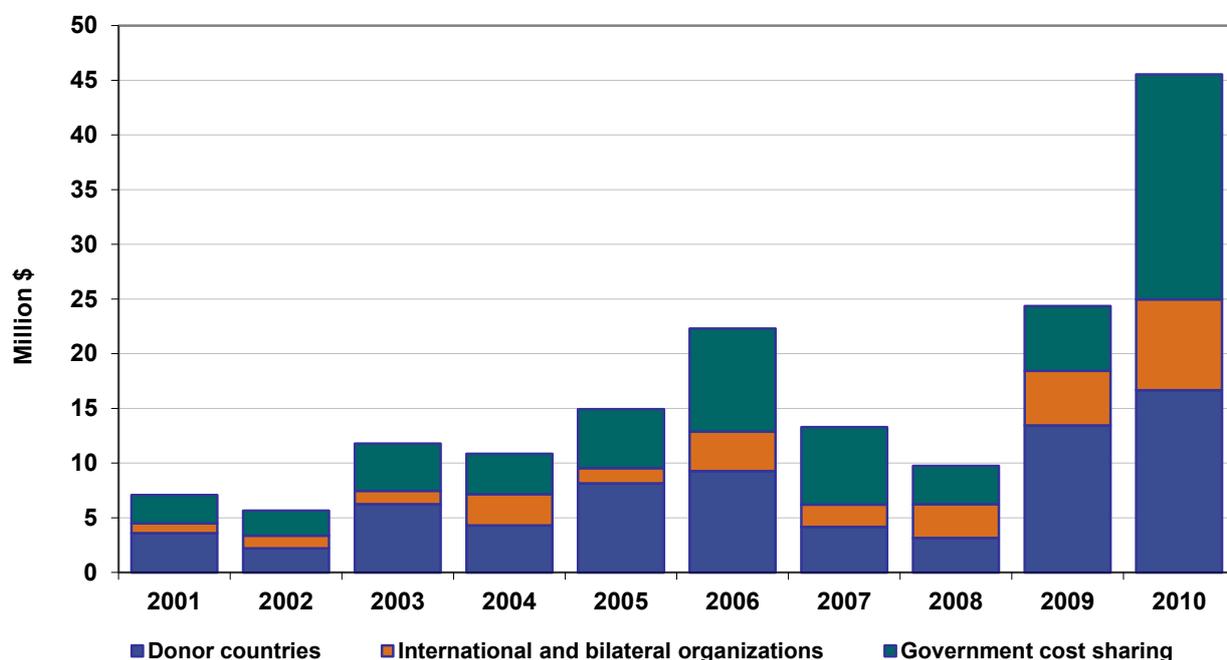


Fig. 7. New extrabudgetary resources between 2000 and 2010.

²⁴ Section B.1.2. relates to operative paragraphs 8 and 10 of resolution GC(54)/RES/9 on timely payment of NPCs and payment of APC arrears; and on ensuring the commencement of projects upon receipt of at least the minimum payment of the NPCs.

²⁵ Section B.1.3. relates to operative paragraph 18 of resolution GC(54)/RES/9 on seeking resources in implement footnote-a/ projects.

B.2. Delivering the technical cooperation programme

79. TC programme delivery can be expressed in both financial and non-financial terms. Financial delivery is expressed in terms of disbursements and obligations. Non-financial delivery (i.e. outputs) can be expressed numerically in terms of, for example, experts deployed, training courses conducted or purchase orders placed. For the programme as a whole, new resources stood at \$127.6 million. Implementation, measured against the adjusted programme for 2010, reached a rate of 76.6% (\$123.1 million for net new obligations against \$160.9 million for the adjusted programme), almost the same as the rate of 77.3% attained in 2009 (Table

1). The substantial increase in the absolute values of the 2010 figures for the indicators below is mainly due to extrabudgetary projects and expenditures (see B.1.3).

B.2.1. Indicators: Human resources and procurement²⁶

80. Human resource and procurement indicators (non-financial delivery indicators) for 2010 show a substantial increase in expert and lecturer assignments, fellowships and training course participants in comparison to 2009 (Table 2). Procurement also shows an increase against 2009 figures. Please see the Supplement to this report for a more detailed presentation of delivery in 2010, with both financial and non-financial indicators.

Indicator	2009	2010	Increase/ (decrease)
Adjusted programme	130 720 675	160 868 708	30 148 033
Net new obligations	101 001 299	123 116 582	22 115 283
Implementation rate	77.3%	76.6%	(0.7%)
Disbursements (including in-kind)	85 366 795	114 265 840	28 899 045

Table 1. Delivery of outputs: financial indicators for 2009 and 2010.

Indicator	2009	2010	Increase/ (decrease)
Expert and lecturer assignments	3694	3890	196
Meeting participants and other project personnel	5090	4964	(126)
Fellowships and scientific visitors in the field	1532	1838	306
Training course participants	2493	2962	469
Training courses	188	222	34
Purchase orders placed	2466	2523	57
Subcontracts issued	5	10	5

Table 2. Delivery of outputs: non-financial indicators for 2009 and 2010.

²⁶ Section B.2.1. relates to operative paragraph 15 of resolution GC(54)/RES/9 on ensuring that components of TC projects are readily available to MSs.

B.2.2. Indicators: Utilization of TCF resources

81. In financial terms, implementation of the TCF (excluding extrabudgetary projects) was high. New obligations, the measure that most closely indicates in financial terms the delivery set in motion during the year, reached \$76.2 million, a TCF implementation rate of 73.9%, slightly down from \$85.5 million in 2009. Despite this, TCF disbursements in 2010 were much higher, accounting for \$91.9 million, as compared with \$71.6 million in 2009.

B.2.3. Unobligated balance

82. At the end of 2010, the unobligated balance²⁷ was \$29.7 million, slightly higher than at the end of 2009. Of this total, some \$4.7 million represents TCF pledges for 2010 and previous years still unpaid as at 31 December 2010. \$2.1 million represents cash held in currencies that are difficult to use in the implementation of the TC programme. The reduction from the 2009 total of \$13.7 m was made possible following an agreement with UNDP China. The useable unobligated balance stood at \$23.0 million at the end of the year.

Description	2006	2007	2008	2009	2010
Total unobligated balance	19 626 000	19 336 711	25 649 096	26 255 064	29 726 410
Pledges not yet paid	(1 642 125)	(1 142 148)	(993 287)	(3 352 995)	(4 689 668)
Non-convertible currencies that cannot be utilized	(12 090)	(8 239)	(11 911)	(11 839)	(16 632)
Currencies that are difficult to convert and can only be used slowly	(8 681 250)	(6 945 906)	(12 166 564)	(13 709 757)	(2 037 063)
Resources that can be used for TC programme obligations	9 290 535	11 240 418	12 477 344	9 180 474	22 983 047

Table 3. Comparison of unobligated balance of the TCF (in US dollars).

²⁷ Total funds available less disbursements and less unliquidated obligations against the current year.

B.2.4. Programme Reserve Projects

83. The Secretariat initiated one reserve fund project during 2010 at the urgent request of Kazakhstan, KAZ/7/002, titled ‘Supporting Assessment of the Territory of the Semipalatinsk Nuclear Test Site for Further Economic Use’. The project objective was to provide support and strengthen national capacity for

radiological measurements, collection, assessment and interpretation of radioecological data pertinent to feasibility studies towards economic uses of the former Semipalatinsk Nuclear Test Site. The project was put into ‘in closure’ status at the end of 2010 and will not have any further activities or obligations against it.

KAZ/7/002, ‘Supporting Assessment of the Territory of the Semipalatinsk Nuclear Test Site for Further Economic Use’		
Disbursement end 2010	Unliquidated Obligation end 2010	Total
\$38 116	\$10 029	\$48 145

C. Programme Activities and Achievements in 2010



C. Programme Activities and Achievements in 2010²⁸

84. The TC programme is driven and guided by the priority needs of Member States, with the overarching goal of contributing to their socioeconomic development. The programme helps Member States to develop capacities to apply nuclear technologies that have proven to be suitable in addressing priority development needs. It builds partnerships at every level, from counterparts up to other international organizations, in order to best leverage all available support. The programme has a track record of achievements and is based on five decades of dialogue and interaction with Member States. It focuses on improving human health, supporting agriculture and rural development, helping water resource management, advancing sustainable energy development, including the option of nuclear power for electricity, addressing environmental challenges, and promoting nuclear safety and security.

85. The four geographical regions have different needs; this was reflected in the variance of programme distribution between the regions in 2010. Food and agriculture accounted for the highest percentage of disbursements in the Africa region at 25.9%, followed by human health at 22.6%. In Asia and the Pacific, disbursements in the area of nuclear safety were significant at 24%, followed by radioisotope production and radiation technology at 17.9%. In Europe, nuclear science held the lead at 26.2%, followed by nuclear safety at 23.3%, and in Latin America, the highest percentage of disbursements was in the field of human health, at 21%, followed by food and agriculture at 17%. In comparison with the top two areas of disbursement in 2009, priorities in Africa and in the Asia and the Pacific region

remained the same, while in Europe, nuclear safety replaced the second highest 2009 priority of human health. In Latin America, food and agriculture replaced the 2009 priority of nuclear safety.

86. In Africa, a growing awareness of the important role and potential contribution of nuclear technology to address basic human needs has led to significant efforts by Member States to obtain benefits in key development areas of national and regional significance related to human health, food and agriculture, water resources management, energy, environment and industry. To maximize impact, the focus is on developing human resources to help Member States build sustainable human and institutional capacities in nuclear science and technology. While promoting the peaceful use of nuclear energy for socioeconomic development, the TC programme also emphasises the crucial importance of nuclear, radiation and waste safety and nuclear security, and actively supports Member State efforts at national and regional levels to strengthen national safety infrastructures and to build adequate nuclear security systems.

87. The Asia and the Pacific region is home to more than half the world's population, with a considerable disparity in development in many sectors, including nuclear science and technology. While the region is playing an increasingly important role in the world economy and its fast development in recent decades has created tremendous opportunities for growth, it still faces many serious challenges with regard to food and energy security, environmental protection, health care, and the availability of water and other essential natural resources. Member States in the region expect that some of these important socioeconomic issues can be addressed by an increased utilization of nuclear energy and technologies.

²⁸ Section C. relates to operative paragraphs 1, 15, 20, 22, 25 and 26 of resolution GC(54)/RES/9 on: facilitating and enhancing the transfer of nuclear technology and know-how among MSs; ensuring that the components of TC projects are readily available and meets international quality standards; strengthening TC activities through the development of effective programmes and well defined outcomes; helping Member States to obtain information on (a) the role of nuclear power in mitigating GHG emissions and (b) the role of radiation and nuclear technology in mitigating polluting gases, in managing agricultural and industrial wastes, and improving water security; supporting the self-reliance, sustainability and further relevance on national nuclear and other entities in Member States; and consultations on the support for and implementation of activities under regional cooperation agreements.

88. In Europe, activities are focusing on nuclear and radiation safety, the development of nuclear power (including fuel cycle waste technology and decommissioning), improving health care, and isotope and radiation technology applications in the environment, agriculture and industry sectors. In healthcare, special attention was given to QA/QC in cancer diagnosis and treatment. Emphasis was also placed on emergency preparedness and nuclear security. In the area of safety, special emphasis was put on strengthening regulatory infrastructures and on the operational safety of nuclear installations. In the area of nuclear power, assistance focused on assisting Member State decision-making on the development or expansion of their nuclear power programmes.

89. In Latin America, regional projects and resources assigned to the field of food and agriculture now constitute the largest single component of the regional programme in the current cycle, followed by human health and environment. Capacity building in radiation safety infrastructure has continued as one of the most active areas, along with support to building regional capacity in terms of human resources and laboratory infrastructure.

C.1. Regional overview

C.1.1. Africa

2010 Africa overview	
Programme disbursements	\$30.0 million
Net new obligations	\$27.1 million
Implementation rate	73.7%
Number of countries receiving support	41
Expert and lecturer assignments	701
Meeting participants and other project personnel	779
Participants in training courses	920
Fellows and scientific visitors	683

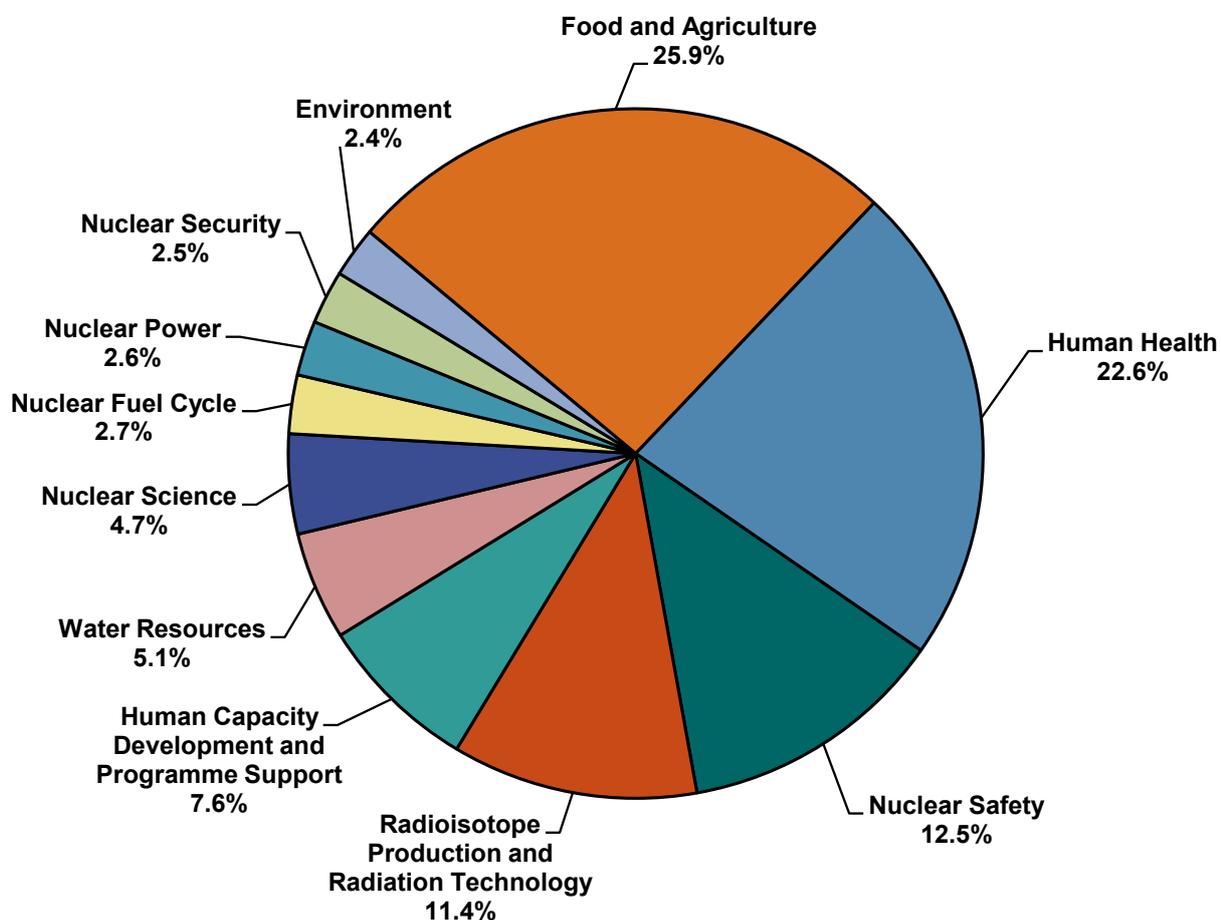


Fig. 8. Disbursements by Technical Field for 2010 – Africa.

