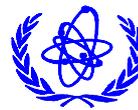




REPUBLIC OF NAMIBIA



**INTERNATIONAL ATOMIC
ENERGY AGENCY**

COUNTRY

PROGRAMME FRAMEWORK

2007 - 2012

On behalf of the Government:

On behalf of the International Atomic Energy
Agency:

.....
Signature

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Ambassador
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PREAMBLE

In accordance with the new IAEA Country Programme Framework (CPF) guidelines, the CPF is a four to six years planning document, agreed between Namibia and the IAEA, which defines the role that nuclear technology can play in the overall national development plan. In its preparation of the CPF, the Ministry of Health and Social Services engaged various counterparts to:

- identify potential stakeholders or coordinating agents. Currently these include the Ministries of Fisheries and Marine Resources; Mines and Energy; Agriculture, Water and Forestry; Health and Social Services and the University of Namibia
- identify national development priorities in line with Vision 2030 and the Developmental Plans (i.e. NDPIII)
- assess the role of nuclear technology in addressing the identified priorities.
- define the future programmes to be supported in the IAEA Technical Cooperation cycle, based on the priority areas.

Broad based consultations on the above with stakeholders and the IAEA culminated in the formulation of the CPF and the signing thereafter by the representatives of the Government and the IAEA

In the framework of the CPF, an opportunity is identified and if it is deemed relevant and sustainable, a project is proposed for support through the technical cooperation (TC) programme.

The Government's and the Agency's endorsement of the CPF Document, while not being legally binding, demonstrates a common commitment and shared responsibility to implement a sustainable Technical Cooperation Programme subject to IAEA Board approval.

The Ministry of Health and Social Services as the National Liaison Office for all IAEA matters in Namibia is pleased to take the leading role in advancing the role of nuclear technology by engaging counterparts to realise the objectives of the CPF in the broader context of Namibia's national developmental plans.

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Mr K Kahuure
Permanent Secretary

EXECUTIVE SUMMARY

The Country Programme Framework (CPF) described in this document constitutes the frame of reference for the medium-term technical cooperation between the IAEA and Namibia. It was developed through intensive discussions with competent national authorities. In the mutually agreed strategy for matching nuclear technology to national priorities for sustainable development, the focus of cooperation will be on aspects of agricultural production, human health, water resources development, human resource development, industrial applications, energy planning and the further strengthening of the national radiation protection infrastructure.

Consistent with relevant recommendations of the Agency's Board of Governors, the Strategy for Technical Cooperation and the objectives of Country Programme Frameworks, the future programmes are organised into three categories, namely, (a) the near-term core programme, (b) the medium-term core programme, and (c) general support activities.

An underlying theme for this CPF will be the strong focus on human resource development. This will be supported by a new human resource strategy approach to support the Government's National Development Plan. In this connection, subsequent programmes of assistance from the Agency will emphasis the need for training in more innovative ways beginning where necessary from the grassroots level at undergraduate and possibly at secondary level. The main educational institution to drive this in Namibia will be the University of Namibia, supported by a national Steering Committee and the IAEA.

The Near Term Core Programme relating to food and agriculture will include support to animal disease control, with special focus on Foot and Mouth Disease and Contagious Bovine Pleuropneumonia diagnosis and the close monitoring of drug residues in livestock products. As a major exporter of livestock products to lucrative markets in South Africa and Europe, it is essential that the high quality control of livestock products is maintained in Namibia. Furthermore, activities will be pursued to tackle livestock diseases in the northern part of Namibia with a view to including livestock producers from the north into the local market and eventually the foreign market – the potential for the improvement of local socio-economic conditions will be huge if success is followed by properly planned support programmes. It is also essential that Namibia employ integrated soil-water-plant nutrient techniques to protect the environment and sustain crop production to achieve food security goals for those citizens living in marginalised areas in the north of the country. Water conservation, water-saving irrigation technologies and water use efficiency will need to be assessed to provide higher quality water as well as quantity for the population to help address the increasing concern on water scarcity and sustainable water use in agriculture.

In human health, the focus will continue on the provision and expansion of services to address the spread of cancer. With regards to nuclear medicine diagnosis, the emphasis will be on the establishment of a new nuclear medicine facility in northern Namibia, where about 800,000 people reside. The Government is prepared to cost-share the provision of a SPECT Gamma Camera to ensure that the new centre is well equipped with the latest technology to provide high quality nuclear medicine services. To support the improvement and expansion of cancer diagnosis, an upgrading of both the skills and existing equipment in radiation therapy will be needed. Again, there will be a need for government cost-sharing with regards to long-term training and the purchase of new equipment.

To support Namibia's quest for independence in the generation of energy, it will be necessary to assist the relevant ministries in preparing an energy study, which will investigate realistic possibilities for energy provision. In addition, to support Namibia's expected status as the third largest producer of uranium, assistance will be given to the national authorities to develop a uranium mining policy.

In the area of radiation safety, it is expected that during the course of the CPF, two new bodies, the Atomic Energy Board and the National Radiation Protection Authority will be formed. The top priority for IAEA support, will be the need to help the national authorities accelerate the process for enhancing the national radiation protection infrastructure in compliance with the International Basic Standards on Safety (BSS) for Protection against Ionizing Radiation and for the Safety of Radiation Sources, with special emphasis in the short term on occupational exposure control (Milestone 2) and medical exposure control (Milestones 3).

The Medium Term Core Programme will place greater emphasis on food and agriculture. Enhanced IAEA assistance is expected to make a significant contribution to the on-going national programme aimed at maximizing crop productivity through crop improvement, food quality and water utilization initiatives. In animal health and production, IAEA support will be needed to help Namibia implement quality control systems in the north of the country with closer attention paid to the lifting of the cordon fence and giving access to the export market for all livestock producers.

In human health, the use of stable isotope techniques will be used to conduct studies on the effectiveness of national micronutrient fortification programmes, assessing food composition and comparing growth and body composition of children born of HIV negative and positive mothers. It is envisaged that additional support will be also needed in addressing skill shortages in both the nuclear medicine and radiotherapy fields.

Human resource development will continue to be given greater priority in the context of the cooperation between the Government and the Agency throughout the medium-term programme. The joint efforts would essentially be for supporting institutions that have been subject to a considerable loss of personnel but where the application of nuclear technology is essential for social and economic development. The nuclear science community at Government, academic and technical and educational institutions would be the primary beneficiaries with the introduction of a nuclear knowledge management programme employing the use of the Agency's own International Nuclear Information System (INIS) as well as the launch of new curricula at UNAM.

The establishment of a viable national radiation protection infrastructure is a key factor for the sustainable promotion of peaceful applications of nuclear science and technology in Namibia. The Agency's support will continue in assisting the Government in establishing the minimum elements of the national infrastructure as well as providing, where appropriate, post-graduate qualification in radiation protection.

Further to the core programme and notwithstanding the fact that the Agency's support is not meant to substitute Government's efforts and responsibility for sustaining nuclear technology-related projects in the country, the assistance of the Agency is at times essential for the continuation of on-going activities, including those initiated through previous TC projects,

which might otherwise lapse or fail. The bulk of the required support activities could be undertaken within the framework of the AFRA programme and other regional technical cooperation projects. It is envisaged that IAEA support will assist the Government in playing a more active role in the participation of relevant regional projects.

1 INTRODUCTION

The Republic of Namibia is party to the *Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA (RSA)* and to the *African Regional Cooperation Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA)*. The two Agreements define the guiding principles and general operating rules that govern the provision of technical assistance to Namibia by the IAEA. It is by virtue of these Agreements that Namibia is participating in and benefiting from the programmes of the IAEA.

The Country Programme Framework (CPF) provides the framework for the provision of technical assistance under these Agreements. The objective of the CPF is to establish a mutual understanding between the Government and the IAEA on future programming, focusing on safety and security and developmental issues that will contribute towards achieving the objectives identified in the National Developmental Plans as well as the Millennium Development Goals.

The current CPF will build on the foundation laid by the *2001-2006 CPF*, with specific focus on livestock disease control, water resources management, crop improvement, radiation for therapeutic and diagnostic purposes, national standards development, environmental studies, energy planning as well as safety and security. The overall aim is to create awareness and enhance the contribution of peaceful applications of nuclear techniques in Namibia while at the same time creating and sustaining an environment for the safe application of these technologies.

In that context the CPF will continue to be the vehicle and source of ideas that will culminate in viable and sustainable cooperative projects in line with the priorities that are identified below. It should thus serve as a reference for use in preparing programme requests to the IAEA, and in appraising those requests and allocating resources.

The CPF is intended to be a concise working document that should be revised if and when critical circumstances change rather than a rigid document locking either party into a plan which may no longer serve mutual needs.

The primary audiences for the CPF are those institutions and partners who are directly involved in the TC Programme and may also serve as a useful source of information for higher levels of management.

2 NATIONAL DEVELOPMENT PRIORITIES AND ACTIVITIES RELEVANT TO THE IAEA TECHNICAL COOPERATION PROGRAMME

2.1 Institutional Framework

The Ministry of Health and Social Services (MHSS) has oversight in the applications of nuclear science and technology in cooperation with the International Atomic Energy Agency (IAEA). The Ministry oversees both the promotional and regulatory aspects of nuclear technology applications in Namibia. By implication the MHSS is the national focal point for nuclear/atomic energy and all matters in the sphere of the IAEA's mandate. The Permanent Secretary of the Ministry of Health and Social Services acts as National Liaison Officer for all matters pertaining to nuclear/atomic energy. The Ministry consults on a regular basis with stakeholders and serves to facilitate the implementation of technical cooperation projects as defined in the CPF.

