

The IAEA's Technical Cooperation Programme

2009 ISOE International ALARA Symposium on Occupational Exposure Management in Nuclear Facilities

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Mandate: Article II, IAEA Statute

“The Agency shall seek to accelerate and enlarge the contribution of atomic energy for peace, health and prosperity throughout the world.”



TC Strategic Goal

“To increasingly **promote tangible socio-economic impact** by contributing directly in a cost-effective manner to the achievement of the major sustainable development priorities of each country.”



TC Strategic Approach

- *Government commitment – “Central Criterion”*
- *Country programme frameworks*
- *Strategic partnerships*
- *Increased funding*
- *Sustainability and self-reliance*



Alignment with other development strategies

- Country Programme Framework
- United Nations Development Assistance Framework
- Development priorities of key partners: FAO, WHO, UNEP
- Millennium Development Goals

Nuclear technology: a strategic approach

- What's the nuclear technology involved?
- Is it cost-effective?
- Is there a better non-nuclear alternative?

Nuclear Technology should either be a better alternative or be complementary.

If there is a more suitable non-nuclear technology, the Agency should recommend that the country consider that option.

Technical cooperation: sectors

- Human health
- Agricultural productivity and food security
- Water resource management
- Environmental protection
- Industrial applications
- Sustainable energy development
- Safety and security

Human health

- Diagnosis and treatment of cancer
- Diagnosis of a range of diseases
- Cardiology
- Assessment of immune responses
- Identification of drug-resistant strains of malaria and TB
- Combating malnutrition



Improving the quality and safety of radiotherapy services in Europe

The challenge...

- Variations in radiotherapy departments from hospital to hospital, leading to suboptimal radiation treatment due to radiotherapy procedure deficiencies.
- The Quality Assurance Team for Radiation Oncology (QUATRO) was developed to counter possible radiotherapy procedure inconsistencies.



A QUATRO radiation oncology expert discusses dose delivery calculation for the treatment of a cancer patient

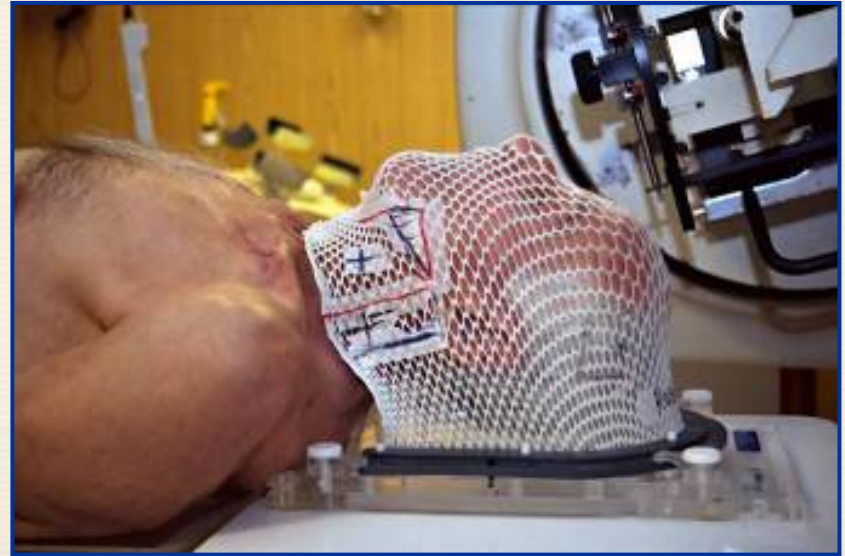


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The project...

- QUATRO audits review the radiotherapy process, including the organization, infrastructure, clinical and medical physics aspects of radiotherapy services.
- The team also reviews the hospital's professional competence with a view to quality improvement.
- Three experts make up the audit team: a radiation oncologist, a medical physicist and a radiotherapy technologist



*A patient immobilization system
for radiotherapy treatment*



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The impact...

- 18 QUATRO missions have been completed in the TC Europe region to date.
- Gaps in technology, human resources and procedures have been identified.
- Audited centres have documented areas for improvement and have received advice for further development.
- Some radiotherapy centres have been acknowledged for operating at a high level of competence.



A QUATRO medical physics expert explains the details of dosimetry for clinical radiation beams



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Improving the quality of medical physics and radiotherapy in Lithuania

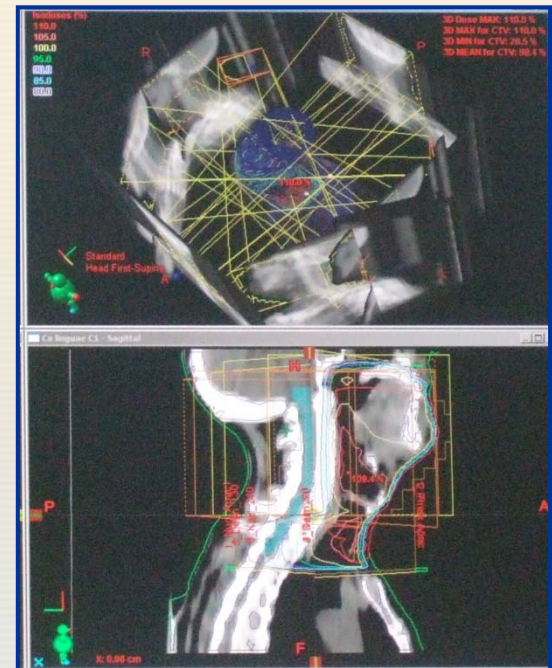
The challenge...

- The Lithuanian Oncology Centre had problems with quality control, dosimetry and maintenance problems, which reduced the availability of the centre's only linear accelerator to treat cancer patients
- LOC wished to acquire and commission a second dual-energy linear accelerator to increase the capacity and reliability of its radiotherapy service, and to attain Centre of Competence standards.



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The project...

- A medical electron linear accelerator was acquired through the project. Radiotherapy treatment techniques were improved with planning software, immobilization equipment and the implementation of new radiotherapy methods.
- 16 hospital staff, including radiation oncologists, medical physicists and technologists, received extensive training.

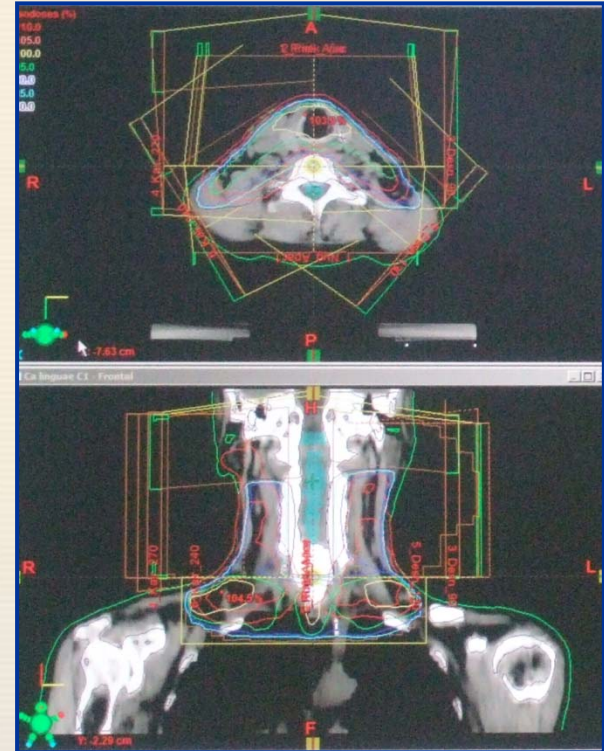


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The impact...