90. In 2010, the TC programme provided support to 41 Member States in Africa. New obligations amounted to \$27.1 million, compared to \$26.4 million in 2009. Improvements to programme and project management continued to be promoted through the proactive involvement of national counterparts, based on the principle of shared responsibility. The roles and functions of the NLO and the project counterpart were emphasized as key factors in the successful implementation of TC country programmes and regional cooperative activities. Special efforts were deployed to achieve increased efficiency through significant improvements in project work plan planning, monitoring and feedback to Member States.²⁹

91. To streamline programme management and promote further focused country and regional TC programmes in 2012–2013 and beyond, special efforts were made to close projects. In total, 135 projects were formally completed in 2010.

92. African Member States were very active in 2010 in the development of CPFs. In total, eight CPFs were signed (Benin, Botswana, Chad, Ghana, Kenya, Malawi, Seychelles and Zimbabwe). Major efforts were also made to link CPFs to UNDAFs. The Agency was involved in the UNDAF process in several Member States (Angola, Botswana, Central African Republic, Egypt, Eritrea, Ethiopia,

Malawi, Mozambique, Namibia, South Africa, Tunisia, United Republic of Tanzania, Zambia and Zimbabwe).

93. In preparation for the 2012–2013 TC cycle, considerable efforts went into strategic upstream planning. A participatory approach, based on the proactive involvement of key country role players (mainly NLOs and project counterparts) concentrated on maximising the contribution of nuclear science and technology to major areas of economic and social significance identified as priorities by Member States. In total 350 national project concepts and 44 regional project concepts were proposed for inclusion in the new programme cycle.

94. The African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA) continued to be the primary mechanism for technical cooperation among developing countries (TCDC) and for enhancing regional cooperation. The AFRA Chair and AFRA Committees took the lead in the preparation and formulation of the proposed 2012–2013 AFRA programme, in line with the priorities outlined in the Regional Strategic Cooperative Framework for 2008–2013. Concepts were developed through the coordinated and collaborative efforts of the AFRA Programme Management Committee (PMC) and the Project



Signature of the CPF for Zimbabwe, 2010.

²⁹ This relates to operative paragraph 16 of resolution GC(54)/RES/9 on providing MSs with adequate information on project development according to the logical framework methodology.

Scientific Consultants (PSCs), reviewed at the 21st AFRA Technical Working Group Meeting, and subsequently endorsed by the 21st AFRA Meeting of Representatives. The proposed non-AFRA regional programme was prepared on the basis of project concepts submitted by a group of Member States and the Secretariat (the technical Departments and the Division for Africa). Consultations were then held with regional stakeholders as appropriate, within and outside the Secretariat. The programme responds to regional needs, and takes into consideration recent emerging trends and new challenges in Africa's development, as well as the need to complement AFRA's proposed 2012–2013 TC programme.

95. The AFRA Programme Management Committee also undertook a mid-term review of the Profile of the AFRA Strategic Cooperative Framework 2008–2013. Efforts were also focused on setting up additional regional resource centres (AFRA Designated Centres) and the implementation of key human resource development activities.

96. Given the special importance of radiation safety and nuclear security, a process of appointing Regional Designated Centres for Training and Education in Radiation Protection through auditing of preselected institutions in Algeria, Egypt, Ghana, Morocco

and South Africa was completed. This effort aims to develop human resource capacities in African Member States and to enhance their commitment to building radiation protection infrastructure that complies with the requirements of the International Basic Safety Standards.

97. In 2010, the AFRA High Level Steering Committee for Human Resource Development and Nuclear Knowledge Management successfully implemented a key feature of its Action Plan to respond adequately to the current and future human resources development needs in Africa with the launch of the AFRA Fellowship Programme. The fellowship programme is a significant milestone. It will contribute significantly to training a new generation of African scientists who will foster nuclear science and technology for socioeconomic development. Ten candidates from six African Member States (Cameroon, Côte d'Ivoire, Niger, Sudan, Uganda, and United Republic of Tanzania) were awarded fellowships to undertake a two-year Masters Programme in Nuclear Science and Technology. This started in October 2010 in the Department of Nuclear Engineering, University of Alexandria, Egypt, and the Graduate School of Nuclear and Allied Sciences, University of Ghana.



AFRA postgraduate fellows at the Graduate School of Nuclear and Allied Sciences, University of Ghana.

Both institutions are recognized AFRA Regional Designated Centres for Higher and Professional Education, and both have the capacity to implement the harmonized curriculum required for awarding a Master's Degree in Nuclear Science and Technology in the region. Also in 2010, the AFRA High Level Steering Committee for Human Resource Development and Nuclear Knowledge Management finalized at the policy and operational levels the actions required to establish the AFRA Network for Education in Nuclear Science and Technology (AFRA-NEST). This network will focus on training and educating African scientists in several fields related to nuclear science and technology.

98. The African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba) entered into force on 15 July 2009. In conformity with Articles 12 and 14 of the Treaty, the African Union Commission (AUC) in its capacity as depositary convened the First Conference of the Parties to the Treaty in November 2010. The Conference aimed, inter alia, to elect members of the African Commission on Nuclear Energy (ACNE) established by the Treaty. The Agency and AFRA participated in the Conference. As part of its contribution to the Conference, the Agency prepared a document, 'Factual Information on the Status of Nuclear Science and Technology in Africa', providing a brief overview of the status of nuclear science and technology and of activities related to its peaceful application in Africa. The document supported substantive discussions in relevant areas during the Conference. The AUC intends to seek active advisory support from the Agency to operationalize ACNE and to facilitate future collaboration between ACNE and AFRA, in view of the potential synergies.

99. In 2010, the IAEA facilitated policy consultations between AFRA and the African Energy Commission (AFREC) for the conclusion of a Memorandum of Understanding (MoU) defining the modalities of cooperation in support of the efforts of the region in energy planning and introduction of nuclear power. The MoU includes concrete actions to be implemented by AFRA and AFREC in the field

of sustainable energy development through training, regional integration of energy planning, education of policy makers, e-learning, data collection, and Regional Training Centres.

C.1.2. Asia and the Pacific

2010 Asia and the Pacific overview	
Programme disbursements	\$27.4 million
Net new obligations	\$22.2 million
Implementation rate	70.2%
Number of countries and territories receiving support	34
Expert and lecturer assignments	1200
Meeting participants and other project personnel	1071
Participants in training courses	777
Fellows and scientific visitors	487

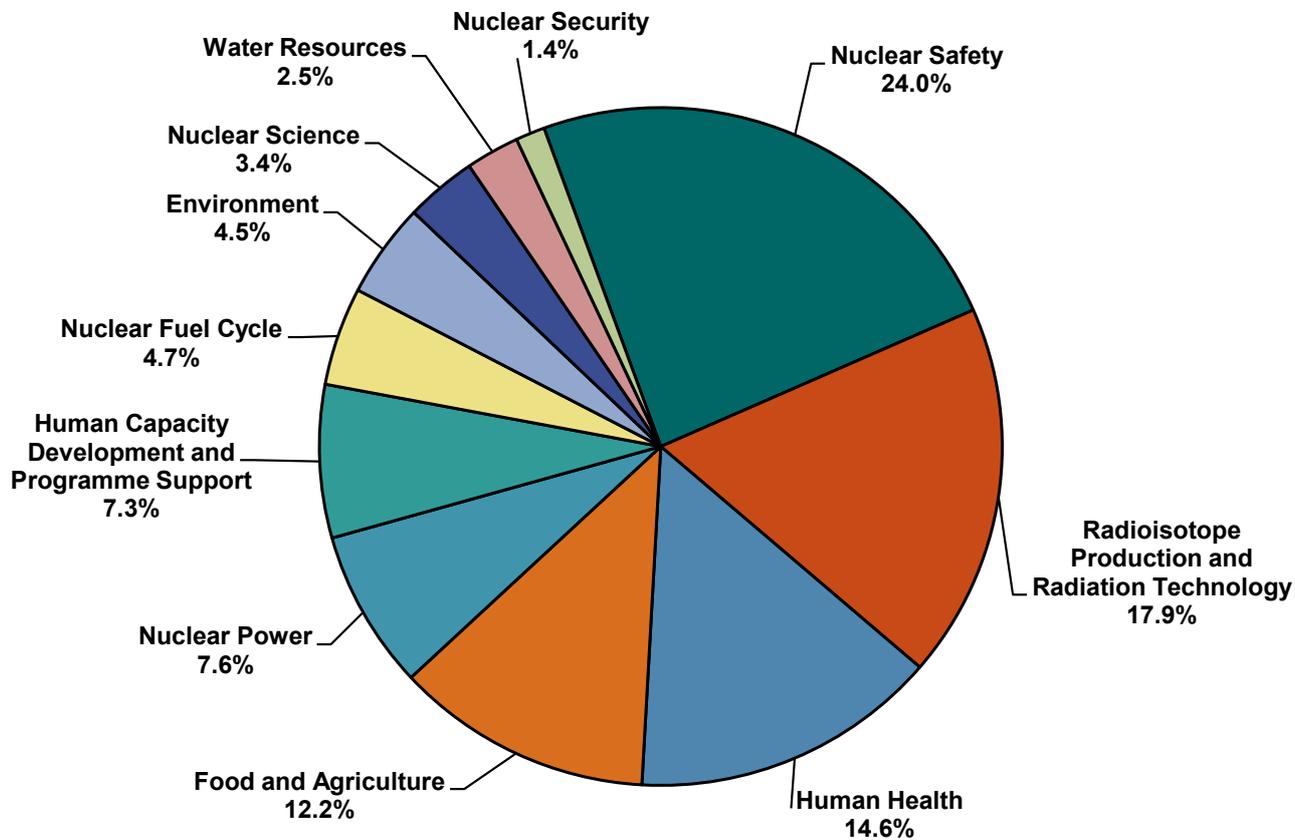


Fig. 9. Disbursements by Technical Field for 2010 – Asia and the Pacific.

100. In 2010, the Agency provided technical assistance to 34 countries and territories in Asia and the Pacific³⁰, six of which are LDCs (Afghanistan, Bangladesh, Cambodia, Myanmar, Nepal and Yemen). A high volume of delivery was recorded with net new obligations amounting to \$22.2 million and a financial implementation rate of 70.2%, notwithstanding the unfavourable security/political situation in several countries in the region. The distribution of disbursements in the region for 2010 by area of activity is shown in Figure 9.³¹

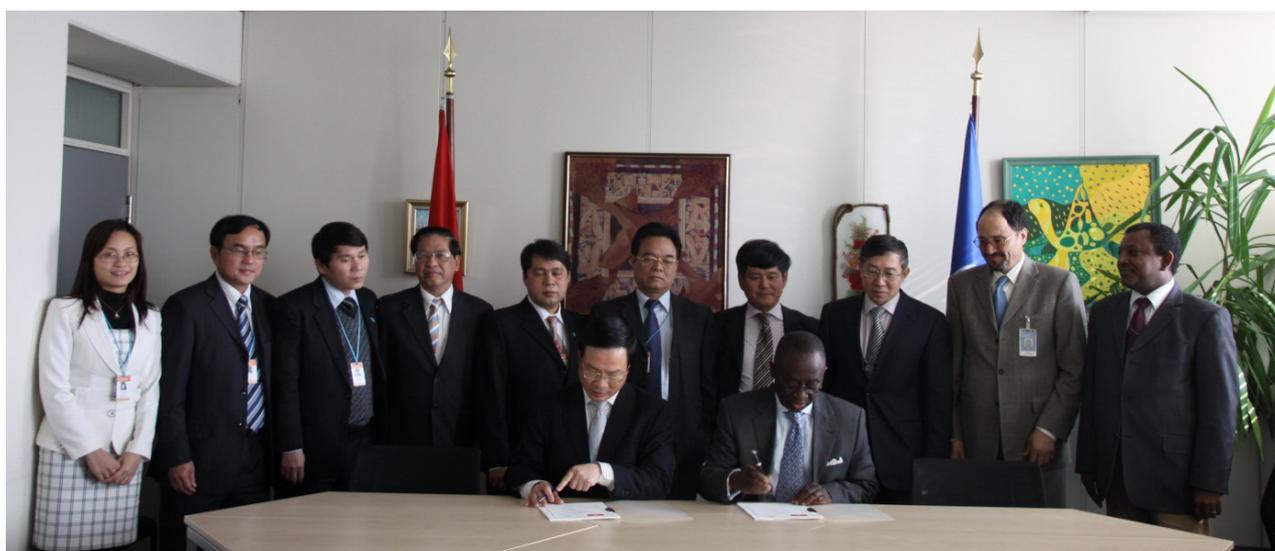
101. More than 100 projects completed their planned activities and were closed in 2010. The closure of a further 50 was initiated.

102. Several countries developed or renewed their CPFs in 2010. Eight CPFs were signed (China, Malaysia, Nepal, Oman, Pakistan, the Philippines, Singapore and Syria), bringing the number of valid CPFs in the region from five in 2008 to 19 in 2010. Nepal is the first country to sign its CPF in advance of having a national TC programme. A CPF for Viet Nam was signed in February 2011. In addition, draft CPFs for Afghanistan, Iraq, Qatar, Saudi Arabia and

the United Arab Emirates were prepared and are under review.

103. Attention was also devoted to developing partnerships with other UN organizations through participation in the UNDAF process in Mongolia, Indonesia, the Philippines and Saudi Arabia. The UNDAF for Mongolia was signed by the Agency in March 2011.

104. In 2010, Member States carried out extensive strategic planning activities with the support and assistance of the Agency, using available CPFs, the Regional Cooperative Framework (RCF) and Strategic Profiles in upstream preparations. This provided a sound basis for the preparation of national and regional programmes for the 2012–2013 TC programme cycle. Close consultations between national authorities, prospective project counterparts and the IAEA's Secretariat took place, including regional meetings held in Vienna as well as in the region for the two regional cooperative agreements, the Co-operative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology (ARASIA) and



Signature of the CPF for Viet Nam, 2011.

