TECHNICAL CO-OPERATION REPORT FOR 1999

REPORT BY THE DIRECTOR GENERAL

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PREFACE

The Board of Governors has requested the transmission to the General Conference of the attached Technical Co-operation Report for 1999, the draft of which was considered by the Board at its June 2000 session.

The Director General is also hereby reporting in fulfilment of the request contained in resolution GC(43)/RES/14 on “Strengthening of the Agency’s technical co-operation activities.”

FOREWORD

The Agency's Technical Co-operation Report for 1999 is the bridge between two centuries. One of the key efforts in 1999 was preparation for the 2001-2002 programme cycle through upstream work when Member States and Agency staff from all Departments participated in planning for the Technical Co-operation Programme.

This report is also the last that will be using data and information compiled in the Agency's old mainframe computer system. With the move to a new financial system at the beginning of 2000, future reports will be able to present data and statistics in a different way.

This year's report covers three separate topics:

Part I is the Agency's main means of fulfilling its obligation under General Conference Resolution GC(43)/RES/14 to report on the Strengthening of Technical Co-operation. It covers the period since the last report (i.e., from 1 April 1999 to 31 March 2000). Both Parts II and III – the Agency's means of accounting for funds received for and spent on the Technical Co-operation Programme in 1999 – also contain elements that complete the Agency's response to this resolution. This year, instead of reporting on individual milestones within the TC Strategy, Part I looks at the elements of the Strategy and how they contributed to the TC Programme. The first is the concept of Partners in Development which underpins the goals of the Strategy. The second is one aspect of Technical Co-operation among Developing Countries (TCDC); that is, the continuing evolution of Regional Resource Centres. The third is Thematic Planning, a tool devised for the TC Programme, but one that has shown its usefulness for the whole Agency in the context of results-based programming.

Part II reports on the major achievements of the TC Programme in 1999 in different regions of the world. In addition to reviewing some of the results of national and regional activities in each region – including activities under Regional Co-operation Agreements – this section looks at three interregional projects, and provides highlights of selected projects that were closed in 1999. The full text of the achievements of all projects closed during the year is available in the electronic version of this report on GOVATOM. Also in Part II, in an effort to respond to the External Auditor's recommendation that the Agency use a basket of global indicators to complement both the traditional implementation rate and reports on individual projects, this section takes a look at some global outcomes, outputs, and inputs.

Part III presents a technical discussion of the financial parameters of the TC Programme. A more detailed review of resources and contributions, disbursements, and non-financial indicators is provided in a Supplement to this report.

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TECHNICAL CO-OPERATION REPORT FOR 1999

PART I: STRENGTHENING OF TECHNICAL CO-OPERATION

1. Introduction

1. General Conference Resolution GC(43)/RES/14, October 1999 requests the Director General to pursue, in consultation with Member States, efforts to strengthen the technical co-operation activities of the Agency through the development of effective programmes aimed at improving the scientific, technological and regulatory capabilities of developing countries. The quality of a technical co-operation programme is largely dependent upon the quality of work that goes into its design. Early decisions regarding choice of areas to focus on within a country or region, plus proper selection and design of individual projects are major factors in the degree of impact a programme will have. As 1999 was a year of upstream work for the Technical Co-operation Programme in preparation for the 2001-2002 Programme cycle, this year's report on Strengthening of Technical Co-operation will focus primarily on this area of activity.

2. Key elements of the TC Strategy – Country Programme Framework exercises, Thematic Planning, and good project design through application of Model Project criteria – all relate to upstream work. Rather than taking a quantitative approach in relation to the Strategy's milestones, this year's report will take a qualitative look at actual results achieved through specific efforts undertaken using the tools outlined in the Strategy. The report will also cover briefly key management issues, plus constraints faced by the Agency during Programme implementation.

2. Partners in Development

3. A central feature of the TC Strategy is the concept "Partners in Development". This refers primarily to the partnership the Agency builds with each recipient Member State in order to assist that country achieve identified sustainable development goals. But it also refers to the partnerships built within Member States between the scientific community and "problem-holders" in government and industry, partnerships between the Agency and other donors on behalf of Member States, non-traditional partnerships, such as with the private sector and non-governmental organizations, and the work the Agency does to facilitate partnerships between the institutions of different Member States. Each of these relationships played a role in upstream work in 1999.

4. Partnerships were also strengthened between the Regional Agreements that made important contributions to the efficiency and effectiveness of the Programme. The Multi-media Distance Learning Packages on Tissue Banking and Distance Assisted Training for Nuclear Medicine Technologists developed by RCA were translated into Spanish and training courses were initiated in Latin America through the ARCAL Programme. The package for Nuclear Medicine Technologists was also introduced to AFRA Member States and translated

into French. AFRA and RCA experts provided valuable support to an ARCAL initiative to prepare Safety Guidelines on Radiotherapy.

a) Working with Partners – Recipient Member States

5. Working with recipient Member States on the selection of priority areas for co-operation, definition of problem areas for which nuclear techniques have cost-effective solutions, and identification of expected results from technology transfer is at the heart of upstream work. The most difficult aspects of this work are ensuring that the priorities selected are the major priorities of the central authorities of Member States, and that commitments made by all parties will be upheld once projects are underway so that the results will be sustainable.

6. This work was made easier in 1999 by agreement within the Agency – discussed by the Board of Governors in December – on the central criterion for establishing priorities in given countries and regions for the TC Programme: higher priority will be given to projects which involve either core competencies within the mandated areas of the Agency, or are in thematic areas in countries where there are national programmes enjoying solid financial support. TC projects that are linked to national programmes – particularly those that are explicitly a part of those programmes – have a better chance not only of being completed as planned, but also of having long-lasting, tangible socio-economic impact. Applying this central criterion in upstream work will result in a stronger TC Programme in the future.

7. As a part of this philosophy, a special effort was made in 1999 to work not only with our natural counterparts in Atomic Energy Commissions and Agencies and nuclear research institutes but also with central government authorities and actual problem-holders. One way of doing this was through CPF exercises.

8. The Agency's work with Sudan on a CPF in 1999 is a good example. The exercise started in April with discussions between the Deputy Director General-TC and Government Ministers responsible for all areas where nuclear technology can make a difference, as well as with central authorities up to the most senior level of government. Subsequently, the Sudan Atomic Energy Commission arranged workshops in different sectors with relevant authorities to assist in the definition of priorities sector by sector. Agency staff also met with end-users such as the Agricultural Research Corporation (which, for example, has the capability of reaching agricultural extension services.) Consultations were also held within the Agency with relevant technical staff. The result was a Country Programme Framework signed by both the Agency and the Sudanese Government that defines a core programme for both the near- and medium-term in human health, water resources management, and agricultural production, as well as general support activities. The success of this CPF exercise lay in having consultations with *every* level of government, and in the strong partnership between the Sudan Atomic Energy Commission and actual problem-holders.

9. Another means of working with recipient Member States as partners during an upstream year is through regional meetings. For example, in 1999, the Agency organized seven separate regional consultation meetings for the Europe region. These enabled the countries of the region: (a) to discuss and define priorities for and amongst themselves thereby helping the Secretariat shape the outline of the 2001-2002 regional programme; (b) to plan specific projects together, all before the actual submission of project requests for the 2001-2002 cycle; and (c) to participate in training on project planning and design. Two regional and three national workshops (in Russian) were specifically dedicated to this last item where the IAEA Guidelines on "Planning and Designing IAEA Technical Co-operation Projects" published in July 1997 were explained and discussed.

10. Indeed considerable effort went into working with those authorities in Member States responsible for submitting projects to help ensure the next generation of projects would be well selected and designed. A new training package on project design and planning was developed and delivered at Argonne National Laboratory with the financial support of the US Department of Energy. Three workshops were held for national counterparts from Africa, East Asia and the Pacific, and Latin America. In the case of East Asia and the Pacific, a follow-up workshop was held in Beijing for new counterparts in the region, as well as a number of national workshops. These workshops were particularly interesting because they gave counterparts from different countries an opportunity to review each others' projects prior to their submission to the Agency. This form of mutual support through mutual learning was a key element in strengthening planning for the TC Programme in 1999. The impact will be felt when the new projects submitted for the 2001-2002 TC cycle come on line.

b) Working with Partners – International Development Organizations

11. In a report to the General Assembly distributed to the Board of Governors in 1999[1], the UN Secretary General, Kofi Annan, noted that for technical co-operation to have an impact, different donors – multilateral and bilateral – have to co-ordinate their efforts. Given that technology transfer is most effective when it is aimed at solving specific development problems, it makes sense to co-ordinate efforts of different partners around those problems and together with problem-holders. This approach also helps the Secretariat identify major national programmes and thus meet the central criterion for priority-setting by emphasizing projects linked to those national programmes.

12. As part of its upstream work in 1999, the Agency analyzed the lending patterns of International Financial Institutions as evidence of where governments are investing capital assistance. One of the results of this analysis showed that major donors are providing some $30 billion annually for water sector development in recipient countries. Using this knowledge and the fact that isotope hydrology offers unique tools for water management authorities, the Agency took a proactive stance with Member States, the World Bank, and other key players to demonstrate where bringing the Agency in as a partner could help optimize the large programmes of others for the benefit of recipient countries.

13. One result of this work is the start of a collaborative effort between the IAEA, the World Bank, and Chinese counterpart institutions involved in the Bank's Guanzhong Irrigation Improvement Project. This is a five-year, $200 million project to investigate groundwater in the Guanzhong River Basin with the aim of increasing agricultural production through improved water availability and use. The goal is to incorporate isotope investigations into all seven major river basin initiatives sponsored by the World Bank in China, an effort that could optimize planned Chinese Government investments of more than $3.8 billion.

14. A similar trend in the lending portfolio of International Financial Institutions identified during upstream work in 1999 is the steady increase of investment in environmental management projects. The Agency is just starting to make use of its analysis in this area to identify opportunities in specific countries. It is evident, however, that some interesting opportunities exist for partnering with other institutions to help resolve natural resource management problems such as soil degradation and erosion, coastal and marine pollution, water resource contamination, desertification and mitigation of saline lands. Recent

[1] "The Causes of Conflict and the Promotion of Durable Peace and Sustainable Development in Africa", GOV/INF/1999/2, February 1999

experience has demonstrated the value of nuclear science and technology in understanding and mitigating all of these problems.

c) Working with Partners – the Private Sector

15. GC(43)/RES/14 emphasizes that TC Programmes should pursue a complementary role to commercial applications of nuclear techniques. One of the areas the Agency looked into in 1999 was its relationship with the private sector. While our major partners will always be governments and governmental institutions, the private sector can play an important role in furthering the goals of the Agency and can help improve the effectiveness of its programmes.

16. A clear example of this was identified during the Thematic Planning exercise the Agency conducted on Dam Safety and Sustainability. One of the key lessons learned from discussions with representatives from international consulting firms and non-governmental organizations, such as the International Commission on Large Dams, is that the key end users for isotope hydrology studies are private sector engineering firms. It is estimated, however, that less than 5% of these engineering firms have knowledge about the potential of isotope hydrology in dam management. Likewise, the Agency's counterparts in isotope hydrology laboratories are largely unaware of the data needs and requirements of the engineering firms who are hired to solve the dam operators' problems. One of the new roles of the Agency is to help bring these different parties into contact with each other. In November 1999, a training workshop was organized on the use of isotope hydrology for dam safety and dam leakage. Hosted by BATAN in Yogyakarta, Indonesia, the workshop attracted ten national authorities from the region. This work will be continued in 2000 to provide technical advice to engineering and other professional organizations in the region.

17. Agency counterparts are also finding that building partnerships with the private sector is important. In 1999 the East Asia and the Pacific region sponsored a seminar about how nuclear institutions can sustain themselves in the future. One topic discussed was the need for institutions to "market" their capabilities to end users in order to generate higher revenues from sales of products and services. This seminar led to considerable discussion regarding the shift in the thinking of decision makers towards uses of scientific research and technology development. The Agency will sponsor more work in this area in 2000, including the review of successful case studies of Member States in the region who have redirected their nuclear technology activities towards becoming self-sufficient and sustainable.

3. Regional Resource Centres[2]

18. General Conference Resolution GC(43)/RES/14 requests the Director General to continue the Agency's efforts of working with Member States within relevant regional groups to identify Regional Resource Centres (RRCs), in the context of enhancing technical co-operation among developing countries. The TC Report for 1998 provided a description of the early efforts undertaken in different regions to establish RRCs, including the types of criteria for the selection of candidate centres that had been agreed upon by Member States. This year's report provides a review of progress between 31 March 1999 to 31 March 2000.

[2] The generic term "Regional Resource Centres" has been used throughout this document to refer to "Designated Regional Centres", "Regional Resource Units", "Centres of Excellence", and other terms used in different regions to refer to the same concept.

Africa

19. In the past year, Member States of AFRA embarked on a process with the aim of identifying RRCs in five areas of activity: radiation oncology and medical physics; non-destructive testing; radioactive waste management; repair, preventive maintenance, and quality control of medical and scientific instruments; and radiation mutation and related biotechnology. Between one and four candidates were nominated in each area. The Agency was then asked to analyze the application questionnaires using the criteria and requirements set by AFRA Member States. Where possible, it was hoped to find one Anglophone and one Francophone centre in each technical area.

20. At the end of November 1999, the Field Management Committee of AFRA pre-selected six candidate centres based on the results of the Agency evaluation and their own experience regarding the candidate centres' managerial, administrative, and financial capabilities. In certain instances, further clarification was then sought from pre-selected centres in light of comments made by Agency technical officers. The next step in the process was an audit of pre-selected centres by independent experts in the field plus a member of the Field Management Committee. To date, four centres have been audited by experts from the USA, UK, Poland, Pakistan, and Turkey. Auditing of the remaining pre-selected centres is scheduled to be completed by May 2000. Results of the audit will be reviewed in June 2000 by AFRA's Field Management Committee and recommendations will be made to the AFRA Meeting of Representatives in September 2000 for designation of centres as RRCs. It is expected that the appointed RRCs will become fully operational by the end of 2000.

Latin America

21. At the XVI Technical Co-ordination Meeting of ARCAL in May 1999, participants adopted procedures to be followed by Member States and the Agency for the evaluation of institutions nominated as candidates for RRCs. Using these procedures, participants reviewed 65 proposals that had been submitted by Member States based on selection criteria approved the previous year. Of these 65 proposals, 31 from 11 Member States were retained for further study.

22. Since then, Technical Divisions at the Agency have reviewed 26 of the proposed institutions, and have supported the nomination of 24 of them. These will be presented to the XVII Technical Co-ordination Meeting of ARCAL in May 2000 for final nomination.

23. Three Centres specializing in the maintenance and repair of nuclear instrumentation were identified earlier through an ARCAL project. These centres – in Mexico, Brazil, and Venezuela – have provided training courses and repaired equipment to the full satisfaction of Member States and are included in the group of centres being put forward in May for final nomination.

East Asia and the Pacific

24. RCA was the first Co-operative Agreement to consider the concept of RRCs. Initially there was only one designated centre – the Bone Bank at Singapore National University – in the area of tissue banking. In 1999, under the joint UNDP/RCA/IAEA project *(RAS/97/030)*, Member States identified additional sites that could be considered for use as RRCs in the five technical areas of the project. These included: access to clean drinking water (4 candidates); management of the marine coastal environment (5); air pollution (9); clean and energy-efficient processes (4); and electronic networking (4). The Agency has already used

a number of these candidate centres for analysis of data and provision of training and experts.

25. Following the 1999 General Conference, RCA Members reviewed a draft questionnaire designed to help in the process of selecting centres from among the candidates. They adopted a revised version of this questionnaire at their meeting in Mumbai at the end of February 2000, and endorsed those that had been designated earlier as RRCs under the joint UNDP/RCA/IAEA project. Evaluation of the performance of the RRCs will be left to the project committee.

26. An additional three candidatures have also been received for RRCs in tissue banking, gamma irradiation services, and radioisotope laboratory services.

West Asia

27. Member States in the West Asia region do not have a formal co-operative agreement, although there have been some discussions regarding the possibility of establishing one.

28. So far, only the Islamic Republic of Iran, has formally offered to the Agency the use of its facilities as an RRC. Further consultations are under way to identify specific centre(s) for this purpose. The Radiation Processing Centre at Yazd with its modern 10 MeV Rhodotron Electron Accelerator has been mentioned in this context. This, or any other proposal, has not yet been evaluated by Member States.

Europe

29. Member States in Europe have taken a more informal approach to the selection of RRCs; nonetheless, a number of centres have emerged naturally through experience and practice. The Slovak Nuclear Regulatory Authority, for example, plays a leading role in the regulatory sector, as does the Nuclear Research Institute in Řež, Czech Republic, in water-cooled and water-moderated reactor pressure vessel technology. The Jožef Stefan Institute in Slovenia hosts up to ten major training events and group activity events per year. The training centre at the Paks Nuclear Power Plant in Hungary has developed a model of Systematic Approach to Training which is of interest to many water-cooled and water-moderated reactor operators including those in China.

30. Other centres in Europe that are considered to be RRCs and have contributed significantly to the region's TC activities include: the State Office for Nuclear Safety in the Czech Republic, the Croatian Hazardous Waste Management Agency, the Institute of Nuclear Chemistry and Technology in Poland, Obninsk research institutes in the Russian Federation, the Çekmece Nuclear Research Centre in Turkey, and the Demokritos National Centre for Scientific Research in Greece.

4. Thematic Planning

31. Previous reports have referred to Thematic Planning as one of the major tools for implementing the TC Strategy. This year's report will take an in-depth look at the nature of this tool, and how it was used in 1999.

32. Thematic Planning complements the Country Programme Framework process by seeking the most effective and efficient technical solutions to generic development problems. It thus helps ensure the relevance, sustainability, and impact of the Agency's work with Member States. The strategic value of Thematic Planning exercises to date has been to help

prioritize and guide the provision of nuclear applications through technical co-operation based upon the IAEA's best experience and practices, plus a clear understanding of the roles and interests of the major stakeholders and other partners. Thematic Planning exercises have also helped to identify opportunities to form new partnerships that multiply benefits for Member States.

33. Experience to date has shown that the best Thematic Planning exercises have had the following characteristics:

- a clear definition of the problem area and evidence that it is one for which a number of Member States are interested in finding solutions;

- broad participation from different types of partners in the Thematic Planning exercise (e.g., "problem-holders" from Member States; other international organizations working in the same area; representatives of other interested parties such as non-governmental organizations or the private sector; people knowledgeable about conventional or competing technologies used in relation to the problem); and

- agreement at the end of the exercise of "next steps" and other possible follow-up by participants.

34. In 1999, the Agency undertook two Thematic Planning exercises, one on Dam Sustainability, the other on Fruit Fly Control using the sterile insect technique (SIT). This year's report will summarize the major outcomes of both as an illustration of how this mechanism used as a tool in upstream work can help strengthen technical co-operation.

a) Dam Sustainability

35. The starting point for Thematic Plans is not a specific nuclear technique, but a development problem for which nuclear techniques could form part of the solution. Dams and reservoirs are vital to a large part of the world's water supply, irrigation, flood protection and hydropower. At present there are approximately 45,000 large dams in the world (i.e., those exceeding 15 meters in height and one million cubic meters in capacity) with more than 1,700 new ones under construction. Large investments are made each year to increase or maintain their efficiency and thereby serve socio-economic development. Funds are generally spent on engineering and construction solutions to mitigate three types of problems: leakage from reservoirs, leakage through dams, and sedimentation that depletes the storage capacity of reservoirs.

36. The Agency initiated this Thematic Planning exercise on the basis that many Member States have made major investments in this sector and wish to prevent losses to the return on their investments through dam leakage. As part of the exercise, the Agency brought together hydrology experts, representatives from Member State governments, other donors such as the World Bank, end-users such as water and power authorities, and non-governmental organizations such as the International Commission on Large Dams with Agency staff. Participants discussed the role and comparative advantage of isotope hydrology for solving dam management problems ranging from site selection and reservoir design to dam leakage and sediment control, and reviewed specific opportunities for Agency programming.

37. The results of the exercise were:

- a clear list of 15 areas where isotope techniques might play either a primary or complementary role in dam management, a list that can be used for promotion purposes;

- an understanding of where further research is required to validate methodology, e.g., tracking of sediments, and commitment by the Agency to undertake this research;

- a higher profile for the Agency among key donors such as the World Bank and a better understanding of the role the Agency can play in optimizing the large investments of others in this sector;

- identification of specific countries and specific World Bank projects where the Agency could usefully provide technical assistance if requested to do so by Member States; and

- recognition of the lack of knowledge about isotope techniques among potential major end-users such as dam owners and operators and private sector engineering consultants, and the need to devise an action plan to close this knowledge gap.