The project has increased the accessibility of radiotherapy services in Lithuania, and cancer patients in Lithuania are receiving radiotherapy treatment safely and economically and according to internationally recognized standards.



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Agricultural productivity & food security

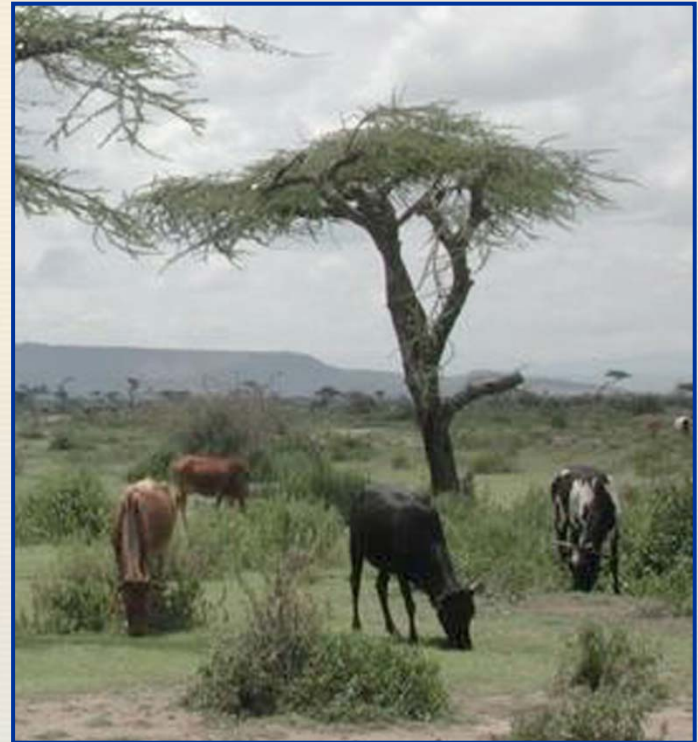
- Working in cooperation with the Food and Agricultural Organization
 - Increase and sustain crop production through induced mutation breeding
 - Effective pest and disease control
 - Increased soil fertility
 - Better soil and water management
 - Improved food quality and safety



Improving livestock productivity through integrated techniques in Africa

The challenge...

- Livestock farming is an important source of animal-based food products and income for many African countries.
- African Member States wished to optimize livestock productivity through better nutrition, efficient reproduction, and the diagnosis and control of major endemic animal diseases.



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The project...

- This regional project improved livestock productivity by developing appropriate selection criteria for genetically improved livestock, instituting integrated management, nutrition and healthcare practices and using modern reproductive techniques.
- The project utilized integrated technologies including artificial insemination, radioimmunoassay progesterone measurement, and ultrasonography.



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The impact...

Ultimately, the project will result in substantial increases in meat and milk productivity in African countries, increasing farm profitability, improving farmers' socio-economic status and reducing the importation of animal by-products. This is an important contribution to national and regional food security.



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Water resource management

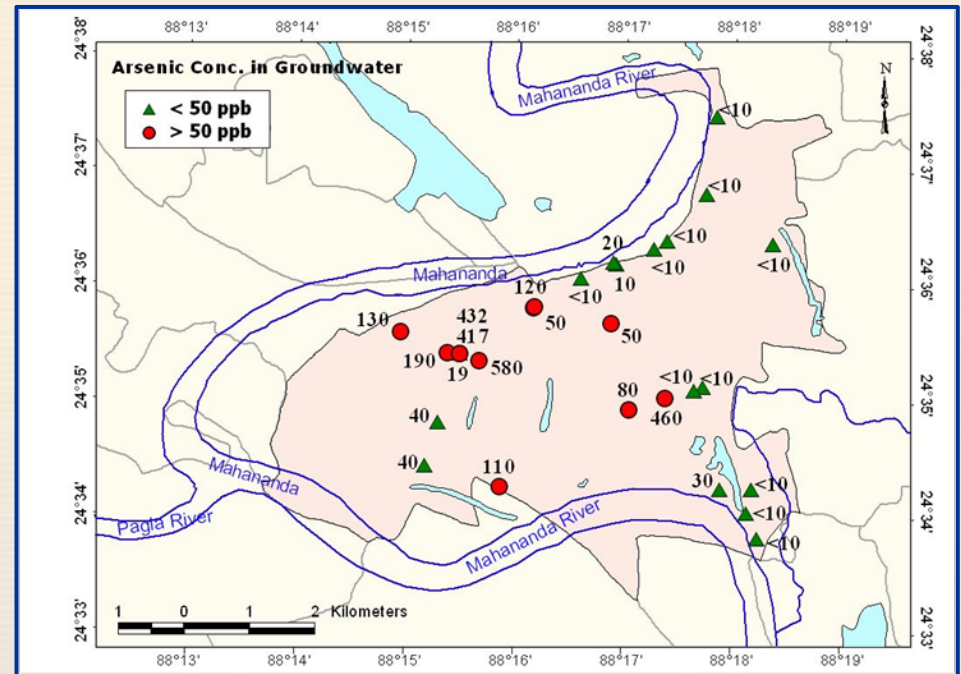
- Identification of the characteristics of water
- Determination of source, pathway and rate of recharge
- Better Member State understanding of the water cycle
- Improved water resource management



Identifying safe drinking water, Bangladesh

The challenge...

- Groundwater in the Deltaic Basin, Bangladesh, is contaminated with arsenic. This has created a major public health crisis, affecting millions of people.
- Bangladesh needed assistance to identify a source of safe drinking water, and to protect it from degradation.



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The project...

- The project used isotope techniques to gather information on recharge conditions and the age of groundwater in the basin.
- Isotopic “fingerprints” of shallow and deep groundwater were developed to determine the source and renewability of groundwater in the different aquifers.
- The isotopic information is being used to guide Bangladesh’s policy of deep aquifer exploitation and is presently being used in a World Bank project for arsenic-free rural water supply.
- Deep groundwater wells have been developed as an alternative source of arsenic free drinking water.



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The impact...

- The project has helped the Government to find alternative, safe and sustainable sources of drinking water in the Deltaic basin.
- It has provided precise, scientific and low cost information to help guide decisions about managing water supply.