³⁰ The Agency's technical cooperation with Iran has continued in accordance with document GOV/2007/7 as approved by the Board on 8 March 2007 as well as with the mechanisms which the Secretariat has put in place to ensure that all Agency cooperation with Iran is in compliance with UN Security Council resolutions 1737(2006), 1747(2007), 1803(2008) and 1929 (2010).

³¹ This relates to operative paragraph 24 of resolution GC(54)/RES/9 on examining the specific characteristics and problems of the developing countries and LDCs.

the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA).³²

105. To further strengthen regional cooperation and enhance relevance, a Regional Cooperative Framework (RCF) for IAEA technical cooperation in Asia and the Pacific was developed and adopted by the Member States during the 2010 NLO meeting. The Framework identifies potential areas and opportunities for regional cooperation, as well as the means and modalities for concrete implementation and knowledge sharing.

106. Following the updating of the RCA Medium Term Strategies in 2009, RCA Member States have developed Strategic Priorities for 2012–2017 that focus on the direction of future RCA activities. Draft Strategic Profiles for ARASIA Member States have also been prepared and are under final review.

107. Member States in Asia and the Pacific continue to show an increased interest in nuclear power, and over the past decade several have taken concrete steps towards constructing and operating their first nuclear power plants. Factors that have increased interest in nuclear power for electricity generation include international obligations to reduce CO₂ gas emissions, mitigation of climate change effects and the increasing price of fossil fuel, as well as higher demand for electricity as a result of fast growing economies. IAEA assistance, provided through national, regional and interregional TC projects, covers many areas of nuclear power infrastructure, including awareness-raising to facilitate decision making and public acceptance, human resource development and nuclear safety regulation. The Agency also facilitated information and experience sharing between Member States with nuclear power and Member States interested in nuclear power. To help Member States in the region build viable national nuclear power infrastructure in an integrated manner, and to ensure that the different

IAEA Departments deliver to these Member States under one common action plan, TCAP worked in 2010 with some Member States and the IAEA technical Departments concerned to develop an Integrated Master Plan (IMP). This aims to channel IAEA assistance in a coordinated and cohesive manner, taking into consideration country progress and the 19 IAEA infrastructural issues. As a result of these efforts, Viet Nam's IMP for 2011–2015 was developed in early 2011, and other countries are also taking firm steps to develop their IMPs this year in full cooperation with the IAEA.

108. Nuclear and radiation safety remains one of the priority technical cooperation area in the region. Assistance was provided through human resource development, review/evaluation missions such as Integrated Regulatory Review Service (IRRS) missions, and legislative help. With the combined efforts of the Member States and the Agency, safety infrastructure in most countries in the region was strengthened significantly in 2010.

³² This relates to operative paragraph 16 of resolution GC(54)/RES/9 on providing MSs with adequate information on project development according to the logical framework methodology.

C.1.3. Europe

2010 Europe overview	
Programme disbursements	\$34.3 million
Net new obligations	\$54.7 million
Implementation rate	87.1%
Number of countries receiving support	32
Expert and lecturer assignments	1122
Meeting participants and other project personnel	2186
Participants in training courses	620
Fellows and scientific visitors	332

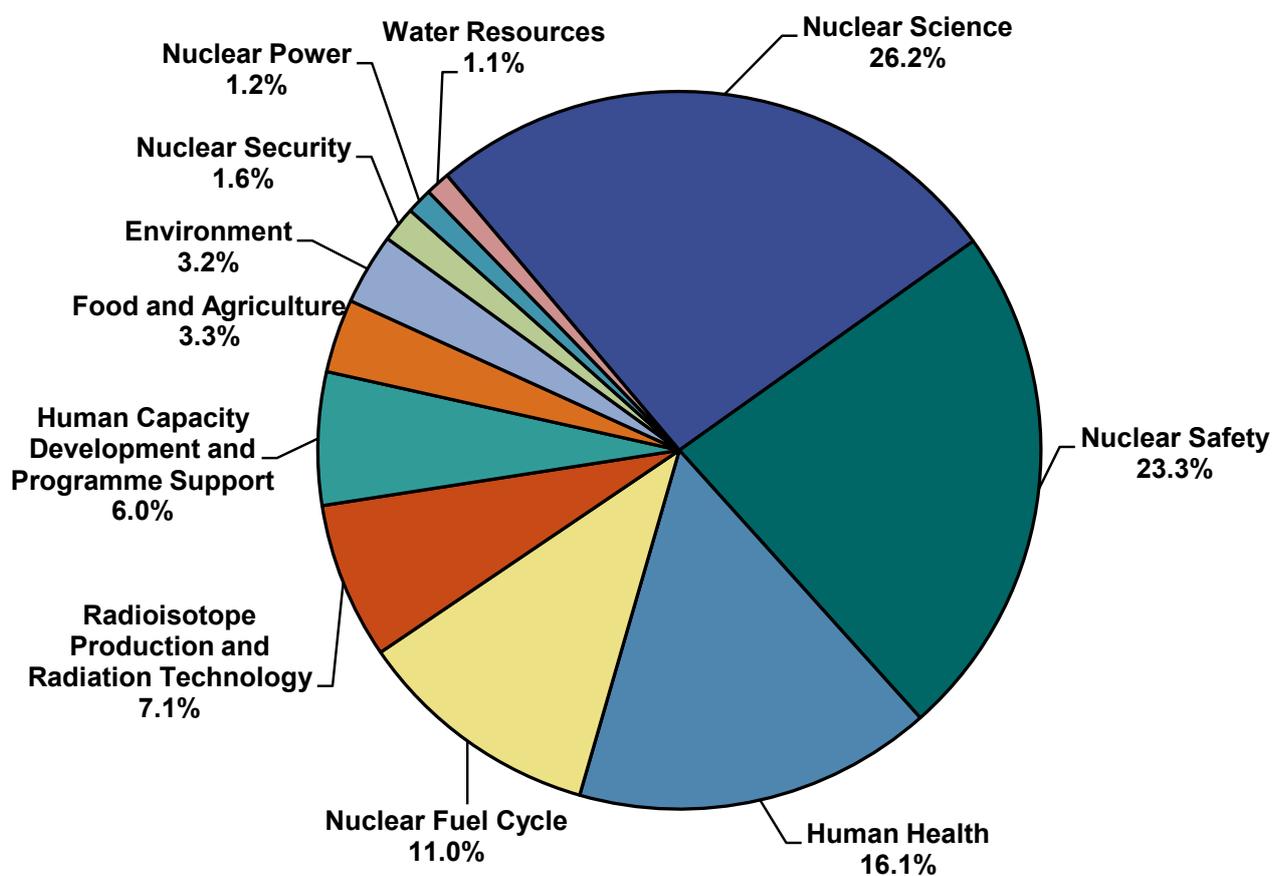


Fig. 10. Disbursements by Technical Field for 2010 – Europe.

109. In 2010, the TC programme provided support to 32 countries in Europe. Net new obligations reached \$54.7 million, and the financial implementation rate was 87.1%. The distribution of disbursements in the region for 2010 by area of activity is shown in Figure 10.

110. A total of 80 projects completed their planned activities and were closed in 2010.

111. CPFs were completed and signed for Hungary, Estonia and Kazakhstan. Work continued on the renewal of CPFs for Albania, Armenia, Azerbaijan, Bulgaria, Croatia, Cyprus, Georgia, Latvia, Poland, Moldova, Slovakia, Slovenia, Tajikistan, FYR of Macedonia, Turkey and Ukraine

112. The Agency participated in the UNDAF process for Albania, Azerbaijan, Georgia, Kazakhstan, Moldova, Montenegro, Tajikistan, and Ukraine, and maintained dialogue and information sharing with other UN partners in the region through participation in the Europe and Central Asia UNDG (Regional Directors) meetings organized by UNDP, as well as in the Europe and Central Asia Regional Coordination Mechanism meetings organized by the United Nations Economic Commission for Europe (UNECE).

113. 2010 saw the adoption of a strategy for the TC programme by Member States in the Europe region aimed at enhancing the efficiency and effectiveness of the programme, with strong emphasis on regional cooperation. The strategy, *inter alia*, promotes triangular cooperation in the region: that

is, horizontal cooperation among Member States coupled with cooperation with relatively more advanced countries in the nuclear field. The strategy has closely guided the preparation of the 2012–2013 regional programme for the Europe region.

114. Regarding regional cooperation, collaboration with the European Commission (EC) was strengthened in the areas of safety and in dealing with the problem of uranium tailing sites in Central Asia. On safety, the EC approved support to projects RER/9/096, ‘Strengthening the National Infrastructures for the Control of Radiation Sources (TSA-1), (Phase II)’ and RER/9/099, ‘Strengthening the Effectiveness of Regulatory Authorities and Advanced Training in Nuclear Safety’. With regard to the legacy of uranium sites, the EC approved support for sub-regional activities in Central Asia under RER/3/010, ‘Supporting Preparation for Remediation of Uranium Production Legacy Sites’, as well as for completion of the environmental impact assessment of two uranium production sites in Uzbekistan under UZB/9/005, ‘Improving Operational Safety of the Research Reactor at the Institute of Nuclear Physics (Phase II)’. Cooperation on the legacy of uranium production sites in Central Asia is continuing with international partners such as UNDP, the EC, United Nations Environment Programme (UNEP), the European Bank for Reconstruction and Development (EBRD), the Eurasian Economic Community (EurAsEC), and the Organization for Security and Co-operation in Europe (OSCE).



Soil conservation activities under project TAD/5/005 in Tajikistan, an example of work within the UNDAF framework.

C.1.4. Latin America

2010 Latin America overview	
Programme disbursements	\$19.4 million
Net new obligations	\$15.8 million
Implementation rate	63.4%
Number of countries receiving support	22
Expert and lecturer assignments	810
Meeting participants and other project personnel	892
Participants in training courses	645
Fellows and scientific visitors	336

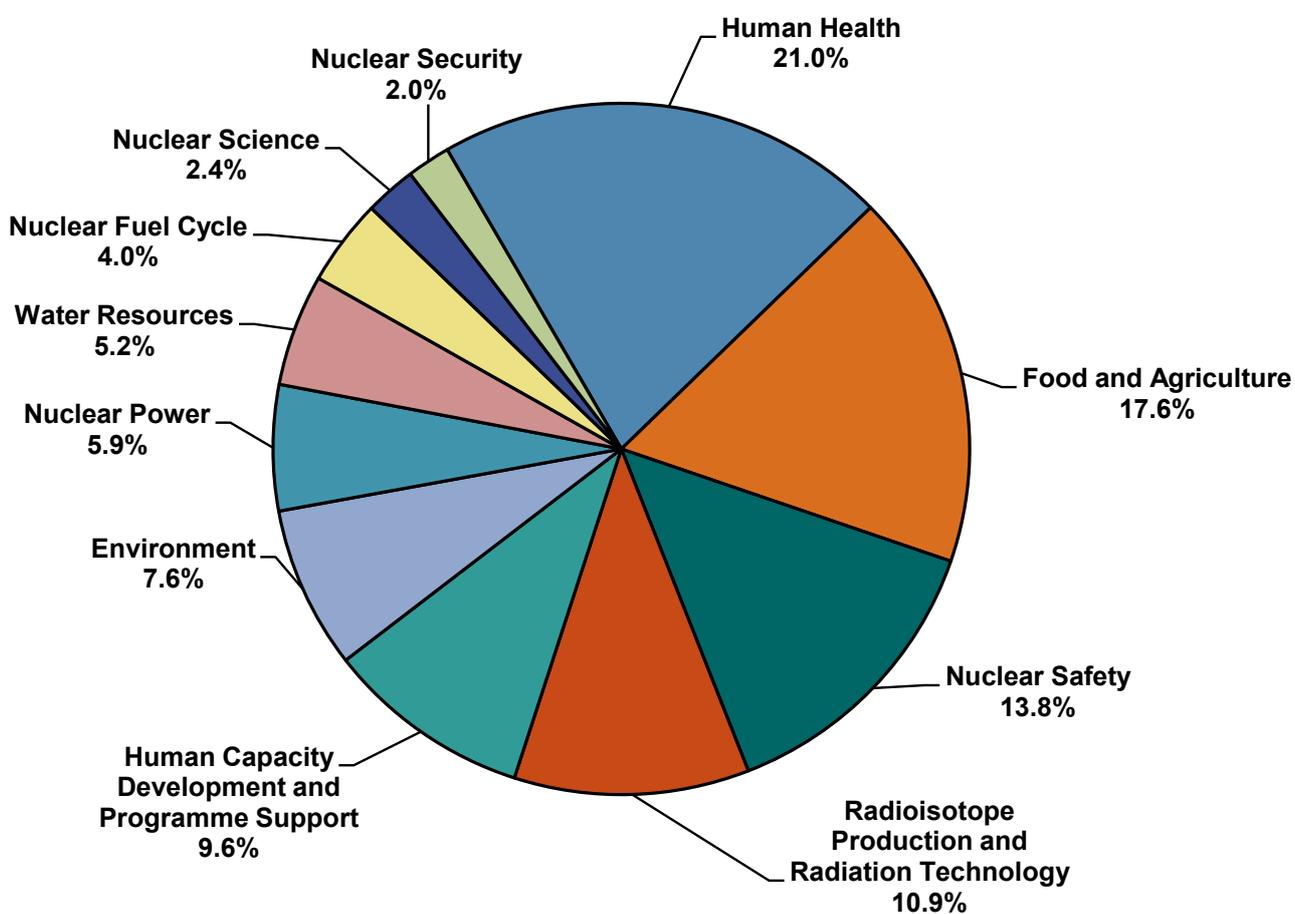


Fig. 11. Disbursements by Technical Field for 2010 – Latin America.

115. In 2010, the TC programme provided support to 22 Member States in Latin America. Net new obligations reached \$15.8 million, and the financial implementation rate was 63.4%. The distribution of disbursements in the region for 2010 by area of activity is shown in Figure 11.

116. During 2010, a total of 58 projects completed their planned activities and were closed.

117. Four new CPFs were signed with Jamaica, Belize, Mexico and Ecuador.

118. The region's 33 NLOs and ARCAL Coordinators met together in Antigua, Guatemala, to launch the preparation of the 2012–13 TC programme cycle, concentrating on a results based management (RBM) approach. A briefing for the Latin American Member States' Permanent Missions in Vienna was held in November 2010.³³

119. ARCAL celebrated the 25th anniversary of its founding at a special ceremony in September 2010 during the General Conference. The ARCAL Regional Agreement continues to establish itself as a major intergovernmental institution in the field of nuclear applications for development. With the accession of Honduras to the Agreement and the ratification by Guatemala, all but two of the region's Member States have ratified their ARCAL membership. Outreach activities to potential new

development partners were carried out actively during the year. The amount of financial resources implemented under the ARCAL TC projects in the current cycle was more than double the amount executed in previous years.