38. Specific projects have subsequently been proposed for both the TC Programme and Regular Budget Programmes. These include a regional TC project proposed for East Asia and the Pacific promoting the use of isotopes for dam safety and sustainability, and for a planned co-ordinated research project using isotopes to determine the origin of sediments in reservoirs. Experience in dam management using isotope techniques was also exchanged between regions. During the year two ARCAL experts participated in AFRA Specialized Team investigations of dam leakage problems to gain understanding of field operations and the management approach.

b) Fruit Fly Control Using SIT

39. The presence of certain fruit flies in a country can pose a significant barrier to trade in fresh fruits and vegetables, and thus undercut economic development. The insecticides widely used to control fruit flies can in turn harm the environment and human health. The base cost of SIT can appear high, but the technique is environmentally friendly. The opportunities and challenges posed by these issues were the basis for launching this Thematic Planning exercise. The Agency followed the same process in this case as it did for Dam Sustainability, and organized discussions between different types of stakeholders.

40. The conclusions reached were:

- as some governments move to put stricter controls on widely-used insecticides, use of SIT and other biological insect management systems will increase;

- the use of SIT for purposes of control and not only eradication could significantly reduce pesticide use, residues, pollution and associated costs; benefit-cost ratios are already increasing for SIT control of the Mediterranean fruit fly, *Ceratitis capitata* (Medfly), and may lead to a major expansion in the market for sterile medflies for pest control programmes;

- breakthroughs from FAO/IAEA research and development, particularly the development of strains that permit male-only releases and the introduction of improved

fly-rearing systems have also served to increase the efficiency of SIT and lower operational costs;

- today's publicly-owned fly production facilities cannot meet current market demand for sterile medflies and other fruit fly species needed for control; commercialization of this activity is the only practical solution and might well result in greater efficiencies, providing commercial incentive for further research and development efforts;

- Central America, the Southern Cone of South America, and the Mediterranean Basin are the regions where the greatest gains from using SIT for fruit flies can occur in the short and medium term;

- the cost effectiveness of using SIT differs from species to species; the Agency needs to set careful priorities for both its research and TC programmes based on cost analysis;

- genetic transformation and other biotechnology approaches could potentially shorten the time required to develop new fruit fly strains in the future; and

- impact of the Agency's work could be heightened by the development of partnerships with other organizations sharing a common interest in protecting the environment, in facilitating global trade of agricultural commodities, and in increasing farm productivity.

41. As a result of these conclusions, the Agency has developed a three-pronged approach combining proactive identification of countries and regions that would benefit from technical co-operation in this thematic area, a carefully phased research programme in support of projects, and efforts to bring aspects of the technology to the market within 10 years.

42. Feedback from both exercises confirm the value of Thematic Planning for the Agency as a whole. It is one means of extending the principles of the TC Strategy to the planning of Regular Budget activities as well as the TC Programme, and could play an important role in results-based programming.

c) Role of Nuclear Power in Achieving Sustainable Development

43. GC(43)RES/14 requests the Director General to help interested Member States to obtain access to relevant information on the role of nuclear power in achieving sustainable development in developing countries and in mitigating greenhouse gas (GHG) emissions through the Clean Development Mechanism as may be elaborated under the Kyoto Protocol.

44. In 1999 the Agency sponsored three regional workshops/seminars on the Flexible Mechanisms (Clean Development Mechanism and Joint Implementation) under the Kyoto Protocol and nuclear power involving 28 Member States. A generic CDM case study was developed to provide guidance for specific national case studies. Subsequently, four such studies were initiated by China, India, Pakistan and Viet Nam. Two further workshops and a training course will facilitate the process in 2000.

5. Management Improvements

45. Strengthening planning and upstream work needs to be combined with strengthened management practices. The major management effort in 1999 was improving synergy between (a) the TC Programme and programmes funded by the Regular Budget, and (b) the work of different Departments on the TC Programme itself.

46. Synergy between Programmes has been improved with the introduction of Results-based Programming and Budgeting in the Agency which has necessitated more careful delineation of expected results. Synergy is most easily achieved when goals and objectives are both clear and common to all parties and can be achieved in a harmonized manner. Agreement on the central criterion for priority-setting for the TC Programme and particularly on the value of giving high priority to projects that are linked to national development programmes in Member States has also helped in this regard.

47. A major effort to improve synergy between the work of different Departments involved in the TC Programme culminated in agreement on a set of Management Principles outlining roles and responsibilities of all parties in the formulation and implementation of the Programme. These Principles have been further elaborated through the updating of Operational Procedures and the initiation of a Pilot designed to reinforce matrix management in the work of the Agency.

6. Constraints and Shortcomings

48. The Agency makes every effort to implement the TC Programme efficiently and effectively. There are, however, some constraints that are beyond its control.

49. Some of these relate to political realities. In 1999, efforts to complete Country Programme Frameworks were delayed in a number of countries as the priorities of governments changed, or indeed as governments themselves changed. In these circumstances, the best the Agency can do is to work again with partners to ascertain where governments are going to put their efforts and their resources, and to show how the TC Programme can best support those efforts.

50. Constraints can also result from economic conditions. Commitments made in good faith by governments can be difficult to keep when exchange rates move dramatically as they did between certain currencies in 1999, putting strains on government budgets. The impacts can range from the inability of a government to pay for clearance of goods through ports, to difficulties in paying regular salaries for government employees at public institutions. Interestingly, good economic conditions can also have an adverse impact on programming, when younger scientists decide to leave public institutions for better prospects in growing private sectors.

51. Training and fellowships is another area that experiences constraints. 1999 saw delays in several projects due to saturation of fellows in some host institutions and the ensuing difficulties of finding suitable placements. It has been suggested that longer fellowships may be more attractive to some host institutions interested in having fellows stay on to practice the techniques learned as part of a work-study programme, thus benefiting both fellows and host institutes. In one country, project results were difficult to achieve because although the counterpart institution had a wealth of senior scientists, it had insufficient manpower at the technician level available for training or capable of carrying out certain tasks.

52. Communication is another issue that had an adverse impact on projects in several countries both in terms of planning and implementation. Although the use of information and communication technology is growing rapidly in most countries of the world, it is growing at an uneven pace. In certain areas distance learning may well contribute to more efficient programme delivery. In some countries, however, programming was constrained in 1999 because of difficulties in effecting the simplest forms of communication.

53. Within the Agency, budgetary constraints have also had their impact. It became increasingly difficult to improve programme quality to the level expected by the TC Strategy and cope with the growing number of recipient countries and territories (98 in 1999, compared with 87 in 1994) by relying solely on the dedication of staff members.

54. GC(43)RES/14 emphasizes that the Agency's TC Programme should contribute to achieving sustainable development in developing countries, and particularly in least developed countries. In 1999, the 23 recipients considered least-developed countries represented 23% of total recipients, but received only 13% of total disbursements from the Technical Co-operation Fund. There are many structural reasons why this is so, including issues of absorptive capacity; the Agency may nonetheless need to consider whether it is possible or desirable to alter that balance.

7. Lessons Learned from Evaluation

55. Government commitment has long been known to be a key factor in successful technical co-operation. Among the lessons learned in 1999, however, is that government commitment is a necessary, but not a sufficient condition to guarantee tangible socio-economic benefits from investment in nuclear technology.

56. The Agency's thematic review of the utilization of research reactors and low-energy accelerators showed that in the past, many governments committed substantial resources to the establishment of facilities. But over time, and with some exceptions, interest waned, and with it, government funding. This left in some cases more problems than promises of good results. Today, there is little evidence of this field's economic attractiveness to developing countries in commercial terms, and the impact of non-commercial applications also remains very modest in many cases. The handful of potentially lucrative applications, such as production of radioisotopes for medical purposes, are increasingly dominated by a few large, purpose-built facilities in more advanced countries.

57. The lesson learned from this review is that decisions on larger projects need to be accompanied by thorough feasibility studies. But even these are not enough. A project may be clearly feasible from a *technical* point of view, but still not have a favourable cost-benefit ratio. To avoid wasting scarce resources, cost-benefit analyses should precede substantial investment, especially for expenditures on costly equipment. The analysis must be taken to the point where it becomes clear whether tangible impact can and will be achieved.

58. One further lesson was learned from this exercise. Even feasibility studies and cost-benefit analyses cannot compare with hard evidence gathered from prior experience. It has been incorrectly presumed that sustainable development benefits will flow automatically from government and Agency investments in all nuclear technology themes. The available evidence suggests otherwise. Predictions and expectations regarding tangible socio-economic benefits need to be checked constantly against actual performance, and re-assessments made along the way. The principle of evidence-based priority setting, therefore, is of primary importance to the Agency as it looks to the future of its TC Programme.

PART II: TECHNICAL CO-OPERATION PROGRAMME MAJOR ACHIEVEMENTS

1. Africa

59. The Agency welcomed two more Member States in 1999—Angola and Benin. This brings the total number of Member States in the region eligible for participation in the Technical Co-operation Programme to 30.

60. The Agency strengthened its partnerships in the region by signing a Framework for Strategic Co-operation with the Organisation of African Unity for a period that extends through 2001. Enhancing co-operation in projects covering animal production and health, and the control and eradication of pests threatening livestock, this framework will lead to additional joint efforts between the Agency and the Organisation of African Unity's Inter-African Bureau of Animal Resources. In another area no less important, control of human communicable diseases, efforts were made to establish a working relationship with the World Health Organization and to develop co-operative programmes in conjunction with the Multilateral Initiative on Malaria.

61. Expanding the Africa region not only in the number of Member States, but also in types of partners, provides the context in which the Technical Co-operation Programme can contribute to projects in areas such as water resources management, food and agriculture, and communicable diseases.

Water Resources Management

62. Africa may face the most daunting challenge of any region in water resources management. Most African urban centres cannot meet the water supply and sanitation requirements of their present population and face alarming prospects for worsening human health conditions, social and economic limitations, and detrimental environmental impacts in the future.

63. Recognizing the important role and potential contribution of isotope hydrology in addressing practical problems for water resources management, several African Member States sought the Agency's technical assistance to help implement end-user oriented projects integrating isotope techniques in their on-going national water resources management programme(s).

64. The scenario envisaged by the local authorities to maintain water resources in the Zinder region of **Niger** is to use superficial water during the rainy season and the groundwater of the continental aquifer during the dry season. The use of isotope techniques can help determine the groundwater resources and identify any sources of contamination. Information obtained during the first year of the project *NER/8/007–Assessment of Water Resources in the Zinder Region* confirmed the practical relevance and usefulness of applying isotope techniques to the hydrogeological study. Two field sampling campaigns took place: one during the dry season (November) and one during the cold season (February). Samples collected were analyzed for carbon-14, carbon-13, tritium, and stable isotopes in Niamey, Niger and Orsay, France, and the first flow model is being constructed. The project results will provide information as to where to drill additional wells, thus identifying where expansion is feasible for housing or agriculture. Also, the results will aid local authorities in making decisions regarding exploitation of groundwater resources based on aquifer recharge information.

65. During the course of this year, the activities under the Model Project *ETH/8/006–Isotope Techniques for Water Resource Management* were focused on the national efforts to study the characteristics of the Akaki groundwater field with a view to its eventual exploitation to supply 35%–40% of the water requirements of Addis Ababa, **Ethiopia**. Contacts were also established with prospective partners, especially the French Development Agency and the United Nations Centre for Human Settlements (HABITAT). A well-structured national management team has been established to implement this Model Project.

66. In **Uganda**, a preliminary assessment of four geothermal prospects has been completed, indicating priority areas for geochemical and isotope investigation. Under project *UGA/8/003*, field and laboratory facilities have been upgraded to start the feasibility of a geothermal exploration programme.

67. Responding to African Member States' requests, the Agency developed Model Project *RAF/8/029–Sustainable Development of Groundwater Resources* in 1999 in order to optimise the long-term performance of water sector investments by Governments and external donors in sub-Saharan countries. The project builds upon the experience and tangible, practical results gained from a similar previous programme involving nine other African countries. A US extrabudgetary contribution of $100,000 was used in 1999 to support the management and implementation of the programme through (i) enhanced co-ordination with authorities, bilateral donors, and external organizations active in the water sector; (ii) increased involvement of national stakeholders; and (iii) better dissemination of information regarding operational activities to raise awareness and to seek stronger constituency support for isotope hydrology in the participating Member States.

68. During the first Co-ordination Meeting of this regional project in February 1999, representatives of the seven participating countries (**Kenya, Madagascar, Namibia, South Africa, United Republic of Tanzania, Uganda,** and **Zimbabwe**) reviewed the activities completed since the 1998 pre-project meeting and presented updated proposals regarding the national components of the Model Project which described in each country the areas of study and the problems in the field to be addressed using isotope techniques. A Regional Workshop on "Isotope Data Interpretation and Integration in Site Conceptual Models" was held under the project in Johannesburg, South Africa. The workshop, attended by twelve professionals from the participating countries, helped the participants to develop the necessary skills for using lumped parameter models to interpret groundwater isotopic data as well as hydrological models such as VISUAL MODFLOW to improve the assessment of the water resources being investigated under the project.

69. In **Namibia,** project participants investigated the Stampriet Artesian Basin, which was the subject of extensive hydrogeological studies carried out in the late 1970s. Based on the assessment of previous investigations of the basin, a new plan was drawn up for the project. Isotopic and geochemical sampling of the Kalahari aquifer was completed, and the samples are being analyzed. Steps were undertaken to closely link this project with the water resources assessment programme being funded with Japan.

70. Following surface and groundwater sampling, the project counterparts in the **United Republic of Tanzania** have accomplished a geophysical survey for test drilling and continue to monitor the fluctuations in groundwater pressure levels. The samples collected have been sent for stable isotope and carbon-14 determinations to the regional isotope laboratory in South Africa, and for nitrogen-15 determinations to Egypt. The tritium and chemical analyses are being performed locally at the Dar es Salam laboratories established by the IAEA.

71. In **Kenya**, information was compiled regarding general water flow, water quality, conductivity, and the nature of the recharge into the Merti-Habaswein aquifer system. Also,

35 water samples were taken from existing boreholes in various parts of the aquifer system for chemical and isotope analysis.

Human Health

72. The rising incidence of communicable diseases has become one of the major problems in Africa, exacerbated by the spread of human immunodeficiency virus (HIV). The tuberculosis (TB) infection rate now exceeds 100 per 100,000 inhabitants in most countries. Annually, 1.5 million new cases and 600,000 TB deaths occur. Furthermore, malaria is still the largest cause of mortality in Africa, particularly in children. Each year about 1.8 million people die of malaria on the continent, of whom 30% are children.

73. More effective national control programmes can be devised by implementing appropriate methodologies for early detection of the pathology and rapid assessment of its susceptibility to drugs. The past decade has seen the development of isotope techniques associated with molecular biology tools that provide sensitive and rapid methods of infection diagnosis and detection of drug-resistant pathologies that are making a significant impact on diagnostic procedures similar to that of radio-immunoassay in the 1960s.

74. Since 1997 the Agency has been helping, through a regional technical co-operation project, six sub-Saharan Member States (**Kenya, Mali, Sudan, United Republic of Tanzania, Zambia,** and **Zimbabwe**) to enhance the capabilities of their national referral centres to diagnose drug resistance in malaria and TB. The Agency's support to the global effort to tackle widespread human communicable diseases on the continent was followed in 1999 by the implementation of similar national technical co-operation projects in **Ghana, South Africa,** and **Uganda**.

75. For TB, the isotopic technique to detect drug-resistant mutations has been transferred to all the laboratories. A substantial number of clinical samples have been analyzed by the laboratories. It is highly likely that in the very near future, mutational detection of drug-resistant TB will become the new gold standard with the advantage of results being available in days rather than weeks (as is the case in culture testing). The methodology is further being simplified by performing a polymeric chain reaction directly on sputum samples.

Identifying Drug-Resistant Strains of Tuberculosis

The recent resurgence of TB is a major public health concern in **South Africa**. The infection rate in some communities exceeds 70 per 100,000 inhabitants. As in other developing countries, diagnosis of TB is mainly based on the acid-fast smear test in accordance with the current World Health Organization guidelines. The implementation of this diagnosis is inadequate in addressing cases of primary drug-resistant TB and consequently inefficient in preventing further spread of drug-resistant strains. To support national efforts, the Agency has been assisting, through project *SAF/6/003–Isotopes for Control of Tuberculosis*, the University of Stellenbosch and Tygerberg Hospital in Johannesburg to develop isotope molecular methodologies for accurate and rapid detection of multidrug-resistant strains of TB and to establish a molecular database of clinical isolates from communities in the Western Cape. During the first year of the project, 50 samples were collected from patients in the Ravesmead community. After testing about 10% of the samples, the results showed resistance to at least one of the frontline TB drugs. Clinicians were informed about the results, and the patients were treated accordingly. Validation of the techniques could open new prospects for large-scale applications in communities, thereby making an important impact on national TB programmes.

76. With regard to malaria, the techniques transferred by the Agency are being used to identify mutations which correspond with drug-resistance to medications such as Fansidar and Chloroquine. As in the case of TB, this methodology is quicker and cheaper than conventional methods–a difference of days rather than weeks.

77. At the request of the Government of **Uganda**, project *UGA/6/012–Isotope-aided Techniques for Antimalarial Drug Resistance* was established in 1998 under the Programme Reserve to support national efforts by enhancing the capability of the Medical Biotech Laboratories, Kampala to apply isotope-based molecular techniques for rapid detection of drug-resistant malaria. Activities supported by the Agency focused on establishing the molecular methodology for carrying out regular drug-resistance surveillance and correlating this with clinical outcome. Five sentinel sites were visited, 358 children were treated for malaria, and samples for molecular analysis were collected. About 60 samples were analysed for Chloroquine-resistance and 50 for Pyrimethamine-resistance. Analysis for Sulfadoxine-resistance and the remaining samples still need to be completed before conclusions about the validity of the methodologies in predicting clinical outcome can be made. In particular, in such a highly endemic situation, it is important to distinguish treatment failures from re-infections, an aspect which remains to be addressed in this project. The project activities were carried out in close collaboration with the Ministry of Health. The Ministry staff have been trained in sample collection techniques, and one staff member is undergoing postgraduate training at the Medical Biotech Laboratories. Future plans for projects concerning communicable diseases in the Africa region will be discussed at a regional formulation meeting in 2000. Partners in the fight against communicable diseases, such as the WHO, have been invited to the meeting.

78. Medical and scientific equipment was repaired and put back into service this year through *RAF/6/014–Improvement of Clinical Radiotherapy (AFRA II-12)*. By decreasing the downtime of cancer-treatment machines from 30% in 1997 to 10% in 1999, more cancer patients are being treated. These repairs have also led to reduction in the cost of treatment. Under the same project, dosimetry equipment provided to six countries, as well as training and advisory assistance, has improved the safety of radiotherapy personnel as well as the patients.

79. Recent statistics indicate that in **Ghana,** 30% of children aged 3–36 months are suffering from short- and long-term malnutrition. In response, the Ministry of Health has initiated a five-year national action plan on food and nutrition targeting lactating women and their infants whereby nutritional supplements are being given to the participants. Under the project *GHA/6/011–Breast Milk Trace Element Composition and Infant Growth,* the Agency is assisting counterparts with isotope techniques to evaluate the nutritional impact of a community nutrition programme with the aim of improving the supplementation strategy and, in the end, combating the prevalence of malnutrition in Ghana. In addition, a national seminar entitled “The Use of Stable Isotopes in Nutrition Specifically for Breast Milk Output Measurement” was organised under the project and trained 20 participants. The results of these evaluations will be used to determine the optimal timing of supplement intake during pregnancy and also the best composition of the supplement so that the maximum volume of breast milk can be obtained.

Food and Agriculture

80. Drought is the most widespread crop production constraint in parts of Africa. Due to the climate and to anthropogenic factors (deforestation, overpopulation, and overgrazing), drought is likely to cause more serious problems in the future. Plant breeding, including mutation breeding using radiation technology, is probably the most viable approach to

stabilizing food production under normal (non-catastrophic) environmental drought conditions.

81. In the field of agriculture, Project *RAF/5/042–Development of Improved Crop Varieties (AFRA III-18)* is being executed by the Agency in collaboration with the AFRA field management, the Project Scientific Co-ordinator, and counterpart institutions from the participating countries. Several mutant lines of improved crop varieties of sorghum (**Mali**), sesame (**Egypt**), and cassava (**Ghana**) were disseminated to farmers though extension services after their official release in 1998. The seeds of each released crop were multiplied by private or state-owned companies and given to farmers. The evaluation of the performance of several other improved crops (sunflower, African rice, cotton, banana, and coconuts) in the laboratory and on farms is nearing completion. Release of these most promising mutant lines will occur in 2000. This project will continue to evaluate drought-resistant crop varieties in several countries.

82. Dates are **Tunisia's** third largest export. But crop losses because of the date moth are limiting the export benefits. In addition, a ban in the year 2000 of the primary fumigation chemical will have a drastic effect on Tunisia's export of dates. A two-pronged solution has been devised. The successful installation of a 100-kCi gamma irradiator is being used to disinfest the dates after harvest before they go to storage or for trade (*TUN/5/013–Food Irradiation Pilot Plant*). The irradiator is also being used to control the date moth using SIT (*TUN/5/019–Control of the Date Moth Using Radiation Sterilisation*). As a result, an increase in the export of dates from Tunisia is envisaged, which will help contribute positively to the economy of the country.