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Environmental protection

- Using nuclear technologies to understand and protect marine and terrestrial environments
- Sustainable use and management of natural resources
- Monitoring pollutants, measuring changes and mitigating damage
- Management of sensitive areas such as coastal zones



Conserving the environment in the mining sector of Peru

The challenge...

- Mining activities in Peru have resulted in a high level of environmental contamination.
- This has led to a deterioration in farming activities.
- The main rivers in Peru are affected by high levels of cyanide and metals, including copper, lead, zinc, cadmium, arsenic, nickel, and mercury – all from mining activities.



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The project...

- The project was carried out by the Peruvian Institute of Nuclear Energy (IPEN), with Agency support.
- It used isotopic tracer techniques to determine contamination levels to support the establishment of clean operating practices in the mining and minerals industries.
- The Agency provided fellowships, a scientific visit and equipment to analyze non-radioactive and radioactive materials in environmental samples.



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The impact...

- The installation of equipment led to an improvement of analytical capability.
- The amount of arsenic and other pollutants in sediments of the Rimac and Aruri rivers located in the mining zone of the central uplands around Lima was evaluated.
- Studies on hydrodynamics of underground waters of mines in Puno and Lima and the characterization of effluent filtration from mines in Arequipa and Cajamarca were completed.
- On the basis of the findings, the Peruvian Institute of Nuclear Agency (IPEN) drew up an environmental conservation plan.



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Strengthening the national environmental monitoring system in the marine ecosystem in Guatemala

The challenge...

- Puerto Quetzal is the most important industrial harbour of the Central American Pacific coast. Despite its leading position and modern functioning, this national company had no environmental monitoring programme.
- The marine area around Puerto Quetzal and the South coast is affected by population increase and power-generated industries.



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New low-energy gamma spectrometer

The project...

- The project helped to determine the levels of contamination of ecotoxic metals in the marine environment and complemented the National Directorate of Energy's evaluation of radioactive contaminants.



Sugar terminal, Puerto Quetzal



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The impact...

- Multilateral collaboration between Empresa Portuaria Quetzal and other national institutions (Ministry of Environment, Ministry of Energy and Mines and Universities) has been enhanced.
- Puerto Quetzal has set up its own environmental department, equipped with oceanographic and nuclear detection equipment to reconstruct past and monitor future pollution possibly occurring in the harbour's area of influence. The expertise gained through the project will allow the implementation of an environmental monitoring system at Puerto Quetzal.
- With the support of harbour authorities and government officials, the project has led to better coastal marine management.



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Physical and chemical applications

- Support to national analytical laboratories
- Development of capacities to certify applications in industry, medicine and agriculture that use nuclear S&T
- Radiopharmaceutical production, radioanalytical services, industrial methodologies (e.g. non-destructive testing), environmental applications (e.g. flue gas scrubbing, effluent clean-up)

Expanding microanalytical capabilities in Slovenia

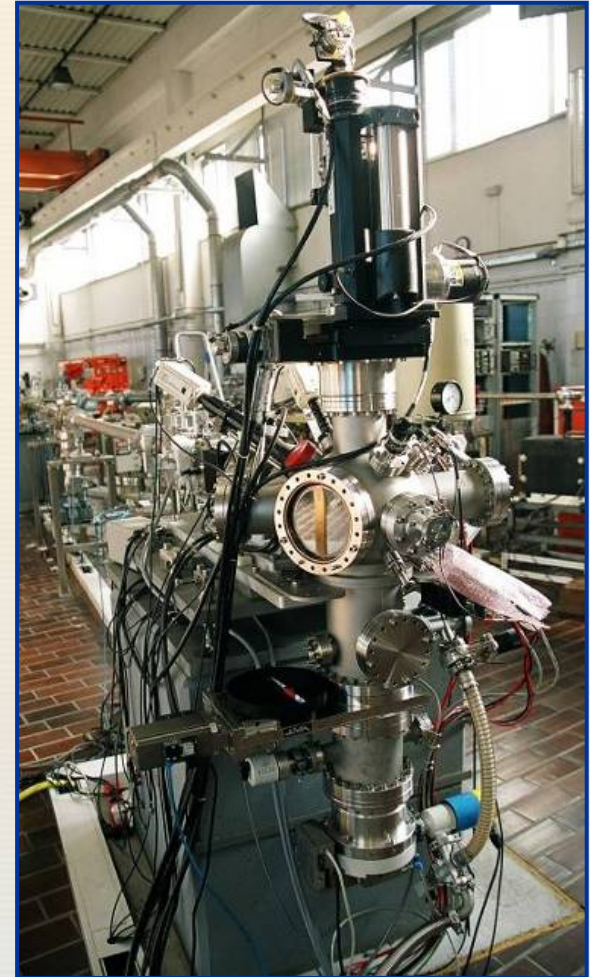
The challenge...

- The demand for products developed through microengineering is on the rise. Several Slovenian companies are interested in the application of micromechanical structures in their products. To remain competitive in the world market, Slovenian companies need to utilize improved microstructure fabrication techniques.
- Microstructures can be produced by a technique referred to as proton beam micromachining (PBM) or deep ion beam lithography (DIBL).



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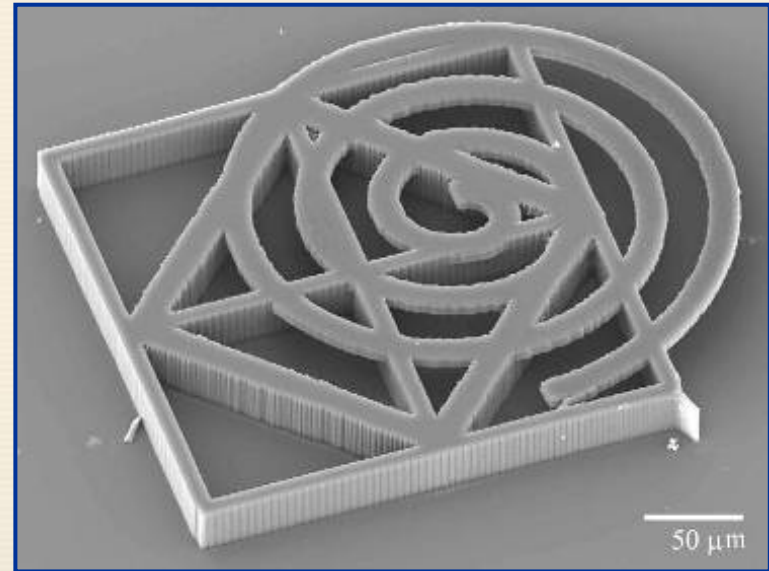
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Ion microbeam facility

The project...

- This project aimed to help the microanalytical centre (MIC) in the Department for Low and Medium Energy Physics of the Jožef Stefan Institute to increase its participation in micro-engineering research and development.
- The ion microbeam station at the MIC in Ljubljana was equipped to become an ion microbeam micromachining centre.



***Three-dimensional microstructure
produced at the Jožef Stefan Institute***



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The impact...