120. Regional partnerships were maintained or established with the following entities, by field:

- **Health and Agriculture:** Pan American Health Organization (PAHO), Research Centre for Energy, Environment and Technology (CIEMAT), Latin American Association for Radiation Oncology (ALATRO), European Society for Therapeutic Radiology and Oncology (ESTRO), and Inter-American Institute for Cooperation on Agriculture (IICA).
- **Environment/Water:** Association of Caribbean States (ACS), Intergovernmental Oceanographic Commission (IOC), National Oceanic and Atmospheric Administration (NOAA) United States, and United Nations Environment Programme (UNEP).
- **Energy and Industry:** Latin America Energy Organization (OLADE).
- **Nuclear Safety:** Nuclear Security Council (CSN) Spain, United States National Regulatory Commission (USNRC), European Commission.



ARCAL 25th Anniversary Celebration held on 22 September 2010. Photo: M. Alfonso.

³³ Relates to operative paragraph 16 of resolution GC(54)/RES/9 on providing MSs with adequate information on project development according to the logical framework methodology.

C.1.5. Interregional projects

121. 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 trans-regional, global, capacity building or joint activities. In 2010, a total of \$1.8 million was disbursed under interregional projects out of the total TC disbursement of \$114.3 million.

122. INT/4/142, ‘Promoting Technology Development and Application of Future Nuclear Energy Systems in Developing Countries’, continues to build technological capabilities for long-term energy planning and to support dialogue between technology holders, technology users and developing countries involved in nuclear power planning. In 2010 workshops took place on Long-range Nuclear Energy Programme Planning and Strategy Development, and Project Management for New Nuclear Power Projects (hosted by the Republic of Korea). Two workshops of the INPRO Dialogue Forum on Nuclear Energy Innovations between nuclear technology holders and technology users were also held, which addressed topics of common interest: socio-and macroeconomic factors of nuclear energy programmes, ‘proven’ nuclear technology, safety approaches for innovative nuclear

systems and multilateral approaches to nuclear energy deployment.

123. The IAEA and NOAA formalized their collaboration to provide technical assistance in the management of the impacts of harmful algal blooms (HABs) under a Practical Arrangement signed in 2010. The Agreement, which supports INT/7/017, ‘Providing Coordinated Support in the Use of Receptor Binding Assay to Address Impacts of Harmful Algal Toxins in Seafood’, outlines how the two organizations work together to support IAEA Member States in the development and implementation of joint strategies and programmes concerning human health, seafood safety and the environmental impacts of HABs. The focus is on developing capacities for HABs monitoring, toxin testing and technology transfer applicable to HABs investigations. Special attention is paid to the receptor binding assay (RBA) methods for toxin in shellfish, which cause paralytic shellfish poisoning and ciguatera fish poisoning. The Agency, in cooperation with the Intergovernmental Oceanographic Commission (IOC), United Nations Educational, Scientific and Cultural Organization (UNESCO) and NOAA, initiated region wide support in 2009 to 14 Member States in Latin America and the Caribbean to develop their capabilities for early detection of toxins in shellfish, using rapid assay techniques



Preparing samples for RBA analysis, Research Centre on Microscopic Structures (CIEMIC), Costa Rica.
Photo: Y. Bottein, NOAA.

based on radio-labelled saxitoxin. RBA uses a nuclear technique to determine levels of neurotoxins produced by harmful algae. The technique is more sensitive and allows for a higher throughput than the conventional mouse bioassay method. It can, therefore, ensure better protection of the public as well as the income of shellfish farmers.

124. Globally, the pandemic of wheat black stem rust (Ug99) is considered the most serious threat to wheat and barley in 50 years. The threat has already caused an increase in wheat prices, as all commercial varieties are sensitive to the disease, and also threatens barley. The spread of the disease is being monitored by the FAO in the framework of the Borlaug Global Initiative (BGRI). Activities under the TC project INT/5/150, 'Responding to the Transboundary Threat of Wheat Black Stem Rust (Ug99)', have demonstrated unexpectedly early successful results in the development of mutant germplasm with increased resistance to the disease, although these very preliminary observations need to be consolidated. Sixteen countries from Africa and Asia and the Pacific are participating, with Kenya making a leading contribution, together with other interested stakeholders including FAO, the International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Maize and Wheat Improvement Center (CIMMYT), the United States Department of Agriculture – Agricultural Research Service (USDA-ARS), BGRI (USA), the Chinese Academy of Agricultural Sciences (CAAS), the Bhabha Atomic Research Centre (BARC, India) and the Western Australian Department of Agriculture and Food of the Government of Western Australia (DAFWA). By the end of 2010, close to 300 000 mutant germplasm (40 genotypes of wheat and barley) were screened for resistance to wheat black stem rust and virulent derivatives. The intermediate successful results will be confirmed during 2011.

125. The project INT/1/055, 'Support for Human Capacity Building in the Utilization and Operation of the Synchrotron-Light for Experimental Science and Applications for the Middle East (SESAME)',

aims to strengthen international cooperation among Member States participating in SESAME. To date, TC has completed the training of 17 SESAME long term (6 months) fellowships, and 9 short term (1 to 2 month) on-the-job training assignments. Four expert missions were organized in 2010 in support of SESAME activities.

List of frequently used acronyms

AFRA - African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology

Agency - International Atomic Energy Agency

APCs - assessed programme costs

ARASIA - Co-operative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology

ARCAL - Co-operation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean

CPF - Country Programme Framework

FAO - Food and Agriculture Organization of the United Nations

HAB - harmful algal bloom

IAEA - International Atomic Energy Agency

LDC - least developed country

MDG - United Nations Millennium Development Goal

NLO - National Liaison Officer

NOAA - National Oceanic and Atmospheric Administration

NPCs - national participation costs

NPP - nuclear power plant

OLADE - Latin American Energy Organization

PAHO - Pan American Health Organization

PCMF - Programme Cycle Management Framework

PET - positron emission tomography

QA - quality assurance

QC - quality control

RBA - receptor binding assay

RCA - Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology

RSA - Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the International Atomic Energy Agency

SIT - sterile insect technique

TC - technical cooperation

TCF - Technical Cooperation Fund

TSA - thematic safety area

UNDAF - United Nations Development Assistance Framework

UNESCO - United Nations Educational, Scientific and Cultural Organization

WHO - World Health Organization

Annex 1: Selection of project examples by thematic sector



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Human health

Through the technical cooperation programme, the IAEA helps Member States use nuclear techniques to address important health problems. Agency services support the efforts of health care professionals and technologists, policy makers, regulators, universities and patients, providing Member States with specialized skills and infrastructure to prevent, detect and cure major illnesses. Within this sector, the Agency helps Member States to address the challenges posed by cancer, malaria and tuberculosis, malnutrition and disease, as well as supporting quality in nuclear medicine, radiation oncology and diagnostic radiology. Human health is one of the most important areas of the TC programme, with 17.9% of programme disbursements in 2010.

1. In Africa, efforts in 2010 were directed towards helping Member States to carry out comprehensive cancer capacity need assessments and national cancer strategic planning. These efforts took place in collaboration with the African Oncology Group (AFROG), WHO and other partners, using the Programme of Action for Cancer Therapy (PACT) framework. Projects to address malnutrition have also been an area of focus.

2. In Asia and the Pacific, apart from cancer (see earlier section) the major health problems are the widespread incidence of prenatal mortality, child mortality, diabetes and coronary artery disease, and tuberculosis (TB). Recently, HIV/AIDS has become significant, as has the increasing prevalence of malnutrition, which is also leading to obesity in some countries. Improvements to the quality of radiotherapy, nuclear medicine and diagnostic radiology through the establishment of medical physics programmes have been emerging as major areas of technical cooperation in the region. National and regional TC projects are also supporting the development of nuclear medicine procedures and techniques for early detection of diseases such as cancer and cardiovascular diseases. Another important focus of interest in the area has been the establishment of good manufacturing practices (GMP) in cyclotron-produced radiopharmaceuticals for their safe use in the nuclear medicine sector.

3. In both Europe and Latin America, efforts to improve the quality of radiotherapy services are having a positive impact on the number of patients that can be treated and the safety and effectiveness of the treatment delivered.

Cancer

4. The radiotherapy department of Mulago Hospital, Kampala, utilizes a cobalt-60 teletherapy machine and low-dose rate brachytherapy to treat cancer patients. The availability of a core cancer treatment staff of eight, trained over the years through TC projects, means that more patients can be treated with simpler, palliative single or fewer fractions. Supported by UGA/6/015, 'Expanding the Radiotherapy Services', the service was able to treat 1437 patients with the cobalt machine in 2010, while brachytherapy treatment for cancer of the cervix totalled 377 insertions. Local training of radiation therapy technologists has been initiated with the first trainee completing the course at the end of 2010. Through this project, good cooperation has been established with Ugandan hospices, anti-smoking campaigners and HIV/AIDS control programme managers, as more patients in Uganda present with AIDS-related cases of cancer such as Kaposi's sarcoma.

5. In the Asia and the Pacific region, the RCA project RAS/6/038, 'Strengthening Medical Physics through Education and Training', has

further improved safe operating practices and technical standards in the region through the establishment of a common QA/QC programme. Pilot clinical training programmes started in 2010, including two programmes for diagnostic radiology medical physics in the Philippines and Thailand, one programme for nuclear medical physics in Bangladesh, and one programme for radiotherapy medical physics in Malaysia. Clinical training documentation was published and distributed to residents and supervisors.

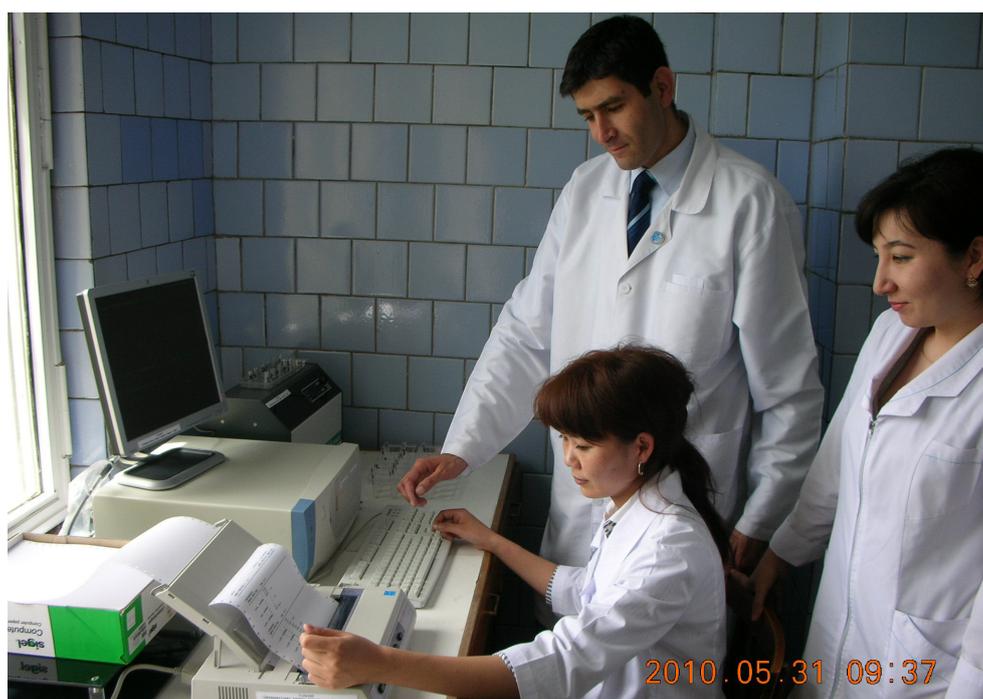
6. The RCA Regional Office in Korea has also established a fruitful partnership with UNDP, leading to financial support of \$300 000 from UNDP for a project to promote and accelerate nuclear SPECT/PET imaging technologies in the region. Additional co-funding of \$200 000 was provided by the RCA Regional Office. The project has benefitted a number of RCA Member States and was implemented directly by the RCA Regional Office.

7. In Estonia, under EST/6/008, 'Implementing Advanced Techniques in Radiotherapy', a new medical linear accelerator for the North Estonia Medical Centre (NEMC) in Tallinn was delivered with shared resources provided by the North-Estonian Regional Hospital Foundation. This

third accelerator will reduce patients' waiting time and staff workload, and will contribute to quality treatment of cancer patients.

8. In Tajikistan, TAD/6/005, 'Implementing Laboratory Services for Tumour Markers', has contributed to capacity building at the Tajik National Medical University's Obstetrics and Gynaecology Chair No 1. Several medical professionals have received training and a variety of medical equipment and consumables have been provided. The project has benefited from an extrabudgetary contribution of the Government of Turkey for the purchase of a year's supply of Technetium-99 generators for tumour diagnostic purposes during the period 2010–2011.

9. The radiotherapy department at the Semipalatinsk Regional Oncology Centre (SROC), which serves the population affected by the activities of the former Semipalatinsk Nuclear Test Site, has been upgraded under KAZ/6/008, 'Modernization of Radiotherapy in Eastern Kazakhstan'. The project was implemented in coordination with the Government's efforts to refurbish the radiotherapy and nuclear medicine departments of the SROC. The Agency has delivered an orthovoltage radiotherapy unit and accessories for short-distance X ray therapy



Staff of the Department of Obstetrics and Gynaecology at the Tajik State Medical University observing results of radioimmunoassay analysis using gamma counting. The Agency supplied the necessary equipment and trained staff under TAD/6/005.

and trained radiation oncologists, medical physicists and radiation therapy technologists.

10. The leading type of cancer in Nicaraguan women is cancer of the uterine cervix, with 500 new cases being diagnosed each year, 70% of which are in non-surgical stages. Activities under NIC/6/009, 'Quality Improvement in Brachytherapy', have contributed to improve local control of the disease and the overall survival rate for patients by means of a high dose rate (HDR) brachytherapy. 345 patients were treated in the first year, with 1380 applications. Advice was provided on clinical protocols for uterine cervical cancer and human resource capabilities were improved through fellowships on clinical metrology and dosimetry, calibration procedures of HDR sources, QC, and the acquisition of radiographies for patient anatomy reconstruction. The capabilities of the Centro Nacional de Radioterapia, the only cancer centre in Nicaragua, were greatly improved, enhancing comfort and convenience for patients.

Nutrition

11. Micronutrient deficiencies are a public health problem in Senegal and have significant physiological and economic consequences. Iron/folic acid, vitamin A and iodine deficiencies are the most important, but others such as zinc are also present. Such deficiencies have serious consequences in terms of maternal, child and infant mortality. In Senegal, about 61% of children under the age of six suffer from a lack of vitamin A, whilst anaemia is as high as 62% amongst women between the ages of 15 to 49. As a result of these alarming figures (in addition to on-going activities such as nutrient supplementation, dietary diversification, promotion of breast-feeding and salt iodization) the Government has launched a national strategy for the fortification of foods for general consumption with micronutrients with the partnership of both the public and private sector, under the supervision of the Senegalese Committee for the Fortification of Food with Micronutrients (COSFAM).