83. Irradiation of sewage sludge and municipal wastewater has the potential of reducing risks to human health through elimination of pathogens. The treated solid wastes are also a valuable source of plant nutrients and organic matter which improves the physical qualities of the soil. In **Egypt,** Government programmes underline the crucial importance of desert reclamation as one of the main elements of national development strategies. However, reclaiming desert lands which are sandy and low in organic matter and nutrients requires the sustainable availability of affordable agricultural inputs. The on-going project, *EGY/8/013–Irradiated Sewage Sludge for Increased Crop Production,* aims at establishing in this context the feasibility of applying irradiated sewage sludge and wastewater to irrigate crops. Field experiments carried out under the project have clearly demonstrated the potential use of treated sewage as a soil additive. The test results obtained by the counterparts showed the benefits of sewage application in terms of improved soil physical properties and fertility, and supply of macro- and micronutrients essential for plant growth. A possible continuation of this project would support larger-scale field experiments of irradiated sewage applications. In addition, a technology/economic feasibility study could be conducted that would facilitate the construction of a pilot sewage sludge irradiation plant.

84. **Namibia** is one of the driest countries in sub-Saharan Africa. Agriculture is mainly based on livestock production, and the country is a major exporter of meat to Europe. Epizootic diseases, mainly contagious bovine pleuropneumonia (CBPP) and Foot-and-Mouth Disease (FMD) are the main obstacles which separate the livestock industry of Northern Namibia from the commercial farming areas. The two parts of the country are physically separated by a trans-veterinary cordon fence. The control and eradication of these diseases is a major national goal. Under project *NAM/5/005–Strengthening Capability for Diagnosis of Animal Diseases,* the Agency has assisted the Central Veterinary Laboratory of the Ministry of Agriculture and Rural Development in Windhoek in establishing monoclonal antibody-based enzyme-linked immunosorbent assay (ELISA) and the polymeric chain reaction technique for CBPP and FMD diagnosis. As a result of the Agency's assistance, the laboratory is now in a position to provide services to the whole Southern Africa Development Community region for better control of CBPP.

85. Efforts under Model Project *IVC/5/024–Regional Reference Laboratory for Animal Disease Diagnosis* in 1999 focused on strengthening capabilities to confirm different diagnoses of rinderpest and related animal diseases. As the Regional Reference Laboratory for rinderpest, the Central Laboratory for Animal Pathology in Bingerville, **Côte d'Ivoire**, is collaborating with other countries of Central and Western Africa. Countries from these areas are sending samples for testing to this laboratory.

Achieving Freedom from the Rinderpest

The Agency has supported the Pan African Rinderpest Campaign (PARC) under the Model Project *RAF/5/043–Assistance to Complete Eradication of Rinderpest from Africa* over several years. The objective of PARC is to achieve freedom from rinderpest infection in Africa by 2002. The Agency's support, consistent with the objectives of PARC, initially focused on establishing a national and regional capacity for diagnosing rinderpest and related diseases using ELISA. Substantial progress has been achieved in 1999 assisting Member States to follow the recommendations of the Office International des Epizooties on ways to eradicate and prove freedom from rinderpest infection, the so-called "OIE-pathway". In the past year, countries have been preparing documentation supporting their request for international recognition as rinderpest-free and introducing performance indicators to assess the national rinderpest epidemiosurveillance networks. Special emphasis has been given to Sudan where rinderpest cases are still being reported in some parts of the country. The support of the Agency was extended to establish an epidemiology unit for the statistical and geographical analysis and mapping of disease information.

The project also helped Member States become self-sufficient in the production of diagnostic reagents using radioisotopic tracer technology. The developer of the reagent production technology selected the IAEA as the most appropriate international body to facilitate its rapid introduction into regional sero-monitoring programmes. The implementation consists of training several leading African scientists in the techniques throughout the region. Thus, there is a strong technical co-operation among developing countries aspect to the project. An independent assessment of the project concluded that the project is succeeding in bringing the Agency's co-operation in line with the forefront of technical developments in animal disease diagnosis.

2. Latin America

86. A notable feature of the Latin America Region in 1999 was its effort toward technical co-operation among developing countries. As evidence of the success of this co-operation, 90% of the lecturers and more than 60% of the experts recruited by the Agency for projects in Latin America came from the region. In addition, during the regional meeting held in Santiago, Chile, in May 1999, a discussion on strategic components of technical co-operation allowed the Agency to highlight the issues of sub-contracting and outsourcing of activities among the countries in the region, based on the different technological levels achieved by them. For example, technical co-operation projects created a strong capability in Costa Rica and El Salvador in the field of geothermal resources exploitation. These countries are now ready to transfer their technical expertise to other countries in the region.

87. ARCAL representatives adopted a Manual of Procedures in 1999, which contains all the necessary guidelines and procedures related to the Agreement. This manual will be an important tool for ARCAL National Co-ordinators when they implement the programme in their countries.

Radiation Protection

88. Under various technical cooperation projects, procedures have been implemented to apply, in full, the Agency's Basic Safety Standards for radiation protection. This was addressed through Model Project *RLA/9/030–Upgrading Radiation Protection Infrastructure*[3], and further through Model Project *RLA/9/035–International BSS in Medical Practices (ARCAL XLIX)*. Both projects were complemented by national-level activities. Specifically within *RLA/9/030*, 100% of the region has achieved Milestone 1–establishment of a regulatory framework, while with Milestone 2–establishment of occupational exposure–80% of the region has achieved this milestone.[4] During 1999, some countries within the region not participating in the Model Project asked for support in specific areas to fulfill implementation needs for the BSS.

89. Under project *RLA/9/035,* the following Quality Assurance Protocols were prepared: General Radiography Units, X-ray Intra-oral Odontology, and Mammography. Participating hospitals will use the Protocols to improve the quality of treatment.

90. In the sector of Radiation Protection and Safety, four projects were being implemented under the ARCAL Programme during 1999. Under project *RLA/9/028–Guidelines on Control of Radiation Sources (ARCAL XX)*, the following Regulatory Guides have been developed for different practices: Radiotherapy, Nuclear Medicine, Industrial Radiography, Industrial Applications of Non-sealed Sources, and X-ray Diagnostics. Experts from AFRA and RCA discussed the Regulatory Guide on Radiotherapy in a meeting held in Latin America in July 1999 as part of the Tripartite Forum for the promotion of technical co-operation among developing countries. These Regulatory Guides will be published by the IAEA as a Technical Document.

Human Health

91. Because many countries in the region are facing problems with the spread of communicable diseases, the Agency is complementing the countries' efforts for diagnosis and control of such diseases by training personnel in nuclear techniques under project *RLA/0/016–Human Resource Development and Nuclear Technology Support*.

92. In nuclear medicine, congenital diseases that lead to irreversible impairment of children's development were a focus in **Uruguay**. Between 1995 and 1997, a nation-wide screening program for neonatal hypothyroidism was successfully started and sustained with the Agency's assistance (*URU/6/022*). Using some of the successful avenues paved by this earlier project that had already helped build up a national monitoring service, screening for cystic fibrosis became the target under project *URU/6/023–Screening Neonates for Cystic Fibrosis Using RIA*. By screening newborns through an radioimmunoassay of umbilical blood for immunoreactive trypsin, cystic fibrosis can be detected, and thus reduce the number of deaths from undiagnosed cystic fibrosis (about 15 per year).

93. Projects in Latin America have also helped improve the lives of adult females through cervical cancer treatment. Project *PER/6/013–Improvement of Brachytherapy Services,* being implemented at the National Institute for Neoplastic Diseases in **Peru,** has enabled the remaining 30% of untreated cervical cancer cases to be treated through an application of a remote after-loading unit for brachytherapy. This unit not only improved the patient coverage

[3] Previous to 1999, this project was under *INT/9/143–Upgrading Radiation Protection Infrastructure.*
[4] Refer to GOV/1999/67 for the full text of Milestones.

but also contributed to a reduction of hospital expenses and of radiation risks for patients and staff.

94. Protocols and manuals were another output of Latin America regional projects that made a difference in human health. By providing protocols in cardiac, brain, bone, liver, and kidney treatment (*RLA/6/036–Quality Control and Optimization of SPECT Clinical Protocols [ARCAL XXXII]*), the quality of care given to patients in the 16 participating hospitals of the region has been greatly improved. Participants in Model Project *RLA/6/037–Standardization of Nuclear Nephrology Techniques (ARCAL XXXVI)* prepared a manual containing standards and procedures on nephrology techniques. This manual, in Spanish, will provide access to consistent treatment among kidney patients throughout the countries of the region.

Environment and Water Resources Management

95. The Latin America region has played a key role in international environmental agreements (Climate Change Convention, and Ozone Layer Protection and Biodiversity Convention), promoting innovative mechanisms to tackle environmental degradation. In this regard, the Agency has been working closely with several countries in the region incorporating isotopic techniques to help solve specific problems.

96. An overall development objective in many places is to reduce the negative social and environmental consequences of discharging inadequately treated industrial wastewater from the chemical process and mining industry as well as other production activities, like the use of pesticides and fertilizer in agriculture. In many countries of the region, a high-level of expertise has been achieved in the field of nuclear applications in industry, reinforcing, through the use of experts from the region, technical co-operation among developing countries under the frame of the ARCAL Agreement. In addition, two more regional centres for training in water management were opened in Venezuela and Brazil under the project *RLA/8/024–Industrial Applications of Tracer Technology and Nucleonic Control System (ARCAL XLIII)*.

97. Project *CHI/8/025–Contamination of Water Resources in Semi-Arid Zones* attributed the growing contamination plume from the La Coipa mine in **Chile** to the intensive use of cyanides in gold extraction. The contamination is increasing rapidly and presents a danger for the freshwater resources of this semi-arid region. Tritium-tracing tests carried out in October 1999 supplied information that is being used to develop a model to predict the progression of the contamination plume. The model will also help facilitate mitigation efforts.

98. In **Brazil,** *BRA/8/025–Electron Beam Purification of Wastewater*, a fully operational analytical laboratory has been established and a pilot plant irradiator has been redesigned and put into operation at a local chemical plant. Counterpart scientists are studying data to optimize treatment of the plant's various waste streams. The project is investigating single-step electron beam irradiation of the chemical plant's combined liquid effluents as an alternative to conventional treatment. Until the engineering tests are complete, it is not possible to be certain what cost/benefit ratio will emerge. If several hundred kilowatts of electron beam power are needed, capital costs could easily run to several million dollars, as will the annual operating costs. Nonetheless, any substantial savings over the current $15 million in discharge fees the industry pays annually would be attractive. Improved effluent quality would also result in benefits to the environment that are difficult to quantify in the absence of real data, but which are likely to be substantial. Moreover, successful commercialization of the process could lead to its use at similar facilities world wide.

Isotope Techniques Applied on the Island of San Andres

The Island of San Andres is an important tourist destination in **Colombia**. Growth in tourism has exacerbated the shortage of water on the island. The use of isotope techniques and artificial tracers under project *COL/8/019–Groundwater Hydrology* allowed authorities to develop a plan to improve water resources on the island. Using the results from the project, it was demonstrated that the amount of local rainfall is more than enough water to supply the population; unfortunately, most of this water is lost by runoff into the sea. Construction of a dam to store the water, as well as draining systems to increase the infiltration of rain water have been suggested.

99. Counterparts in **Cuba**, under the project *CUB/8/016–Pollution and Transport of Pollutants in the Almendares River*, were able to calibrate a water-quality simulation model with Agency help using radioactive tracers. The results from the model revealed that a costly Government plan to lower contaminant levels in the river would not yield the results desired. Based upon the simulation model, a new (January 1999) Government-level water authority, "Consejo Provincial de Manejo de Cuencas Hidrográficas", decided to increase the release of water from an upstream reservoir. Recent measurements have shown the elimination of pollutants as a result of the project. These results were declared a relevant achievement by the Ministry of Science, Technology, and Environment of Cuba.

100. Sediment accumulation in reservoirs reduces the storage capacity. Nuclear probes that continuously measure the suspended sediment have been installed in two rivers in **Venezuela** through project *VEN/8/011–Study of Origin and Flow of Sediments*. The technology transferred allows the authorities to manage the sediment build up in La Honda Reservoir, an important hydropower station in the west part of the country. Sedimentation management will extend the life of the power plant.

Food and Agriculture

101. Local economies and day-to-day living needs in Latin America are affected by both pests and low animal production. The Agency provides technology and expertise to this region with the aim of eradicating insect pests, tackling excessive pesticide use, and increasing the output from farm animals.

102. Normally, about 300 cases of screwworm infestations or screwworm myiasis are reported to the field programme each month in **Jamaica**, but this number has already been reduced to about 225 each month following initiation of sterile male fly releases. Under project *JAM/5/007–New World Screw Worm Eradication*, a field management programme, distribution centre, and operations have been established. The first release of sterile male insects occurred in August 1999 and will continue for another six months. In close collaboration with the United States Department of Agriculture, the Agency is already looking towards the eradication of the pest from other Caribbean Islands through project *RLA/5/044–Preparing Caribbean Eradication of New World Screwworm*.

103. To address environmental problems and barriers to food trade caused by excessive pesticide residues, the Agency is strengthening Member States' analytical capacity to monitor these residue levels in the hope that agrochemical guidelines will be produced to optimize the use of pesticides while protecting the environment. Pilot programmes have commenced in

Colombia (*COL/5/018–Pesticide Residues in Fruits, Flowers, and Vegetables*) and **Ecuador** (*ECU/5/021–Monitoring the Fate of Pesticide Residues*), which are representative of tropical countries where multi-disciplinary partnerships are required to tackle acute pesticide problems.

104. In **Argentina**, Agency input helped to establish laboratory facilities as well as the training of the staff on the use of isotope techniques in fertilizer studies through *ARG/5/008–Soil Fertility Studies in the Pampa Region*. In the research locations where these isotope techniques were applied, grain yield increases of 500 to 1600 kg/ha were obtained. As a result of the project, human know-how and institutional capacities for the use of isotope techniques for fertilizer efficiency have been established. In addition, experts prepared optimizing guidelines on improved soil and fertilizer management practices and their economic and environmental impact for dissemination to farmers in the area. The Agency established close collaboration with project counterparts in the Ministry of Production in the province of Buenos Aires and the farmer associations to assist in this effort so that local farmers can incorporate these techniques into their farming practices, thus improving their crop yields to the levels identified from the research locations.

105. The importance of output from farming is not limited to crop production. Output, whether a product like milk, or live animal births, is an important aspect of economic development in the Latin America region. **Chile,** through project *CHI/5/019–Nuclear Techniques in Animal Production*, has significantly strengthened its capabilities to do field studies with a direct impact on the profitability of dairy cattle farming. In particular, the project contributed towards an increase of milk production on experimental farms by about 60% per year and increased the return on milk by $0.10/L. Through research on local farms, improved pastures have identified the feasibility to increase sheep meat production from less than 100 kg/ha to 300 kg/ha.

106. At the same time, **Bolivia**, under the project *BOL/5/010–Improvement of Reproduction in Andean Cattle*, enhanced animal reproduction. The identification of constraints to llama, sheep, and cattle population in the Oruro region of Bolivia was clearly made through an initial collection of baseline data (feed quality and consumption, body weight, and oestrus behavior) and progesterone analysis using radioimmunoassay techniques. From these data, a series of technical interventions through better feeding strategies and improved management practices were subsequently evaluated to alleviate the main factors affecting productivity. As a result, birth rate was increased from 45%–55% (regional average) to 80% in a large herd of llamas at the university, the interval from calving to first ovulation was reduced by 2.5 months in Holstein cattle adapted to the high-altitude environment, and improved reproductive performance is expected in sheep by increasing their body weight at first lambing. Project counterparts have enhanced the dissemination of validated field practices by offering short training courses, field days, and on-the-spot demonstrations to local farmers. In addition, the University of Oruro provides formal technical advice to the Llama Breeders Association.

3. East Asia and the Pacific

107. The economic outlook in East Asia and the Pacific improved in 1999. This factor, along with others, contributed to the Agency's ability to disburse 30% more through projects in the region in 1999 compared with 1998.

108. Features of the programme for 1999 in the region include building relationships with other international organizations and non-governmental organizations. Joint efforts with the World Bank are exemplified by projects in Bangladesh and China. Work with non-governmental organizations such as International Life Science Institute and the Threshner

Foundation, in Viet Nam and China, respectively, was also part of the region's portfolio this year.

109. If harmonization of the Agency's work with that of other organizations helps to ensure relevance of programming and higher potential for impact, forging links with the private sector can lead to sustainability of results. In 1999, the East Asia and Pacific region sponsored a conference in China to promote sustainability and self sufficiency through marketing research and development results to end users, thus generating income.

Human Health

National Screening Programme Goes Further

Thailand has the potential to save approximately 600 newborns annually from a life of mental retardation due to iodine deficiency thanks to a neonatal screening programme started with Agency support in 1995. The goal of this national screening programme is to test every newborn in the country, some one million babies every year. In 1999, Thailand decided to take its screening programme one step further by standardizing it through achieving International Standards Organization certification. Under project *THA/6/029–Extension of Neonatal Screening to Rural Areas*, two expert missions were fielded to help Thailand achieve this certification. Meanwhile, the third regional laboratory for routine screening in Songkhla was established and became operational under 1999 national funding. More than 450 public health staff attended seminars covering public health screening services. These seminars were held in seven provinces to reach as many public health staff as possible. The counterpart institute also organised a regional workshop to support neonatal screening under *RAS/6/032–National Screening Programmes for Neonatal Hypothyroidism*.

110. Improving nutrition for targeted populations was the focus of a regional training course entitled "Isotopic Applications in Human Nutrition with Emphasis on Micro-Nutrient Intervention Programme". The course was held as part of the *RAS/7/010–Measuring the Effectiveness of Multi-Nutrient Supplementation* project. Expert services helped to design and implement studies for using isotopic techniques in **Indonesia** and **Pakistan**. The results from the studies provide data that can be used by the national governments to monitor nutrient intervention trials.

111. Under *RAS/6/028–Thematic Programme on Health Care (RCA)*, nuclear medicine physicians and nuclear medicine technologists continued their training in myocardial perfusion scintigraphy, diabetic nephropathy, and SPECT. Expert missions were also provided to Member States on the treatment of thyroid cancer using iodine-131. On the distance-learning side, other regions are using materials developed through *RAS/6/029–Improved Training for Nuclear Medicine Technicians,* which have been translated into other languages. More than 200 students enrolled in these sessions during 1999 in the East Asia and the Pacific region alone.

112. Although a high-dose rate iridium-192 brachytherapy unit was purchased by the University Sains Malaysia Hospital in 1995, treatment of patients did not begin right away. Under project *MAL/6/017–Optimal Utilization of High Dose Rate Brachytherapy Facility*, expert missions identified the inadequacies and shortcomings of the unit's installation, provided training in the clinical use of the unit and its associated treatment planning system, and drafted quality assurance protocols and treatment documentation. As a result, treatment

of patients started in 1999. Also in **Malaysia**, through project *MAL/2/004–National Facilities for Monoclonal Antibody Production*, local expertise in monoclonal antibody production and characterization was established in two facilities, at the University of Malaysia and University Sains Malaysia. The project attracted the Malaysian authorities to fund further efforts to sustain the programme for the national production and supply of products to area hospitals.

113. A major success for the Agency in 1999 was its support for a World Bank-financed programme in **Bangladesh** to mitigate arsenic contamination of groundwater. Some 75 million people are exposed to this contamination including 20 million people at risk of arsenicosis, prompting both the Government and the World Bank to make available considerable resources to investigate the causes, and to develop solutions.

114. To date, studies have convinced national as well as World Bank authorities of the value of isotope techniques and its relation to the success of the programme. Supply of safe drinking water from deep tube wells is an important mitigation option in this programme. Before substantial financial and policy investments were made, it was necessary to evaluate the hydrologic relationship between shallow (contaminated) and deep aquifers. A small, Agency pilot project in isotopic analysis developed "isotopic signatures" of shallow and deep groundwaters confirming that the deep aquifer(s) were free from arsenic contamination now and are likely to remain so in the future. Together with similar isotopic data going back 20 years, these isotopic signatures provide a crucial decision-making tool that would save the Government millions of dollars in further feasibility work for the implementation of mitigation strategies.

Nuclear Safety

115. In the Agency's Medium Term Strategy, one of the objectives is "to achieve more effective application of safety standards in Member States". One way of achieving this objective is by assisting Member States to develop appropriate legislation.