- The capabilities of the ion microbeam micromachining tool were enhanced, facilitating the development of devices for industrial applications.
- New equipment is providing an expanded and higher quality micro-engineering capability that is being utilized in industrial and research activities involving the prototyping of novel devices, such as microscopic magnetic field sensors.
- The industrial sector will benefit from locally produced micromechanical structures, creating new opportunities for exports.
- The enhanced ion microbeam station at the Jožef Stefan Institute is now available for physics and applied research.



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Sustainable energy development

- Comprehensive energy planning
- Broad range of nuclear power programmes



Establishing sustainable and diversified energy in Burkina Faso and Ivory Coast

The challenge...

- Limited access to energy is a major obstacle to social and economic development in Africa.
- Better energy production will pave the way to improved living conditions and advances in the industrial sector, and will help large segments of the population move above the subsistence level, particularly in rural areas.
- Better access to modern energy will also help mitigate the continuing environmental degradation caused by the poor management of natural resources.



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The project...

- These projects aimed to enhance national capabilities for the creation of sustainable energy development strategies through the determination of the best long-term energy supply mix.
- Training and expert services were provided to support studies and make recommendations on the development of the energy sector in Burkina Faso and the Ivory Coast.
- The project provided expert mission guidance on strategic planning exercises and national training courses to employ energy planning models efficiently and effectively.

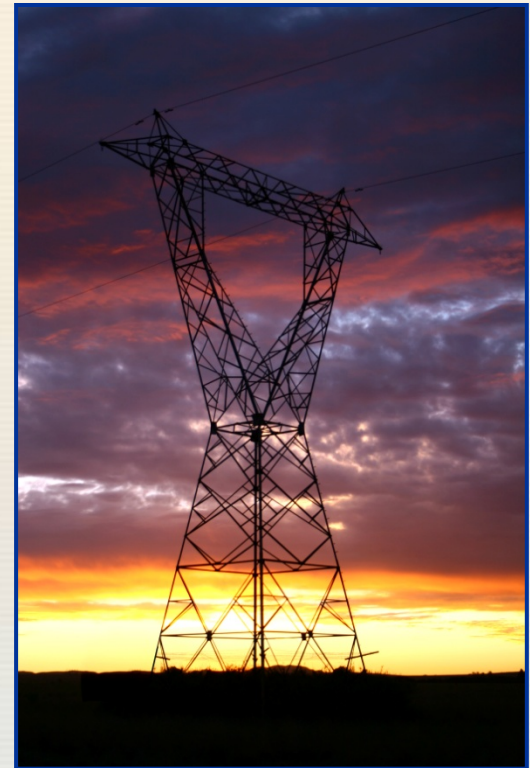


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BKF/0/003 Energy Demand Planning

IVC/0/005 Energy Planning



The impact...

- Following training, Burkina Faso and the Ivory Coast will be able to develop comprehensive energy demand reports and will ultimately enable these countries to better plan for future energy development.



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Safety

- Upgrade nuclear infrastructure
- Prepare for and respond to emergencies
- Capacity-building in:
 - legislative frameworks, regulatory infrastructure, operational safety, safety assessment, management for safety, radiation protection, waste management, emergency preparedness and response.

Regaining control over orphan sources in China

The challenge...

- China, with its large size and population, uses numerous radioactive sources in the health, industry, education and research sectors. Source recovery is important to ensure the safety of local populations and the environment, and to prevent unintended contact with stray radioactive sources.



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The project...

- This project was launched in early 2007 to assist China to build national capacity to gain control over orphan radioactive sources and to strengthen the control of vulnerable and disused radioactive sources in the country.
- Personnel from China's Environment Protection Authorities (EPAs) were trained through national training workshops on how to search for 'lost' sources, and how to control and dispose of them safely.



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The impact...

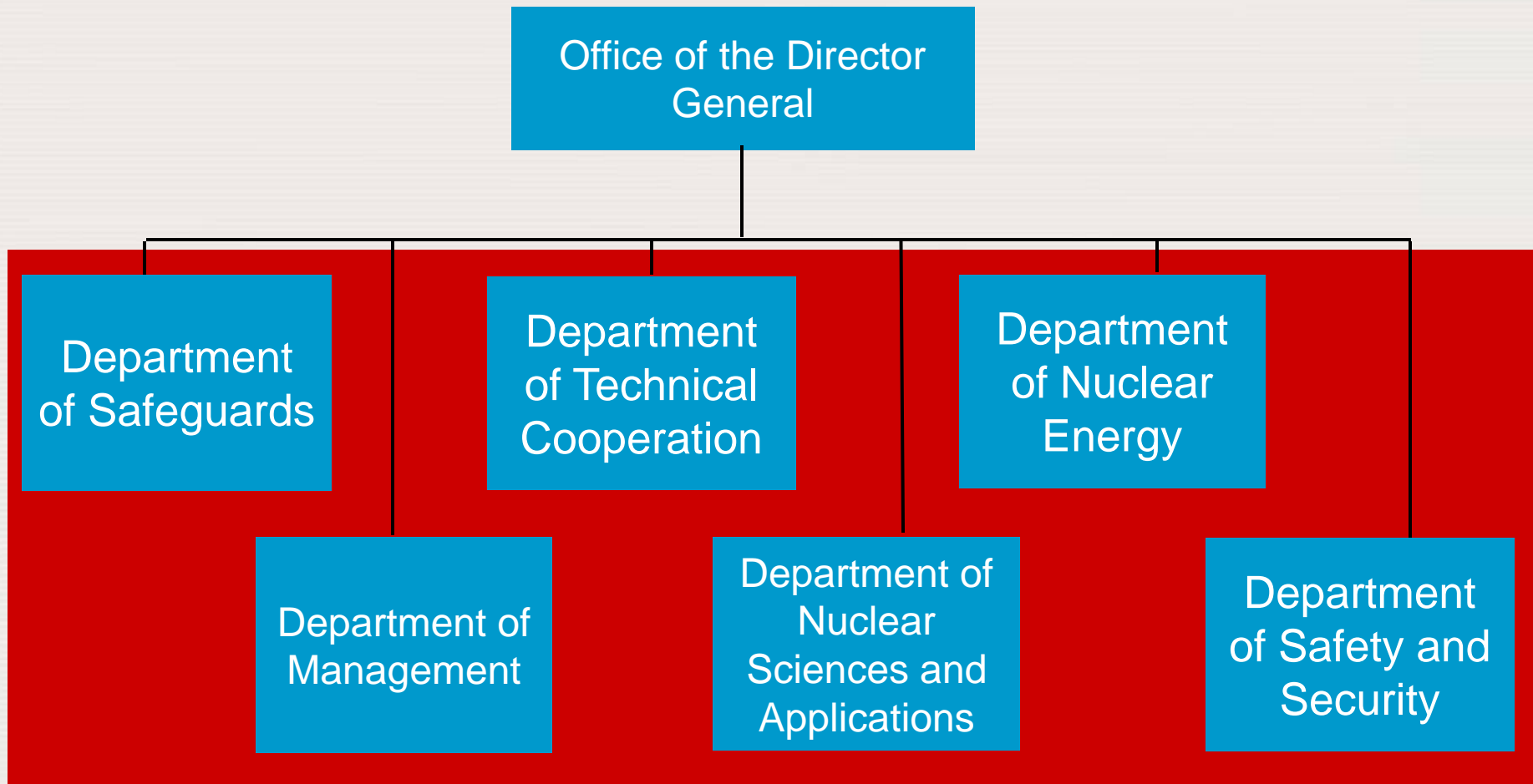
- In Nanning City, the local EPA recovered seven sources which had been used in level gauges from three bankrupt cement manufacturers. They also discovered a glass manufacturer who had privately buried a caesium source in 1998 and were able to enforce strengthened safety and security of radioactive sources in more than 20 enterprises.
- In Shanxi, the EPA recovered six sources that could be used in nuclear gauges from a bankrupt fertiliser manufacturer.
- After the magnitude 8 earthquake in China's Sichuan Province on 12 May 2008, teams of radioactive source search and recovery experts were deployed inside two weeks. 50 sources were detected and safely removed.