12. The Food Technology Institute (ITA) of the University of Cheikh-Anta Diop (UCAD), which is the counterpart institution for SEN/6/016,

'Improving Micronutrient Status through Food Fortification', has been officially designated as the national institution responsible for implementing the COSFAM Strategic Plan. ITA has conducted the 2010 national baseline study on the status of iron and vitamin A in children from 12 to 59 months of age and in women from 15 to 49 years of age, with samples collected from 144 mother-infant pairs. ITA has initiated a QC programme aimed at ISO 17025 certification of its laboratories. To further strengthen the technical capacity of the region to support nutrition studies, the IAEA procured an isotope ratio mass spectrometer under RAF/7/006, 'Techniques to Assess Nutrition Intervention Programmes Related to HIV/AIDS in Africa', which has been installed at UCAD.



Professor Salimata Wade, a TC expert from Senegal, established the first French-speaking Masters Degree in Nutrition Studies in the sub-Saharan region in 2009. On 9 September 2010, Professor Wade was awarded the African Union Regional Award for Women Scientists from the President of the Commission of the African Union, Mr Jean Ping, for her work on nutrition and malnutrition using stable isotope techniques.

13. In Asia and the Pacific, the TC programme has addressed the issue of malnutrition through regional projects using stable isotope techniques. Obesity has been recognized as a major public health problem in some Member States, as it is a significant risk factor for chronic non-communicable diseases. The Agency has helped the Kuwait Institute for Scientific

Research (KISR) to utilize stable isotope techniques to provide a sensitive, precise and accurate means of assessing and characterizing the problem. In Syria, a laboratory for body composition investigations has been set up to validate measures such as anthropometry and bio impedance, which are often used to assess body fat.

14. Iron deficiency (ID) is the most prevalent micronutrient problem in developing countries, affecting more than two billion people, mainly pregnant women, infants and children under the age of five. ID affects the physical and mental development of children and diminishes adult disease resistance and work productivity. Project RLA/6/053, 'Prevention and Control of Iron Deficiency Anaemia (ARCAL LXXXV)', has contributed to increase nutritional assessment capacity in Latin America, including the use of stable isotopes to determine iron bioavailability from foods and the efficacy of iron intervention programmes. Existing centres and laboratories have been upgraded with the procurement of appropriate equipment and supplies. Laboratory methods have been standardized between countries and the same indicators and cut-off points for nutritional and iron status were used across the region, allowing the comparison of results between countries. This standardized approach was positively received by all participating countries. In addition, each country now has capacity to carry out biochemical analyses, and new iron compounds suitable for wheat flour fortification have been assessed. Local programme success was measured by haematological and biochemical indicators of iron status. The results indicate that iron deficiency and anaemia prevalence is lower, measured against the baseline values, when additional iron was given to the participating children.

Diagnosis and treatment

15. The implementation of BEN/6/002, 'Establishment of a Radioimmunoassay Service for the Management of Endemic Goitre', has led to the establishment of the first radioimmunoassay (RIA) service in Benin using in vitro nuclear medicine techniques for the detection and management of

endemic goitre. Through the project, linkages have been established between five local health centres where samples have been collected (Bantè, Bassila, Dassa, Djougou, and Savalou), and a radioimmunoassay service (SeRiD) has been set up in the Faculty of Health Sciences at Cotonou. A reporting system and patient database has been developed, and twenty community social workers have been trained on epidemiology, clinics and the evolution of endemic goitre. Twelve medical doctors have also received training on recent developments in the management of patient suffering from endemic goitre. In terms of sustainability, the radioimmunoassay service is now financially autonomous as regards the management of reagents and the payment of staff (a biologist and a nurse). The number of examinations requested by physicians is increasing steadily.

16. In Uzbekistan, the nuclear medicine department of the Institute of Endocrinology in Tashkent has been enhanced through UZB/6/006, 'Upgrading Nuclear Medicine for Early Diagnosis of Endocrine Pathologies'. The Institute is the only one in the country to offer radioiodine therapy for thyroid cancer and hyperthyroidism. It serves more than 10 000 patients every year, including patients from neighbouring countries. The use of in vivo single photon emission computed tomography (SPECT) imaging has improved the diagnosis and treatment of thyroid diseases and other serious disorders.

17. In Latin America, the Colombian health system has been improved with the introduction of nuclear medicine techniques in the fields of oncology, cardiology, immunology, paediatrics, and chronic and degenerative diseases. TC project COL/6/011, 'Use of Nuclear Medicine Techniques to Improve Health Sector', has contributed to the development of nuclear medicine services throughout the country, providing technical advice on the acquisition of new technologies and the development of human resources. A self-sustained hospital radiopharmacy has been established, and a three-phase plan has been devised to set up a molecular imaging department. Government clearance has been obtained and funding

allocated for a positron emission tomography (PET) facility including a cyclotron, a positron emission tomography/computed tomography (PET/CT) scanner and a PET radiopharmacy. Diagnostic and therapeutic applications in nuclear medicine have expanded, health costs have fallen, and more of the population has access to better health services. Lastly, a chapter on radiopharmacy has been included in the university syllabus for nuclear medicine technologists.

Quality

18. In Asia and the Pacific, Agency assistance was provided under ISR/6/018, 'Supporting a National Programme for Radiotherapy Quality Control', to support a number of QUATRO missions to review the practice of radiation oncology in Israel. These missions, closely supported by the Ministry of Health, carried out comprehensive audits of radiotherapy programmes. The overall performance of the radiotherapy institutions as well as their interactions with external service providers were reviewed for quality assurance.

19. In Croatia, CRO/6/008, 'Upgrading the Quality Assurance and Quality Control Programmes in Radiotherapy', supported the review, harmonization and upgrade of QA/QC programmes in the radiotherapy departments of two major regional hospitals in Croatia to avoid accidental exposure during therapeutic procedures. Several scientific visits and one fellowship have increased national competency in the field of QA/QC, successfully establishing both hospitals as national examples in this sector.

20. In Kazakhstan, KAZ/6/006, 'Establishment of a Secondary Standards Dosimetry Laboratory (SSDL)' was instrumental in upgrading the Kapchagai Calibration Laboratory to modern standards for calibrating instruments used in radiation protection, radiotherapy, research and industrial applications. The upgraded laboratory has joined the IAEA/WHO network of SSDLs and has good potential to serve countries in the sub-region such as Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, and beyond.

21. Under regional project RER/6/018, 'Strengthening Regional Capacity in Medical Radiation Physics, Phase II', audits of treatment planning systems (TPS) in Serbia and Poland were provided, to ensure the optimal usage of treatment planning systems and safer radiotherapy. The TPS audit reviews the dosimetry, treatment planning and radiotherapy delivery processes in radiotherapy centres following the pathway similar to that of the patient through imaging, treatment planning and dose delivery. The Agency provided equipment on loan (a dosimetry phantom) as well as auditing methodology to help national auditing organizations to introduce the national TPS audit system. Also under project RER6/017, 'Improving Clinical Practice in Nuclear Medicine (Phase II)', a regional training course on Clinical Audit & Quality Assurance in Nuclear Medicine was held to provide instruction on how to introduce and to conduct systematic audit process in the clinical arena, covering specific components of nuclear medicine practice.

22. Parasitic diseases in Latin America are still a major public health problem, affecting distinct population segments. Molecular biology techniques coupled with the use of radioisotopes can provide sensitive and specific approaches for the diagnosis of parasitic infections, including the detection of circulating parasites in asymptomatic patients. Regional project RLA/6/050, 'Implementation of a Quality Assurance and Quality Control Network for Molecular Diagnosis of Insect-borne Diseases (ARCAL LXXXII)', supported the development of a regional network for QA, providing a QC programme to reference laboratory centres for the molecular diagnosis of insect-borne diseases. A QA/QC network is now established in Latin America for the molecular diagnosis of tropical disease. The project has helped to reduce the mortality and morbidity rates caused by parasitic diseases throughout the region by assisting participating laboratories and care units to conduct proper diagnosis and early treatment.

Agricultural productivity and food security

The IAEA, in partnership with the Food and Agriculture Organization of the United Nations (FAO), helps Member States improve food security. Efforts focus on improving yield and quality by enhancing the diversification and adaptability of crops. Technical cooperation projects also help Member States to reduce pesticide use and to decrease the crop losses caused by pests and diseases, as well as to overcome phytosanitary (plant health) barriers to trade.

The IAEA also helps Member States to improve livestock productivity. Projects concentrate on efficient use of locally available feed resources, improved reproductive techniques and breeding programmes for indigenous and upgraded animals, as well as on advancing diagnostic capacities and prophylactic strategies for the control of important transboundary animal diseases.

Food and agriculture projects account for 14% of TC programme disbursements.

23. Many regions in Africa are vulnerable to climatic variability and droughts. The introduction and adaptation of irrigation, especially small-scale irrigation, is a key factor for increasing crop production, saving freshwater, reducing vulnerability to food deficits and contributing to income generation for resource-poor farmers in semi-arid areas. Agriculture is the largest freshwater consumer, using more than 70% of available supplies. Freshwater resources are shrinking rapidly and water quality is declining due to pollution with sediment, fertilizers and pesticides that have been generated from runoff across farm lands from poor irrigation and soil management practices. It has become imperative to use water-saving methods like drip irrigation and to train farmers how to adopt this technique. Crop varieties that utilize less water have been developed with IAEA assistance and several national efforts are being validated and disseminated to neighboring countries through TC activities.

24. In Asia and the Pacific, the TC programme is concentrating on crop improvement, soil fertility, irrigation in the context of climate change, insect and pest control and animal production and health. Support has been provided for the development and transfer of methodologies, cultivation practices and technologies to induce and identify mutated

genes that will contribute to improved crop quality. Activities in highly salt-affected lands, both on the coast and inland, continue to be a major focus in helping Member States to address the impact of climate changes on soil and water salinity through the development of soil and irrigation management practices.

25. In Latin America, regional projects are helping Member States to enhance soil conservation and environmental protection, and to be able to evaluate the impact of pesticide contamination in food included molluscs and fish, and environmental compartments, as well as in the diagnosis and control of animal diseases, e.g. fasciolosis. Work is continuing on the establishment of a network of Latin American National Laboratories and Centres of Excellence with the introduction of harmonized procedures to determine food contaminants. Improved varieties of beans, rice, wheat, banana, tomato and soya bean have been developed in many countries in the region and are being disseminated for testing in countries with similar climatic conditions. A regional network of laboratories operating under QA system and accredited to ISO17025 standard has been established with Agency assistance. Other projects in the region focus on increasing food production in drought affected areas, and on establishing and

maintaining fruit fly free and low prevalence areas through the use of the Sterile Insect Technique (SIT). With the application of the SIT, fruit fly free areas have been established in a number of Latin American countries, resulting in private sector investment and the creation of many jobs in rural areas and leading to a decrease in pesticide use and to an increase in exports of fruits and vegetables to lucrative markets. Most recently in 2010, Panama was able to eradicate the outbreak of the South American cucurbit fruit fly, and Costa Rica became an exporter of gourmet tomatoes.

Soil and water management

26. Through KEN/5/030, 'Assessing Nutrient and Moisture Use in Major Cropping Systems', a comparison of the effectiveness of different water conservation tillage methods (subsoiling, tied-ridging and the conventional ox-plough tillage) in conserving water for the production of maize and cowpea in smallholder farming in subsistence farming of maize and cowpea was undertaken in semi-arid eastern Kenya. Maize and cowpea yields were determined for four seasons, using maize, cowpea, maize-cowpea intercrop and maize with 5 t/ha manure cropping systems. Besides crop yields, financial returns were calculated as the difference between gross income and total production costs. The latter included all the inputs used in the production like labour (land preparation, weeding, harvesting), animal draught, seeds, fertilizers and crop protection chemicals from land preparation to harvest. In addition, prevailing market prices for cowpea and maize grains, labour, inputs applied and other relevant socio-economic data were collected every season to enable profitability estimates. A farmers' field day was organized and a survey of the acceptability of the technologies was conducted.

27. The project's preliminary results showed that tied ridges gave significantly higher maize grain yields than subsoiling tillage and ox-plough: the latter two gave similar maize grain yields. However, tied ridging increased land preparation costs by 190%. Manure treatments gave the highest maize grain yields in the relatively wet seasons (from 0.88

to 1.23 t/ha). Net returns from maize production ranged from a negative of \$200 to positive \$165 ha⁻¹, it was only profitable in the wet seasons. Cowpea resulted in positive net incomes in ox-plough tillage in all seasons, but farmers preferred growing maize to cowpea.

28. A regional project RAF/5/058, 'Enhancing the Productivity of High Value Crops and Income Generation with Small-Scale Irrigation Technologies,' aims to improve regional capacities and expertise in Africa to manage agricultural practices, using small-scale irrigation technology and sound criteria for better use of water and fertilizer resources. Nuclear techniques are a unique tool to assess soil moisture for plant water requirements (using neutron probes) and to assess fertilizer uptake and use efficiency (using, N-15 labelled fertilizer). Nineteen African countries are participating (Algeria, Benin, Botswana, Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Libya, Mali, Mauritius, Morocco, Niger, Nigeria, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe). Field experiments and socioeconomic studies carried out so far by the participating Member States showed that drip irrigation increases crop yield while saving irrigation water by up to 30% compared to traditional (sprinkler or bucket watering) or rainfed, i.e. no irrigation.

29. The project has generated tremendous interest from smallholder farmers who are eager to adopt the technology. Small-scale irrigation technologies and best agricultural practice have been demonstrated to about 150 farmers during farmers' field days in Tanzania and Ghana. The project, which started in 2009, already showed good results by April 2010, and was covered by UN Radio and several other media on World Water Day 2010.

30. Under QAT/5/002, 'Developing Biosaline Agriculture in Salt-affected Areas in Qatar', IAEA assistance has supported the establishment of a biosaline agriculture unit in Qatar to conduct research and to study adaptation and sustainability aspects of selected salt-tolerant germplasm in the highly saline zone of Dukhan Sabkha. Using a combination of

agronomy, hydrology and soil physics approaches to assess long term plant survival and soil rehabilitation, highly salt-tolerant plants were grown, including *Acacia ampliceps*, Salt Bush (*Atriplex lentiformis*), *Eucalyptus camaldulensis*, *Prosopis juliflora*, Pomegranate (*Punica granatum L.*), Kallar grass (*Leptochloa fusca*), Para grass (*Brachiaria mutica*), *Kochia indica* and *Sesbania acculeata*.