116. In 1999, a regional project *RAS/9/023–Legislation for Safe and Peaceful Nuclear Applications* assisted the Member States of the region to develop nuclear regulatory legislation. Two regional training workshops entitled "Consolidation of an Adequate Legal Framework for the Safe and Peaceful Use of Nuclear Energy" and "Development of a Legal Framework Governing Civil Liability for Nuclear Damage and Preparedness in Response to Radiological Emergencies" were conducted in 1999. Through the workshops, access to the information on the status of each country's legal framework was shared, problems encountered by the countries in developing this new nuclear legislation have been identified, and assistance needed from the Agency for each country has been discussed. Bilateral assistance relating to the establishment or revision of the country's nuclear-related legislation will begin in 2000.

117. On the regional level, specialized training for nuclear power plant personnel was part of project *RAS/4/015–Operational and Safety Issues of NPPs (Phase II)*. Training was offered in operational safety and maintenance under the auspices of a Memorandum of Understanding between the Republic of Korea and the Agency. In 1999, three group training sessions were conducted at KEPCO Nuclear Power Education Centre: Simulator Instructors Course, Mechanical Equipment Course, and Steam Generator Course.

118. Technical co-operation helps advance the Agency's role as the main repository for safety guidelines and standards through country assessment and review activities such as Operational Safety Assessment Review Team missions. Nuclear safety is a field of activity where greater synergy between the Technical Co-operation and Safety Departments is strengthening the safety culture of both nuclear power plant operators and regulators.

119. Under *PAK/9/021–Safety and Operational Support to CHASNUPP,* a three-week pre-Operational Safety Assessment Review Team mission was conducted in February 1999 to assist the plant owner and regulator in ensuring its operational readiness. The mission identified several areas to improve and consequently, two follow-up missions took place in April 1999. Meanwhile, an assistance programme for the Chashma Nuclear Power Plant was developed. As part of the programme, an expert mission provided advice to the fire safety review team; also missions advised counterparts on the design modification review. The programme, in addition, provided regulatory assessment training and a consultation meeting during 1999. A small advisory committee consisting of representatives from **China, Pakistan**, and the Agency was established in 1999 to map out future assistance activities.

Food and Agriculture

120. In **Mongolia**, the Agency is assisting the counterpart to produce high-quality Rhizobium biofertilizers and promote their use by farmers under project *MON/5/010–Rhizobium Biofertilizer Production and Use*. In 1999, the field experiments were conducted with four different local varieties of legume crops (pea, soybean, horse bean, and kidney bean) and one non-fixing crop (spring wheat) with the inoculants being produced at the counterpart institution. In order to promote the use of biofertilizer by farmers, co-operation with other international and local organizations has been established. Among them, the Technical Assistance to the Commonwealth of Independent States of the European Union has established three extension centres in Darkhan, Dornod, and Hovd–three agro-ecological areas in Mongolia. The Rhizobium biofertilizer will be introduced to farmers through these extension centres.

Industry

121. The Technical Co-operation Programme strives to transfer to end users the expertise and techniques developed through its projects. The Government of Malaysia has set a good example by sustaining technical co-operation activities and transferring the research and development achievements to commercial entities. For example, the gamma sterilization centre has now been International Standards Organization 9002 certified and registered with the United States Food and Drug Administration as a contract sterilizer. Also, a national non-destructive testing certification scheme has been fully established and certificates are awarded at three different levels. Additional training and services have been provided to other developing countries in the region as well as to local industries.

122. Considerable progress has been made in promoting industrial applications of radiotracers in developing countries. In **Viet Nam**, *RAS/8/086–Radiotracers, Sealed Sources, and Nucleonic Gauges in Industry (RCA)*, the radiotracer technique has been transferred to an oil field to enhance oil production. In the same vein, the petroleum industry in **Sri Lanka** (*SRL/8/016–Nuclear Techniques in the Petroleum Industry*) and **Thailand** (*THA/8/013–Radiotracers and Sealed Sources in Petrochemical Industry*) use radiotracers and sealed sources for troubleshooting and inspecting columns, pipes, and storage tanks. In **Malaysia** (*MAL/8/016–Advanced Nucleonic Gauges for Oil and Gas Industry*), advanced applications of nucleonic gauges are being transferred to local industries. The Malaysian Institute of Nuclear Technology Research and Petronas Research and Services will co-operate to adapt this technology to local industrial conditions.

4. West Asia

123. The West Asia region is characterized by a diversity of interests, substantial ongoing adjustments in the socio-economic environment, and by political sensitivity. Technical co-operation with the Member States in West Asia continues to be predominantly in the areas of non-power applications.

124. Despite the usual problems of a political nature, including the continued difficulties of delivering technical assistance to Iraq and the restrictions on the provision of goods and services to certain Member States in the region, there were positive developments for the promotion of co-operation among states on a bilateral or multilateral basis. The increasing use of regional expertise for carrying out expert assignments is also expected to strengthen the implementation of technical co-operation among developing countries in the region.

Pest Control

125. The regional project *RAW/5/008–Preparing to Combat the Old World Screwworm in West Asia* provided a useful basis for forging collaboration with the Arab Organisation for Agricultural Development, thus combining the organization's interests and resources with those of the Agency's. The Arab Organisation for Agricultural Development and the Agency jointly organized a training course in Malaysia which has the only facility available with expertise in the area of Old World Screwworm rearing and field applications. The course helped to identify the most relevant organizations and people dealing with this problem in the participating Member States. In the next few years, these preparatory activities will contribute to the international and regional effort to contain the spread of Old World Screwworm and eventually eradicate the pest.

126. Co-ordination between Member States also made a positive contribution to the feasibility studies for the eradication of the Medfly in **Israel** and **Jordan**. In the latest phase of project *ISR/5/009–Feasibility Study of SIT for Medfly Eradication*, sterile insects were released over the Israeli and Jordanian Arava Valley at a frequency of two releases per week. Although a tremendous reduction in the Medfly population in the Arava Valley was observed at the end of the third year of the project, studies also showed that eradication cannot rely exclusively on the release of sterile insects and that supplementary measures must be taken. These measures include fruit stripping and eventual chemical applications in severely infested areas. The result of these studies will be useful inputs to the expansion of SIT in adjoining areas.

127. Negotiations are on-going with United States Agency for International Development under their Middle East Regional Co-operation programme to obtain a grant of $2.5 million benefiting **Israel**, **Jordan,** and the **Territories Under the Jurisdiction of the Palestinian Authority**. The three parties have requested the Agency to act as the prime grantee on their behalf. Programme activities are intended to expand and build upon a regional approach to control the Medfly.

Water Resources Management

128. In West Asia, Agency and governmental water authorities continue to collaborate to improve water-use efficiency and crop yield, as well as create groundwater recharge schemes.

Fertigation Techniques Demonstrated

The positive outcome of the experimental studies on the optimization of combined fertilizer use and irrigation, generally known as fertigation, was successfully extended to farm applications for increasing crop productivity in **Jordan**, **Lebanon**, and the **Syrian Arab Republic**, under project *RAW/5/007–Fertigation for Improved Water Use Efficiency and Crop Yield*. The counterpart in Jordan held on-farm demonstrations and training courses for farmers and agricultural engineers on the use of fertigation for growing potatoes. According to the experimental results, crop yield increases of 20% are possible, as are savings of 33% in the use of nitrogen fertilizer. The counterpart in Jordan also encouraged the use of fertigation techniques in small gardens for growing medicinal plants under a programme supported by the Queen Noor Al-Hussein Foundation aimed at improving the family income of rural women.

129. Implementation of activities in the Member States participating in the regional project *RAW/8/007–Isotope Applications for Improved Groundwater Utilization* was affected by delays in the finalization of the country-specific action plans. As a result, some field missions and a project co-ordination meeting had to be rescheduled. The Agency provided support to the counterparts for the isotopic analyses of water samples collected in the field studies. The facilities in the region, in particular those at the laboratories of the Water Authority of Jordan, were used for the analysis of some of the samples. The results will serve as the basis for the application of various modelling techniques for the estimation of artificial recharge schemes and the problems of salinity and pollution in groundwater basins.

130. Under *SYR/8/009–Application of Radiation Technology in Water Treatment*, the IAEA advised the Syrian Atomic Energy Commission and the Ministry of Housing on the application of radiation technology to improve the quality of effluent water from the sewage treatment plant of Damascus, **Syrian Arab Republic**. Agency experts trained counterpart staff on the chemical analysis of municipal wastewater and sludge and on the principal aspects of pathogenic micro-organisms in aqueous systems. Determination of the physical and physio-chemical properties and other characteristics of wastewater and sewage sludge at various processing steps in the sewage treatment plant will continue during the year. This analysis will be important to assess the need for and role of radiation processing for the reuse of wastewater in irrigation and sludge as fertilizer in agriculture.

Environment

131. Whether environmental damage is caused by industrial pollutants, residual radioactive contamination, or uncontrolled dumping, governments in the region want to assess the damage, monitor the status, and mitigate the effects.

132. The Government of **Israel** assigns high priority to the monitoring and control of pollution in air, water, and the environment. Under project *ISR/1/010–Nuclear Techniques for Monitoring Environmental Pollution,* the Agency is helping establish a centre for nuclear analytical techniques in the control of air, water, and environmental pollution. The main effort during 1999 was to establish a working system for proton-induced x-ray emission (PIXE) using the 3-MeV Van de Graaf accelerator at the Weizmann Institute. This work was completed and the PIXE system, which is the only such facility in the country, will start producing systematic analytical results in the year 2000. These results will provide essential input to the national programme for environmental pollution control.

133. Nuclear testing activities in **Kazakhstan** have resulted in radiological contamination in many areas. At one point in history, underground controlled nuclear explosions were carried out at some sites to create artificial underground storage cavities for crude oil. The oil industry in Kazakhstan is interested in assessing the suitability of these sites for this purpose. Under *KAZ/2/003–Radioecological Studies and Environmental Monitoring*, a complete radioecological assessment was performed of the natural and residual contamination in these caverns. One site, called the LIRA Facility, had six underground caverns that were studied for this purpose. The present study confirmed the absence of any radiological hazard at the LIRA Facility. This conclusion was based on the regular monitoring of the LIRA Facility and the analysis of a total number of 250 samples at the Institute of Physics in Alatau.

134. In **Lebanon**, there is considerable concern that parts of the country were used for uncontrolled dumping of toxic and other wastes. Agency counterparts are looking for ways to assess, monitor, and mitigate the consequences of pollutants and contaminants. The Agency provided a liquid scintillation counter and a gas chromatograph/mass spectrometer system under project *LEB/2/005–Determination of Toxic Pollutants in the Environment*. By introducing complementary analytical techniques to the existing ones, the provided equipment has enhanced the country's ability to analyze radioactive, organic, and inorganic pollutants in the environment. In addition, the emphasis on improving quality assurance and quality control requirements under this project will raise the level of confidence in the results.

Human Health

135. The focus of project *RAW/6/003–Screening of Newborns for Thyroid Deficiency* is to ensure that Member States of the region can continue to carry on the thyroid-deficiency screening process as an integral part of national child health care systems. An increase in the number of samples collected was reported. The **Islamic Republic of Iran**, for example, screened 3,000 infants during the first 10 months of 1999 as compared with only 2,141 infants during the same period in 1998. One more Member State, **Yemen**, joined this project during 1999. The assistance to Yemen at this stage is intended to quickly build up the counterpart's abilities so that this important medical service can be provided in the Aden region as soon as possible.

136. In **Kazakhstan,** under project *KAZ/4/004–Isotope Production at WWR-K Reactor for Medical Applications*, the construction of a pilot facility was started for the production of iodine-131 using dry distillation from irradiated tellurium oxide. Technetium-99m will be produced using the zirconium-molybdenum gel method. A suitable installation was in the process of being fitted to the hot cell for remote operation.

137. In the **Syrian Arab Republic**, Model Project *SYR/4/007–Cyclotron Facility For Medical Radioisotopes* is on schedule to complete construction of the building which will house the cyclotron procured by the Government using its own resources. It is expected that the radiopharmaceuticals produced by this cyclotron will be available for the health care services in the Syrian Arab Republic, and at a later stage to the neighboring countries. In addition to the availability of these products at a reduced cost compared with their import, the short-lived radiopharmaceuticals labelled with fluorine-18 would not otherwise be available on the market because of their decay over the time it would take to have them shipped from outside sources. This was a decisive factor for the Syrian Arab Republic to commit considerable financial resources, outside of the project itself, for the purchase of the cyclotron and construction of the building and support facilities. The IAEA provided expert advice on the layout of various facilities, including the associated radiochemical laboratories and the hot cells, which had been built by the counterpart using components provided by the Agency. Provision and installation of some auxiliary equipment, such as an ion chromatography

system, was carried out parallel to the construction activities. This equipment will be relocated to the new building once it has been completed.

5. Europe

138. In spite of the political and economical difficulties in 1999, including the war in the Balkans, the Agency disbursed more than $16 million through technical co-operation projects in the region. Implementation also received special attention with "outsourcing" (use of RRCs and regional experts and lecturers) being one of the main mechanism for achieving increased effectiveness and efficiency. In 1999, the Technical Co-operation Programme in Europe benefited from extrabudgetary funds and cost sharing worth $2.2 million. In addition, many of the governments in the region made domestic investments that substantially contributed to technical co-operation projects.

139. Of particular note during the year was the support given to the Y2K problem. The Agency organized three workshops, two in Vienna and one in Bulgaria, attended by over 130 participants from 24 Member States from Europe and other regions. These workshops brought together Y2K computer specialists, safety authorities, and senior officials with contingency planning authorities. Results from Y2K testing and remediation measures were shared.

Nuclear, Radiological, Transport, and Waste Safety

140. In Europe, over 50% of the projects provided by the Agency are in the nuclear safety and nuclear power areas. During the past year, the Agency, through regional nuclear-safety projects, invested in human resources development by providing opportunities for training and sharing experience to over 500 people in areas such as safety assessment, operational safety, and nuclear safety regulatory infrastructure. The co-ordination of the activities in the region within the major nuclear safety and energy projects was maintained by working with other international bodies, such as the European Commission, Organization for Economic Co-operation and Development-Nuclear Energy Agency, G-24, World Association of Nuclear Operators, and major donors.

141. Extending assistance to Member States to upgrade safety-related infrastructures is an important part of the Technical Co-operation Strategy. Activities under Model Project *RER/9/056–Upgrading Radiation Protection Infrastructure* continued in 1999 in accordance with work plans agreed to between the Agency and all participating countries (**Albania, Armenia, Belarus, Bosnia and Herzegovina, Cyprus, Estonia, Georgia, Latvia, Lithuania, Republic of Moldova,** and **The Former Yugoslav Republic of Macedonia**). By the end of 1999, nine out of the 11 participating countries had promulgated laws and a Regulatory Authority was established in eight of them. Six Member States had a system of notification, authorization, and control of radiation sources operational. In 1999, four regional training courses and one nine-week basic radiation training course were organized. In the same period, 12 training courses at the national level also took place.

142. Because of the number of programmes concerning nuclear and radiological safety in **Armenia,** and in view of the different countries and international organizations involved, comprehensive co-ordination is essential for the success of these programmes. A good example of such co-ordination is *ARM/9/007–Emergency Response Programme*. Experts from the US, European Union, IAEA, and the Russian Federation participated. In 1999, a national emergency exercise "ARAGATS-99" was conducted. In spite of some difficulties encountered during the exercise, emergency response tactics were taught under simulated conditions, allowing remaining problems to be identified. ARAGATS-99 was closely co-

ordinated with an exercise for medical specialists on emergency response which was organized within the framework of the regional project *RER/9/049–Medical Education for Nuclear Accident Preparedness*.

143. Along the same lines, the Agency facilitated a review and upgrade of the safety assessment calculations for emergency procedures of the **Hungarian** Atomic Energy Authority, including calculation of severe accident scenarios (Model Project *HUN/9/020–Emergency Response Preparedness).* These calculations were outsourced to the Slovak Nuclear Regulatory Authority, which has the expertise and could deliver the calculations based on the Hungarian data to the full satisfaction of the project's counterparts. As an update, *RER/9/050–Harmonization of Regional Nuclear Emergency Preparedness* continues to assist counterparts in managing their institutional, technical, and communication responsibilities when dealing with accidents that have transboundary effects.

144. In **Bulgaria,** increasing the safety of Novi Han Radioactive Waste Repository is the focus of project *BUL/4/005*. The operation of this repository began in 1964 but was suspended in 1994 after the regulatory body realized that the surface conditions were poor and the geological and hydrogeological conditions were complex. Following this, the Agency was requested to support the assessment of the repository and to assist in corrective action, if required. Since 1997, numerous expert services, fellowships, and scientific visits concerning safety assessments, physical site protection, radiation monitoring, technical control systems, and quality management were organized. Attention was also focused on the construction of an above-ground waste management facility for the treatment, conditioning, and storage of low- and intermediate-level radioactive waste from nuclear applications. By the end of 1999, the implementation of all safety measures were completed and the license for re-opening the repository is expected to be issued in 2000.

145. Steam generators at the Krško nuclear power plant in **Slovenia** are going to be replaced in 2000, which is a major activity in the plant's modernization programme costing about $100 million. Under *SLO/9/010–Assessment of Safety Report for Steam Generator Replacement*, the Agency has advised the Slovenian Nuclear Safety Administration (SNSA) on the appropriateness of their methodology for assessing the safety report for steam generator replacement and power upgrade at the Krško nuclear power plant. This has helped SNSA to proceed with the licensing process. The steam generator replacement is expected to extend the lifetime of the plant and increase its availability and operational safety. Through the project, the staff of the SNSA has acquired experience which will be useful in dealing with other plant modifications.

146. A good example of complementary regional and national projects can be reported for two projects dealing with the impact of the Chernobyl accident. The efforts predominately aim at rendering these territories back into normal agricultural usage in order to improve the socio-economic situation in this region. Implementation of project *BYE/9/006–Rehabilitation of Chernobyl Affected Territories* in **Belarus** has demonstrated that it is possible to reduce the doses received by the population by decontaminating private settlements. In 1999, a 2–3 fold reduction of the dose rate was noted as a result of the decontamination work, leading to a decrease in the annual effective external dose of inhabitants. The results obtained were presented at a regional train-the-trainers workshop on "Decontamination of Contaminated Villages" within the regional project *RER/9/059–Reducing External Exposure Doses in Contaminated Villages*. During this workshop, the participants had an opportunity to test the suggested techniques for decontamination: they decontaminated two private houses in the Belarussian village of Svetilovichi. The results of the decontamination work and their social impact were highly praised by the Government during a recent IAEA visit. The Government also reported that encouraging psychological impacts for the inhabitants have been observed. It can be concluded that the Chernobyl accident should be looked upon not merely

as a radiological and technical problem, but also as a social, psychological, and economic problem.

The Battle Against Illicit Trafficking

Combating illicit trafficking of radioactive materials is a complex task that requires co-operation of all the countries and international bodies involved. Following the 1998 General Conference Resolution GC(42)/RES/18, the Secretariat continued its efforts in addressing the problem. In 1999, a project, *RER/9/060–Physical Protection and Security of Nuclear Materials*, began with a meeting between representatives from 22 Member States in Central and Eastern Europe and the Newly Independent States, in addition to eight donor countries. As a result, a prioritized list of the needs of the States was developed.

The project focused on preparing a training course for customs and police officers to combat smuggling of radioactive materials. This course was organized in September 1999 in co-operation with the World Customs Organisation, Interpol, and the Austrian Customs Administration. Lectures were delivered on topics ranging from the basics of nuclear physics to the psychology of a potential smuggler. The quality of the course was improved by the practical exercises which were conducted at the Austria Research Centre in Seibersdorf and at the Austrian-Hungarian border where an extensive pilot study has been performed by the IAEA and the Austrian Government on radiation detection equipment at borders. The Agency also supported training courses organised by individual Member States on the national level, such as the one conducted by **Malta** in conjunction with the European Union.

Nuclear Power and the Fuel Cycle

147. In the area of nuclear power planning, the Agency takes its responsibilities full circle, from helping a Member State plan or review the nuclear power option to decommissioning a nuclear power plant. Under *CRO/0/002–Energy and Nuclear Power Planning Study*, the main objective was to upgrade local capabilities for energy, electricity, and nuclear power planning by creating a team of experts who would conduct this type of study under varying economic and technological development situations. The Government of **Croatia** made practical use of the results which served as a basis for the National Energy Strategy and 10 national energy projects, all of which have been presented to the Parliament of Croatia. Another Agency nuclear energy planning activity occurred in the **Ukraine**. Under project *UKR/4/006–Strategy for Development of Nuclear Energy*, the co-operation between the Ukranian and Agency experts resulted in a short-term programme to develop nuclear energy in the country.

148. At the opposite end of the cycle, the decommissioning of a research reactor in **Poland** (*POL/4/011–Decommissioning Plan for EWA Research Reactor*) represents a successful example of technology transfer in the area of nuclear fuel cycle management and waste. After almost 37 years of operation, this water-cooled and moderated reactor was permanently shut down in February 1995. The main objective was to support the decommissioning planning and management; some radiation monitoring equipment was also provided. As a result of this project, the counterpart completed most of the necessary decommissioning work in 1999. Fuel has been removed from the reactor, and the primary circuit has been dismantled with only the bioshield remaining in the reactor hall. The Agency is satisfied that the counterpart developed the skills and technical competence to safely

decommission this facility, as is shown by the low collective dose incurred by the workers during decommissioning.