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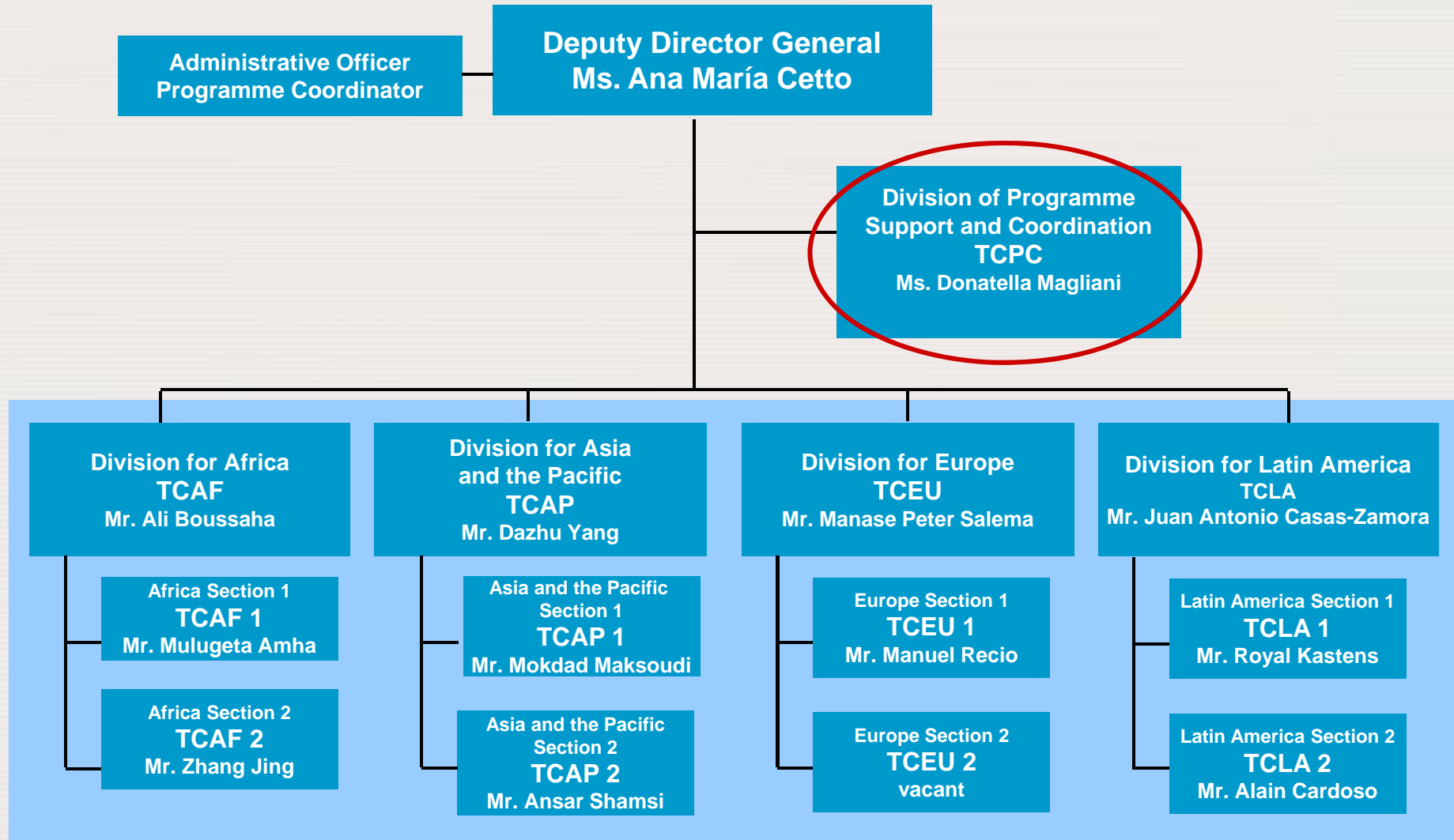


IAEA Departments





Department of Technical Cooperation



TC Programme - Quick Facts

- Recipients: all IAEA Member States are eligible for TC assistance
- 122 Recipient countries: national, regional and interregional projects
- 80% of recipients are non-nuclear power countries
- 26 recipient countries are Least Developed Countries (LDCs)
- TC Department: approx. 190 staff
- New obligations in 2008: \$83.1 million

TC Programme Funding Sources

- TCF (Technical Co-operation Fund)
 - Voluntary contributions from all Member States
 - National Participation Costs (NPCs)
 - Assessed Programme Costs (APCs)