31. In Latin America, RLA/5/053, 'Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartments at a Catchment Scale in the Latin American and Caribbean Region (ARCAL CII)', concentrates on the following basins: Alto Valle del Rio Negro and Neuquén in Argentina, valleys of the Ribeira river in Brazil and the Apalta in Chile, Lake Tota in Colombia, the Machuca-Jesús María river in Costa Rica, Ariguanabo in Cuba, Jambeli and Saquimala rivers in Ecuador, Chapare in Bolivia, and Salto in Uruguay. RLA/5/0/53 is providing practical guidance to participating laboratories on integrated approaches to assess indicators of the effectiveness of pesticide management practices to monitor compliance with Codex Maximum Residue Limits. Where more stringent trade standards apply, additional information is required on pesticide interactions with soil constituents which is obtained by the use of isotopic tracer and conventional techniques. Information is fed back to end users as objective indicators of pest management practices and is helping to reduce agricultural inputs without compromising crop productivity, environmental quality or human health.

Mutation breeding of crops

32. TC project CAF/5/003, 'Development of New Varieties of Cassava through Mutation Breeding and Biotechnology Techniques', aims to develop manioc varieties with resistance to the African Cassava Mosaic Virus (ACMV) through mutation breeding and biotechnology techniques. The counterpart institution, the University of Bangui, has identified 154 local varieties of cassava and is carrying out laboratory work on mosaic virus (genetic identification) and cassava (mutation breeding).

The project is being implemented in collaboration with 20 farmers' associations. Among the 154 local varieties, many mosaic virus-resistant, high-yielding varieties have been selected and harvested after 18 months. Tests for high yield and for taste have been carried out in cooperation with the local farmers and their families. This participatory project benefits from national and international partnerships and its results are very promising. The counterpart has planted 25 ha of mosaic virus-resistant, high-yield cassava in 2010. Planting of over 150 ha and 300 ha are planned for 2011 and 2012, respectively.

33. Agriculture is the backbone of the economy of Sudan, with most crops grown under gravity irrigation between the Blue and the White Nile, occupying an area of 882,000 hectares. Under SUD/5/030, 'Increasing Productivity of Selected Crops Using Nuclear Related Techniques', and working closely with farmers, newly developed crop mutant varieties with enhanced water and nutrient efficiency; are being introduced. The project also supports irrigation scheduling to optimize soil and water management practices for enhanced crop production and increased farmer income. Varieties in banana, wheat and sorghum lines have been established, and productivity has been increased for other crops, such as tomatoes. A tomato variety resistant to yellow leaf curl virus has been submitted for registration with the National Variety Release committee for approval of its use by farmers, and the Albeety variety of the banana mutant is now in mass production. The Government of Sudan has complemented IAEA support with the construction of a modern greenhouse, the provision of a power generator and an advanced grain analyser to characterize the quality of wheat and sorghum.

34. In Tanzania, rice (*Oryza sativa*) is a staple crop, grown both for food and as a cash-crop by small and large-scale farmers alike. Rice production in Tanzania is affected mainly by climatic conditions and crop diseases. Through URT/5/026, 'Improving Rice Varieties through Mutation Breeding and Biotechnology in Zanzibar', the IAEA has transferred mutation breeding technologies and



Infrastructure and facilities for rice breeding and field studies in Zanzibar.

efficiency enhancing biotechnology methods to the Kizimbani Research & Training Station in Zanzibar. The project has utilized information from local farmers through a process called Participatory Variety Selection (PVS) in the selection of superior rice genotypes. This has helped to isolate disease resistant and high yielding lines of rice, including a line resistant to Yellow Mottle Disease and another line that could potentially yield 5-6 times more per hectare than local varieties

35. Supported by RAS/5/045, ‘Improvement of Crop Quality and Stress Tolerance for Sustainable Crop Production Using Mutation Techniques and Biotechnology’, RCA Member States have made good progress in the induction and identification of mutated genes for improved crop production. There are a number of promising genotypes and mutant lines of important crops (wheat, rice, soybean, etc.) in all participating countries, which will be further assessed for successful development.



Early mature mutant line (right) and its parent BRRI dhan 29 (left).

36. In Europe, RER/5/013, ‘Evaluation of Natural and Mutant Genetic Diversity in Cereals Using Nuclear and Molecular Techniques’, aims to evaluate and increase the genetic diversity of major cereals and solanaceous food crops (such as brinjal, pepper, potato, tomato) by using nuclear techniques, molecular genetics and biotechnology. By 2010, the project had produced 250 advance mutant lines, and had established an active research network of 12 countries in Europe and Central Asia.

37. In Turkey, TUR/5/025, ‘Using Molecular Techniques for Enhancing the Efficiency of Mutation Induction and Utilization of Mutants in Agriculture’, has contributed to reinforcing the capacities of the Sarayköy Nuclear Research and Training Centre in Ankara for the application of radiation induced mutation to improve the quality of cherry tomatoes. In the FYR of Macedonia, under MAK/5/006, ‘Improving Wheat, Barley and Triticale for Food and Feed in Drought-Prone Areas, Using Nuclear Techniques’, the Faculty of Agricultural Sciences and Food of Skopje received equipment and technical guidance for selecting wheat varieties with enhanced drought tolerance.

Applying the Sterile Insect Technique

38. TC project SEN/5/031, ‘Implementing the Pre-Operational Phase to Create a Zone Free of *Glossina palpalis gambiensis* using the Sterile Insect Technique (SIT)’, is undertaken in partnership with the African Union Pan African Tsetse and Trypanosomiasis Eradication Campaign (AU-PATTEC) and the French Government with the objective of implementing pre-operational activities for the elimination of *Glossina palpalis gambiensis* in the Niayes region of Senegal. Excellent progress has been made in the use of SIT for integrated pest management. A feasibility study on the creation of a tsetse-free zone was carried out under SEN/5/029, ‘Feasibility Study to Create a Tsetse-free Zone Using the Sterile Insect Technique’. Under SEN/5/031, a pre-operational phase project was launched to suppress the fly population in preparation for test releases of sterile male flies which took place in 2010. Fine tuning of these releases is ongoing, and

operational SIT releases are scheduled for 2011. A new, small-scale insectarium is operational.

39. In South Africa, activities under SAF/5/011, 'Refining an Integrated Application of SIT Against Some Key Lepidopteran Pests of Southern African Agricultural Crops', successfully applied SIT against the false codling moth, a major citrus pest. SIT is used on most citrus crops for export in the Western Cape Province. The sterile moths are produced at a mass rearing facility in the Western Cape that was constructed based on IAEA technology transfer, and is managed as part of a public-private partnership. The project on the implementation of SIT for the integrated control of the Mediterranean fruit fly is also progressing well in table grape and other export crops, with 30,000 ha of fruit protected by SIT. This programme has been privatized under a public-private partnership with financial input from the government. A new and expanded mass rearing facility was built in 2009 that will enable production of up to 60 million sterile flies per week. This will allow SIT activities against this pest to be expanded to many other valleys.

40. TC regional project RER/5/014, 'Suppressing the Mediterranean Fruit Fly by Integrating the Sterile Insect Technique on an Area-Wide Basis in Neretva Valley', aims at minimizing the transboundary damage caused by the Mediterranean fruit fly in Bosnia and Herzegovina and Croatia. In 2010,

a Mediterranean fruit fly emergence and release facility with a capacity of 20 million sterile males per week was inaugurated. This facility supported the releases of sterile flies over a 1,000 ha pilot area in the Neretva river valley in Croatia, achieving a significant reduction in pesticide use and fruit infestation

41. RLA/5/057, 'Establishing and Maintaining Fruit Fly Free and Low Prevalence Areas in Central America, Panama and Belize, Using the Sterile Insect Technique (SIT) (ARCAL CVI)', supports a multilateral approach to facilitate fresh fruit and vegetable exports from Central America, through the creation of fruit fly low-prevalence and fly-free areas. This successful support to more effective management of major pest insects has opened lucrative export markets and as a result has brought investments for production of fruit and vegetables of over 185 million US dollars. Currently, all exports of tomato and bell pepper from Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua come from the fruit fly low prevalence areas established. In addition, Belize and Guatemala export papaya from the Mediterranean fruit fly free areas to the US market with no postharvest treatment. These major accomplishments have already created over 6,500 jobs and are expected to generate 45,000 jobs in the next five years due to the intersectorial links to the packing, transport and related service industries.



Fly production facility in Mexico. Photo: J. A. Casas-Zamora.

Livestock

42. RAF/5/057, 'Strengthening Capacities for the Diagnosis and Control of Transboundary Animal Diseases in Africa (AFRA)', focuses on enhancing the diagnostic capacity of national veterinary services in Africa to monitor and control major transboundary animal diseases. In 2010, two training courses on epidemiology broadened national capacities in planning and conducting cost effective disease surveillance activities, delivering training to over 40 trainees. Participating laboratories received diagnostic reagents and specific equipment to perform surveillance activities to establish prevalence data vital for the planning of countermeasures. Vaccine producing laboratories were also supported to produce the necessary quantities for successful control campaigns.

43. The livestock sector is the main pillar of the economy in Mongolia, and TC projects have been providing support to improve livestock productivity since 1986. Two specialized laboratories, one for isotopic nutrition tracing and labelling technologies to evaluate the nutritive value of feed and one to monitor reproductive efficiency using radioimmunity, have been established at the Research Institute of Animal Husbandry and the Mongolian State University of Agriculture, respectively. Improved nutrition management has decreased input costs for farmers by almost 67%. National capacity has been improved in the use of artificial insemination in yaks and cattle, feed evaluation, and the identification of toxic plants and plants containing bioactive compounds.

44. Mongolia's summer droughts and harsh winters have a severe effect on livestock, plant growth and feed availability: some 8 million livestock animals died during the winter of 2009–2010. It is essential to integrate crop and livestock systems to improve productivity and sustainability in the farming sector. Under the ongoing project MON/5/016, 'Improving Productivity of Cattle, Camels and Yaks through Better Nutrition and Reproductive Management', the Agency is continuing its long standing assistance to Mongolia, building on successes and experiences

gained so far to improve the quality and quantity of feed, concentrating on high nutritional value and tolerance to low temperatures. The animal feed package developed under the project was demonstrated in selected farms for adoption by all farmers and herd breeders. In 2010, foot-and-mouth disease (FMD) emerged as a lethal livestock disease in the region. Due to the timely intervention of the Agency and the efforts of the Mongolian Veterinary services, the FMD outbreak in Mongolia was contained. However, FMD will remain an important area of activity throughout 2011, as the animals will be migrating from Ulaanbaatar to pastoral land in search of better feeding.

45. Under TC projects CMR/5/017, 'Improving Animal Productivity and Health, NER/5/013, 'An Integrated Approach for Improvement of Livestock Productivity', and HON/5/005, 'Improving the Nutrition and Health Conditions of Livestock in Order to Increase Productivity and Reproductivity (Phase II)', national capabilities for cattle artificial insemination have been strengthened and farmers are benefitting from the use of genetically superior sires to improve milk production and reproductive performance.



Semen processing at the Artificial Insemination Centre in Niger.

Water resource management

IAEA TC projects promote the use of isotopic techniques to understand the source, extent and behaviour of water resources, and to support the development of comprehensive national and transboundary water resource plans for sustainable water management.

TC projects also help Member States to establish or improve analytical laboratories that can measure environmental radioactivity and pollutants in the oceans, and support the ability of Member States to manage and protect marine resources.

46. Water resource management remains a high priority issue in the Africa region. Given the transboundary nature of groundwater management, an integrated, regional approach is essential. An important regional focus in 2010, in collaboration with UNDP/Global Environment Facility (GEF), was supporting the integrated management of the Nubian Aquifer. In the Asia and the Pacific region, the spread of arid zones and increasing desertification has meant that management of water resource has emerged as a major challenge in the region, particularly among some States of the Middle East. In areas with limited naturally occurring usable water resources, sustainable water management is crucial. In 2010, Agency assistance was provided in areas such as the application of isotopic hydrology in delineating flow regime in aquifers. Such studies are expected to make a very important contribution towards sustainable management of the limited groundwater resources in the long run. In Latin America, the focus was on coastal aquifers, with the intention of supporting national management actions.

47. Significant progress was made under RAF/8/041, 'Formulation of an Action Programme for the Integrated Management of the Shared Nubian Aquifer (UNDP/GEF)' in 2010. A successful meeting in Sudan brought together all countries of the shared Nubian aquifer system, and a strategic framework for the future management of the aquifer was developed. A regional meeting to review the existing legal framework for use of this shared water resource was also organized. In addition, a 3-D model simulating the Nubian Aquifer's response to significant drawdown and other related parameters

was developed. The model test runs did not reveal any immediate and significant transboundary effects: however the Member States (Chad, Egypt and Sudan) are now reviewing and adapting the models to suit national needs before adaptation to regional use can be conclusive. The Nubian Aquifer Member Countries strongly support the involvement of the Joint Authority at all levels, particularly on issues that are linked to a regional legal framework. The IAEA, UNESCO, UNDP and national counterparts within the Nubian Aquifer catchment area continue to support the project until its completion in 2011.

48. Through the on-going project RAS/8/108, 'Assessing Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management', RCA Member States received technical assistance in the effective application of environmental isotope and chemical techniques for the assessment of water quality trends. In the Philippines, the project results were used as a basis for recommendations to the Water District Managers and the Local Government to prevent surface contamination of groundwater. In Thailand, IAEA assistance under THA/8/015, 'Use of Isotope Hydrology for Groundwater Resources Management', has supported the introduction and application of isotope hydrology techniques in integrated water resources management, which is a top priority for the social and economic development of the country. As a result of the project, an isotope hydrology laboratory has been established for national research services. Hydrological processes in the Upper Chi watershed and Lower Nan River Basin have been assessed using isotope techniques combined with other relevant techniques, and a

national database of isotopic data on the groundwater of Thailand has been established. Regulations for water resources management have been proposed, and human resource capacity in the field of isotope hydrology has been significantly strengthened.

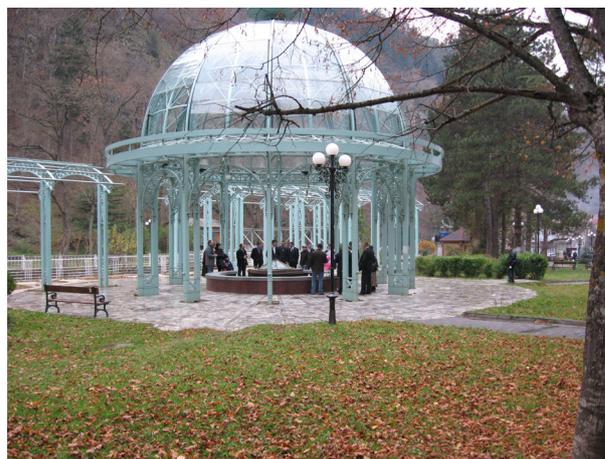
49. Kuwait's shortage of naturally occurring usable water resources makes the sustainable management of these resources crucial. KUW/8/005, 'Assessing the Hydrological and Hydrochemical Interaction between the Main Aquifers in Southern Kuwait Using Geochemical and Isotopic Methods', built understanding of the current situation of aquifers in Kuwait and supported sustainable exploitation plans. The IAEA provided expert services and trained scientific staff to carry out studies using isotopic hydrology to delineate flow regime in the aquifers. This is expected, in the long run, to make a very important contribution to the sustainable management of Kuwait's limited groundwater resources.