2.2 National Policies, Strategies and Programmes

Vision 2030 was formulated in an attempt to establish a long-term planning system for Namibia and with the aim to foster a sense of direction, discovery and destiny among the Namibian Nation. The focus is on providing a systematic process for developing and implementing consistent long-term development strategies, based on active participation of all stakeholders at each stage of the process.

The Vision is seen to provide valuable policy synergies, which should link long-term perspectives to existing medium and short-term planning tools. Whilst the Second National Development Plan ("NDP2") was used as a valuable guideline in establishing detailed inputs into Vision 2030, the National Development Plans ("NDPs") are seen as the primary implementation tool of Vision 2030. This implies that the Vision 2030 initiative needs to be effectively linked and integrated into the NDP process (both institutionally and procedurally) in order to bring the two into a highly productive synergy. As such, Vision 2030 is not a fixed prerogative, but a dynamic development process, which must evolve over time and be flexible enough to accommodate a continuously changing environment, new strategic directives and re-aligned milestones.

The vision of becoming "a prosperous and industrialised Namibia, developed by her human resources, enjoying peace, harmony and political stability" is through eight broad objectives that consist of the following:

1. Ensure that Namibia is a fair, gender responsive, caring and committed nation, in which all citizens are able to realise their full potential, in a safe and decent living environment.
2. Create and consolidate a legitimate, effective and democratic political system (under the Constitution), and an equitable, tolerable and free society, that is characterised by sustainable and equitable development and effective institutions, which guarantee peace and political stability.

3. Develop diversified, competent and highly productive human resources and institutions, fully utilising human potential and achieving efficient and effective delivery of customer-focussed services, which are competitive not only nationally, but also regionally and internationally.
4. Transform Namibia into an industrialised country of equal opportunities, which is globally competitive, realising its maximum growth potential on a sustainable basis, with improved quality of life for all Namibians.
5. Ensure a healthy, food-secured and breastfeeding nation, in which all preventable, infectious and parasitic diseases are under secure control, and in which people enjoy a high standard of living, with access to quality education, health and other vital services, in an atmosphere of sustainable population growth and development.
6. Ensure the development of Namibia's natural capital and its sustainable utilisation for the benefit of the country's social, economic and ecological well-being.
7. Accomplish the transformation of Namibia into a knowledge-based, highly competitive, industrialised and eco-friendly nation, with sustainable economic growth and high quality of life.
8. Achieve stability, full regional integration and democratised international relations, the transformation from an aid – recipient country to that of a provider of development assistance.

With the implementation period of the Second National Development Plan (NDP2) that came to an end in 2006, in November 2005 Cabinet held the second Retreat (the first was held in 2000) in consideration of the formulation of NDP3. The objectives of the retreat were to explore fast track modalities for the eradication of poverty, provide guidance on priority programmes for the NDP3 in the context of the Political Parties development strategies and deliberate on efforts aimed at increasing public-private investment so as to accelerate national development. The retreat focused on critical issues for investment, growth and poverty reduction, with special attention to the role of Fiscal Policy, expenditure priorities and options for Government, the role of productive sectors and cross-cutting issues.

Emphasis was placed on national budgetary reforms with the aim to strengthen prudent macroeconomic management and improve effectiveness and efficiency of expenditures. Government also reiterated its commitment to continue to monitor borrowing more critically by employing the Sovereign Debt Management Strategy.

Furthermore, Cabinet emphasised the need to ensure that the necessary internal conditions for mobilizing domestic savings (both public and private) sustaining adequate levels of productive investment, increasing human capacity, reducing capital outflow, curbing the illicit transfer of funds and enhancing international cooperation for creating an enabling domestic environment are addressed.

Among the several elements that contribute to a good investment climate, credible national development strategies and policies that reduce uncertainty by giving a clear sense of direction to private and public sector agents and provide a strategy for improving a country's infrastructure were identified as the most crucial. The promotion of Public Private Partnerships is seen as a valuable tool to achieve this.

The Vision 2030 objectives together with the 2005 Cabinet Retreat recommendations will serve as the basis for NDP3 programmes, currently under formulation.

On the Official Development Assistance front, the National Planning Commission is committed to effectively cultivate domestic and external partnerships in order to mobilize, coordinate and manage development resources to augment government development efforts for the improvement of the standard of living of all Namibians.

Over the past few years, significant changes have taken place in the development cooperation arena. These include the gradual phasing out of traditional grant forms of assistance and move towards trade and development and soft loans. Partnerships between the public and private sectors are gaining in importance, and there is a growing appreciation of the advantages of budget support and the sector-wide approach, as opposed to stand-alone projects. Some development partners are also moving towards regional forms of development cooperation, as compared to the traditional focus on individual countries. The Government of the Republic of Namibia has taken note of these changes and has embraced these paradigm shifts in order to maximise the benefits to be derived.

There has been a noticeable decline in traditional aid flows to Namibia since 1998. This may largely be attributed to the factors mentioned earlier. Of particular interest is the discernable drop in bilateral assistance between 1999 and 2003. However, this has partially been offset by the increasing amounts of multilateral assistance from 2001 to 2003.

Despite the overall downward trend in levels of development assistance, foreign expertise and financial support still play a significant role in Namibia. Whilst funds disbursed by development partners constituted a slight upward trend of 6.76% of total government revenues in 2001 with a slight decrease of 6.37% in 2002, the result of 2003 indicates an important down trend of N\$669 million (US\$ 95 million), translated into 6% of government revenues. As this is lower in relative terms than previous years, the great challenge for Namibia is to find practical and fitting alternative methods of replacing declining aid resources in order not to compromise the course of national development.

Another important aspect related to aid flows can be attributed to the fact that over 90% of aid flows to Namibia are channelled outside the State Revenue Fund (SRF). The Government of the Republic of Namibia would however prefer that most, if not all, external resources were directed through its own systems, in order for GRN to be in a position to account for this important source of development investment. This will also strengthen the public finance management system and enable the Government to properly and accurately account for all development assistance received from our development partners.

2.3 Activities Relevant to the IAEA Technical Cooperation Programme

2.3.1 Agriculture and Food Security

Namibia with its semi-arid and arid climatic conditions is one of the driest African sub-Saharan countries. Most of the land in the country is rain-fed cropland prone to desertification, i.e. soil degradation in dryland in arid and semi-arid areas. Crop yields are severely limited by a combination of low inherent soil fertility and nutrient imbalances, as well as sandy or stony soils with low water holding capacity and high susceptibility to drought. Pasture productivity and quality is low in rangelands and not sufficient to feed the large livestock population of the country. Moreover, desertification is exacerbated by overgrazing and deforestation of the scarce vegetation in extensive areas of the country. Under Namibia's climatic and soil conditions as well as rainfall patterns the potential for arable agriculture is generally limited to the north of the country where water is less scarce. Only about a half of total land is suitable for livestock or crop production. In the central regions agricultural potential is confined to livestock farming. However in the south extensive sheep and goat farming has been developed.

Potential exists for greater contribution of agriculture to GDP, but constraints include limited human resources and the level of education and skills. The main environmental constraints for further development in the area of agriculture are the perennial threat of drought, overgrazing, overstocking, bush encroachment, soil erosion and desertification.

The Government plans to focus on food security by addressing low agricultural productivity, lack of social services, accessibility to water for the population in rural areas, and environmental degradation due to the population growth and intensive livestock production. An integrated holistic approach to sustainable utilisation and management of land and water resources is thus required.

Animal Diseases

The overall agricultural output is mainly contributed by the livestock production sub-sector, in particular cattle (2.1 million), goats and sheep production. A veterinary cordon fence from East to West located about 200 kilometres from the border with Angola divides the country into two livestock production zones: the central and southern are free from epizootic diseases and are consequently opened to the export markets while the northern zone is under strong impact of the existence of epizootic diseases, mainly Contagious Bovine Pleuropneumonia (CBPP) and Foot and Mouth Disease (FMD) The livestock produced there may not be transported to the south of the fence.

Namibia is an important exporter of live animals (cattle, sheep, goats) to South Africa and beef to European countries. However, this export activity would increase if the northern part, above the trans-veterinary cordon fence or "red line", which has around 800 000 cattle is no longer excluded from the international market because of the existing epizootic diseases, CBPP and FMD. This situation is very sensitive and concerns three groups of interests: a) the local farmers; b) the meat industry; and c) the Government. Thus, the control and the eradication of the diseases will open the whole country to the international beef trade and will

contribute to solve social and economical problems in this area. Increased efforts towards the control of transboundary animal diseases need to be pursued in order to ensure a sustainable growth in this sector.

Diagnostic facilities are established at the Central Veterinary Laboratory (CVL) in Windhoek and are about to be completed at the Ondangwa Laboratory in the North of the country. Presently, immunoassay ELISA techniques and PCR methods are performed for CBPP, FMD and brucellosis diagnosis. A lack of qualified personnel to sustain and maintain the development at a high technological level in the CVL for the control of animal diseases in Namibia as well as for the food hygiene and hence the export market has to be also addressed by the Government.