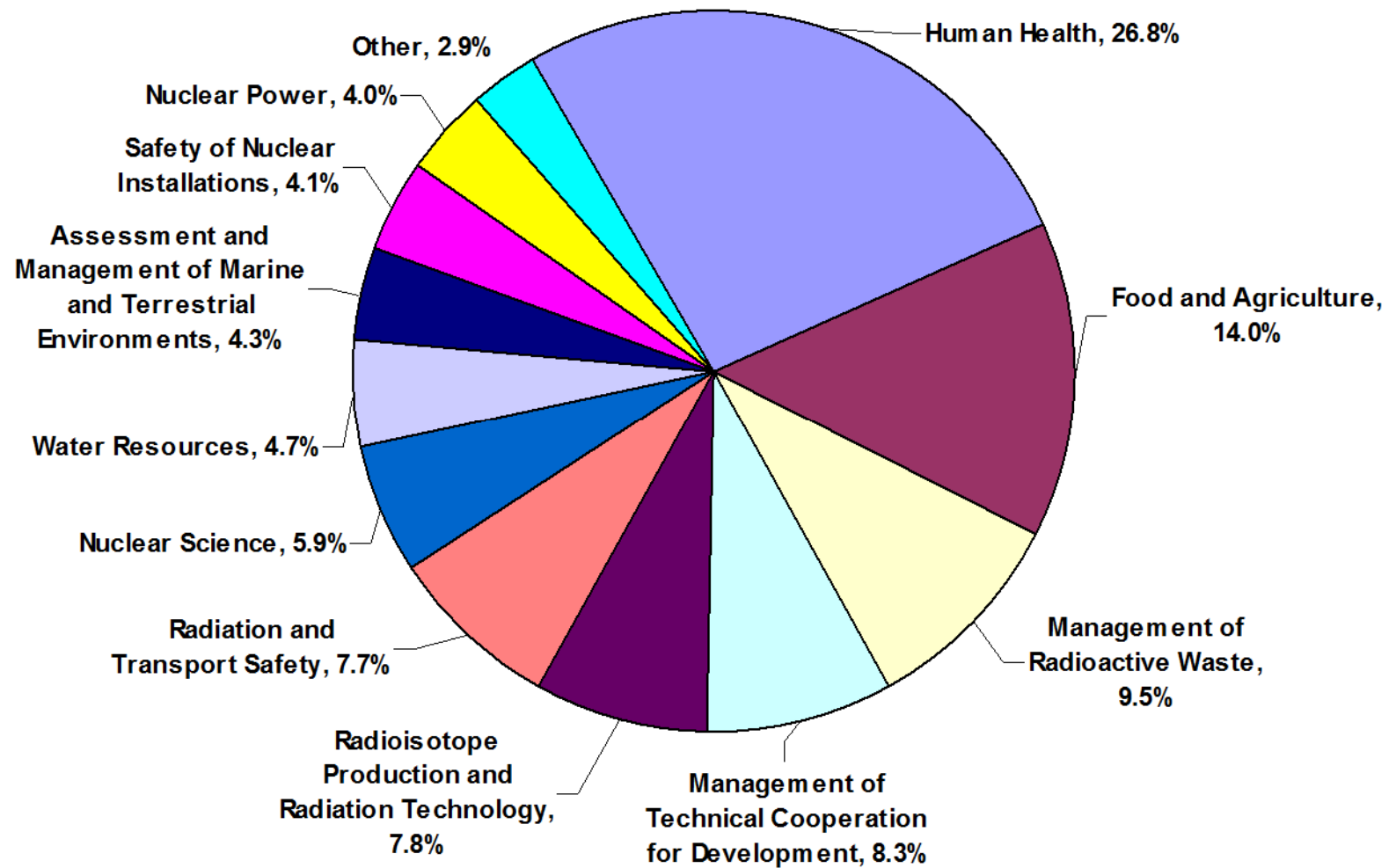
Funds are used for approved TC programme activities in all Member States
- Extrabudgetary
 - Donor funding from Member States, other international organizations, NGOs and the recipient government itself (Government Cost Sharing). Funding often targeted according to donor specifications.
- UNDP
 - Only available to UNDP-designed and approved projects, where the Agency is designated the 'executing agency'
- In-Kind
 - Money does not pass through the Agency's accounts. Member States and international organizations provide assistance by paying directly for travel, training fees, equipment etc.

Technical Cooperation 2008

- \$96.4 million disbursed
- Support provided to 122 countries and territories
- 3240 expert and lecturer assignments
- 3676 meeting participants
- 2744 training course participants
- 1621 fellows and scientific visitors

TCP 2008 at a glance

Disbursements by Agency Programme 2008

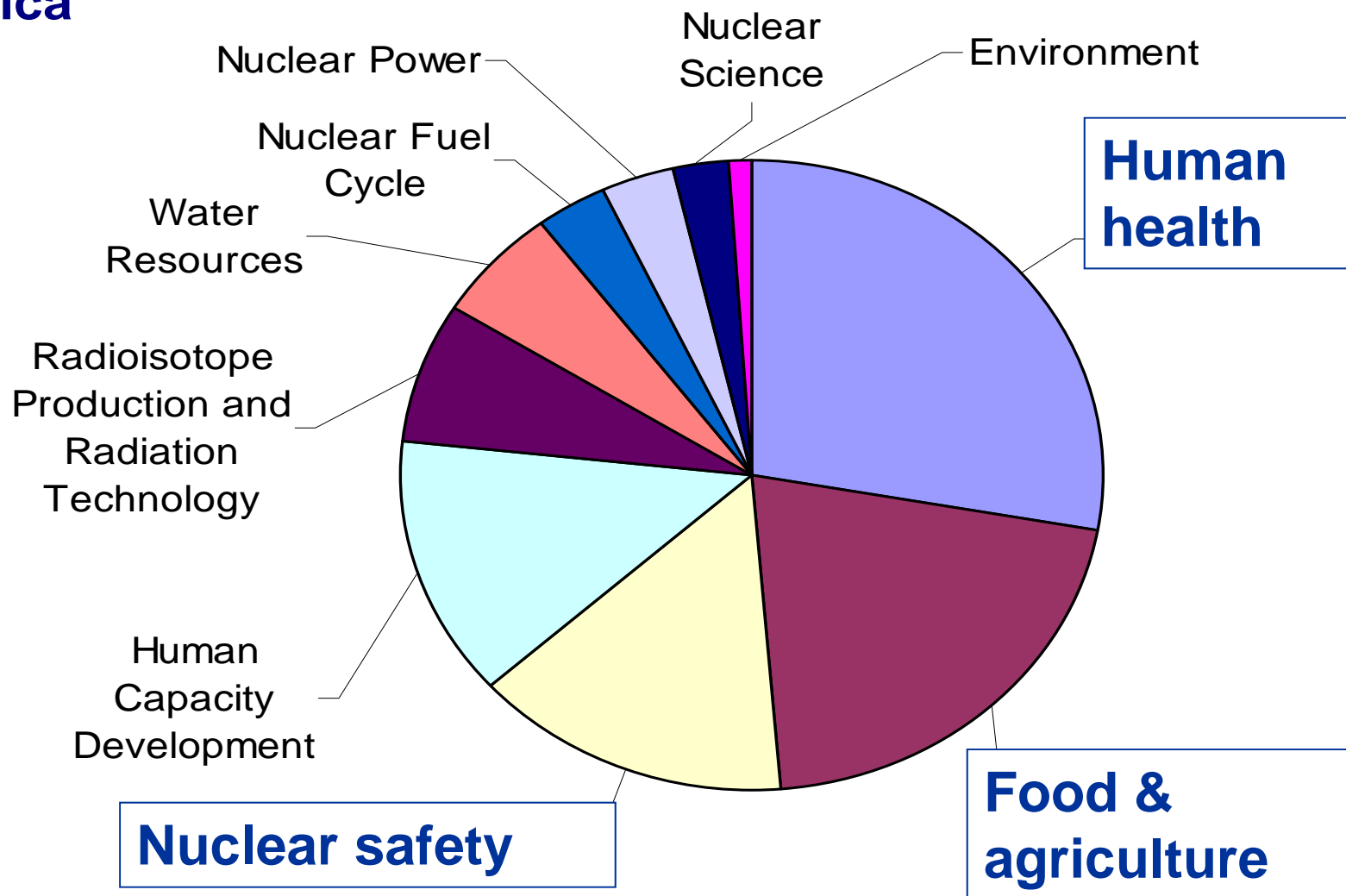


Africa

- Two new Member States: Malawi, Mozambique
- Meeting basic human needs remains top of the agenda
- Many projects proposed for the upcoming cycle support the MDGs and are directly linked to NEPAD flagship projects
- Special emphasis is placed on LDCs, with 50% of the budget for national projects
- 37.5% of the budget is devoted to regional cooperation
- Main areas of focus: human health, nuclear safety, food and agriculture