50. In Iran, under IRA/8/016, 'Investigation on Tehran Watershed using Isotope Hydrology and Classical Techniques', the Water Research Centre received assistance on the principles and applications of isotope techniques in hydrology, recharge, surface water-groundwater interaction, artificial recharge, seepages from dams and reservoirs and groundwater contamination, as well as in field sampling design, interpretation techniques for stable isotopes and interpretation of data. As a semi-arid country, Iran suffers from occasional long periods of drought which leads to severe water shortages in many areas, in particular in and around the capital city of Tehran, where the supply of water cannot keep pace with the rapid increase in population

51. In Europe, water resource management is being supported in Albania by enhancing the technical capabilities of the Centre of Applied Nuclear Physics and the Albanian Geological Survey under ALB/8/012, 'Assessing Water Resources in Aquifers'. By the end of 2010 the project had established capabilities to assess the age and origin of water samples through the measurement of radioactivity (Radiocarbon) and stable isotope

content of water samples, and provided for the hydrogeological mapping and GIS-based database creation for the country.

52. In Georgia, the first national TC project on water resources, GEO/8/003, 'Using Isotope Techniques to Assess Water Resources in Georgia', was successfully completed. The project evaluated the origin and pathways of groundwater captured for drinking water supply in Central Georgia. The start of construction in 2005 of the Baku-Tbilisi-Ceyhan oil pipeline, which crosses the water recharge area of this region, generated concerns about the impact of possible pipeline leakages on the captured springs. The area's geology is complex, and the famous Borjomi mineral waters have their source here. Water monitoring and sampling campaigns within the scope of the project provided information on the isotopic and chemical composition of groundwater in the springs and nearby rivers. The recharge area of the Borjomi drinking water was found highly vulnerable, and therefore recommendations were made for improved protection of the oil pipeline in the critical sectors of the infiltration zone as well as a proposal for a contamination alarm system.



The famous Borjomi mineral water park in Georgia: the historical fountain where a borehole was established for isotopic and chemical composition studies under GEO/8/003.



Map of the study areas in Argentina, Costa Rica, Cuba, Ecuador, Peru and Uruguay.

53. In Latin America, seven coastal aquifers and their characteristics were investigated by the authorities dealing with water resources, nuclear institutions and universities in Argentina, Costa Rica, Cuba, Ecuador, Peru and Uruguay under RLA/8/041, 'Application of Isotopic Tools for Integrated Management of Coastal Aquifers (ARCAL XCII)' (supported by Spain). As a result of the regional project, specific national management actions based on the technical results of the project were implemented.

54. In Argentina, the numerical model produced through the project was used by the Empresa de Obras Sanitarias, the water authority responsible for development and management of the Mar del Plata aquifer, to develop scenarios of expanding water demand versus the available recharge; and for delimiting areas for drilling production wells up to 2030. In Costa Rica, technical results from the project were incorporated in regulating areas of

vulnerability and zoning protection areas of recharge to groundwater. The National Groundwater, Irrigation and Drainage Service (SENARA), has outlined the conditions for development of water resources in view of the deterioration in water quality in the tourist areas of Huacas-Tamarindo. Discussions on water development have reached the government Constitutional Chamber (Sala Constitucional) and General Comptroller's Office (Contraloría General de la República). The capabilities for investigating water resources were also developed in the university.

55. In Cuba, the Instituto Nacional de Recursos Hidráulicos, the main authority in the management of hydro resources in Cuba, were provided with information to support the control of progressive marine intrusion in the study area. In Ecuador, hydrology is a new field, and has been developed through IAEA technical cooperation. Agreements have been formalized to carry out hydrogeological studies as a basis for water resource development. In

Uruguay, the results of the project indicate that well field development should be towards the northern zone and further exploitation in the south should be discontinued.

56. Through the project, over 420 counterparts from the participating countries have received training for the first time on the use of isotope techniques for water resources investigations, numerical modelling and analytical techniques. Training was carried out at IAEA headquarters and in Argentina, Mexico, Spain, Uruguay and Venezuela. Laboratory and field capabilities were created and upgraded in all participating institutions. For the first time, four laboratories (out of nine in

Latin America and the Caribbean IAEA Member States) are now equipped with liquid-water isotope analysers (laser spectroscopy), facilitating the use of isotopic techniques in hydrological investigations.

57. The quality of the analytical results, critical for interpretation of the hydrological processes, has been checked through an intercomparison exercise led by CIEMAT, Spain, to assess the capabilities of the analytical laboratories to quantify major constituents in groundwater. As a result, recommendations were provided to the laboratories on some basic QA/QC actions. All the laboratories implemented their own corrective actions to improve the analysis of the samples.



Collaborative work between Coastal Advanced Polytechnic Academy (ESPOL) and Forestry Group for the development for the Santa Elena Peninsula, Ecuador, under RLA/8/041. Photo: Ecuador.



Field training of counterparts under RLA/8/041. Photo: Argentina.

Environmental protection

The IAEA's technical cooperation programme helps Member States to achieve their development priorities while monitoring and protecting the air, earth and oceans. Through the TC programme, the IAEA provides Member States with information and skills in the peaceful application of nuclear technologies to better understand and manage their environment.

58. In Africa, major efforts at the regional level in the environment sector have been directed at marine pollution, with the aim of closing technical gaps and addressing unbalanced capacity levels between African States in the field of marine pollution assessment and monitoring. The multidisciplinary nature of marine pollution was also taken into consideration, using an integrated approach that included historical dating and reconstruction. Technical support has focused on improving regional capabilities for using nuclear techniques to assess contamination of the marine environment around the African continent, with a view to promoting its sustainable management.

59. The TC programme in the Asia and the Pacific region has significantly enhanced Member State environmental management capacities, particularly in tackling air pollution and managing the marine environment. The TC projects approved under RCA and ARASIA as well as national programmes have helped Member States to establish robust analytical capabilities to assess and monitor the levels of radionuclides in the marine environment (mainly coastal zones), and to strengthen the use of nuclear techniques to analyze air samples to determine the presence and origin of pollutants in large cities in Asia. The achievements attained so far are being used by decision-makers from several large city councils to engineer solutions to the problem of air pollution. The IAEA laboratories in Monaco provided training for the monitoring and analysis of spilled oils, emphasizing oil fingerprinting techniques and the analysis of marine samples to ensure seafood safety.

60. In 2011, through regional project RER/3/010, 'Supporting Preparation for Remediation of Uranium

Production Legacy Sites', the Agency continued to support countries affected by uranium production legacy sites, in particular in Central Asia, in preparing for the remediation of contaminated areas. Terms of Reference (ToR) for Environmental Impact Assessments (EIA) were completed for the Minkush site in Kyrgyzstan, and Charkesar and Yangiabad in Uzbekistan. The project has facilitated coordination and collaboration between key international stakeholders, including the European Commission (EC), OSCE, European Bank for Reconstruction and Development (EBRD), UNDP and others. As a result, OSCE has engaged in the preparation of a similar ToR for the EIA of Taboshar and Degmai in Tajikistan while the EC used the ToR generated under the TC project to launch a project for Uzbekistan worth Euro 1.5 million to develop the EIA for the Charkesar and Yangiabad sites. The EU has approved a Euro 0.6 million extrabudgetary contribution to the project to facilitate the continuation of this successful international cooperation, and to implement other complementary activities.

61. Major achievements in 2010 under RER/2/005, 'Characterizing Seasonal Variations in Elemental Particulate Matter Concentrations in European Urban and Rural Areas under Different Climatic Conditions', include the establishment of infrastructure for the systematic collection and characterization of atmospheric particulate matter (APM) and the application of WHO and EU guidelines in the interpretation of the data produced. The project has supported the development of staff skills in the application of highly sensitive, non-destructive nuclear analytical techniques (e.g. X-Ray fluorescence) and in generating data on source apportionment.

62. In Montenegro, MNE/5/002, 'Upgrading Capabilities to Establish Effective Monitoring Systems for Residues in Food and Air Quality', has reinforced the capabilities of the Centre of Ecotoxicological Researches to monitor certain substances and residues in air. The delivery of a liquid chromatography–mass spectrometry system has notably enhanced the capability of the laboratory to, inter alia, detect organic trace contaminants in the environment, especially air, and to monitor environmental background contamination. The new capabilities will help the country to comply with relevant EU directives and thereby to accelerate its accession to the European Union.

63. In Kazakhstan, KAZ/7/002, 'Supporting Assessment of the Territory of the Semipalatinsk Nuclear Test Site for Further Economic Use', has contributed to ensuring the economic growth and sustainable development of the Semipalatinsk Nuclear Test Site (STS) region in Kazakhstan. The Government, which is considering turning selected parts of the territory of the STS to economic use, requested Agency support to ensure that the radioecological measurements and characterization of the territory carried out by its National Nuclear Centre (NNC) followed a proven methodology, were sufficiently comprehensive and representative and of adequate quality. A team of international experts completed an independent review of a report produced by NNC containing data taken from around 3,000 sq. km out of the total 19,000 sq. km of STS. The experts' report includes recommendations on how to reinforce procedures and the overall quality of the programme.

64. In Slovakia, SLR/3/002, 'Management of Radioactive Waste from the A-1 Nuclear Power Plant Decommissioning', has been completed. The project contributed to increasing abilities and skills in the management of non-standard and historical radioactive waste from the A-1 NPP decommissioning. Participants visited institutes, sites and facilities using state-of-the-art approaches, methodologies and technologies in radioactive waste management. Equipment for the characterization

of radioactive waste and radiation protection was provided. A final project meeting was held to share technical experience achieved with stakeholders from Ignalina NPP and Chernobyl NPP and to identify technical synergies between Slovakia, Lithuania and Ukraine in decommissioning and managing waste from NPPs.

65. In Latin America, biomonitoring was used to investigate air pollution in pilot study areas in Ensenada-Berisso-La Plata (Argentina); La Paz (Bolivia); Sao Paulo city (Brazil); Santiago de Chile (Chile); Ciudad de La Habana (Cuba); San Salvador and the Sitio del Niño (El Salvador); Port au Prince (Haiti); Zona Metropolitana - Valle de México (Mexico); Asunción (Paraguay); Lima (Peru); Montevideo (Uruguay); Caracas (Venezuela) through the TC project RLA/2/013, 'Correlation Studies between Atmospheric Deposition and Sanitary Problems in Latin America: Nuclear Analytical Techniques and the Biomonitoring of Atmospheric Pollution (ARCAL LXXXIX)', supported by Spain.

66. The project produced a methodological tool to identify critical areas where health problems due to air pollution can occur. It confirmed that different nuclear analytical techniques, such as neutron activation analysis (NAA), X-ray fluorescence (XRF) and particle-induced X-ray emission (PIXE) to characterize the biological organisms collected in the different pilot study areas of mega cities of Latin America, are appropriate tools for monitoring air pollution. A guideline in Spanish prepared by the University of Córdoba (Argentina) *Guía para el muestreo de líquenes y plantas epífitas que se emplean como biomonitores de acumulación de metales pesados y elementos traza en Latinoamérica* was produced for the use of epiphytic lichens and other organisms typical to Latin American countries as biological indicators of atmospheric deposition of trace elements. This document is the first of its kind for the Latin America region and will be used for identification and sampling of biological indicators in the countries.



Laboratory in Brazil for the analysis of lichens.



Biomonitor in Paraguay.

67. Over 50 counterparts were trained through courses and fellowships, improving regional capacities for biomonitoring of airborne contamination, as well as the sampling and treatment of samples, and the use of basic statistical techniques for data processing. Proficiency tests to determine trace elements in biological material and soil organized by the Seibersdorf Laboratory helped several participating laboratories to improve their analytical results and obtain ISO/IEC 17025 accreditation.

68. As part of efforts to contribute to the improvement of air quality in the RCA region, the on-going RCA project RAS/7/015, 'Characterization and Source Identification of Particulate Air Pollution in the Asian Region', continued in 2010 to help RCA counterpart institutions apply advanced appropriate nuclear analytical techniques (NATs) for the assessment, characterization and source identification of particulate pollution. A database covering 14 countries between 2003 and 2008 was created and disseminated to all Member States in November

2010. This world-first database is already assisting air quality managers to make informed decisions on pollution abatement and control strategies, and the Clean Air Initiative for Asia has expressed interest in using it. The data from this database has been used in over 95 referenced journal publications from ten Member States, a significant end-user community has been established throughout the region.

69. In Asia and the Pacific, the IAEA has been assisting ARASIA Member States under RAS/7/020, 'Enhancing the Sustainability of the Marine Coastal Environment (ARASIA)', to build capacities in the assessment of the level of radioactive and non-radioactive (organic) marine contaminants. Member States have developed measurement capacity, especially for Cs-137, demonstrated through annual proficiency tests carried out by the IAEA Marine Environment Laboratories, Monaco. Methodological guidelines for marine radioactivity measurements have been adopted and are being followed by participating institutions in the ARASIA Member States. A regional methodological guideline document has been prepared under RAS/7/018, 'Upgrading Regional Capability to Assess Marine Contaminants in the ARASIA Member States', for harmonization of sample preparation and measurements.

70. A retrospective reconstruction of pollution levels in Cuba, Colombia, Guatemala, Haiti, Venezuela and the basin-wide Caribbean Sea has identified trends in heavy metal and organic pollution over the last 100 years. Data have been made available for the first time from 4700 samples analysed from 12 sediment cores from the coasts in the Member States participating in TC project RLA/7/012, 'Use of Nuclear Techniques to Address the Management Problems of Coastal Zones in the Caribbean Region', supported by Spain. The historical reconstruction of the heavy metal concentration in the Gulf of Cariaco, Venezuela, for example, indicates a natural input of heavy metals from terrestrial material and the contribution of organic matter and nutrients, probably related to the agricultural activity in the area. A slight decrease

in the concentrations of lead (Pb) was observed in the 1990s as a positive effect of the restrictions on the commercialization of gasoline containing lead. The project also provided, for the first time, data on mercury content from 680 samples.