149. Several workshops were held under project *RER/4/011–Improving Nuclear Power Plant Operations Management*, from "The Year 2000 Issue" to "Quality Performance in NPPs: The Role of Management" (held jointly with European Atomic Forum [FORATOM]). This latter workshop provided the forum for which co-ordination efforts between the Agency and FORATOM could be more firmly established.

Human Health

150. Quality radiotherapy has been given a high priority by the Member States in the Europe region. The regional projects *RER/6/008–Building Capacity in Medical Physics* and *RER/6/009–Upgrading of Radiotherapy for the Treatment of Cancer* are closely linked to each other, as they aim at establishing quality assurance systems in the cancer treatment centres in Eastern Europe. To ensure high-quality training for radiotherapy clinicians and medical physicists, the Agency has signed an agreement in the form of a contract of services with the European Society of Therapeutic Radiology and Oncology (ESTRO). This has enabled successful training of hundreds of professionals in Europe in the field of Radiation Oncology. In this process, the Agency maintains the responsibility of inviting Member States, selects the participants, and is accountable for the training, thus leaving to ESTRO the technical aspects, such as the curriculum and lecturers. The formula, which is a good example of "outsourcing", has shown many advantages for both ESTRO and the Agency and is likely to be continued in the future, as it allows the Agency to concentrate on the strategic aspects of the implementation of these important regional projects.

151. Under *RER/6/009*, the Agency has been instrumental in rehabilitating radiotherapy services which virtually ceased to exist in **Bosnia and Herzegovina** as a result of the war. Both the buildings and the equipment were seriously damaged. The restoration work has been a good example of strong governmental commitment as well as donor support. The new National Radiotherapy Centre was opened in April 1999 in a completely renovated modern-design building of the Institute of Oncology in Sarajevo. Through the project, some important pieces of equipment such as the Cirus telecobalt unit, which was used to treat the first patient in May 1999, were provided.

152. Model Project *CZR/4/007–Cyclotron for Short-lived Medical Radioisotopes* is a good example of the changing role of the Agency's Technical Co-operation Programme. In November 1999, the **Czech Republic** inaugurated a new facility for positron emission tomography (PET) and other advanced nuclear medicine techniques. This modern PET centre near Prague, the first of its kind in Central Eastern Europe, has the capacity for the production of radiopharmaceuticals labelled with short-lived radioisotopes. The Agency assisted by focusing on procurement assistance, monitoring, and expert advice related to the preparation of specifications, acceptance tests, bid evaluation, and contracting. The transfer of experience in cyclotron and PET operation was complemented by scientific visits and fellowships. While the technical aspects of the production of isotopes and radiopharmaceuticals by cyclotron and the clinical aspects of PET were addressed separately, regular monitoring visits ensured sound co-ordination and co-operation. As a result, the Agency played not only a traditional technology transfer or infrastructure-building role, but more importantly also provided services that could be called "business management and technical advice".

153. As a result of the project *MAK/2/003–Local Production of Radiopharmaceuticals*, the majority of the technetium-99m kits, which used to be costly imports for **The Former Yugoslav Republic of Macedonia**, are now locally produced. The SPECT camera supplied

under a related project, *MAK/6/003*, is functioning well and regular cardiac studies are carried out using locally prepared technetium-99m kits. Apart from cost savings, the local production has helped the Institute of Pathophysiology and Nuclear Medicine in Skopje to provide reliable and good quality service to a majority of the population who did not have these services available to them before. The Government has supported the project activities by funding the reconstruction of two rooms necessary for radioisotope kit production.

154. Another example of successful implementation of human health related projects is the initiation of a tissue bank in **Turkey** (*TUR/7/007–Radiation Sterilization of Tissue Grafts*). In 1996, the Çekmece Nuclear Research and Training Centre requested assistance to establish the first national tissue bank in Turkey. Project support comprised expert missions, fellowships, scientific visits, and equipment so that the tissue bank could be set up in 1999. Through this project, national capabilities for radiation sterilization of human tissue grafts for safe and effective clinical applications can now be provided.

Water Resources Management

155. Nuclear techniques for water resource assessment provide a good example of sub-regional co-operation even across politically sensitive borders. Project *RER/8/008–Study of Prespa Lake Using Nuclear and Related Techniques* applied isotope technologies to assess water resources in Prespa Lake in southeastern **Albania**. Periodic oscillations of the Prespa Lake level, due to natural phenomena, disturbed the ecological balance within the region, affecting three neighbouring countries (**Albania**, **The Former Yugoslav Republic of Macedonia**, and **Greece**) which share the water from Prespa Lake. Two key issues are to determine the hydrogeological balance of this lake in relation to other lakes in the vicinity and to determine the water quality in all of the lakes. In 1999, counterparts compiled data and collected and analyzed samples from the lakes. The results will help determine how to restore the ecological balance to the area.

Quality Assurance in Nuclear Analytical Techniques

When nuclear analytical techniques are used in areas of trade, health, safety, and environmental protection, those counting on the results need to be assured that they are reliable, credible, and meet international standards. In 1999, the Agency initiated a new project in the region *(RER/2/004–Quality Control and Quality Assurance of Nuclear Analytical Techniques)* which has, after one year, introduced modern quality assurance, management, and audit practices into eight selected nuclear analytical laboratories in the region.

Initially, training was provided for the laboratory managers and their quality assurance officers. Subsequent reports on progress from the laboratories have enabled independent auditors to develop harmonized quality assurance audit procedures, which were first applied in 1999 and will continue in 2000.

The project will enable participating countries in Europe to meet requirements imposed, for example by the European Community and others, on products crossing borders and thus remove barriers to trade.

6. Interregional Projects

156. Within the Technical Co-operation Programme, there are some issues that need to be addressed globally, and thus demand projects that span different regions. This year's annual report will highlight three Interregional Projects covering the topics of managing radioactive waste, radiation protection infrastructure, and plant production in saline groundwater and wastelands.

157. Model Project *INT/4/131–Sustainable Technologies for Managing Radioactive Wastes* aims to manage low- and intermediate-level radioactive waste coming from non-power nuclear techniques, including nuclear applications in medicine, research, and industry. The project's prime objectives are to advise and aid in the collection and conditioning of spent radiation sources, including transferring disposal technology. In addition, the project will explore establishing facilities for long-term storage and developing reference designs for low- and intermediate-level radioactive waste near-surface disposal facilities. In 1999, the project expanded to include 19 more Member States, bringing the total number of Member States benefiting from the project to 41. Project management has already received requests from eight additional Member States who will receive support for the first time in 2000.

158. Member States' waste management staff participated in "hands-on" demonstrations on "Predisposal Waste Management Methods and Procedures" and/or received support with radium or cobalt source conditioning. Through these support functions, a number of Member States have recognized the benefit of having a core group of professional waste management operators. This has resulted in requests to the Agency for support through national programmes to establish centralized waste management facilities.

159. Following the acceptance by the Board of Governors of the Agency's Medium Term Strategy (GOV/1999/69), the project's medium-term goals for the management of radioactive wastes coming from nuclear applications in medicine, research, and industry were reviewed and four milestones set. The milestones are:

- in collaboration with Member States to identify and assess their needs and goals;
- to achieve in Member States a more effective use of current knowledge of radioactive waste treatment and handling;
- to achieve in Member States a safe, environmentally acceptable, and efficient waste package suitable for transporting and interim storage; and
- to promulgate in Member States a safe, environmentally acceptable, and efficient means of disposing of radioactive waste.

160. The review has resulted in the proposal that the project be expanded to cover a second phase which will concentrate on fulfilling the identified milestones.

161. The project has already demonstrated that for countries having small quantities of spent sources or contaminated materials from past activities, transfer of technology results in a satisfactory pre-disposal waste management solution. In countries that have a small but continual output of radioactive wastes, which is the case in most developing countries, the project should lead to a sustainable national capability. In countries that produce more significant amounts of waste on a regular basis (countries with nuclear research centres), the project will help with the planning of the national strategy, the prioritization of resources, and the planning of centralized waste management facilities and near-surface disposal facilities.

162. Model Project *INT/9/143–Upgrading Radiation Protection Infrastructure*[5] is the Agency's primary vehicle for assisting participating Member States reach the International Basic Safety Standards, for protection against ionizing radiation and for the safety of radiation sources. In 1998, it was divided into regional projects for management purposes, but these projects still share common objectives and methodologies. Some of the results achieved in the area of radiation protection have been reported under regional headings in this report. A detailed report has also been provided to the Technical Assistance and Co-operation Committee and the Board of Governors[6] identifying the progress made against established milestones. As that report shows, significant accomplishments have been achieved in establishing regulatory frameworks, including systems for notification, authorization, and control of radiation sources, and for occupational exposure control.

163. Model Project *INT/5/144–Saline Groundwater and Wastelands for Plant Production* has demonstrated the sustainable use of saline groundwater and wastelands by growing salt-tolerant plants to cover the arid desert land. These results may help improve the environment and produce biomass for use as food, forage, fuel wood, manure, and for possible processing in agro-based industry. Agency-sponsored group activities in 1999 provided an opportunity to encourage technical co-operation among developing countries when all seven National Co-ordinators visited the other counterpart institutions and sites. During these occasions, work progress was presented by the National Co-ordinators who also worked with experts to plan future work.

164. Results from the project have clearly demonstrated that all participating countries (**Egypt**, **Islamic Republic of Iran**, **Morocco**, **Myanmar**, **Pakistan**, **Syrian Arab Republic**, and **Tunisia**) can grow useful plants on arid wastelands using saline water. All countries have identified plant species for further propagation, and none of the countries have reported any deterioration of the soil due to salt build up on the surface. The technology has been transferred to the end users (farmers and relevant government agencies) in two countries; while Pakistan has successfully established two to three plant species on large end-user fields, Morocco has established three to four species on smaller farm fields.

7. Highlights of Projects Completed in 1999

165. The following five pages highlight some of the achievements from selected projects completed in 1999. A full list is available electronically on GOVATOM.

[5] INT/9/143 has been continued as regional projects RAF/9/024, RLA/9/030, RAS/9/021, RAW/9/006, and RER/9/056.
[6] GOV/1999/67

a) Africa

Proj. No.	Project Title	Project Objectives	Summary Achievements
ALG/2/006	Marine environment monitoring along the Algerian coast	To upgrade the existing capability for monitoring natural and artificial radioactivity along the coastal marine environment.	Environmental monitoring laboratory upgraded. Marine radioactive monitoring initiated.
ETH/6/006	Production of RIA reagents and radiopharmaceutical kits	To strengthen diagnostic services through consolidating the local capability for preparation of RIA reagents and radiopharmaceutical kits.	Services provided for the diagnosis of thyroid, renal, and brain diseases by radioisotope imaging. Thyroid hormone levels determined by RIA.
RAF/4/009	Nuclear instrumentation (AFRA IV)	To improve maintenance and repair of nuclear electronic instruments in countries participating in AFRA.	Forty-eight technicians trained as trainers. Three national laboratories established to design and manufacture vital detector instruments.
RAF/6/007	Local preparation of radioimmunoassay reagents (AFRA V)	To develop, in the countries participating in AFRA, the necessary conditions and infrastructure for the local preparation of RIA reagents and to train the manpower required.	Cost benefit illustrated on cost per assay—$3 in 1992 to $0.5 in 1997. Network of RIA centres established. Over 100 biophysicists and laboratory technicians trained.
SEN/5/024	Increasing nitrogen fixation potential of cowpea	To assess the biological nitrogen fixation of several varieties of cowpea already available or selected, and to produce new mutants obtained after irradiation or other chemical/physical treatments.	Equipment and supplies for biotechnology provided. Sixteen new varieties of cowpea evaluated. Isotope laboratory established.
SUD/5/022	Increasing productivity of smallholder dairy cattle	To identify nutritional constraints to productivity of dairy cattle in small farms and develop suitable feed supplementation strategies.	Feed sources analyzed. Microbial protein supply determined. Livestock reproduction performance monitored using RIA. Feed supplementation strategies developed using local resources.
TUN/9/009	Treatment and management of radioactive wastes	To establish a national radioactive waste management system including a central facility for processing and storage of all radioactive wastes.	National capability for safe management of radioactive wastes strengthened.
ZAM/5/021	Assistance for the control of CBPP outbreak in Zambia	To strengthen the national capability for the diagnosis and monitoring of CBPP through the introduction of the FAO/IAEA CBPP ELISA which will be used in the monitoring of the national CBPP control programme.	ELISA technology at the Central Veterinary Research Institute applied and samples screened for CBPP. Collaborative links between CVRI and Onderstepoort Veterinary Institute in South Africa established.

b) Latin America

Proj. No.	Project Title	Project Objectives	Summary Achievements
ARG/5/005	Fruit fly eradication in the south region	To achieve declaration of fly free zone in the southern region of Argentina by eradicating the fruit fly; to support control and eradication activities of fruit fly in Mendoza and San Juan provinces.	Fruit fly suppressed. Declaration of fly-free zone in Mendoza Province.
BOL/6/019	Radiotherapy	To upgrade the existing radiotherapy services of medicine centres in La Paz, Cochabamba, Santa Cruz, and Sucre.	Brachytherapy equipment provided to all three centres. Equipment calibrated and commissioned. Patient treatment regimes established.
BRA/4/043	Production of iodine-123 via xenon target	To improve nuclear medicine health care by reducing patients' exposure to radiation in diagnostic procedures; specifically, to facilitate the production of iodine-123 from xenon gas targets.	System installed to produce high-purity iodine-123. Production levels meeting 80% of national demand, thus benefiting 90,000 patients in 174 nuclear medicine centres.
COL/6/007	Drug resistance in malaria parasites	To improve the drug treatment of malaria by contributing to controlling the spread of resistance to multiple drugs.	Techniques for identifying drug-resistant strains of malaria were established in local laboratories.
ECU/4/005	Low- and intermediate-level radioactive waste repository	To select a suitable site and design for a repository of low- and intermediate-level radioactive waste; to establish waste acceptance requirements.	A national waste management plan established along with a site identified, facility designed, and trained manpower to implement the plan.
PER/0/020	Medical physics training	To introduce a Master's degree course in medical physics for the eventual improvement of diagnostics and radiation safety in hospitals.	Masters degree course in Medical Physics established. Equipment supplied for laboratory training.
RLA/4/011	Nuclear instrumentation maintenance (ARCAL XIX)	To consolidate infrastructure for maintenance and repair of nuclear instruments, including the supply of spare parts.	Over 250 participants trained on the repair of nuclear instruments and the maintenance of detectors. Three regional repair centres consolidated.
URU/8/009	Study of environmental quality of the Bay of Montevideo	To evaluate sediment transport mechanisms in the Bay of Montevideo in order to optimize dredging operations.	Improved infrastructure and expertise in the use of radiotracers for hydrological and environmental studies helped counterpart authorities identify cost-savings.
VEN/9/006	Radioactive waste management	To identify an appropriate location, design a facility, and train necessary staff for the collection, conditioning, and safe storage of spent radioactive sources.	A simple, cost-effective, and safe method for conditioning spent sources based on technology available in the country transferred. A national inventory of spent sources conducted.

c) East Asia and the Pacific

Proj. No.	Project Title	Project Objectives	Summary Achievements
BGD/6/013	Introduction of brachytherapy	To establish brachytherapy services.	Brachytherapy services now provided to cancer patients at INM, Dhaka.
CPR/4/015	Manpower development for safe operation of NPP	To assist Chinese authorities in creating infrastructures for developing qualified manpower needed for operation and maintenance of existing and future NPPs.	Qinshan NPP full-scope simulator operational. Training Centre capabilities to train Control Room Operators established. RINPO in-service inspections and root-cause analysis capabilities improved.
CPR/7/004	Quality control for radiation sterilized tissue grafts	To establish good procurement, processing, and packaging practices (GMP) with quality evaluation procedures for radiation-sterilized tissue grafts.	Local production of clinical tissue grafts increased. More than 6000 burn patients in Suzhou Hospital and 10000 other patients in 20 nearby hospitals benefited.
INS/5/023	Feed supplementation for increasing livestock production	To extend the use of simple nutrient block feed supplements for cattle and goats to a large proportion of the country's smallholder farms.	Transfer of UMMB feed supplementation for small farmers in three regions accelerated. On these farms, 25% increase in milk production and 50% meat production demonstrated.
MON/4/003	Strengthening nuclear instrumentation and maintenance	To upgrade the capabilities of the electronics laboratory to provide maintenance, repair and construction of nuclear and scientific instruments.	Capabilities of the laboratory in repair and maintenance of nuclear instruments improved. Services to other institutions provided.
PHI/9/020	TLD dosimetry for personnel dosimetry services	To expand and improve personnel dosimetry services by using thermoluminescence dosimetry.	TLD monitoring for some licensed users in nuclear medicine, teletherapy facilities, and industrial radiography implemented. TLD monitoring for all radiation workers in the country will be implemented.
RAS/0/021	Nuclear power planning (RCA)	To facilitate national implementation of nuclear power programmes through the pooling and analysis of information on effective strategies used in RCA Member States.	Through increased use of regional expertise and identification of specific regional challenges, regional co-operation expanded.
SRL/5/031	Immunoassay in diagnosis and control of poultry diseases	To establish a laboratory for diagnosis and control of poultry diseases using ELISA and related techniques and to train specialists in the field.	Laboratory with equipment to use ELISA technology established. Commercially available kits for routine diagnosis of poultry diseases used.

d) West Asia

Proj. No.	Project Title	Project Objectives	Summary Achievements
IRA/3/004	Target selection for uranium prospecting	To complete data integration and target selection using integrated geological, geographical, and remote sensing data for uranium prospecting.	Remote sensing capability established. Regional assessment of uranium anomalies performed. Investigative work programme prepared. Preliminary studies on prospecting uranium performed.
IRA/4/020	Accelerator-based analytical techniques	To improve the analytical capabilities of the Van de Graaff Laboratory by the introduction of micro-beam analytical technique.	Capability for analyzing samples of medical, industrial, hydrological, and biological nature acquired. Training programme on the use of PIXE, NRA, PIGE, and RBS undertaken.
IRQ/5/007	Mutation techniques for crop improvement	To enhance national expertise in the field of induced mutations by the use of nuclear techniques.	Three new cultivars of wheat and two of barely released to farmers. Crop yields from newly developed cultivars improved.
ISR/9/006	Improved research reactor safety	To improve the level of operational safety of the IRR-1 research reactor by upgrading its safety and safety-related systems.	Monitoring of gaseous effluents released from the reactor improved. Reactor safety system and newly installed equipment connected.
JOR/9/006	Radiological emergency response training	To establish and train personnel for a radiological emergency response team.	Basic elements of emergency planning, preparedness, and response established. Capabilities for environmental radioactivity monitoring enhanced.
KAZ/0/002	Establishment of INIS Centre	To establish an INIS Centre for easy access to technical information on nuclear and related subjects.	INIS Centre established. Flow of information from the country to INIS Database and level of use of products serving scientists and decision makers increased.
LEB/2/004	Elemental analysis and applications	To establish a laboratory for nuclear analytical measurements; to train staff; and to determine radioactivity in food and environmental samples.	Laboratory for nuclear analytical measurements equipped. Measurement of radioactivity in food and environmental samples demonstrated.
RAW/5/002	Water balance and fertigation for crop improvement	To proceed with water balance and fertigation techniques for crop production improvement in arid and semi-arid zones.	Drip irrigation and fertigation techniques in the region successfully demonstrated.
SYR/4/006	Neutron activation analytical laboratory	To utilize the miniature neutron source reactor for neutron activation analysis, production of short lived radioisotopes, and training.	Neutron activation analysis carried out. Over 1200 samples analyszed

e) Europe

Proj No.	Project Title	Project Objectives	Summary Achievements
ARM/0/002	Improving nuclear engineering graduate courses	To upgrade the capabilities of the State Engineering University of Armenia and the Yerevan State University in nuclear engineering and science education.	A new training programme and modern training laboratory established.
BUL/8/013	Feasibility study for flue gas control by EB technology	To perform a feasibility study for the use of electron beam technology for the control of flue gases from a district heating thermal plant in the Sofia area.	Decision made by Bulgarian Government to construct an electron beam pilot treatment plant to clean flue gases.
BYE/9/004	Establishing regulatory procedures and standards laboratory	To develop a comprehensive radiation metrology system with accreditation and certification consistent with international recommendations.	Calibration laboratory established for radiation protection and environmental dosimentry. Laboratory services provided at national level and to neighboring countries.
GRE/9/017	Upgrading of whole body counter	To improve and upgrade the whole body counter (WBC) system of the University of Ioannina.	Metabolic studies and radiation protection programme expanded in response to the Chernobyl accident.
HUN/9/019	Strengthening training for operation safety at Paks NPP	To implement a systematic and comprehensive national education and training programme for NPP personnel—to maintain and enhance safety, quality, and reliability in the operation and maintenance of the Paks NPP.	State-of-the-art maintenance training centre established. Capacity to host maintenance-related training established. Lower electricity generating costs resulted from increased performance of NPP. Safety culture enhanced through staff awareness and maintenance skills.
MOL/9/002	Development of radiation monitoring capability	To improve the country's capability to detect and measure accurately radioactive materials in the environment from sources within and outside the country.	A centralized waste processing and radioactive waste storage facility established. Skills transferred to monitor environment surrounding the repository.
SLR/4/005	Leak tightness improvement at WWER-440 NPPs	To develop procedures for leak detection, leakage rate measurement, and identification and repair of leakages in the containment structures of WWER-440 reactors.	Experience transferred now used to provide services for NPPs in Slovakia and abroad. Project had impact towards the containment safety of WWER-440 NPPs.
SLR/9/005	Strengthening the nuclear safety regulatory body	To strengthen the Slovak Nuclear Regulatory Authority's capabilities to fulfil its nuclear regulatory tasks to the level of good international practice.	New regulatory body on nuclear safety and emergency response established. Emergency Response Centre staff trained to international standards.
UKR/9/010	Environmental impact for the Chernobyl NPP unit 4	To assist in the assessment of the radiological integrity of UKRITYE, especially in regard to possible interaction with surrounding soils and underground water.	Mineralogical and geochemical characterization of the fuel-containing masses performed. Transport of radioactive materials by water from sarcophagus evaluated.