There are two different farming systems in the country, namely the commercial and communal sub-sectors. Some 44% of the total land, mostly of low to medium productivity is held under freehold by approximately 4,500 commercial farmers that account for 4-5% of GDP, operate 8,260 ha and employ 16% of the work force. This farming system is highly productive and commercial export oriented. The communal areas in the north cover the best agricultural land; it accommodates approximately 60% of the total population on 41% of the land. Farming in this area is mainly small-scale using traditional methods of cultivation and is primarily directed for subsistence. The challenge to Government towards the small farmer sector consists of effective provision of inputs to farmers, facilitating the adoption by farmers of improved methods of production, crop varieties and expertise they require to increase productivity and production.

Crop Production

Namibia has low annual rainfall (on the average less than 300 mm) and erratic rainfall pattern both within and between years. The average growth period is very short (one to two months). Some 22% of the country consists of arid land, 70% is semiarid land and 8% dry sub-humid areas. The soils are very fragile, mostly sandy, of low inherent fertility and limited productive capacity. From the climatic conditions and available arable land, it may be inferred that the country is particularly vulnerable to desertification and has very limited resources suitable for agricultural production. Despite the scarcity of land and water resources, in particular water, more than 70% of Namibia's population is rural depending upon livestock and agricultural production. The contribution of agriculture to the gross domestic product (GDP) is very variable estimated from 6 to 12%, depending upon the rainfall regime of the year. Consequently, sustainable management of natural resources (land, water and biodiversity) is a question of national survival.

A key and critical development problem is the sustainable utilization and management of the natural resources base (land, water and biodiversity) and protection of the environment. Isotopic techniques provide unique and quantitative data on nutrient and water dynamics in the soil plant system and therefore make available information essential for both the precise definition of the constraints and the assessment of effectiveness of the interventions designed to alleviate them with the ultimate goal of enhancing sustainable agricultural productivity. It is expected that the use of nuclear techniques will accelerate the development and adoption of improved soil, water and nutrient management (SWNM) practices to support crop and livestock production and diversification in target sites, thus generating income and economic gains and contributing to reduce poverty, increase household food security and improve livelihood of the smallholder farmers.

Conservation of soil moisture within the plant rooting zone will be an important consideration in providing optimum growing condition for crop growth. Management of crop cover, soil fertility and soil water conservation under different cropping sequence conditions is critical for enhancing crop productivity and minimizing land degradation in rain-fed agriculture. The support from IAEA in the areas outlined above under different cropping rotations would greatly address the Crop Production/Food Security sector.

As part of the national efforts to improve crop production, the IAEA may be requested to support the establishment of targeted breeding programmes using mutation induction, biotechnological and other techniques with focus on water-limited conditions. In this connection, three main combined strategies may be considered:

- Improving tolerance to drought through mutation induction of local germplasm to develop varieties with traits that may improve water use efficiency and higher yield such as earliness, dwarfness and increased root system development.
- Reclaiming dry and marginal lands by developing crops adapted to harsh environments and, for instance, also suitable for animal feed.
- Developing cultivation packages for the improved crop varieties that would combine water, soil and fertilizers in an attempt to optimize outputs while reducing the use of these natural resources.

Insect Pest Control

Eradication of Fruit Flies

Insect pests cause considerable losses, requiring the use of expensive insecticide applications and post-harvest treatments, often precluding the access of agricultural products to export markets that are free of certain pest insects. One group of pests where nuclear techniques have the potential to make a significant contribution to an integrated control is fruit flies. Namibia is an exporter of fresh fruit to the European Union and other regions. For example, the table grape producing areas, such as the ones along the Orange River, because of their isolation and technical sophistication, could be considered for the application of the Sterile Insect Technique (SIT). The integrated application of the SIT has been very effective in another important table grape export area, the Hex River Valley in nearby South Africa, and is being expanded to other areas in this country. The effective application of the SIT can result in significant reductions in insecticide applications and of fruit rejections by importing countries and can lead to greater access to export markets that require low insecticide residues in fresh produce.

Eradication of Tsetse Fly

Another important group of pest insects are tsetse flies that transmit the disease *nagana* to livestock and sleeping sickness to human beings.

In 2006 a joint sub-regional effort was initiated between Botswana, Namibia, Angola and Zambia to eliminate – under the coordination of the African Union’s Pan-African Tsetse and Trypanosomosis Eradication Campaign (AU-PATTEC) – a common belt of tsetse flies that extends from Botswana, through Namibia’s Caprivi area, into southern Angola and Zambia. To facilitate PATTEC’s regional activities associated with this programme, a Regional

Project Coordinating and Management Unit (RPCMU) was established with representatives from all four Member States. It is proposed to use the Namibian Katima Mulilo's Mapacha Airport in the Caprivi area as the basis for expanding the tsetse eradication operations in 2007, 2008 and 2009 by 16,600 km², 8 000 km² and 18000 km², respectively, into south-eastern Angola and south-western Zambia.

Water Resources

Namibia's general climatic, geological and topographical features make it the most arid country in Sub-Saharan Africa and consequently water is an extremely scarce resource. Rainfall and the associated surface water and groundwater sources in the interior of Namibia are extremely limited and variable. Throughout the country, potential evaporation exceeds precipitation by a factor of between two and five. There are very few natural perennial surface water resources other than the Border Rivers. It is estimated that 36% of water consumption is derived from groundwater, 24% from the ephemeral rivers, and 38% from the perennial border rivers. Because of high temperatures, it is estimated that 83% of the total rainfall evaporates; only 1% contributes to groundwater recharge; 2% can be harvested in surface storage facilities and the remaining 14% is used for vegetation. The problem is further exacerbated by the low levels of average rainfall, ranging from less than 50mm per year in the western regions to 70mm per year in the north east regions.

The combination of low rainfall and high evaporation results in irregular and unreliable supplies of water from ephemeral rivers. Only the perennial rivers on the borders of Namibia provide reliable but variable sources of water. However, as this water is shared with the neighbouring countries, the use of water from these rivers must be based on agreements most of which have not been signed. There are 9 major dams and a large number of small dams, constructed mainly on commercial farms and on communal land as a source of domestic consumption and stock watering. Most water is abstracted from boreholes of which there were approximately 50,000 registered boreholes, an estimated 50,000 unregistered at the end of 1999, and many others which do not function. However, because of hydrological and geo-hydrological conditions, the risks of not finding water or finding unsuitable water are high.

Scarcity of water has the potential to constrain the development of virtually all sectors, from major developments in industry such as mines and factories, to development in the health sector relating to the provision of potable water for domestic consumption. Scarcity must however be considered in the context of aridity as a normal phenomenon in Namibia and of disaster droughts.

The strategy of the Namibian Government in the water sector is to achieve sustainable development and provide equitable access to freshwater resources for all sections of the population. For the first time in Namibian history, opportunities have been created for an integrated approach to the development of water resources in the country. Policymakers adopted a new National Water Policy in 2000 and Parliament passed the Namibian Water Resources Management Act in 2004. This new policy and legislative framework call for initiatives which promote the coordinated development and management of water, land and related resources without compromising the sustainability of vital ecosystems.

To achieve the Government's social, economic and development goals and to provide the population with access to safe water for drinking, personal hygiene and other domestic purposes, it is necessary that in order to ensure water supply, a reliable method for the

automatic measurements of flow rate in the ephemeral rivers must be developed. Accurate river-flow information is a primary prerequisite for the technical, economical and environmental evaluation and the optimal operation of the country's interior water resources. Based on the experience acquired and the established infrastructure because of previous IAEA assistance, the application of isotopes techniques will concentrate on the assessment of the recharge and flow regimes of the aquifers systems. The aquifers are of crucial importance in Namibia, as about 45% percent of the Namibian population lives in these areas and the natural resources are already severely overstressed. Sustained agriculture and adequate water supply to the towns and farmers in the two basins require the assessment of the sustainable yields of all parts of these aquifers. In addition, the groundwater quality is more adversely affected by pollutants such as nitrates, chlorinated hydrocarbons and sulphate from agriculture activities in the recharge areas and by salination due to over exploitation.

It is the view of Government that long-term sustainability of water resources exploitation can only be achieved through the promotion of rational water resources development relying upon an integrated management approach. This will be achieved by, among others, the assessment of water resources potential from surface water and groundwater sources, strengthening water resources data bank and developing up-to-date water master plans. Namibia will also need to support programmes that promote policies that tackle the scarce water resources through the establishment of a comprehensive framework that will promote development, management and use of water in a sustainable manner and with strong stakeholder participation. In this connection, it should be highlighted that the governments of Luxembourg and Germany have been supporting the government in developing a better understanding of water resources for many years. Other potential partners include UNESCO and FAO.

There will also be a need to strengthen the national monitoring system of both water quality and quantity for surface and ground water and to develop a national database for water resources. Environmental risks arising from agro, industrial chemical waste and waste disposal sites need to be addressed. The use of isotope hydrology techniques will provide the necessary input for this work too.