Africa: thematic breakdown for 2009–2011 cycle

Africa

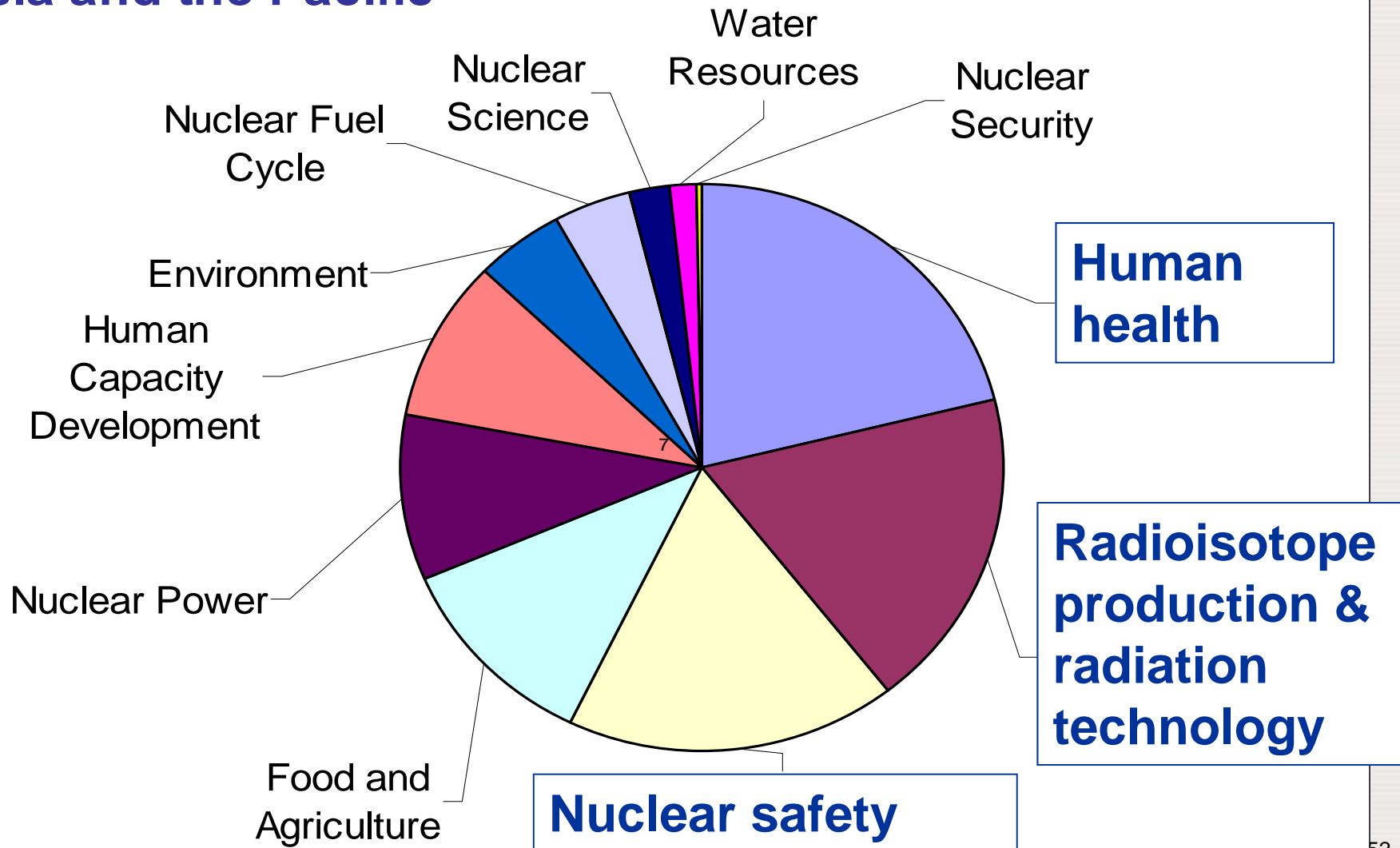


Asia and the Pacific

- Increasing interest in nuclear power
- Overall programme emphasises strengthening human capacity in the application of nuclear technology
- Regional projects prioritised at meeting of NLOs from all Member States in the region
- Main areas of focus: human health, radioisotope production and radiation technology, nuclear safety