8. Global Indicators

166. In his 1998 report on the Audit of the Accounts of the Agency[7], the External Auditor noted that the Agency's governing bodies and Member States have relied on the implementation rate (i.e., ratio of new obligations to the adjusted programme, or financial expenditure rate) to judge progress across all of the Agency's TC projects. He recommended that the Agency develop a basket of high-level global indicators which would complement the implementation rate and against which a more balanced view of progress could be reported to governing bodies. The three examples of possible global indicators that he gave were:

- proportion of planned outputs fully or partially completed to time and budget;
- quantified details of what the Agency has purchased for its money; and
- the average cost of such activities.

167. This year's report will use the External Auditor's suggestions to look at the TC Programme from a more global perspective.

a) Planned Outputs and Outcomes

168. In its annual review of achievements of the TC Programme, the Agency reports on the outputs and outcomes of selected *individual* projects (see Sections 1 - 7 above). This is a relatively straight forward task. However, with approximately 850 active projects on the books, it is difficult to ascertain and report on a global picture of results across the Programme. What is possible, is to look at a slice of the Programme each year and estimate the "success rate", i.e., the proportion of projects that have achieved their expected outputs, within that given slice.

169. This effort is also in line with the Agency's attempt to introduce results-based programming into all of its work. This involves considering not only the inputs provided and activities undertaken by the Agency, but also the expected outputs and outcomes[8] of projects and programmes, concepts that were introduced into the TC Programme through both the TC Strategy and the Guidelines on Planning and Designing IAEA Technical Co-operation Projects.

170. Normally this information is supplied through TC Evaluation reports. This year, in order to provide an overall picture of the type of global indicators that the Agency uses, a summary of findings from two evaluation exercises will be included in this report as an illustration of findings at both the output and outcome levels.

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[7] Presented to the Board of Governors in May 1999, and to the 43rd General Conference, GC(43)/5

[8] Defined in the Agency's New Approach to Programme Development, GOV/2000/13. Outputs, which result from the appropriate delivery of inputs through activities, are normally within the control of the Agency to achieve; outcomes, or expected results, are the specific changes induced by an act or set of actions, i.e., a problem solved or a constraint removed. Outcomes are directly linked to an output or set of outputs, and are usually beyond the control of the Agency to achieve on its own.

Utilization of Research Reactors and Low-Energy Accelerators

171. In 1999, the Agency conducted an evaluation of TC projects in the area of research reactors and low-energy accelerators. As part of that evaluation, a questionnaire survey of the Agency's counterparts in Member States was conducted. A professional polling firm distributed the Agency-designed questionnaire and compiled the returns, thereby guaranteeing the respondents' anonymity with respect to the IAEA. In total, 245 counterparts in past and present TC projects in the given thematic area received a questionnaire covering all aspects of project design, implementation, and outcomes. The responses covered 42% of projects closed since 1991, a sample more than sufficient to make the results statistically valid for this aspect of the programme as a whole.

172. For 80% of the projects, the beneficiaries' situation improved, either substantially (40%) or to some extent (40%). This encouraging result is probably linked to the fact that in 75% of the cases, the performance indicators for the projects' specific objectives were met either completely (20%) or mostly (55%). And in turn, the specific objectives were deemed highly relevant to resolving the targeted constraint or problem, with 86% responding either completely or mostly relevant.

173. These three indicators taken together show, according to the counterparts' own assessment, that a majority of the projects met their specific objectives and led to tangible benefits, a result made possible by effective implementation of correctly targeted interventions.

174. However, this was not uniformly the case, and it is clear that more can be done to bring the entire TC Programme up to a standard of quality that Member States have a right to expect. For example, only about 25% of the outputs reported in this sample were achieved within the planned time. Almost 40% of the respondents reported that achievements were completed only partially or not at all on time. This result reflects the uncertainties often associated with implementation under less than ideal circumstances. But the findings also indicate that programmers need to pay more attention to drafting realistic work plans before implementation begins.

175. When one moves beyond the achievement of specific objectives to the level of the overall problems or needs the projects addressed, the survey responses indicate a lower success rate. The respondents reported that socio-economic problems were fully resolved in only about one-quarter of the reported cases. A more detailed review of the overall findings of this evaluation can be found in GOV/INF/1999/14.

Review of Model Projects

176. Another "slice" of the TC Programme the Agency is currently looking at is Model Projects. Work is underway to review all Model Projects started in the years 1995-98. These are the most logical projects to look at because, at the outset, a major effort went into establishing what the expected outputs and outcomes of the projects would be. A total of 53 Model Projects were approved in those years, 50 of which were selected for this exercise (large, multi-year interregional projects were not included as they are being reviewed separately.)

177. Brief surveys of 19 of these projects have now been completed. Obviously not all outputs and outcomes can be expected to have been reached, particularly in those projects that are still active. The surveys have been based on reviews of project files plus discussions with project and/or technical officers, plus consultation with counterparts where possible. The findings are rudimentary and have not been verified through field missions. Nonetheless, the

results documented to date paint a picture which is both credible and instructive. This report covers only initial findings; the full report will form part of the Evaluation Report to the Technical Assistance and Co-operation Committee in December 2000.

178. Nineteen of the Model Projects in East Asia and the Pacific and Africa approved between 1995 and 1998 have been reviewed to date. Of these, only eight projects have been completed, but already 11 have achieved all or virtually all of the expected outputs[9] and another six have achieved many of the expected outputs and can expect to achieve most or all of them within a reasonable time frame. One project has had its expected outputs considerably delayed due to changes in plans on the part of the counterpart, but is still moving forward. In only one project out of the nineteen were serious problems encountered due to difficulties with equipment, and the project was terminated.

179. As outcomes are directly dependent on outputs, they are normally realized some time later. Of the 19 projects reviewed, eight have already achieved all or virtually all of the expected outcomes[10], and another six can expect to do so in time, although in some cases the time frame will be much longer than originally anticipated and may require domestic investment for related activities that is not currently available. In four projects, it is unlikely that all the originally expected outcomes will be achieved, primarily because original assumptions – the existence of specific markets or demand, for example – did not turn out to be valid. Even in these projects, however, the outputs have resulted in certain outcomes. One project, for example had as an objective the establishment of a non-destructive testing facility to perform advanced testing needed during the construction of a pipeline. Outputs were achieved: the facility is operational and most of the necessary people have been trained. With the delay of the pipeline, however, the originally-conceived outcome of the project will not be achieved; nonetheless, the facility is available for other purposes.

180. Although the review of this particular "slice" of the Programme has not yet been completed, the preliminary findings are heartening. Ninety percent of the projects that have been surveyed to date have achieved or are likely to achieve expected outputs, while 70% will likely achieve in time the outcomes planned at the outset. Only one project out of the 19 has run into serious difficulties, a commendably low ratio in the difficult business of technology transfer.

181. It is also instructive to note that the success rate of projects in this "slice" of the Programme – Model Projects – is much higher than in the other slice reported above covering the utilization of research reactors and low-energy accelerators. This is a field in which few Model Projects are to be found.

b) Delivery of Components – What the Agency Has Purchased with TC Programme Funds

182. The External Auditor suggested that the Agency use the quantified details of what the Agency has purchased for its money as one of the global indicators for the Programme. This has normally been done through a report on the delivery of the different components of the TC Programme. The practice is continued in this year's report, but with more attention paid not only to activities (e.g., number of training courses) but also to outputs (e.g., numbers of trained persons).

183. Compared with 1998, delivery in non-financial terms for the human resource components in 1999 showed an increase throughout: 25% for expert assignments, 3% for fellows and scientific visitors, and 13% for training course participants. The average duration

[9] e.g., trained staff, operational laboratory
[10] e.g., increased number of patients treated, increased yield per hectare

continued to drop, a trend noticeable for all types of assignments in an analysis over the past five years. Women's participation in technical co-operation increased in almost every category in 1999. The highest rates for women were in the fellowship and training course categories, where they accounted for 29.3% and 27.5% of the participants respectively. For equipment, the number of purchase orders was virtually the same as in 1998, while the dollar value went up slightly.

Experts and Meetings/Workshops

184. The total number of assignments fielded in 1999 was 5,511 (an increase of 25% over 1998). Included in this total are assignments of various types: international experts, national experts, meeting/workshop participants, other project personnel (such as technical/support staff), and training course lecturers.

Year	Adjusted programme $ million	New obligations $ million	Implementation rate %	Number of persons	Number of assignments	Number of months
1995	22.5	15.8	70.1	2,565	3,857	1,420
1996	19.1	13.4	69.9	2,367	3,610	1,302
1997	20.9	14.2	68.1	2,777	4,184	1,403
1998	17.5	11.4	65.3	2,753	4,111	1,296
1999	22.3	15.4	68.8	3,743	5,511	1,690

185. As shown below, the most dramatic growth was in meetings/workshops, indicating that peer reviews have become an increasingly popular and effective forum for the exchange of expertise and problem resolution.

Assignment type	1998	1999
International experts	2,034	2,365
National experts	205	294
Meeting/workshop participants	1,363	2,323
Other project personnel	3	10
Lecturers	506	519
Total	**4,111**	**5,511**

186. The output of expert missions and meetings/workshops normally consists of a set of recommendations and advice on or analyses of particular aspects of individual projects, and is usually summarized in a report submitted by the expert or the group of meeting/workshop participants. As the exact nature of the particular outputs in 1999 cannot be captured easily, the number of assignments is, for the time being, used as a proxy indicator. In the case of training course lecturers, the output is more tangible and can be seen as the number of course participants trained (2,324 persons in 1999).

187. With respect to individual experts from a given region delivering services to another country within the same region – TCDC – the picture in 1999 looked as follows: Africa, 30%; Latin America, 62%; East Asia and the Pacific, 44%; West Asia, 5%; and Europe, 77%.

188. Details on the origin of the individuals who undertook the variety of assignments and details on the countries/regions which received the assignments, are given in Tables C.2 and C.3, respectively, in the Supplement to this report.

Fellowships and Scientific Visits

189. In 1999, 1,015 fellows and 366 scientific visitors were placed, a slight increase of 3% over 1998. For fellowships and scientific visits, the output is the number of persons trained, i.e., a total of 1,381 trainees for 1999.

Year	Adjusted programme $ millions	New obligations $ millions	Implementation rate %	Number of fellows	Number of fellowship months	Number of scientific visitors	Number of scientific visitor months
1995	15.4	10.8	70.3	1,041	3,356	314	183
1996	13.6	9.8	72.0	1,032	3,490	358	190
1997	12.5	8.1	64.7	862	2,626	361	183
1998	14.0	9.8	69.9	998	2,700	337	157
1999	14.6	9.8	66.9	1,015	2,682	366	165

190. Of that total, 38 trainees received 109 months of training at little or no cost to the Agency (Type II fellowships). The estimated value of this cost-free training was $445,086, contributed by four Member States. The following table provides a breakdown of these Type II fellowships by donor.

Donor	Number of fellows in the field	Number of months of training	Monetary Value (US $)
Germany	5	5	17,049
Spain	4	10	33,660
United Kingdom	1	1	4,200
United States of America	28	93	390,177
TOTAL	38	109	445,086

191. Details on where the fellows and scientific visitors came from and where they were trained, are shown in Tables C.5 and C.6, respectively, in the Supplement to this report.

Training Courses

192. In 1999, six interregional and 156 regional training courses were held in 57 countries. This number includes courses under the Regional Co-operative Agreements—35 under RCA, 16 under ARCAL, and 13 under the AFRA programme. Of the total 162 courses, 131 (81%) were hosted by developing countries. In line with the request by the Board of Governors, the large majority (142) of the training courses were implemented under TC projects; the remaining 20 under the Regular Training Courses Programme.

Year	Adjusted programme $ millions	New obligations $ millions	Implementation rate %	Number of courses	Number of participants	Number of months
1995	10.3	8.7	84.8	119	1,806	1,272
1996	10.0	8.6	86.0	122	1,718	1,138
1997	8.7	7.3	84.2	122	1,752	1,049
1998	9.3	7.6	81.7	160	2,012	885
1999	9.9	8.3	83.3	162	2,324	1,136

193. The output of these courses is the number of persons trained, i.e., for 1999, a total of 2,324 persons. Details on where the participants came from and where they were trained are shown in Tables C.5 and C.6, respectively, in the Supplement to this report.

194. In addition to these 162 events, 21 national training courses and training workshops were held.

Equipment

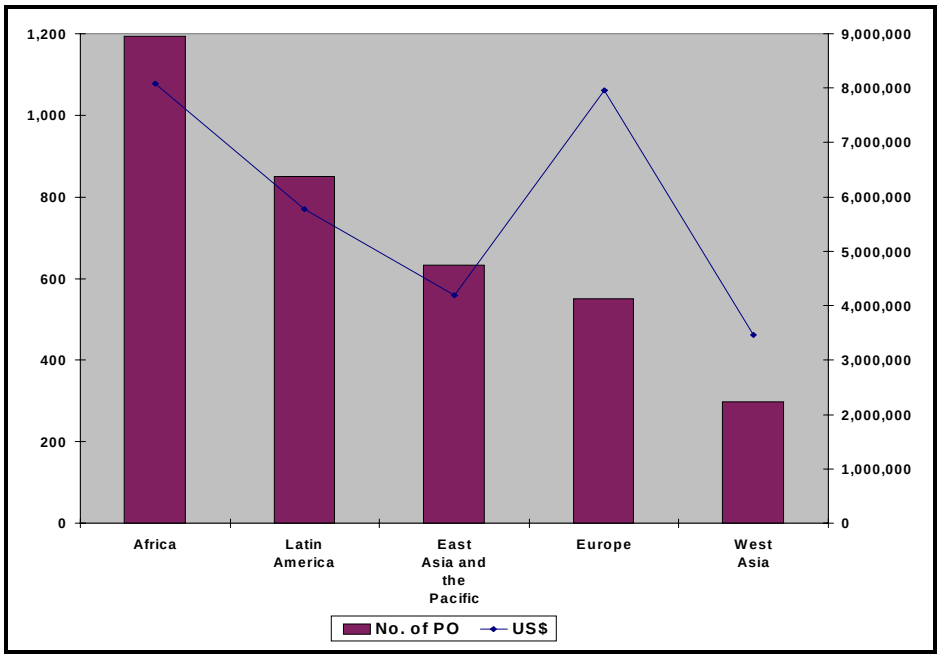
195. The number of purchase orders was virtually at the same level as in 1998, while actual disbursements for equipment procured under the TC Programme went up by $0.3 million. The percentage of total disbursed resources on equipment stood at 47.4%, slightly above the level of 1998.

Year	Adjusted programme $ million	New obligations $ million	Implementation rate %	Disbursements $ million	Number of purchase orders [a)]
1995	32.8	26.1	79.4	25.1	3,632
1996	32.2	25.0	77.8	23.1	3,919
1997	34.7	28.8	83.3	28.1	4,444
1998	33.4	28.5	85.2	30.1	3,952
1999	30.6	25.5	83.5	30.4	3,950

[a)] including training course equipment and research contract orders

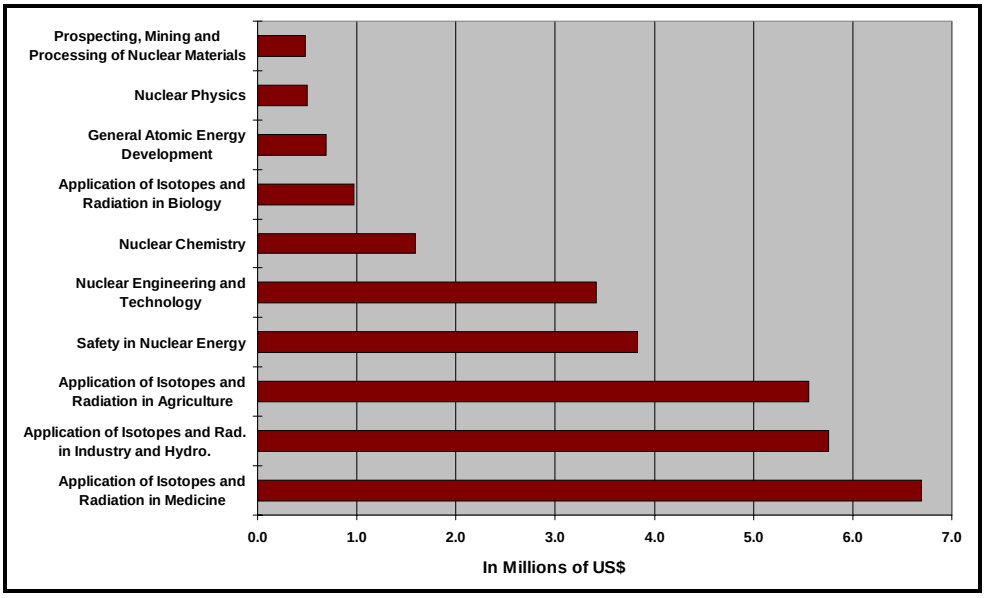
196. As shown in the chart below, the highest share in monetary terms was for the programme in Africa. The programme in Europe again saw a small number of large value purchase orders. The high monetary value includes 20% of equipment disbursements covered through cost-sharing by recipient States and extrabudgetary resources made available by other donors.

EQUIPMENT DELIVERY BY AREA



197. It is not possible to describe the output level for all the equipment delivered under a large number of projects in 1999. As an alternative indicator, an illustration is therefore given in the chart below on the fields of application for which the items were purchased.

EQUIPMENT DELIVERY BY FIELD OF APPLICATION



198. Special attention continued to be paid throughout 1999 to ensure Y2K compliance of all items ordered. To date, no report of equipment failure or problems of a Y2K nature for items procured by the Secretariat has been received.

199. Details on equipment by country of origin are shown in Table C.7 of the Supplement to this report.

c) The Average Cost of Key Components

200. The External Auditor suggested using the average cost of TC activities as one of the global indicators of the Programme. The cost of components is affected by many factors ranging from inflation and exchange rates to length of assignments, origin of experts, and destination of fellows. As many of these factors are beyond the control of the Agency, or are dictated by the needs of projects, average cost is not a wholly reliable indicator of efficiency. Nonetheless, there are some positive figures to report from 1999.

201. One of the major changes affecting Programme savings was the reduction of standard (average) expert costs during the year. After analyzing the situation for the first few months of 1999, it was decided to reduce the standard monthly rate for experts[11] from $14,700 to $13,200. Toward the end of the year, this was further reduced to $12,000. This was mainly possible due to the use of more experts from within individual regions and to the very strict controls placed on travel costs. Given the size of the reduction in 1999, it is not anticipated that further drops are likely. Moreover, from the beginning of 2000, this "standard monthly rate" is being used for planning purposes only; individual projects are being charged only actual costs.

202. With regard to reduction of costs and increase of administrative expediency in the procurement of equipment, the use of standing offers for certain types of equipment was continued. However, the diminishing returns anticipated in last year's report began to show in 1999. A new approach, namely, the ordering of general laboratory equipment and supplies by catalogue, was introduced with the aim of streamlining the procurement of small value items, introducing enhanced clarity between requisitioning and ordering, and reducing the time span for ordering as well as the administrative burden of competition.

203. Finally, it should be noted that the increase in delivery in 1999 of virtually every component – 25% for expert assignments, 3% for fellows and scientific visitors, and 13% for training course participants – was done without a commensurate increase in staff to the implementation sections of the Agency's TC Department. It is unlikely similar increases in delivery will be possible in the future with current levels of staff.

[11] Including cost of airfares, hotels, per diems, and fees.

d) Implementation Rates

204. To round out the picture of global indicators, the Agency will continue to give a summary of implementation rates of the Programme.