2.3.2 Public Health

The Namibian Nation is facing health problems related to diseases, the environment and social causes. At birth, life expectancy is 52 and 55 years for males and females, respectively. Communicable diseases, mostly HIV/AIDS, Pulmonary Tuberculosis and Malaria still yield a high toll, with more than 1,000 deaths per 100,000 people every year. With regards to non-communicable diseases, the top causes of mortality include cancer, cardiovascular diseases (including Congestive Cardiac Failure and ischemic heart disease) and respiratory diseases. Maternal, prenatal and nutritional conditions are also a major concern. Despite the huge budget allocation (11% of Government spending) to the Ministry of Health and Social Services, it cannot meet the financial, infrastructure, material, equipment and drug supply needs needed to tackle these diseases adequately. The Ministry of Health and Social Services has long acknowledged that nuclear techniques can play an important part in addressing public health concerns by committing resources and engaging the IAEA in the development of programmes that could contribute to the improvement in the delivery of quality public health services. This has been reflected in the assistance the IAEA has given to helping Namibia establish nuclear medicine services and radiation therapy programmes over the past several years.

With regards to further collaboration and opportunities, the IAEA could be requested to assist the Government of Namibia in exploring the possibilities for using molecular biology techniques for controlling malaria and to better understand the link between the management of HIV/AIDS and nutrition.

Namibia also needs to consolidate and where justified expand the existing capability for cancer management, first to improve the health services and second, to provide services for the whole country. However, in order to pursue these goals, the government will have to allocate more resources to hiring and training the appropriate medical staff that would be needed to provide these services. This would need to be supported, where feasible, with the updating of existing cancer treatment machines either through government funding or donor support.

HIV/AIDS

A recent UNICEF report estimates that the HIV prevalence rate for adults in Namibia is 19.6%, with an average estimate of 230,000 people living with HIV/AIDS. The prevalence of HIV has sharply increased over a period of 10 years from 4.2% in 1992 to 22% in 2002, although it began to decline slightly between 2002-2004 following a Ministry of Health and Social Services surveillance scheme. However, for people grouped in the 25-29 age bracket, the prevalence is still around 26%.

One of the most common forms of HIV transmission is through unprotected sex with an infected person, where only a few women have control within relationships to enforce the use of preventative measures. Alcohol abuse, high prevalence of sexually transmitted infections, and the high rates of unemployment in the northern part of the country have accelerated the spread of the disease.

The National AIDS Control Programme was established in 1990 after independence in order to coordinate the efforts made by the government to deal with this epidemic hindering Namibia's development and growth. The negative impacts of HIV/AIDS on the health and longevity of the population have been clearly observed from 1991 to 2001, where the population growth rate decreased from 3% to 2.6%.

Namibia's Vision 2030 advocates for the aggressive implementation of the National HIV/AIDS reduction plan in order to reduce the incidence of HIV. Also highlighted in the second National Development Plan (NDP2) is one of eight objectives to combat further, the spread of HIV/AIDS in Namibia.

The Medium Term Plan (MTPIII) for the years 2004-2009 was launched by the Ministry of Health to challenge the spread of HIV/AIDS, with a strong emphasis on the need for a multi-sectoral response involving all stakeholders across the spectrum of interventions. More recently, in 2007, the government in tandem with its main development partners together with the civil society have developed the National Policy on HIV/AIDS, which aims to ensure sustained leadership commitment to the epidemic, facilitate appropriate sectoral policy development and law reform, and strengthening of a multi-sectoral and multi-disciplinary institutional framework for coordinating and implementing HIV programmes. The policy also aims to ensure greater involvement of people living with HIV/AIDS in the national response and that they enjoy equal rights and opportunities in their community with no discrimination.

against them, as well as the provision of high quality services in prevention, treatment and care. The new policy will be implemented through five broad strategies:

- (i) strengthening of an enabling environment to those infected and affected with HIV/AIDS,
- (ii) prevention of further spread of the disease,
- (iii) provision of access to high quality and cost effective treatment and care,
- (iv) mitigate the socio-economic impacts of HIV/AIDS,
- (v) integrate and coordinate the programme management at national, sectoral, regional and local levels.

HIV and Nutrition

During its 26th Special Session in August 2001, the UN General Assembly adopted a resolution on the Declaration of Commitment on HIV and AIDS, calling on the international community to, amongst others (i) provide assistance for HIV and AIDS prevention, care and treatment in developing countries, (ii) increase investment in and accelerate the development of HIV vaccines, while building national capacities, especially in developing countries, (iii) support and encourage the development of infrastructures, laboratory capacity, improved surveillance systems, data collection, processing and dissemination, and training, with a focus on the countries most affected by HIV and AIDS, particularly developing countries, (iv) develop and evaluate suitable approaches for monitoring treatment efficacy, and (v) strengthen international and regional cooperation, in particular North-South, South-South and triangular cooperation, related to the transfer of relevant technologies suitable to the environment in the prevention and care of HIV and AIDS, the exchange of experiences and best practices.

The connection between nutrition and HIV and AIDS stems from the fact that macronutrient malnutrition accelerates muscle wasting and micronutrients such as vitamin A and zinc enhance immunity. Overall, it is becoming increasingly evident that investment in nutritional programmes is an effective way to improve the health care of people living with HIV and AIDS (PLWHA).

A recent manual published jointly by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) recognizes the relationship between infection and nutrition and offers simple dietary suggestions for the estimated 42 million people living with HIV and AIDS in the world. By bolstering the immune system and boosting energy levels, balanced nutrition can help the body fight back against the ravages of the disease and by maintaining body weight it can support drug treatments and prevent malnutrition.

It would be important, given the prevalence of HIV and AIDS amongst vulnerable groups, to evaluate the relationship between HIV and AIDS and nutrition so that the appropriate government policies to tackle this pandemic can be adopted. There is also an urgent need to develop appropriate and sustainable interventions to improve maternal and child nutrition as well as nutrition for people living with HIV/AIDS in Namibia. The IAEA can support activities where nuclear techniques can be used as tools to develop and evaluate intervention aimed at promoting child nutrition such as exclusive breastfeeding, adequate complementary feeding and nutrition for people living with HIV/AIDS.

Cancer Management

Nuclear Medicine

The use of nuclear medicine as a vital means for the early diagnosis and proper management of cancer diseases is widely recognised. Namibia currently has one nuclear medicine centre – the Bernard May Nuclear Medicine Centre at the Windhoek Central Hospital. However, the centre is equipped with two very old Gamma cameras, which are not working due to the unavailability of spare parts – the suppliers no longer make the machines. However, under an on-going IAEA TC project, a brand new SPECT gamma camera was procured in 2007 in order to maintain the provision of nuclear medicine services at Windhoek, recognised as one of the best facilities in Africa. With regards to availability of relevant medical staff, there is only one nuclear medicine specialist and one radiographer. On the operational level, all radioisotopes needed for running the gamma cameras are imported from the Republic of South Africa and are used for the management of over 2,000 studies annually. Of these studies, 50% are reported to be cancer related diagnosis, highlighting the need for improved services.

The Government of the Republic of Namibia has, through the Ministry of Health and Social Services, committed itself to providing healthcare services, including nuclear medicine services to all its citizens. In order to contribute to this overall objective, the Government intends to expand the nuclear medicine services to northern Namibia by establishing a nuclear medicine department at the Oshakati State Hospital. In northern Namibia, the Oshakati State Hospital is the main referral hospital for the most vulnerable and disadvantaged sections of the population with regard to healthcare services that reside in this region. Patients who visit the Oshakati State Hospital and require nuclear medicine examination and treatment are either turned away or referred to the only nuclear medicine department in Namibia, some 800 kilometres away at the Windhoek Central Nuclear Medicine Department. This would ensure increased accessibility to the population in northern Namibia and reduce the current costs for providing nuclear medicine services.

It is therefore pertinent that the infrastructure for providing nuclear medicine services is expanded to the northern region. Whilst assistance will be needed from the Agency to train staff and procure some equipment, this initiative will need to be matched by government commitment to recruit new staff and cost-share the provision of a new SPECT Gamma Camera for the Oshakati hospital in the north. It will also be necessary to strengthen the Windhoek Nuclear Medicine Centre to allow it to introduce new nuclear medicine services to handle the increasing need of myocardial SPECT studies to assess patients affected by cardiac diseases. A national programme will also be considered to harmonise the service by establishing a tele-link between the two hospitals and thereby fostering closer collaboration.

Radiation Therapy

Namibia currently has one radiotherapy unit equipped to administer cancer treatment and palliation through both tele-therapy and brachytherapy. Since the Radiotherapy unit came into operation on the 2nd of April 1997, the annual number of new patients treated averaged about 500. It is however expected that with the unit fully operational the annual figure could be as high as 1,000. The number of cases is continuously increasing, especially the HIV related cancers. Over the past years the IAEA has supported human resource development in all specialities needed in radiotherapy and currently two radiation oncologists and four radiographers are working in the department. However, in order to provide a better service to the population, the Ministry of Health and Social Services plans to embark on a plan to

increase staffing levels, so that the radiotherapy centre can increase its treatment capacity to a target of 1,000 people – a 100% rise. In this regard, assistance will be needed from donors, especially the IAEA, to train additional staff such as one more radiation oncologist, 2 radiographers and one medical physicist during the next 5 years. To meet its target of treating more cancer sufferers, equipment will need to be replaced and proper maintenance services will need to be introduced. The government also plans to expand the service by either acquiring a linear accelerator or by developing a new service in the northern part of the country. In this connection, it would suffice to make preparatory arrangements for this initiative by conducting a feasibility study for this purpose. Moreover, assistance from other UN agencies such as WHO may be required to integrate cancer diagnosis and radiotherapy management into a comprehensive National Cancer Control Programme.