71. As well as indicating the level of pollution in the Caribbean, this is a valuable input to the preparations of the UNEP Convention on Mercury currently being undertaken by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), the advisory body of the UN system on the scientific aspects of marine environmental protection. Mercury data from developing countries is almost unavailable, and the RLA/7/012 input is critical for the preparation of the Convention. Cooperation and synergies have been established with UNEP-Caribbean Regional Co-ordinating Unit (CAR/RCU) and the IAEA through a Memorandum of Understanding signed in 2007. Regional capacities have been improved through laboratory upgrades, the establishment of specializations in dating sediments, improved analytical results through laboratory QA and intercomparison of results. Over 70 counterparts have been trained from the 12 Member States on various aspects of coastal zone investigations.

Industrial applications

Nuclear science and technology can be used in a wide range of industrial applications. A range of safe, tested nuclear techniques can be used to measure pollution levels, identify and measure material properties, sterilise and disinfect, and change chemical, physical and biological properties. The IAEA builds Member State capacity in radiation technologies through training and the establishment or upgrading of nuclear centres, and ensures strong quality assurance and quality controls.

Radioisotope and radiation technology applications

72. In Asia and the Pacific, industrialization trends indicate a greater degree of production sophistication and competitiveness that requires improved measurement control methods and more efficient techniques for investigating and solving plant process problems. Through intensive assistance under the auspices of the RCA Agreement, the utility of radioisotope technology is being demonstrated across a broad industrial spectrum, ranging from petrochemical refineries, chemical industries, mineral ore, sugar mills, paper mills, cement industries, gas and oil fields and wastewater treatment plants.

73. Dedicated training courses and meetings held in 2010 under RCA and ARASIA projects, as well as under national projects, allowed a greater number of industries to further their awareness of the beneficial role that radioisotope techniques can play, especially in troubleshooting and industrial process assessment. Specific radioisotope techniques, such as gamma scanning and computed tomography for the inspection of processing columns and vessels in oil refineries, have been disseminated in 2010 to additional new industries in the region. Technical cooperation also enhanced regional capacities in radiation processing of polymeric nano materials for use in material composites, innovative thermoplastics and advanced coating materials. Radiosterilization and food preservation have also seen a significant increase in several countries with important fruit and medical supply exports.

74. Awareness that radiopharmaceuticals for clinical use should be prepared and managed

according to high-quality criteria is increasing, and many countries have launched programmes to improve quality standards in local radiopharmaceutical production and usage. Under RAS/2/013, 'Good Radiopharmacy Practice and Good Manufacturing Practice', several production laboratories in Asia and the Pacific are being supported to meet the requirements of good manufacturing practice (GMP), for both radiopharmaceutical kit formulations and radionuclide generators. Activities include training of staff and the standardization of operating procedures.



Cassava starch+KOH+Acrylic Acid after irradiation and dried in preparation of super water absorbent.

75. RCA Member States continued their efforts in 2010 regarding the use of radiation processing in polymeric materials for agricultural applications and environmental remediation. Supported by the RCA project RAS/8/109, 'Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation', participating Member States were able to develop radiation processing of natural polymer for various valuable uses

76. Under SAU/8/011, 'Capacity Building for Application of Radiation Processing Techniques in

Nanostructuring of Polymers’, and other related TC projects, the capacities of the Saudi counterparts has been enhanced in the radiation processing of polymeric nano-materials for application in development of material composites, innovative thermoplastics and advanced coating materials.

77. In Malaysia, MAL/8/021, ‘Establishment of Digital Radiography Methods and Procedures for Small and Medium-Sized Enterprises’, supported the introduction of emerging techniques in non-destructive testing (NDT) such as digital industrial radiography (DIR) and computed tomography (CT). This has made a significant contribution to the enhancement of safety, quality, reliability and productivity in key industries such as oil and gas, power generation, chemical and petrochemical, automobile, aviation and construction, and manufacturing industries (especially for small and medium-sized enterprises).

78. In Europe, support in the field of radioisotope and radiation technology applications was provided under RER/8/014, ‘Supporting Radiation Synthesis and the Characterization of Nano Materials for Health Care, Environmental Protection and Clean Energy Applications’, which is aimed at using radiation technologies for nanomaterial synthesis and nano product characterization, design and the development of nanostructure-based products for health care, environmental and industrial applications. The project has successfully contributed to the establishment of several collaboration programmes among the participating organizations aimed at sharing and complementing expertise and resources. In particular, fruitful collaboration between Italy and Poland, Kazakhstan and Turkey, Moldova and Romania was initiated, enabling the synthesis and characterization of new nanostructured materials for different applications.

79. The growing production and use of sterile medical products and advanced polymer materials in Europe makes strict control through standardized QC methods and procedures indispensable. TC project RER/8/017, ‘Enhancing Quality Control Methods and Procedures for Radiation Technology’, fosters

standardization of radiation processing technologies based on best international standards and practices. The project has helped Moldova and Azerbaijan to start building national capabilities in using radiation processing technology for the sterilization of medical products and accessories, as well as to protect food and agriculture products. In 2010 an inter-comparison campaign to check the accuracy of irradiation as well as the dose measurement capability of participating organizations was completed. Twelve laboratories have already received QA/QC certificates.

80. In Tajikistan, under TAD/8/002, ‘Creating Non-Destructive Testing Capability’, a manual summarizing the basics of industrial NDT technology was produced by international experts that will be used by the Tajik National Academy of Sciences’ Institute of Earthquake Engineering and Seismology as a first step in producing a comprehensive textbook. In addition, modern NDT equipment was supplied to the Institute of Earthquake Engineering and Seismology, which is already in use as part of the daily activities of the institute.

81. Several milestones were reached in Romania in 2010 under ROM/8/016, ‘Establishing a Demonstration Pilot Plant for Treatment of Sewage Sludge Using Radiation Processing Technology’ in which the utility of irradiated sewage sludge is being analysed for its application as an added-value bio fertilizer. The counterpart team was trained in relevant irradiation techniques and in biological, physical and chemical analysis. The provision of an inductively coupled plasma mass spectrometer (ICP-MS) has allowed the National Institute of Physics and Nuclear Engineering to analyse and characterize the chemical components in the sludge samples before and after irradiation to control the process and to verify the efficiency of the irradiation process.

82. In the Latin America region, the strengthening of analytical techniques and methods is increasingly important, as demonstrated by the scope and breadth of regional activities that focus on improving the knowledge and capabilities of national analytical laboratories to certify and regulate applications and products in industry, medicine and agriculture.

Analytical results produced by laboratories have to be reliable and valid before they can be used: therefore one key area of cooperation with Member States is the introduction of quality management systems in laboratories responsible for analytical services and standards. RLA/8/046, 'Establishing Quality Control for Industrial Irradiation Processes (ARCAL CXVIII)', seeks to strengthen procedures for QA/QC for irradiation processes and has produced results that include the harmonization of procedures for methods verification, protocols for industrial dosimetry and laboratory comparison standards.

83. Project RLA/2/014, 'Improvement of Analytical Quality Through Quality Assurance, Training, Proficiency Testing and Certification of Matrix Reference Materials using Nuclear Analytical and Related Techniques in the Latin American Nuclear Analytical Technique Network (ARCAL XCVII)', has helped Member State laboratories to maintain their readiness and improve their technical competence by producing reference materials, by the development of standardized methods for sampling and analysis, and by conducting inter laboratory comparisons and proficiency tests as a tool for external QC. As the project concludes, it has produced new reference materials for QC of inorganic and organic samples and completed proficiency testing for 36 participating laboratories.

84. Ecuador is a good example of complementarity between national and regional activities, where regional activities to strengthen QC for industrial irradiation complement the national project ECU/8/028, 'Upgrading a Gamma Irradiation Facility for Multipurpose Use'. Quality management is a critical component in irradiation facilities and the knowledge gained by national counterparts is essential for licensing procedures as well as for the safe and effective processing of agricultural and other products. The facility will support national export promotion and food safety.

Nuclear Science

85. The Agency is assisting ARASIA Member States, through RAS/1/011, 'Using Ion Beam Analysis and Complementary Nuclear Techniques for Material Characterization in ARASIA State Parties', to develop and strengthen nuclear analytical capacities in the use of ion beam accelerators and associated nuclear analytical techniques. These techniques enhance the possibility to analyse archaeological objects, thus increasing knowledge of cultural heritage in the area. At the national level, the Agency is helping Lebanon and Syria, via LEB/1/006, 'Establishing an In Air Proton Induced X-ray Emission Beam Line for Analysis of Archaeological and Biological Samples', and SYR/1/007, 'Enhancing the Analytical Capabilities of the Ion Beam Accelerator', to strengthen their nuclear analytical capabilities by introducing external microbeam lines to the existing accelerators. This upgrade will support precise micro-analytic capabilities in the fields of material science, archaeology and environmental science. In 2010, a training course was organized in Syria and multiple fellowships took place under both the regional and national projects.

86. Under LEB/2/007, 'Enhancing the Capabilities of the Lebanese Atomic Energy Commission for Surface Chemical and Structural Analysis of Biological and Organic Materials', the analytical capabilities of the Lebanese Atomic Energy Commission (LAEC) were extended to include chemical and structural analysis of organic, biological and biomedical materials. A state of the art Time of Flight Secondary Ion Mass Spectrometer (TOF-SIMS) that will enable the monitoring of degradation effects of paints and polymer materials as well as characterization of locally produced pharmaceutical products was purchased in 2010. The beneficiaries of the project will be the LAEC, universities, the ministries of environment and agriculture, local painting and polymer industries, medical and health research institutions and centres.

87. Under the national project ALB/2/013, 'Supporting the Conservation and Protection of Cultural Heritage Artefacts', the Institute of Nuclear Research Laboratory of the Centre for Applied Nuclear Physics in Tirana, Albania received a state-of-the-art portable micro-XRF spectrometer for non-destructive in-situ analysis in support of restoration, conservation and protection of cultural heritage artefacts. Professional conservators working in museums and conservation centres are now benefitting from the application of this analytical tool.

88. Analytical capabilities for using and teaching gamma spectrometry and x-ray fluorescence techniques were improved under JAM/0/004, 'Developing National Capacities for the Application of Nuclear Science'. A new graduate programme in the Physics Department of the University of West Indies (UWI) and two analytical laboratories were established with modern instruments including a handheld XRF spectrometer, a portable gamma spectrometer and an analyser of radon in soil, water and air. The facilities will be used for teaching and practical applications in support of the local industry, solid waste management and disaster prevention.

Although the MDGs do not include sustainable energy development as a standalone goal, without increased investment in the energy sector, and major improvements in energy services in developing countries, it will not be possible to meet the MDGs. The IAEA helps developing countries to build energy planning capabilities, and supports countries that are exploring the establishment of, or already have, a nuclear power programme.

89. The renewed attention paid by several African countries to nuclear power for electricity generation, and the growing interest in uranium mining and milling, is visible in a three-fold increase in the number of African countries considering nuclear power in their prospective energy mix or as an energy development policy. The regional TC programme continued to support national and regional efforts in this field in 2010, focusing on increasing awareness of the commitments and long term obligations of nuclear power, as well as the decision-making process for starting a programme, including strengthening legal frameworks, regulatory frameworks, and feasibility studies. The regional TC programme also supported new uranium producers with assistance to regulate uranium mining and milling activities.

90. Biomass (wood, agricultural residues and animal waste products) accounts for almost 87% of Niger's total primary energy supply. Imported commercial energy products, including imported electricity, meet the remaining 13% of energy demand. The energy supply system is not sustainable, as energy services are of low quality and limited quantity, and the reliance on biomass has led to overexploitation of the limited forest reserves of the country. The high reliance on imported energy also places a financial burden on the country and is an issue of energy security. Energy planning has been accorded a top priority by the Government as specified in the National Strategy for Reducing Poverty (SRP) and in the CPF document covering the period 2010–2015. Under NER/0/006, 'Planning for Sustainable Energy Development', the Agency has supported the establishment of national capabilities for sustainable energy development planning. A study on the existing electricity supply and demand has been carried

out, and prospective scenarios for the electricity system have been developed using IAEA planning tools. The study results indicate that nuclear power could become an economically relevant option by 2025. The Government announced in June 2010 its intention to explore this scenario and to launch a feasibility study on a national power programme, with the assistance of the Agency.

91. In the Asia and the Pacific region, nuclear power has become a priority development area for several Member States in recent years. IAEA energy planning and analysis models are essential tools for understanding national energy capacity and needs, and for policy formulation and planning. Several Member States carried out both energy analysis and nuclear power programme feasibility and development studies with Agency assistance in 2010. An Integrated Nuclear Infrastructure Review (INIR) mission was conducted in Thailand in December 2010, which provided an overview of the status of the consideration of nuclear power. Common issues for all countries which have expressed interest in nuclear power are human capacity building, nuclear safety and security, legislative frameworks, and stakeholder involvement. The IAEA assistance is focused on comprehensive nuclear power infrastructure development. In 2010, IAEA assistance focused on nuclear power planning, feasibility studies, siting, and the overall development of national nuclear power programmes. Human resources, a critical component in any nuclear power programme, were developed through training in nuclear engineering, nuclear safety and security, as well as fuel cycle and radioactive waste management. A mentoring programme hosted by the Republic of Korea provided a good opportunity for future managers to interact

with recent retired executives while experiencing a wide range of facilities and operations in the Korean nuclear industry.

92. In the Europe region, in the area of sustainable energy development, TC support aimed to facilitate Member State familiarization with and application of the IAEA's energy planning tools. In Georgia, GEO/0/003, 'Supporting the Development of a National Infrastructure for the Potential Application of Nuclear Energy', contributed to maintaining local expertise on energy system analysis and planning. IAEA energy planning tools were installed and staff trained to use them as part of their daily work. International experts have shared their experience in gathering relevant statistics and gave advice to key officers in the various Georgian agencies and ministries involved in sustainable energy development process.

93. Regional project RER/0/029, 'Supporting the Introduction of Nuclear Energy (Phase II)', has continued to help participating Member States introduce nuclear power. Activities under the project address the comprehensive infrastructure to support a nuclear power programme as addressed in IAEA Nuclear Energy Series NG-G-3.1, *Milestones in the Development of a National Nuclear Power Infrastructure*. In 2010, regional workshops were held on stakeholder involvement when considering a nuclear power programme and on identification and management of financial risks for nuclear power plant projects. The project provided a bridge for experience sharing and lessons learned between countries in the region that are planning to expand nuclear power use and those that are starting programmes.

94. In Latin America, training activities in the use of IAEA energy planning tools have been organized together with OLADE through RLA/0/040, 'Building Capacity for the Development of Sustainable Energy (Phase II)', with participation from over 18 countries in the region. This project also includes support for developing an understanding of the nuclear power option for countries considering launching nuclear power programmes. In addition, national projects on

sustainable energy planning are being implemented in Chile, Mexico and Venezuela. These projects aim to ensure that decisions on energy demand and supply infrastructures are evaluated taking into consideration all possible energy supply and demand options including nuclear power and in line with national sustainable development policies.



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