IMPLEMENTATION SUMMARY I

ALL FUNDS

(as at 31 December 1999)

	Adjusted Programme ($)	% of Total Programme (%)	New Obligations ($)	Implementation Rate (%)	Earmarkings ($)
CURRENT YEAR					
AREA BREAKDOWN					
Africa	19,356,847	23.3%	14,907,828	77.0%	4,449,019
Latin America	14,928,446	18.0%	11,034,567	73.9%	3,893,879
East Asia and the Pacific	18,194,113	22.0%	13,408,206	73.7%	4,785,907
West Asia	8,569,892	10.3%	6,762,431	78.9%	1,807,461
Europe	16,426,665	19.8%	13,285,515	80.9%	3,141,150
Interregional	4,055,017	4.9%	2,161,348	53.3%	1,893,669
Global	1,437,879	1.7%	560,484	39.0%	877,395
Total	**82,968,859**	**100.00%**	**62,120,379**	**74.9%**	**20,848,480**
COMPONENT BREAKDOWN					
Experts	22,340,750	26.9%	15,371,761	68.8%	6,968,989
Equipment	30,580,643	36.8%	25,533,653	83.5%	5,046,990
Fellowships	14,601,994	17.6%	9,771,933	66.9%	4,830,061
Training Courses	9,932,699	12.0%	8,276,763	83.3%	1,655,936
Sub-contracts	3,630,187	4.4%	2,377,418	65.5%	1,252,769
Miscellaneous	1,882,586	2.3%	788,851	41.9%	1,093,735
Total	**82,968,859**	**100.0%**	**62,120,379**	**74.9%**	**20,848,480**
FUND BREAKDOWN					
TCF	76,701,588	92.4	58,171,808	75.8%	18,529,780
Extrabudgetary					
Member States	5,689,422	6.9%	3,478,775	61.1%	2,210,647
UNDP	577,849	0.7%	469,796	81.3%	108,053
Total	**82,968,859**	**100.0%**	**62,120,379**	**74.9%**	**20,848,480**
CURRENT AND FUTURE YEARS					
Current	82,968,859	54.8%	62,120,379	74.9%	20,848,480
Future	68,553,316	45.2%	762,736	1.1%	67,790,580
Grand Total	**151,522,175**	**100.0%**	**62,883,115**		**88,639,060**

IMPLEMENTATION SUMMARY II

ALL FUNDS BY AREA AND COUNTRY

(as at 31 December 1999)

Recipient	Adjusted Programme ($)	New Obligations ($)	Implementation Rate (%)	Earmarkings ($)
AFRICA				
Algeria	670,379	489,492	73.0%	180,887
Burkina Faso	50,000	0	0.0%	50,000
Cameroon	221,036	132,447	59.9%	88,589
Côte d'Ivoire	205,580	194,051	94.4%	11,529
Democratic Republic of the Congo	235,181	135,909	57.8%	99,272
Egypt	756,874	511,711	67.6%	245,163
Ethiopia	1,121,603	697,993	62.2%	423,610
Gabon	72,149	43,420	60.2%	28,729
Ghana	511,099	364,915	71.4%	146,184
Kenya	171,618	116,094	67.6%	55,524
Libyan Arab Jamahiriya	339,706	134,153	39.5%	205,553
Madagascar	122,413	112,619	92.0%	9,794
Mali	182,332	138,009	75.7%	44,323
Mauritius	219,166	117,552	53.6%	101,614
Morocco	793,129	659,707	83.2%	133,422
Namibia	154,991	23,767	15.3%	131,224
Niger	247,735	162,997	65.8%	84,738
Nigeria	780,143	589,149	75.5%	190,994
Regional Africa	9,192,616	7,600,880	82.7%	1,591,736
Senegal	271,339	185,200	68.3%	86,139
Sierra Leone	4,930	-9,409	N/A	14,339
South Africa	718,877	557,477	77.5%	161,400
Sudan	637,650	630,859	98.9%	6,791
Tunisia	519,020	393,587	75.8%	125,433
Uganda	239,682	172,778	72.1%	66,904
United Republic of Tanzania	576,160	542,946	94.2%	33,214
Zambia	132,240	66,071	50.0%	66,169
Zimbabwe	209,199	143,454	68.6%	65,745
AREA TOTAL	**19,356,847**	**14,907,828**	**77.0%**	**4,449,019**
LATIN AMERICA				
Argentina	724,204	573,464	79.2%	150,740
Bolivia	240,532	182,237	75.8%	58,295
Brazil	942,144	787,809	83.6%	154,335
Chile	588,485	520,530	88.5%	67,955
Colombia	564,347	417,947	74.1%	146,400
Costa Rica	377,680	210,171	55.6%	167,509
Cuba	890,637	810,317	91.0%	80,320

Recipient	Adjusted Programme ($)	New Obligations ($)	Implementation Rate (%)	Earmarkings ($)
Dominican Republic	398,586	317,515	79.7%	81,071
Ecuador	267,554	172,324	64.4%	95,230
El Salvador	127,000	79,185	62.4%	47,815
Guatemala	83,589	67,871	81.2%	15,718
Jamaica	420,799	220,786	52.5%	200,013
Mexico	500,145	360,837	72.1%	139,308
Nicaragua	161,346	140,380	87.0%	20,966
Panama	48,000	32,963	68.7%	15,037
Paraguay	226,923	135,288	59.6%	91,635
Peru	747,689	446,693	59.7%	300,996
Regional Latin America	7,025,936	5,209,631	74.1%	1,816,305
Uruguay	246,128	145,832	59.3%	100,296
Venezuela	346,722	202,787	58.5%	143,935
AREA TOTAL	**14,928,446**	**11,034,567**	**73.9%**	**3,893,879**
EAST ASIA AND THE PACIFIC				
Bangladesh	783,619	699,436	89.3%	84,183
China	1,784,688	1,188,507	66.6%	596,181
Indonesia	895,065	626,060	69.9%	269,005
Korea, Republic of	641,508	504,410	78.6%	137,098
Malaysia	602,474	416,245	69.1%	186,229
Marshall Islands	79,426	-355	N/A	79,781
Mongolia	669,207	480,988	71.9%	188,219
Myanmar	873,589	729,758	83.5%	143,831
Pakistan	1,336,525	940,905	70.4%	395,620
Philippines	665,093	560,371	84.3%	104,722
Regional East Asia and the Pacific	7,476,746	5,566,312	74.4%	1,910,434
Sri Lanka	632,744	467,821	73.9%	164,923
Thailand	588,130	377,341	64.2%	210,789
Viet Nam	1,165,299	850,407	73.0%	314,892
AREA TOTAL	**18,194,113**	**13,408,206**	**73.7%**	**4,785,907**
WEST ASIA				
Iran, Islamic Republic of	916,516	714,841	78.0%	201,675
Iraq	189,826	125,900	66.3%	63,926
Israel	639,533	545,071	85.2%	94,462
Jordan	319,274	251,492	78.8%	67,782
Kazakhstan	1,099,251	902,444	82.1%	196,807
Kuwait	11,990	0	0.0%	11,990
Lebanon	404,082	319,472	79.1%	84,610
Regional West Asia	3,123,594	2,512,535	80.4%	611,059
Saudi Arabia	147,915	103,123	69.7%	44,792
Syrian Arab Republic	706,606	564,621	79.9%	141,985

Recipient	Adjusted Programme ($)	New Obligations ($)	Implementation Rate (%)	Earmarkings ($)
Territories under the Jurisdiction of the Palestinian Authority	250,276	102,907	41.1%	147,369
United Arab Emirates	6,997	397	5.7%	6,600
Uzbekistan	472,563	437,871	92.7%	34,692
Yemen	281,469	181,757	64.6%	99,712
AREA TOTAL	**8,569,892**	**6,762,431**	**78.9%**	**1,807,461**
EUROPE				
Albania	280,667	248,862	88.7%	31,805
Armenia	638,685	536,547	84.0%	102,138
Belarus	527,913	270,600	51.3%	257,313
Bosnia and Herzegovina	192,098	177,350	92.3%	14,748
Bulgaria	1,020,486	778,772	76.3%	241,714
Croatia	313,200	259,036	82.7%	54,164
Cyprus	21,110	20,807	98.6%	303
Czech Republic	466,272	361,039	77.4%	105,233
Estonia	66,904	6,908	10.3%	59,996
Georgia	237,551	134,861	56.8%	102,690
Greece	290,051	182,396	62.9%	107,655
Hungary	242,686	180,330	74.3%	62,356
Latvia	218,358	112,472	51.5%	105,886
Lithuania	233,213	227,304	97.5%	5,909
Malta	48,374	47,249	97.7%	1,125
Poland	1,469,300	1,186,510	80.8%	282,790
Portugal	115,514	71,230	61.7%	44,284
Regional Europe	6,699,765	5,968,619	89.1%	731,146
Republic of Moldova	92,140	49,837	54.1%	42,303
Romania	553,122	320,140	57.9%	232,982
Russian Federation	104,155	81,818	78.6%	22,337
Slovakia	335,771	210,493	62.7%	125,278
Slovenia	191,086	140,969	73.8%	50,117
The Former Yugoslav Republic of Macedonia	372,613	278,895	74.8%	93,718
Turkey	384,058	294,356	76.6%	89,702
Ukraine	1,311,573	1,138,115	86.8%	173,458
AREA TOTAL	**16,426,665**	**13,285,515**	**80.9%**	**3,141,150**
Global	1,437,879	560,484	39.0%	877,395
Interregional	4,055,017	2,161,348	53.3%	1,893,669
OVERALL TOTAL	**82,968,859**	**62,120,379**	**74.9%**	**20,848,480**

PART III: RESOURCES AND DELIVERY

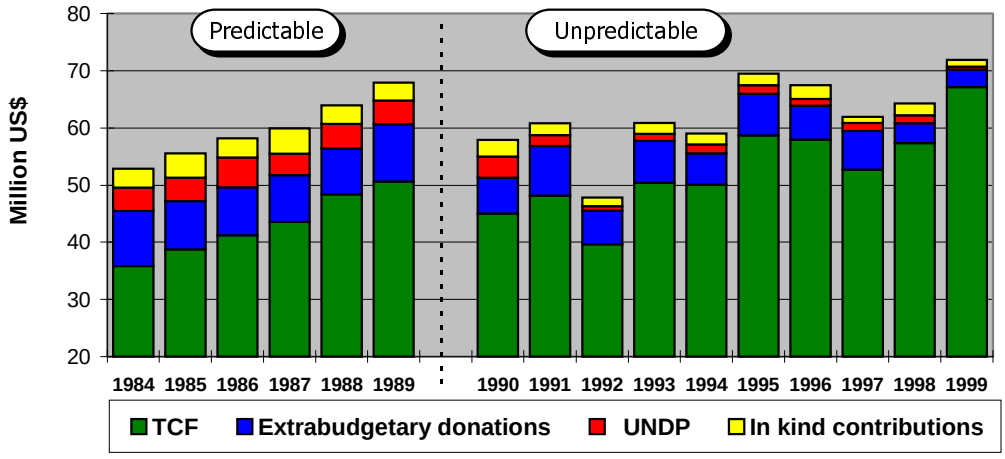
1. Overview

New resources	*$71.9 million*
Adjusted programme	*$83.0 million*
New obligations (current year)	*$62.1 million*
Implementation rate	*74.9%*
Disbursements	*$64.0 million*

205. New resources for 1999 totalled $71,906,000 — a significant increase of more than 14% over the amount provided in 1998. Following the trend of recent years, the Technical Co-operation Fund (TCF) continues to increase its domination of the new funds and now contributes 93.4%. The large increase in the TCF was due to the contribution of more than $9.3 million from one new major donor.

206. As has been done in the last few years, a comparison of the resources obtained should be adjusted for inflation. The consumer price inflation for the OECD area of 2% for 1998 was taken and the respective adjustments made. Even adjusted for inflation, the resources for 1999 were the highest ever recorded. The graph shown below reflects these changes. The graph also shows vividly the predictability of resources earlier (up to 1989) and the unpredictabilty of resources during the 1990s. This up and down trend will probably continue as preliminary discussions with Member States show that expected pledges for 2000 will be less than those realized for 1999.

IAEA TC RESOURCES ADJUSTED FOR INFLATION 1984–1999*



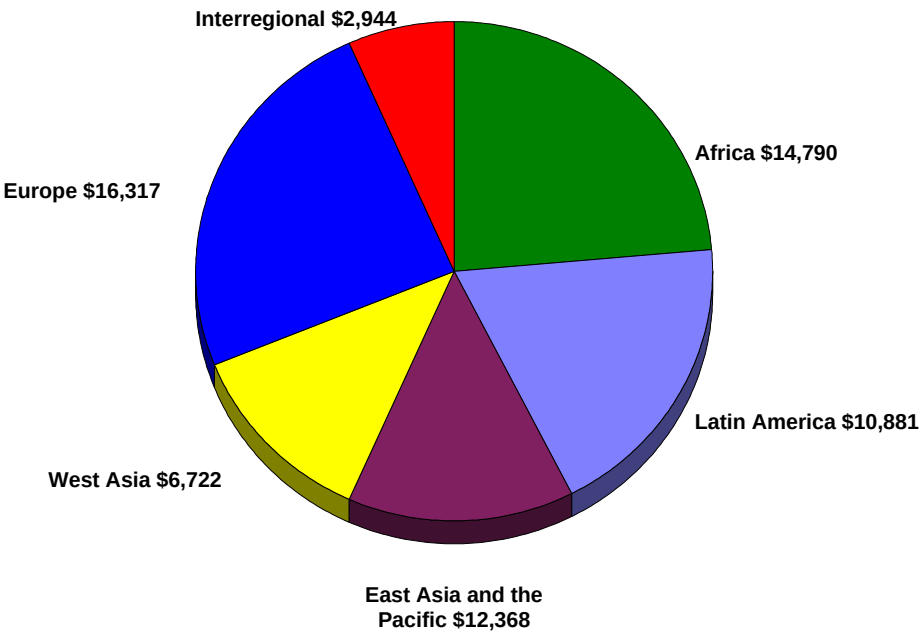
* All figures prior to 1999 adjusted to 1999 dollars.

207. The total adjusted programme at year end was $82,969,000 or more than 5% higher than that recorded at the end of 1998. The implementation rate was 74.9%, only slightly

lower than that attained in the previous year, a fully satisfactory outcome given the larger total programme. It was also achieved at the same time the IAEA was closing down its old accounting system, the Financial Information Control System, and starting up the new Agency Financial Information Management System. This switchover put additional strain on all staff involved with financial transactions as these staff were occupied with training on the new system as well as finalizing operations in the old. It should also be noted that closing times for new obligations and other transactions were earlier than in previous years. Total new obligations including those against future years' programmes rose to $62,883,000, an increase of about 2%.

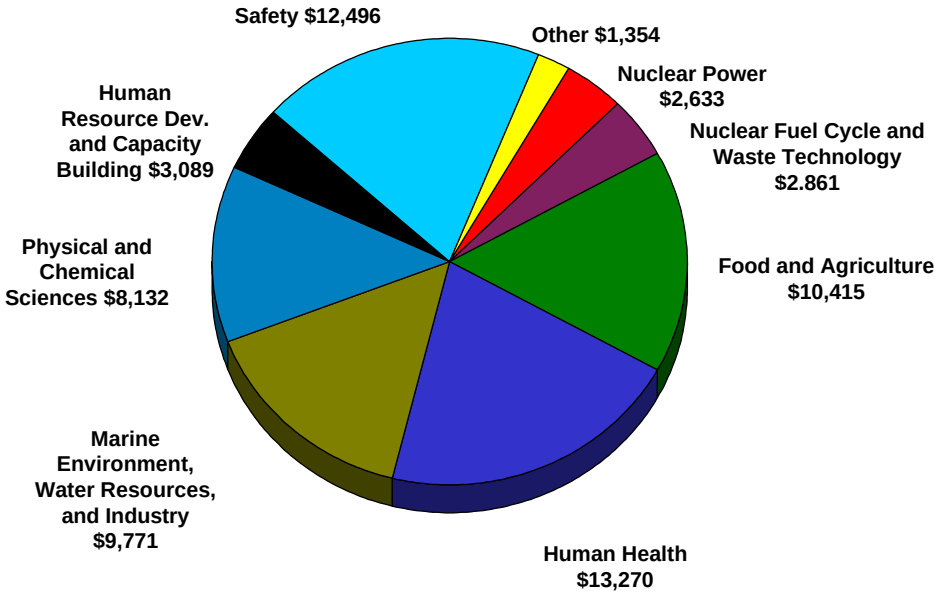
208. Disbursements, which measure the actual delivery to Member States, were $64,022,000 or about one-half million dollars less than the previous year, when an all-time record was set. As the pie chart below shows, the greatest portion went to Europe with 25.5%, followed by Africa with 23.1%, East Asia and the Pacific with 19.3%, Latin America with 17.0% and West Asia with 10.5%. The remaining 4.6% went to the interregional programme, which also includes the miscellaneous costs of $438,000. The big change was in East Asia and the Pacific which increased its share of the total programme by more than 5% after declines in the previous two years.

DISBURSEMENT BY REGION: 1999
(in thousands of dollars)



209. Looking at the distribution of assistance by Agency Programme shows small shifts from recent rankings. **Human Health** took the top spot with 21%, followed closely by **Nuclear Safety** with 20%. **Food and Agriculture** came in at 16%, **Marine Environment, Water Resources, and Industry** was 15%, and **Physical and Chemical Sciences** 13%. **Nuclear Fuel Cycle and Waste Technology** and **Nuclear Power** each had 4%, whereas **Human Resource Development and Capacity Building** made up 5%, and five minor themes comprised around 2%.

DISBURSEMENT BY PROGRAMME: 1999
(in thousands of dollars)



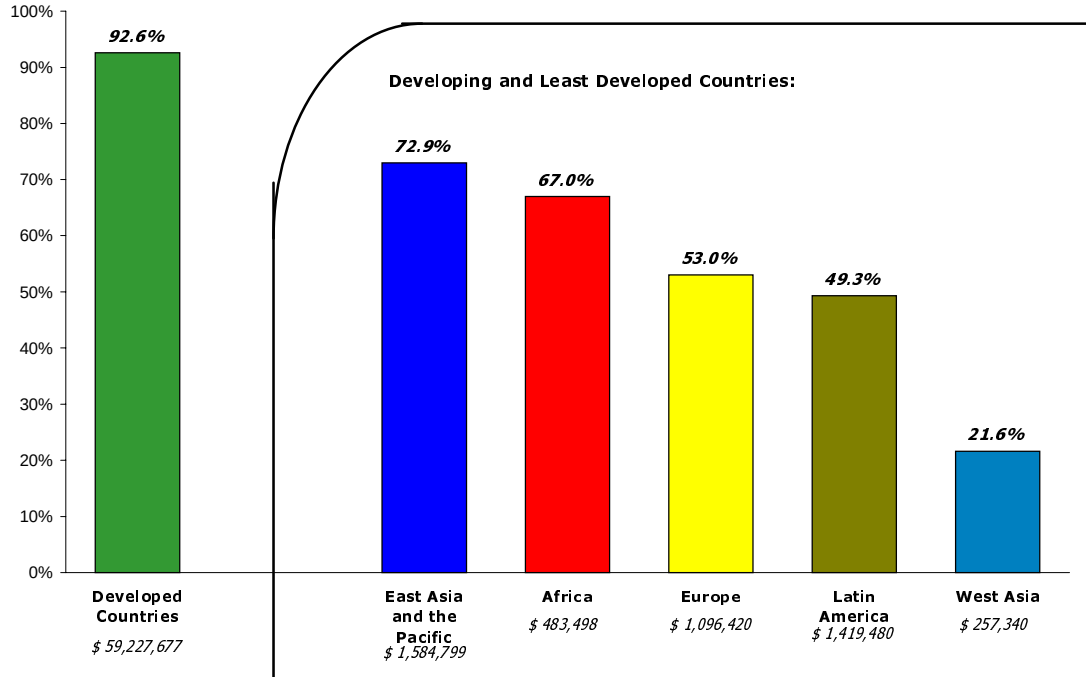
2. Technical Co-operation Fund

210. Pledges to the TCF rose sharply in 1999 and equalled 87.8% of the target. This was mainly because of the impressive contribution of one major donor which had been absent in recent years. Along with other income, total resources came to 92.2% of the target in 1999. This was the only year in which the percentage was over 90% during the decade.

211. The number of countries pledging in 1999 was 73, equal to the number the year before. Five countries pledged more than their share: Italy (240%), Liechtenstein (205%), the Holy See (137%), Egypt (104%) and Guatemala (101%). The Member States pledging 100% rose to 43 and included countries not on the list last year, namely: Armenia, Colombia, Czech Republic, Islamic Republic of Iran, Namibia, Thailand, Zambia, and Zimbabwe. Unfortunately, a number of countries which pledged in 1998 did not do so in 1999.