Malaria, Tuberculosis and Nutrition Intervention Programmes

Malaria

Malaria is a major health problem in Namibia being the leading cause of illness and death from 1999 to 2002, primarily affecting the northern part of Namibia. Recent figures show that malaria accounts for 15% of total child mortality with 600,000 malaria cases (i.e. 27% of population) reported every year. In April 2005, the Government released a new National Malaria Policy Strategy document to fight malaria, emphasizing the importance of technical assistance in terms of human resource skills and equipment as essential to fighting and controlling malaria. The ultimate goal of the Ministry of Health and Social Services is to control malaria by pursuing four basic control strategies;

- (i) Provision of early diagnosis and prompt treatment
- (ii) Implementation of selective and sustainable preventive measures, including vector control
- (iii) Early detection, containment and prevention of epidemics
- (iv) Strengthening capacities in basic and applied research

The Government has acknowledged that the success in implementing these strategies depends on strong partnerships with all stakeholders in planning and implementation of malaria interventions.

Furthermore, the burden of malaria has recently been complicated by the emergence of drug resistance. For example, recent results in Namibia have shown that the efficacy of the prescribed drug, chloroquine, has declined to less than 75-90%. The most pathogenic causative agent of malaria has developed resistance to most drugs currently in use, with the exception of the newly introduced artemisinin derivatives. The prevalence and magnitude of resistance to different drugs vary from one country to another.

Recent developments in molecular genetics of malaria have led to the identification of mutations in genes involved in resistance to the front-line drugs. Their species and strains are identifiable by molecular typing methods. Perhaps the greatest strategic advantage of this approach is in surveillance studies. For malaria, these techniques provide precise and large-scale methods to diagnose whether parasites that follow drug treatment are due to re-infection with novel parasites or to the persistence of the parasites responsible for the original infection.

It is important that molecular methods be considered as potential tools to facilitate decision-making in support of the Government's control programmes aimed at preventing the spread of malaria.

Tuberculosis

A 2004 WHO report records Namibia as having the highest Tuberculosis (TB) epidemic in the world. This is further aggravated by the extreme poverty in the north of Namibia and the high HIV infection rate. TB is the single most common and deadly infectious disease in persons affected with HIV and so the majority of TB patients are caught up in a vicious cycle of poverty, TB and HIV/AIDS.

From the onset of its creation, one year after independence, the National Tuberculosis Control Programme (NTCP) has always worked closely with the WHO and the International Union against TB and Lung Disease (IUATLD), also known as the Directly Observed Treatment Short-Course Strategy (DOTS). After a diagnosis of TB is made, admission, treatment and provision of drugs are made free of charge in all MOHSS health facilities. However, despite assistance from other donors and NGOs, the Government of Namibia has borne the majority of the costs involved in helping TB patients.

In 2003, Namibia received a grant of US\$700,000 from the Global Fund to Fight AIDS, TB and Malaria and subsequently developed a National Strategic Plan on Tuberculosis for the Medium Term (2004-2009). The Strategic Plan will involve the following goals:

- ❑ Treatment success (cure + completion) rate increase from 65% to 85% for all patient categories by 2009
- ❑ All tuberculosis suspects and patients have access to timely and quality-assured laboratory services
- ❑ Adequate and competent human resources for TB control at all levels
- ❑ Management capacity of NTCP strengthened and adequate at all levels
- ❑ Operational research and epidemiological surveillance capacity in place and supporting programme management and M & E
- ❑ 80% of the general population have a satisfactory level of knowledge on tuberculosis disease and services for appropriate health-seeking behaviour
- ❑ All PLWHA and PLWTB have access to a continuum of care and support services for TB and HIV/AIDS, in all health care facilities and home-based care services in public and private sector by 2009
- ❑ Financial resources for TB control in public and private sector are adequate
- ❑ Specific TB control strategies implemented in sectors with a high tuberculosis burden by 2009

At present Namibia is working with a number of donors including; the, USAID, WHO (provision of technical advice on policy and strategies) and KNCV (The Royal Netherlands Tuberculosis Association) a Dutch TB NGO). The NTCP Office is in the process of setting up a scheme for a data surveillance system

Nutrition

Malnutrition and particularly infant and child malnutrition remains a public health problem in Namibia. According to UNICEF: http://www.unicef.org/infobycountry/namibia_statistics.html#22; 24% of children under five years are chronically malnourished (stunted) and about 25% are underweight. Child Mortality is also still high in Namibia at a rate of 62/1000. Poor child care, poverty, lack of access to health services, environmental factors and HIV/AIDS are the

main causes contributing to child malnutrition. The prevalence of HIV/AIDS in Namibia is among the highest in the world.

Although, WHO and UNICEF recommend exclusive breastfeeding for six months followed by appropriate complementary foods, only 19% of infants are exclusively breastfed and 24% of mothers continue to breast feed with solid foods up to 24 months. In addition, vitamin A supplementation covers only 38% of children and 33.4% post-partum mothers.

2.3.3 Mining

Namibia is well endowed with a variety of minerals with significant deposits of uranium, diamond and base metals, such as gold, silver, tin, lead, zinc, and copper. The Government policy is to encourage both foreign and local investment that will impact positive growth on the economy and promote socio-economic development. The basic responsibility of the Ministry of Mines and Energy (MME) is to formulate and implement national mineral and energy policies effectively, in order to serve both the State and mineral investors. It enforces health, safety and environmental regulations in the mineral sector. MME facilitates and promotes mineral exploitation, mining and mineral processing which is carried out by the private sector.

The uranium industry has particularly witnessed significant growth in the past years, with two mines currently in operation and expected to continue mining until at least 2017. It is also anticipated that two more uranium mines will be commissioned in due season. It is thus all the more important that policies and strategies are developed in conjunction with legislative and technical infrastructure in order to gain and keep control over the impacts of the uranium industry on health, safety and the environment. It is trusted that the experience of the IAEA and countries with long history of mining in these areas will be called upon to develop capacity and establish Namibia's own policy framework in this regard especially in the development of a workable legislation to regulate the activities to protect the environment, to protect the general public and workers and to address the issue of remediation.

2.3.4 Energy Planning

Historically, Namibia has been commercially heavily dependent on South Africa for supply of firm energy and power, which for a long time has been done at subsidized prices. According to the projected load forecast, South Africa's internal demand for energy is expected to prohibit power exports to Namibia by the end of 2007, by which time Namibia will be expected to put in place adequate mitigation measures.

In 2005, however, the scenario drastically changed when technical problems within the South African power system led to its inability to supply power on a temporary basis to Namibia. This instantly translated into a power crisis for Namibia as demand far outstripped supply. In reaction to this crisis, the only mitigation options available for Namibia were to renegotiate a new limited power supply agreement with South Africa, as well as running the two thermal power plants (diesel based and coal based) with a combined installed capacity of 144 MW to meet the peak demand requirements.

Although this enabled Namibia to maintain the status quo in the short term, both options are not financially sustainable and still fall short of addressing the key issues of reliability, security, adequacy and sustainability of supply to effectively support economic development.

The dilemma is further compounded by the fact that Namibia does not have any internal perennial rivers that can be independently exploited for hydropower generation. The only perennial rivers are the shared border rivers, namely, Kunene, Kavango, Zambezi and Orange. The commercial exploitation of the hydropower potential of the shared rivers depends on the political will of neighbouring countries within the context of international bilateral agreements. This actual lack of flexibility constitutes a substantial constraint, particularly in addressing the short, medium and long term needs of the Namibian Electricity Supply Industry.

Namibia's inevitable reliance on imported coal and diesel fuels does not make the thermal power generation option sustainable as well. Despite all these impediments, however, the challenge to address the security, reliability, adequacy and efficiency of supply has never been more real. However, Namibia is privileged to have substantial deposits of uranium, whose current exploitation makes Namibia the 6th world largest producer. With the imminent commissioning of the second Uranium mine, Namibia is likely to replace Kazakhstan as the third largest producer in the world. It is expected that the use of part of the uranium oxide for local electricity generation will go a long way in addressing the power shortages and hence substantially contribute towards the national development goals.

Given the current scenarios and the unabated power crisis, Namibia is seriously considering nuclear energy to generate electricity to meet its industrial development goals as stipulated in the national development plan or Vision 2030.

Recognizing that expanding the benefits of the peaceful use of nuclear science and technology is a fundamental mandate for the IAEA, Namibia seeks to be provided with the basic requirements needed to embark on the development of a nuclear power programme for electricity generation. Namibia's expectations are to benefit from information and expertise from internationally accepted proven engineering, legal, safety and management practices in all relevant areas such as technical and human performance, change management, implementation of management systems approach to nuclear power plant operations.

2.3.5 Education and Skills Development

Since Independence, Namibia has attached top priority to addressing the many challenges and constraints affecting the acute human resources needed to push forward its development agenda. In recognition of the shortage of human resources as a major constraint to the social and economic development of the country, the National Planning Commission (NPC) has formulated a comprehensive National Human Resources Plan (NHRP) and the National Development Plans are focused on its implementation. With regards to science and technology, it can even be argued that the problems of human resources shortages are even worse than the national average. However, it has been recognised that nuclear science and technology can play a significant role in realizing the objectives set out in Namibia's National Development Plans and Vision 2030 as its cross-cutting nature is relevant for developing programmes in agriculture (livestock, water and land management), public health, energy planning, environmental safety, education and related disciplines. Furthermore, with the worldwide recognition that the contribution of science and technology towards development is essential, Namibia cannot afford to ignore the urgent need to address these shortages.