Asia and the Pacific: thematic breakdown for 2009–2011 cycle

Asia and the Pacific

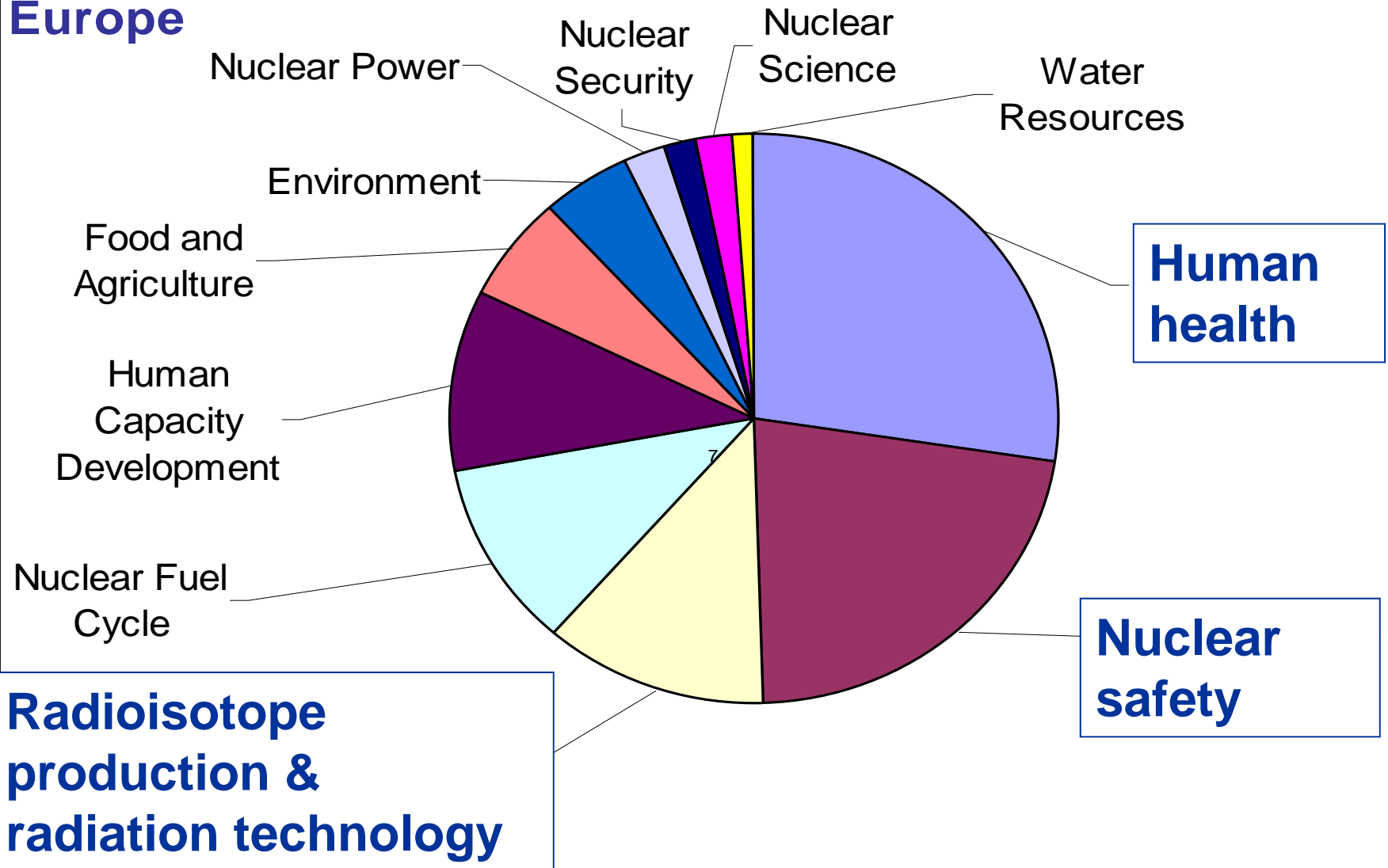


Europe

- Romania and Bulgaria have joined the EU Group
- Reduction in national programmes: no national projects in Greece, Portugal & Russia, only two footnote-a/ projects for Turkey
- Regional projects increasingly important, formulated and prioritised in line with European Regional Profile
- 41% of TCEU funding to nuclear safety and nuclear energy
- 30% of TCEU funding to human health
- Substantial increase in funding to the nuclear energy sector, nuclear power increasing in importance
- Main areas of focus: nuclear safety & power, human health, radioisotope production and radiation technology

Europe: thematic breakdown for 2009–2011 cycle

Europe

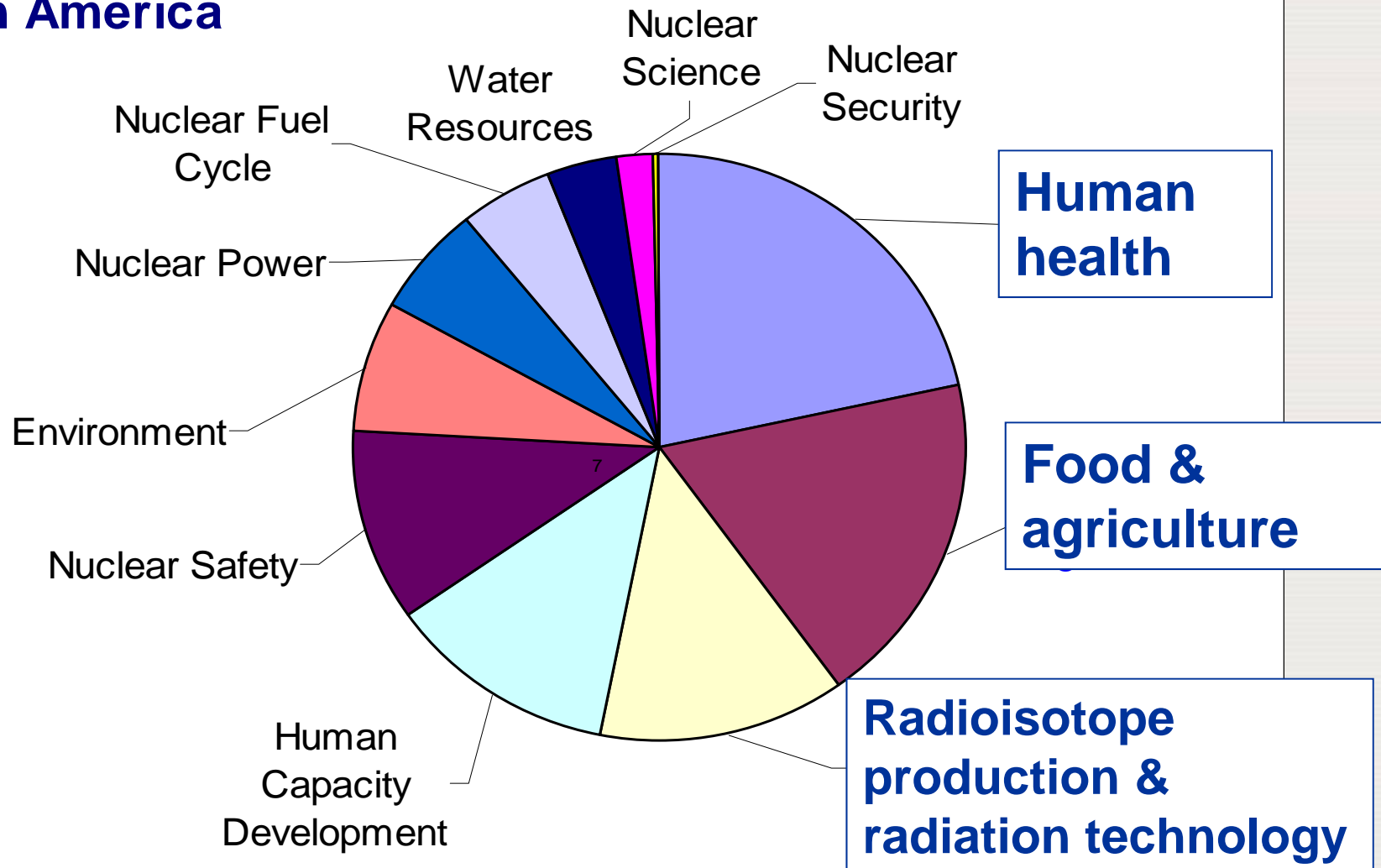


Latin America & the Caribbean

- New Member State: Belize
- Moderate increase in proportion of TCF allocated to regional projects (more support to ARCAL projects)
- Notable increase from previous cycle in food and agriculture, isotopic hydrology and the environment
- Main areas of focus: human health (22%), food and agriculture (18%), radioisotope production and radiation technology (13%)

Latin America and the Caribbean: thematic breakdown for 2009–2011 cycle

Latin America



Thank you