212. The total target in 1999 can be broken down into developing and developed countries' shares. For the developed countries, the target was $63,979,000 (or about 88% of the target of $73 million) and these Member States pledged **92.6%** of that amount. For the developing countries, the target was $9,032,000 (or about 12%) and these Member States pledged **53.6%** of their share of the target. The graph below shows the developed Member States as a group, and the developing Member States broken down by the Areas used for management of the TC programme. The percentages for the developing Member States ranged from 72.9% for East Asia and the Pacific to 21.6% for West Asia.

1999 TCF PLEDGING BY PERCENT
(As of 31 December 1999)



213. With the growing membership of the IAEA, the Agency hopes to boost the number of contributors appreciably in the next three years. Special efforts will be launched at the 2000 General Conference to encourage more states to pledge and pay their target.

214. The 20 largest contributors to the TCF are identified in the following table. With the extraordinary pledge and payment from Italy, the top 20 rankings have changed compared with last year. It is noteworthy that the top ten countries provided 88% of the payments made towards the 1999 TCF, and as the table shows, the top twenty gave 96.1%.

TCF PAYMENTS FOR 1999
(as of 31 December 1999)

Member State	Payments ($)	Percentage of total payments
United States of America	18,026,500	28.6%
Japan	12,978,670	20.6%
Italy	9,361,738	14.8%
France	4,687,330	7.4%
United Kingdom	3,663,870	5.8%
Germany	2,370,000	3.8%
Canada	1,549,669	2.5%
Netherlands	1,168,730	1.9%
Switzerland	876,730	1.4%
Australia	831,039	1.3%
Sweden	793,510	1.3%
Mexico	678,900	1.1%
Austria	674,520	1.1%
China	650,430	1.0%
Denmark	495,670	0.8%
Norway	436,540	0.7%
Finland	388,360	0.6%
Spain	367,661	0.6%
Turkey	317,550	0.5%
Korea, Republic of	287,159	0.5%
Sub-total	60,604,576	96.1%
Others	2,469,402	3.9%
Total	63,073,978	100.0%

215. The year 1999 was the start of a new biennial cycle, and it consequently began with a large, new core programme funded by the TCF. With this new programme and the carryover of project funds not implemented from prior years, the year commenced with 11.4% overprogramming. This was eliminated during the year and, as the table below shows, by the year end the TC Programme was underprogrammed by $636,000.

RESOURCES AVAILABLE AND PROGRAMME COMMITMENTS BY YEAR END ($)

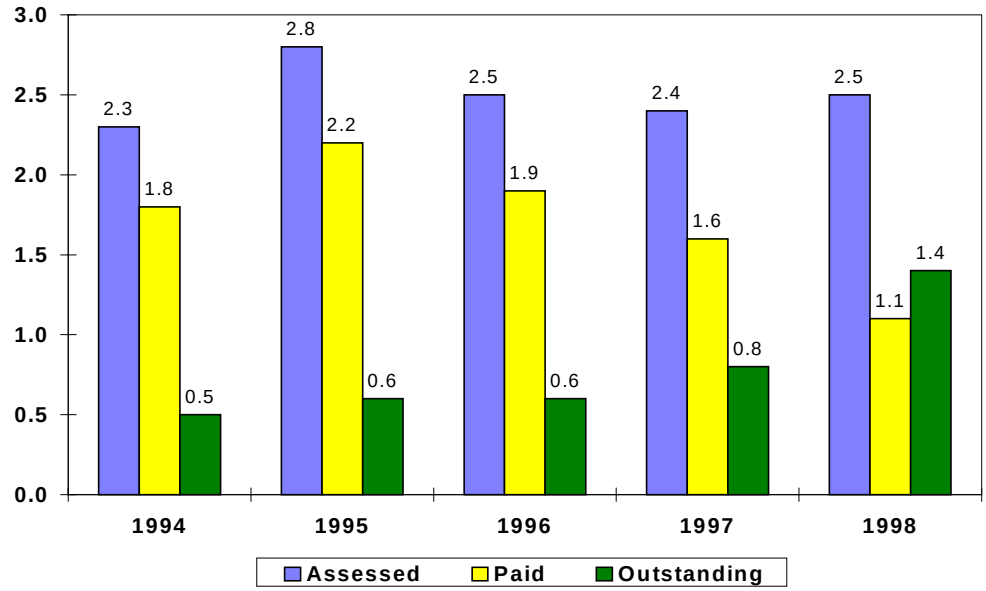
Year	Available financial resources [1]	Programme commitments [2]	Underprogramming (overprogramming)
1990	31,211,000	29,199,000	2,012,000
1991	34,292,000	32,966,000	1,326,000
1992	29,069,000	28,490,000	579,000
1993	36,187,000	30,751,000	5,436,000
1994	36,369,000	35,988,000	381,000
1995	35,512,000	34,552,000	960,000
1996	39,099,000	38,566,000	533,000
1997	36,868,000	41,997,000	(5,129,000)
1998	37,467,000	41,894,000	(4,427,000)
1999	**46,800,000**	**46,164,000**	**636,000**

[1] Total resources for the year less disbursements.

[2] Total of current-year unliquidated obligations and current-year earmarkings.

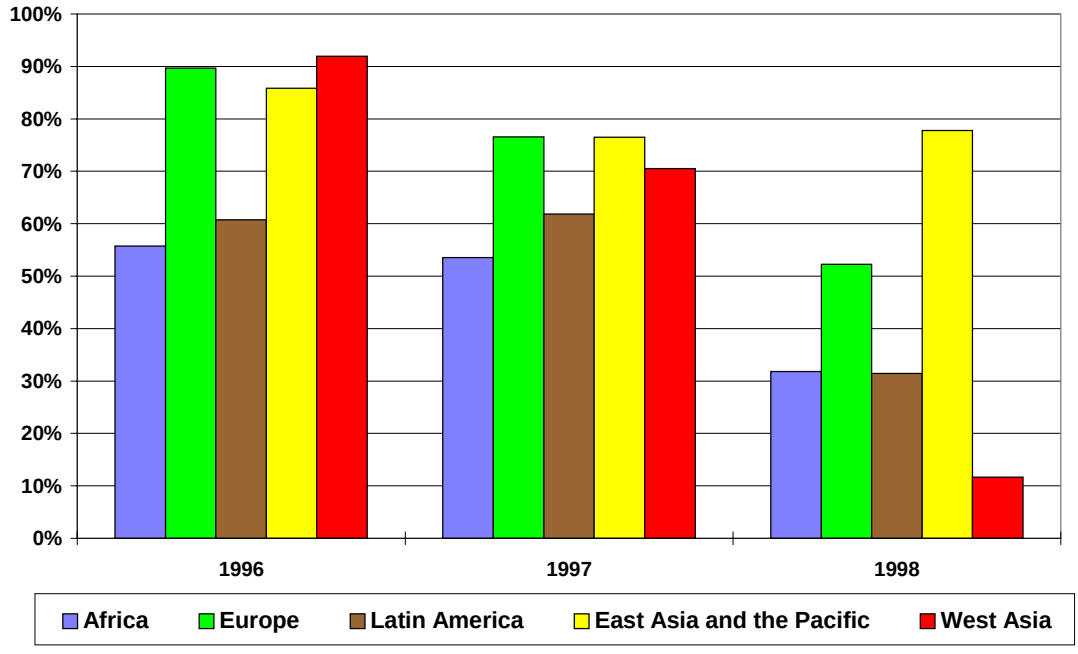
216. A second major source of income for the TCF is the Assessed Programme Costs (APCs), which is levied at 8% of assistance received. It is billed for both TCF funded activities as well as those from extrabudgetary funds. Member States are notified in the Spring after the year in question. The amount due for 1998 totalled $2,477,000 of which $1,053,000 was paid by year end. In addition, $1,122,000 was paid by recipient Member States against amounts owed from previous years. This was a disappointment for the Secretariat, as the total outstanding is once again increasing and now totals over $7,457,000. A breakdown of the amounts outstanding for the last five years is given below.

ASSESSED PROGRAMME COSTS FOR THE TCF: 1994–1998
(in millions of dollars)



217. Payments of APCs by Area of recipient country shows the negative trends in another fashion. Whereas three regions last year had reached over 80% of payments for the preceding year due (1996), in 1999 not a single region attained that goal (see 1997 in the bar chart below). Realizing that the payment of APCs is not voluntary and that it is used in applying the concept of "due account", it is hoped that the trend of falling APC payments will be reversed in 2000. The good news is that a number of countries are paying back earlier arrears, significantly reducing or eliminating all outstanding amounts, and others are starting to pay for the first time.

ASSESSED PROGRAMME COSTS BY AREA: 1996–1998



218. Interest income was $1,580,000 in 1999, a slight decrease from that experienced a year earlier. Unfortunately, the loss on exchange and other miscellaneous adjustments accounted for a decrease in resources of $519,000 so that total other income was $1,061,000, nearly identical to last year's amount ($1,012,000).

219. The current year unobligated balance rose to $19,166,000 at the end of 1999 and was 70% higher than that recorded a year earlier. This is to a large degree the result of later pledging by some Member States. In earlier years, the major pledging was done at the General Conference of the previous year and the Secretariat, using pledges for resource planning, was able to better predict and manage the TCF. Year after year, the pledging by major donors has been made at later dates. For the year in review, it was not until December 1999 (sixteen months after the General Conference at which the pledges were solicited) that over $12.4 million was pledged and paid. This represented almost 20% of all pledges for the year.

220. Taking into consideration future year obligations of $763,000, the unobligated balance, which is shown in the Agency's accounts, was $18,403,000. For the calculation of the usable unobligated balance, the unpaid pledges as well as the currencies which cannot be used (or can be used only very slowly) must be deducted. The usable unobligated balance equalled $11,696,000 at the end of 1999. Efforts will be made in 2000 to increase implementation and reduce this usable unobligated balance considerably by year end, although it should be noted that this amount represents only about 10 weeks of obligations against the fund at the rate maintained in 1999.

CALCULATION OF THE USABLE UNOBLIGATED BALANCE ($)

	1995	**1996**	**1997**	**1998**	**1999**
Unobligated balance current year	16,923,000	16,006,000	10,915,000	11,269,000	**19,166,000**
Obligated against future-year project budgets	(3,150,000)	(478,000)	(1,500,000)	(1,108,000)	**(763,000)**
Unobligated balance all years	13,773,000	15,528,000	9,415,000	10,161,000	**18,403,000**
Pledges not yet paid	(2,467,000)	(3,827,000)	(3,442,000)	(2,400,000)	**(2,877,000)**
Non-convertible currencies which cannot be used	(1,578,000)	(1,707,000)	(1,770,000)	(1,706,000)	**(1,495,000)**
Currencies which are difficult to convert and can only be used slowly	(3,564,000)	(3,139,000)	(3,208,000)	(2,611,000)	**(2,335,000)**
Resources which can be used for TC Programme obligations	6,164,000	6,855,000	995,000	3,444,000	**11,696,000**

221. As noted earlier, the prospects for attaining as high a level of contributions in 2000 as was achieved in 1999 are not good. Nonetheless, the biennium 1999-2000 will have considerably more funding than originally anticipated. Efforts will continue to be made to increase the number of Member States paying voluntary contributions, and the developing Member States will be reminded of their liability to pay the APCs. With the support of the partners in the Technical Co-operation Programme, it should be possible to launch a new cycle starting in 2001 based on an expanded financial base.

3. Extrabudgetary Funds

a) Funds from Member States

222. New extrabudgetary resources from Member States, including Government cost sharing of $0.6 million, amounted in 1999 to $3.1 million, a level similar to that in 1998. For the second consecutive year, extrabudgetary funds remained significantly lower than the level recorded in 1997 ($6.5 million). This category of funds represented 4.3% of all new TC resources and 6.8% of the TC-adjusted programme. The implementation rate reached 61%.

223. Extrabudgetary resources of $3.2 million made available by nine donors[12] and TCF savings of $2.7 million were used to fund footnote-a/ projects and project components totalling $5.9 million. This represented 21% of the total 1999 footnote-a/ programme of $27.9 million. Table D.4 in the Supplement to this report lists both the recipients and the donors.

224. The distribution by major programmes was as follows: Nuclear applications (71%); Nuclear, radiation, and waste safety (13%); Nuclear power and fuel cycle (12%); and others (4%).

225. In addition, smaller extrabudgetary resources from Chile, Australia, France, and Spain were used to extend five core-funded projects.

226. The unobligated balance for this category of resource was $4.9 million. Over $2.1 million of this balance represent funds without project allocation instructions from the donor or were received late during the year. These funds are not programmed but temporarily put into a reserve until instructions are received. The Secretariat was therefore not in a position to deliver goods and services against these funds.

227. The Spanish Agency for International Co-operation is providing funds totalling $1.2 million for the project *UKR/4/005* in Ukraine entitled *In-service Inspection of WWER-1000 Steam Generators*. The first installment of $411,000 was received this year.

228. The OPEC Fund for International Development continued to support programme activities with two contributions of $150,000 over three years, one for project *URT/5/021–Livestock Development in Zanzibar after Tsetse Eradication* and the other for the AFRA project *RAF/6/014–Improvement of Clinical Radiotherapy (AFRA II-12)*.

229. Negotiations with the United States Agency for International Development are underway and progressing for the provision of a $2.5 million grant over three years benefiting Israel, Jordan, and the Territories Under the Jurisdiction of the Palestinian Authority. Funds expected in 2000 will build upon and expand regional efforts to control the Mediterranean fruit fly (Medfly) using the SIT.

230. During 1999, efforts to secure additional extrabudgetary funds such as the OPEC Fund contribution were constrained by the existing rules regarding the acceptance of voluntary contributions of money to the Agency (INFCIRC/370, Part II, 2b). The Secretariat intends to review these rules and propose changes that will facilitate partnerships with non-traditional donors. In order to strengthen extrabudgetary resources, Member States are also encouraged to play a more active role in establishing links between TC projects and national development programmes as a means of both maximizing the impact of these programmes and demonstrating the contribution of nuclear science and technology.

[12] Australia, Czech Republic, France, Japan, Kazakhstan, OPEC FUND, Spain, United Kingdom, and United States of America.

b) UNDP

231. The financial crisis experienced by UNDP in recent years continued in 1999. Core resources for the UNDP programme have declined from $1.2 billion in 1992 to about $700 million in 1999, leading to funding cuts to all programming, including projects managed by the IAEA. The total resources from the UNDP for IAEA projects in 1999 was $470,000, an all-time low. Cuts also forced a 20% reduction in the UNDP portion of the budget for the joint UNDP/IAEA/RCA project on *Better Management of Environment and Industrial Growth*.

232. The UNDP administrative budget was also cut by $17 million for 2000. This has led to increasing requests from UNDP offices in the field for payment for services once provided for free.

233. Although expectations that the UNDP will act as a funding partner with the IAEA are no longer valid, it can still be an important partner in the field. The UNDP Executive Board has recently approved a business plan that calls for a fundamental transformation of UNDP from funding development activities into an upstream agency for policy and institutional support. In this new role, it can assist the Agency's goals by improving field co-ordination in priority themes such as water resources and pest management.

4. In-Kind Contributions

234. In-kind assistance is traditionally recorded for the following: the fully or partially cost-free provision of experts' and training course lecturer services in countries other than their own; the sponsorship of foreign training course participants; equipment donated to and actually received by another Member State; and for fellowship training using Type II resources.

235. For 1999, the total value amounted to $1.2 million and was composed of 295 assignments of experts and training course lecturers provided partially or fully cost-free by 49 Member States and eight international organizations; the sponsorship of travel and stipend for four training course participants by one Member State; the donation of equipment items by two Member States; and 109 months of Type II resources for fellowship training in four countries. The decrease in value over the previous year is due to the fact that 1998 had seen equipment donations of a substantively higher amount, and that Type II resources for fellowship training were not available to the same extent in 1999.

236. Details on all in-kind contributions are shown in Table B.3 (part A) in the Supplement to this report.

237. In addition to the above recorded value, a large number of Member States have contributed to the TC Programme by making their facilities, staff, and other resources available for hosting training courses, meetings/workshops, and Type I resource for fellows at reasonable or no cost to the Agency. The countries who did so are too numerous to list, including both recipient and donor countries in all five geographical regions. Their contribution is another example of the excellent partnership in the TC Programme.

ABBREVIATIONS

AFRA	African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology
APC	Assessed Programme Costs
ARCAL	Regional Co-operative Arrangements for the Promotion of Nuclear Science and Technology in Latin America
CBPP	Contagious Bovine Pleuropneumonia
CHASNUPP	Chashma Nuclear Power Plant (Pakistan)
CPF	Country Programme Framework
ELISA	Enzyme-Linked Immunosorbent Assay
ESTRO	European Society of Therapeutic Radiology and Oncology
FAO	Food and Agriculture Organization for the United Nations
FMD	Foot-and-Mouth Disease
FORATOM	European Atomic Forum
HIV	Human Immunodeficiency Virus
IAEA	International Atomic Energy Agency
OECD-NEA	Organization for Economic Co-operation and Development-Nuclear Energy Agency
PARC	Pan African Rinderpest Campaign
PCR	Polymeric Chain Reaction
PET	Positron Emission Tomography
PIXE	Proton-Induced X-ray Emission
RCA	Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (for Asia and the Pacific)
RIA	Radio-Immunoassay
RRC	Regional Resource Centre
SIT	Sterile Insect Technique
SNSA	Slovenian Nuclear Safety Administration

SPECT	Single Photon Emission Computed Tomography
TB	Tuberculosis
TC	Department of Technical Co-operation
TCF	Technical Co-operation Fund
UNDP	United Nations Development Programme
Y2K	Year 2000

GLOSSARY

Adjusted programme - the total value of all technical co-operation activities approved and funded for a given calendar year plus all approved assistance brought forward from previous years but not yet implemented. It is against this figure - which is not identical with resources actually available - that the implementation rate is measured.

Assessed programme costs - the cost charged to Member States receiving technical assistance, at present amounting to 8% of the assistance actually provided from both the TCF and extrabudgetary contributions (but excluding UNDP-financed assistance).

Available financial resources - total funds available less disbursements.

Country Programme Framework - a descriptive planning process that provides a concise frame of reference for future technical co-operation with Member States.

Disbursements - actual cash outlays for goods provided and services rendered.

Dynamic programming - the process whereby funds released through rephasing and reprogramming are used to meet requirements of developing Member States through the implementation of approved projects for which funds would not otherwise be available; it serves to keep project planning realistic.

Earmarkings - amounts allotted for funding approved assistance awaiting implementation.

Extrabudgetary funds - funds provided by Member States for financing specific projects or activities. They also include funds received from Member States to finance assistance for themselves. These funds are separate from voluntary contributions to the Technical Assistance and Co-operation Fund.

Footnote-a/ projects - projects approved by the Board for which no immediate funds are available.

Global - under the area breakdown in the implementation summary, this represents those miscellaneous costs which cannot be attributed to individual projects or for which detailed accounting would add significantly to overhead costs. Such expenses include cost of radiation protection services, insurance premiums, UNDP field office charges, reimbursement of support services, mission cancellation costs, publication charges, etc.

Government Cost Sharing - funds provided by Member States to augment projects in their own country.

Implementation - the volume of funds obligated (new obligations) in a given period.

Implementation rate - a ratio obtained by dividing implementation by the adjusted programme (expressed as a percentage), reflecting the financial rate of implementation.

In-kind - the value assigned to non-cash contributions.

Model Projects - projects responding to a real need with significant economic or social impact for the end user. These projects feature a competitive nuclear technique and require a local environment conducive to project success and sustainability.

New obligations - the sum of disbursements during the year plus year-end unliquidated obligations minus unliquidated obligations carried over from the previous year.

New resources - the total value of not previously reported funds received in a calendar year.

Overprogramming - the establishment of annual programming levels which exceed available resources.

Programme year - the year for which an activity is planned.

Programme commitments - total unliquidated obligations for the current year plus earmarkings.

Programme Reserve - an amount set aside by the Board each year for financing assistance of an urgent nature requested after the Board has approved the Regular Programme for the year in question.

Rephasing - a temporary release of funds approved for inputs which were planned for a given programme year and which cannot be implemented as scheduled. Rephasing does not change total inputs approved for a project; rather, it serves to keep project planning realistic.

Technical Co-operation Fund - at present, the main fund for the financing of the Agency's technical co-operation activities; it is supported by voluntary contributions from Member States, 8% assessed programme costs paid by Member States over assistance received and miscellaneous income.

Thematic Plan - a prescriptive planning process that focuses on the technology-problem link where TC projects have successfully demonstrated a significant contribution to national socio-economic development, or where solid evidence exists to predict such a contribution.

Type II fellowship - fellowships provided by Member States at little or no cost to the Agency.

UNDP Programme - projects executed or implemented by the Agency on behalf of UNDP and its associated funds.

Unliquidated obligations - obligations incurred for which no cash outlays have yet been made.

Unobligated balance - total funds available less disbursements and less unliquidated obligations against the current year.

Workplan - an outline of the steps to be followed in the execution of a TC project.