In this regard, it is proposed that Namibia strongly pursues an innovative human resource strategy. Traditionally, training for staff under the IAEA TC Programme is provided for recruited personnel, educated to at least graduate level. However, due to the acute shortage of human resources at the science and technology fields, it will be necessary for Namibia to investigate other ways for addressing this persistent problem and to go further than the conventional ways of educating its population in science and technology. In this connection, Namibia will strongly consider the following initiatives for reviewing its human resource strategy;

- ❑ Introduction of nuclear related technology at higher education levels (pre-graduate)
- ❑ Availability and dissemination of relevant information at laboratories, libraries and on the internet
- ❑ Development of new curricula and conducting of special training sessions even at secondary school level
- ❑ Promotion of research in science and nuclear related technology
- ❑ Allocation of financial resources to support the promulgation of nuclear related technologies at existing centres of excellence in higher education

However, it is appreciated that the pursuance of such strategies will not be an easy task and in order to support and give authority to such a renewed strategy, it is advisable that a Steering Committee for the development of human resources in nuclear technology be formed. The major objectives of the aforementioned committee would be to develop, implement and monitor the strategy, as well as to conduct a self-assessment of the committee and its success.

With regards to implementing and supporting bodies, the role of the University of Namibia (UNAM) would be critical not only as a vehicle for promoting the strategy through the development of new curricula but as a recruiting ground for skilled persons to transfer the technology. The University's objectives in the context of VISION 2030 are (i) to develop the human resources capacity to meet the needs of Government Agency's in their developmental efforts and (ii) to assist the same government agencies in realising their identified priorities as stipulated in VISION 2030. This intent will require that the University itself develops its own human resource and technical capability to carry out these activities. Hence a number of departments including physics, chemistry, the multi research centre, geology and agriculture will be called upon to augment the efforts of the government agencies, while also meeting the needs under the human resources components. In order to meet these demands, the transfer of related technologies and disciplines to UNAM staff and students will be essential through IAEA assistance such as that delivered through group and individual training, expert missions, curriculum development, equipment and attendance at relevant scientific forums.

In the interim, the Agency would be prepared to consider supporting Namibia's efforts in the short to medium term through for example;

- ❑ fielding experts to conduct training courses in highly specialised areas
- ❑ fielding experts to introduce new subject areas within a new curricula
- ❑ provision of training for new staff in a particular field
- ❑ equipping new laboratories
- ❑ training of new laboratory staff
- ❑ provision of books and other learning material, i.e, ICT Centres

If implemented properly, it is expected that by sensitizing the potential work force in science and technology at the grassroots level then one major obstacle, that of the shortage of human resources, would be tackled. For the purposes of this CPF, it is proposed that a stronger than normal emphasis will be placed on building capacity at all levels and that innovative ways will be employed to train project staff at the relevant government agencies, ministries and at higher educational establishments.

2.3.6 Radiation and Waste Safety Infrastructure

An appropriate legislative framework is necessary for the control and authorisation of sources of ionising radiation and radioactive material. There are short comings in the current legislative framework which need to be addressed as a matter of priority. The legislation for the protection against sources of ionising radiation and radioactive material is provided in the *Hazardous Substance Ordinance of 1974* and the *Regulations Concerning the Use of Electronic Products, No. 229*. The legislation for the control of radioactive material, *Notice AEB 1/68 of the Atomic Energy Board No R 1822*, was regrettably repealed by the Minerals Act of 1992 without appropriate replacement. However, the Namibian Government through Cabinet directive and by application through a national policy, has mandated the Ministry of Health and Social Services to regulate and control the use of all sources of ionising radiation and radioactive material. To this end, the Ministry has made use of the above legislation and in the absence of an enabling legislation administrative controls are applied accordingly. In the same policy the Ministry has been mandated to set a regulatory infrastructure that can effectively and independently implement control measures for protection against ionising radiation. As a result of this directive the Atomic Energy and Radiation Protection Authority Act was promulgated in 2005 which provides for all the measure to create the required regulatory infrastructure.

The priority of the government is to operationalise the Act by establishing the Atomic Energy Board (AEB) and National Radiation Protection Authority (NRPA). The primary function of the AEB will be to advise Government Agencies on the beneficial and appropriateness of applications of nuclear techniques in Namibia, including ensuring that Namibia meets all its obligations with respect to international/regional conventions and treaties. The Board will further be required to ensure that the regulations to be implemented by the Authority are in line with international standards and practises.

The NRPA's primary function will be to implement the provisions of the Act and in particular authorisations of all practises utilising sources of ionising radiation and radioactive substances. It is therefore imperative that the development of the regulations in support of the Act and codes of conduct enjoy high priority in the strengthening of the regulatory infrastructure.

The development of the occupational radiation protection programme is considered second priority and needs further strengthening. At present over 200 radiation workers are monitored, mainly workers in the employ of the State. There exists potential to expand this service to the private sector. The system that currently provides the personal monitoring service is operating optimally, but upgrading to an up-to-date system should be prioritised. It is also important that a national dose registry is kept of all radiation workers in Namibia by setting up a national database which can be centrally managed from the NRPA offices. While occupational monitoring is limited to personal monitoring, there is a definite need to expand occupational monitoring through the use of other modalities. This includes workplace/area

monitoring and internal dosimetry, particularly in the area of the expanding Uranium industry. Techniques that should be considered included sampling and sample measurements, monitoring of airborne radioactivity and radon gas measurements. These monitoring techniques could gradually be introduced in other workplace where less radiological hazard is likely. It is expected that the occupational radiation protection programme will be strengthened through the appropriate development of the regulations and codes of conduct that will prescribe details concerning individual and workplace monitoring; classification of areas; local rules and investigation levels amongst the many requirements.

There is currently no control exercised over exposure of patients and although there is some regulations for medical exposures, control of these are not applied effectively. Thus radiological protection of patients and medical exposure control is another area that also needs prioritisation in the medium term. Although some studies have been initiated with the IAEA with regard to the evaluation of medical exposure it is important that this exercise be lead by the NRPA within a structured medical exposure control programme. It is expected that the medical exposure control guidance levels will be established in the regulations and that this will conform to those recommended in the International Basic Safety Standards. The guidance levels will need to be supported by quality assurance and training programmes for radiation protection in radiotherapy, nuclear medicine, diagnostic and interventional radiology.

Other areas of concern and which need urgent prioritisation include preparation of a radiological emergency preparedness and response plan; radioactivity measurements in water and food stuff; environmental monitoring to establish exposure levels in all suspect inhabited environments. In these areas no initiatives have been undertaken and as such appropriate programmes need to be defined and strategies developed for implementation.

A core component of all the above is the human resources compliment of the NRPA. Currently there is a shortage of technical human resources and technical expertise to meet the objectives of the above mentioned programmes. Priority includes recruiting staff and developing technical expertise through relevant education and training programmes.

2.3.7 International Treaties and Conventions

The Republic of Namibia is party to the *Revised Supplementary Agreement (RSA) Concerning the Provision of Technical Assistance by the International Atomic Energy Agency (IAEA)* and to the *African Regional Co-operation Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA)*. The two Agreements define the guiding principles and general operating rules that govern the provision of technical assistance to Namibia by the IAEA. It is by virtue of these Agreements that Namibia is participating in and benefiting from the programmes of the IAEA.

Namibia has been a party to the Convention on the Physical Protection of Nuclear Material since 2002 and has concluded an Agreement with the Agency for the Application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons in 1998. In addition, Namibia expects to accede to the following agreements and conventions under the auspices of the IAEA: the Amendment to the Convention on the Physical Protection of Nuclear Material, the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the Convention on Nuclear Safety, the Joint Convention on the Safety of Spent Fuel Management

and on the Safety of Radioactive Waste Management, the Vienna Convention on the Civil Liability for Nuclear Damage and the Convention on Supplementary Compensation for Nuclear Damage.

Out of these, the *Comprehensive Safeguards Agreement/Small Quantities Protocol* has been in force since 15 April 1998; the *Additional Protocol* has been signed on 22 March 2000 and accession to the *Convention on the Physical Protection of Nuclear Material* took place on the 2 October 2002. In addition Namibia has endorsed and made a commitment towards the implementation of the *Code of Conduct on Safety and Security of Radioactive Sources* and *Supplementary Guidance on the Import and Export of Radioactive Sources*.

Initiatives to ratify the above agreements and to ensure that Namibia meets all its obligations under these Agreements will be undertaken within the framework of the new legislative infrastructure. The IAEA's guidance and expertise will be required to effectively meet this international obligation.

Namibia continues to participate in the Agency's legislative assistance activities with regard to the establishment of an adequate legal framework for the safe and peaceful uses of nuclear energy. In particular, representatives from Namibia have participated in a number of regional workshops, training courses, and seminars organised by the IAEA.

3 RELEVANT INTERNATIONAL DEVELOPMENT ASSISTANCE

In Health, *UNICEF* provides US\$246,870 to support the following programmes under its Expanded Programme on Immunisation (EPI) on Child Survival and Development;

- ❑ Malaria control.
- ❑ Prevention of Mother-to-Child Transmission (PMTCT)
- ❑ Anti-retroviral Therapy (ART)
- ❑ Sentinel nutrition surveillance

A further US\$54,200 is provided under its Adolescent Friendly Health Services (AFHS) programmes for Maternal and Adolescent Health (Emergency Obstetric Care)

The *WHO* is providing (i) about US\$5,000 to support the formulation of a National Nutrition Strategic Plan, (ii) US\$852,000 to maintain and strengthen EPI and malaria control services, and (iii) US\$65,000 to strengthen laboratories services, Blood Transfusion programmes, ART and Home-based Care (HBC).

The *UNFPA* provides support in reproductive health.

In Agriculture, the *FAO* supports projects to improve income generation, agricultural productivity and access to food for vulnerable households. Its ongoing projects as well as their total budgets for their full programmes are:

- Establishment of a national dairy training centre for the small-scale dairy sector (US\$312, 979);
- Capacity building and assistance in the review of sanitary and phytosanitary legislation (US\$218,128);
- Technology transfer on Cactus Pear production and utilization (US\$254,000);
- Support to the formulation of the National Programme for Food Security and related South-South Cooperation Programme (US\$210,000);
- Strengthening disease control through improved Transboundary Animal Disease Information Management System (Phase II) (US\$159,000);
- Strengthening livelihoods through Food and Nutrition security in vulnerable SADC Countries (2007 budget for Namibia is US\$190,000);
- Surveillance and control of epidemic food-and-mouth disease and contagious bovine pleuropneumonia in Southern Africa (total budge for the region is US\$2,800,000);
- Integrated imitative on urban and peri-urban horticulture development in Namibia (US\$48,490);
- Support to the date production programme – introduction of date palm cultivation into communal farming settlement (Phase II) (US\$2,479,661)

With regards to assistance under what are called “Water and Land” Programmes, there is a five-year joint UN programme supported by UNDP, UNESCO, FAO and two other non-resident agencies, i.e. UNEP and World Bank on the Namibia Country Pilot Partnership Programme for Integrated Sustainable Land Management (2006-2011). Under this huge project, *UNDP* is providing total funding of US\$1,500,000.

UNDP and UNESCO are also implementing a project on Namibia Renewable Energy, for which UNDP contributes US\$1,000,000 and UNESCO an additional US\$200,000.

On the environment, *FAO* is providing considerable funding of over \$5 million to an Environmental protection and sustainable management of the Okavango River Basin project.

UNDP also provides US\$155,000 to support a project on the National Capacity Self Assessment for Global Environmental Management and Mainstreaming Environment Concerns into Development Planning.

4 OVERVIEW OF THE PAST AND PRESENT IAEA TECHNICAL COOPERATION ACTIVITIES IN THE COUNTRY

Namibia became a Member State of the IAEA in 1983. For the period 1997 to mid-2007 Namibia received TC assistance equivalent to almost US\$ 2.5 million. IAEA support covered mainly areas of agriculture, human health and hydrology. During the past 5 years, 67 Namibian nationals participated in training courses, and 35 fellowships and scientific visits were granted.

Namibia's cooperation with the Agency continues to fall strategically under the Government's second National Development Programme (NDP2) for Vision 2030. The objectives of the national programme aim to provide quality healthcare services, reduce poverty, and empower its citizens economically and socially. Access to quality and affordable healthcare services is one of the priority goals to be supported by the Agency, and the main focus of future collaboration will be in expanding nuclear medicine to the poorest parts of the country. Increased emphasis is also placed on the northern communal areas where agriculture offers the greatest potential for intensification and diversification. One of the objectives under NDP3 is to support crop and livestock production and diversification in the north of Namibia. In addition, Namibia has also been working with the Agency in water resource management. The Government attaches high importance to the development of human resources and all projects have a strong stance on capacity building.

From previous assistance in the field of HR development, three main lessons have been learnt; (i) unavailability of staff to be trained under IAEA TC projects (ii) Lack of interest shown from some government agencies in developing programmes to address skill shortages and (iii) internal brain drain, where although staff trained by the IAEA have returned to Namibia, they can often be relocated to another job within the Government or in the private sector, thereby leaving a gap in knowledge.

The Country Programme Framework (CPF) covering the period 2001-2006 was signed in 2001. The process for revising and drafting this new CPF began in 2006.

For the 1999–2004 approved TC programme, the emphasis was on agriculture, human health and isotope hydrology. Building on Namibia's unique position as being one of the major exporters of livestock products to Europe, two projects were implemented to strengthen the capacity to diagnose animal diseases using nuclear-related techniques at the central veterinary laboratory and quality systems were introduced to control drug residue from animal products to ensure that livestock products met internationally agreed standards (ISO). However, in the north, where most of the rural poor live, livestock diseases such as contagious bovine pleuropneumonia (CBPP) and foot and mouth disease (FMD) are highly prevalent and a project was implemented to strengthen the capacity in the north to diagnose and combat animal diseases. Major outcomes during this period in human health included (i) improvement in radiotherapy services through expert services and training in oncology which resulted in a 50% increase in treatment received annually and (ii) the enhancement of nuclear medicine services at the Bernard May Cancer Centre, Windhoek.

During the 2005-2006 TC Programme priorities highlighted in the CPF were continued particularly in the areas of human health and agriculture. In human health, assistance is being provided to support the Government's plans to build capacity in the northern part of the

country to provide nuclear medicine services. In agriculture, the Agency is supporting Government efforts to achieve food security goals for small holders in the poorer parts of the country, where crop productivity is severely hampered by periodic droughts and poor soil moisture. The project is investigating ways to increase crop productivity through improved soil, nutrient and water management in millet and sorghum-based farming systems.

The current TC Programme for 2007–2008 will continue with support to the water resources sector and health sector. However, concerning the latter, the emphasis will be in introducing a maintenance and repair culture into the main hospitals so that scarce resources can be directed away from high service costs for equipment and towards providing primary healthcare. The main emphasis with regards to Agency assistance in helping Namibia manage its water resources will be in enhancing human capacity to carry out more advanced techniques for assessing the sustainable yields, water quality, recharge and return flow mechanisms within the Platveld aquifer area by integrating isotopic techniques with hydrological and hydrogeologic investigations.

Namibia will continue to participate in both regional and interregional projects and has shown a strong interest in working with the Agency in tackling the problem of HIV/AIDS.

The main activities, including the strengths and weaknesses and the achievements of the Agency's technical cooperation programme in Namibia, are summarized below.

4.1 Agriculture and Food Security

4.1.1 Animal Diseases

The major objective of *NAM/5/006 - Monitoring Veterinary Drug Residues in Livestock* was to strengthen the capability of the Central Veterinary Laboratory (CVL), Windhoek to detect veterinary drug residues in livestock products. This was of strategic importance to Namibia because of its large export market for livestock products that require certification. The CVL is currently working towards international (ISO) accreditation. Assistance in establishing QA/QC systems was provided in the form of expert services. Following the installation of an Interlab computer code, fast internal and external communication of test results is now possible and the rapid provision of reports to end-users (farmers and veterinarians) has been facilitated. This factor has important implications for the transmission of data relevant to the Division of Epidemiology in the Directorate of Veterinary Services. HPLC instrumentation and training in its application was also provided. The CVL also benefited from the provision of other equipment from other donor organizations such as the Food and Agriculture Organisation (FAO). The laboratory is well equipped and managed. The capacity established at CVL will serve to support the Government's plans towards implementing disease control programmes nationwide.

With the enhanced capacity established at the CVL, the Government requested the Agency to assist in its plans to roll back the so-called Trans-Veterinary Cordon Fence (TVCF) or "red line", through the TC project, *NAM/5/007 – Control of Animal Diseases in Northern Namibia* with the main objective to create a sustainable veterinary diagnostic service that will contribute to the control of the major diseases affecting livestock in the northern parts of the country at the Ondangwa Veterinary Laboratory (OVL). The OVL has been operational since late 2006 and has been equipped by the Agency. The Agency will continue to train its staff in

relevant disciplines to help improve the diagnostic capacity in the north with a view to bringing the TVCF further north within the next 5 -7 years.

4.1.2 Crop Production

Under the on-going project, *NAM/5/008 - Increasing Crop Productivity and Resource Use Efficiency in the Northern Communal Areas*, the aim is to increase crop productivity through improved soil, nutrient and water management in millet and sorghum-based farming systems. Most soils of Namibia have been extensively cropped with little or no addition of either manure or fertilizer. Overall, soils in Namibia are very low in organic matter and deficient in phosphorus and nitrogen, as well as in both micro- and macro- nutrients. Due to the sandy nature of most of the soils, the water holding capacity is extremely low. Research into improving varieties of millet, sorghum, cowpea, bambara nut, and groundnut have shown that these crops respond favourably to improved management practices and if conditions are good, tend to reach their full yield potential. In order to substantially enhance the benefits accrued during crop improvement, it is essential to devise improved crop management options that target both nutrients (nitrogen, phosphorous) and water, using isotopic and nuclear techniques.

More recently, laboratory facilities have been upgraded and local staff have been trained abroad and in the field to help create the necessary national capacities to develop nutrient and water technologies to improve soil fertility and increase crop production in Northern Namibia..

4.1.3 Water Resources

Through *NAM/8/003 - Automatic Tracer Flow Gauging Stations in Ephemeral Rivers*, the Agency assisted the Ministry of Agriculture, Water and Rural Development in developing an operational system for automated tracer flow gauging during flash floods in ephemeral rivers to provide reliable data for the sustainable exploitation of water resources. Water supply infrastructure in Namibia relies on impoundments of aquifers fed by flash floods in ephemeral rivers. The ephemeral nature of the rivers and the irregular dispersal of precipitation in the country necessitate appropriate water resource management using flow-rate measurements to assess flow volumes as well as the dynamics of surface and groundwater for the calibration and refinement of water-balanced mathematical models. Under the Agency's technical supervision, a subcontract was awarded to CEDEX, Spain, to set up an automatic gauging pilot station utilizing radioactive and fluorescent tracers. CEDEX was required to assemble the components purchased by the Agency, perform all necessary tests on the equipment for gauging the flow rate of ephemeral rivers using artificial tracers, and supply a quality certificate of good performance for the proper functioning of the pilot station. Training of project staff during the assembly and testing phases was also provided. In addition, on-the-job training was provided on tracer methods in isotope hydrology, design and operation of the automatic station, design of tracer experiments, quantitative analysis, river gauging as well as on use of fluorescent tracers in surface hydrology. The establishment of an automated tracer flow gauging system and capacity development of Namibian staff to operate such a system enhances the availability of accurate river flow information, which is a prerequisite for technical, economical and environmental evaluation and optimal exploitation of the country's interior water resources. This will assist the Government to achieve sustainable development of water resources and to provide the population with equitable access to safe water.

More work in this field was continued under *NAM/8/004 - Recharge, Groundwater Quality, and Flow Mechanisms of the Oshivelo and Kalahari Aquifers*, initiated in 2001 with the main objective being an assessment of the sustainable yields and water quality of Oshivelo Artesian Aquifer (OAA) and Southeast Kalahari Artesian Aquifers (SEKAA) by combining isotopic techniques with hydrogeological and geophysical investigations. The Government strategy in the water sector is to achieve sustainable development and equitable access to freshwater resources for all sections of the population of Namibia. The Agency assisted the counterpart institution in the implementation of a comprehensive isotope investigation programme for the delineation of the recharge areas, determination of the recharge rate and the source of the water quality deterioration in combination with other hydrological and geophysical investigations. The Agency inputs consisted of (i) expert services for the planning and preparation of sampling campaigns, field work, data evaluation and analytical services, (ii) funding of consultancy services for the specific activities (e.g. OAA hydrocensus), (iii) on-the-job training in principles of isotope hydrology, environmental and artificial tracers; applications in surface water and groundwater; special emphasis on artificial tracers in river flow gauging, and (iv) provision of laboratory, field equipment and consumables. Furthermore, technical staff members were trained in principles and applications of isotope methods for proper water resource assessment and management. In conclusion this assistance contributed to the establishment of national capabilities for integrating nuclear techniques with hydrogeological and geophysical methods in conducting studies for sustainable development of groundwater resources. The project will allow better access by the population to safe water and will also influence the level of commercial farming activities either by furthering their sustainable development or reducing them, as documented results regarding the volume and quality of Namibia's groundwater may indicate.

It is envisaged that under the newly approved project, *NAM/8/005 - Application of Isotope Techniques to Assess the Groundwater Quality, Recharge and Return Flow Mechanisms In The Platveld Aquifers, Central Namibia*, which aims to assess the sustainable yields, water quality, recharge and return flow mechanisms within the Platveld aquifer area by integrating isotopic techniques with hydrological and hydrogeologic investigations, Namibia will be much closer to understanding how to manage its water resources better for the whole country.

4.2 Public Health

4.2.1 Nuclear Medicine

Under the TC project *NAM/6/005 - Improving Nuclear Medicine Services in Namibia*, the aim was to upgrade the capability of nuclear medicine at the Dr. Bernard May Hospital, Windhoek, Namibia, through a permanent tele-link with the Tygerberg Hospital in South Africa for medical image transfer and remote consultations. Under this project a tele-linking system in the nuclear medicine (NM) departments at the Dr Bernard May Cancer Centre, Windhoek and the Tygerberg Hospital, Cape Town was installed. State-of-the-art Hermes computer systems were provided and both gamma cameras at the Bernard May Centre were connected to the system to allow sophisticated data manipulation as well as transmission of images. This served to increase the efficiency of the NM service in Windhoek and alleviate the isolation experienced by the personnel. Patients were benefiting from this powerful technology in that improved and more rapid diagnosis of a number of conditions became possible. Expert input into the use of the system particularly in cardiac and infection imaging was provided. However, a discrepancy in legalities at the Tygerberg Hospital led to the

temporary halt of the tele-link service and although the system is not constantly opened, the tele-link service can be employed on a case-by-case basis.

Nevertheless, the Government remains committed to providing healthcare services, including nuclear medicine services to all its citizens. In order to contribute to this overall objective, the Government requested the Agency to help expand nuclear medicine services to northern Namibia by establishing a nuclear medicine department at the Oshakati State Hospital. This would ensure increased accessibility to the population in northern Namibia and reduce the current costs for providing nuclear medicine services. In addition, as the main referral hospital for the majority of the 60% of the population that reside in northern Namibia, it is important that Oshakati State Hospital provide nuclear medicine services. This goal is being addressed under the current TC project, *NAM/6/006 – Expansion of Nuclear Medicine Services*. However, the unavailability of senior medical staff to be trained in nuclear medicine has resulted in some delays to the goal of introducing nuclear medicine services in the north of the country.

Namibia also benefited under the regional project, *RAF/6/022 Sustainable Reg. Capability in Nuclear Medicine (AFRA II-23)* initiated in 1999 to assist AFRA Member States to harmonize and implement training programmes for nuclear medicine technologists, establish and use of specialized teams to audit nuclear medicine institutions and promote the sustainability of nuclear medicine infrastructure. The project concentrated its efforts on the most urgent regional needs, including the training of nuclear medicine technologists to enable them to play the important role of support staff. In addition, the project trained 70 nuclear medicine physicians (in the African regions) in important clinical nuclear medicine procedures such as inflammation/infections and pediatric diseases. Based on the encouraging results obtained through the auditing of nuclear medicine institutions, the project prepared the necessary conditions and modalities for recognizing regional designated centres in nuclear medicine.

4.2.2 Radiotherapy

The Agency played an important role in helping Namibia establish its first cancer treatment centre under the national TC project *NAM/6/003 - Establishment of a Central Radiotherapy Unit*. The Agency assisted the Windhoek Central Hospital in finalizing the detailed design layout of a radiotherapy unit. During the construction phase, the Agency exceptionally supported the long-term training of a radiation oncologist for 4 years and the training of a medical physicist for two years and training of four radiographers in the initial phase of the project. Under the TC project *NAM/0/003 - Human Resource Development and Nuclear Technology Support*, further training was implemented and three radiographers were trained. Strong support was forthcoming from the Ministry of Health and Social Services, which purchased Cobalt-60 and Orthovoltage tele-therapy machines, a treatment planning system and a simulator. A full set of calibrated dosimetry equipment was supplied by the Agency as well as a High Dose Rate (HDR) and a Low Dose brachytherapy unit. A team of experts comprising of a clinician and therapy radiographer was fielded to initiate clinical Quality Assurance procedures and develop the documentation required for prescribing and recording treatment. Repairs and re-commissioning of the Orthovoltage machine were also undertaken. As a result of the project, approximately 450 cancer patients are treated annually, representing a gratifying increase of 50% over the numbers of patients receiving this form of treatment before Agency assistance.

4.3 Radiation and Waste Safety Infrastructure

Under the regional project *RAF/9/024 - Upgrading Radiation Protection Infrastructure*, Namibia benefited from expertise needed primarily for the establishment of regulatory framework, including the system for notification, authorisation, inspection and enforcement for the control of radiation sources (Milestone 1), and the establishment of occupational radiation protection programme, including the system for individual monitoring of personnel occupationally exposed to radiation (Milestone 2). A positive development is that Namibia progressed in the establishment of its national inventory of radiation sources using the Regulatory Authority Information System (RAIS) provided by the Agency in terms of software and related training.

The Agency has also assisted Namibia with equipment and training to setup its external radiation monitoring services for radiation workers. To date over 200 radiation workers are under radiological surveillance as a result of this initiative.

Under the regional project *RAF/9/028 - Post-graduate Training in Radiation and Waste Safety*, Namibia had a number of staff trained through short courses on authorizations and inspection of radiation sources as well as one staff member trained to MSc level in radiation protection educational programmes.

4.4 International Treaties and Conventions

The Agency has supported Namibian nationals in a number of training programmes and meetings to promote the ratification of the Additional Protocol, Joint Convention and other treaties/conventions. These include a fellowship, seminars and training course on the state system for control of and accounting of nuclear material, convention of physical protection of nuclear material, meeting on promoting the Joint Convention. Other support modalities include expert missions that advised Government Authorities on system and requirements to ratify the Additional Protocol.

4.5 Safeguards and Environmental Monitoring in the Uranium Industry

The Agency supported a national project with the objective to create a national capacity and capability to perform environmental monitoring activities in the uranium mining sector as well as to ensure that Namibia is equipped to meet its obligations under the Safeguards Agreement. Two expert missions were undertaken and two national training courses were organised to assist the counterpart and transfer skills for the development of an environmental monitoring programme and safeguards reporting mechanism. A wide range of equipment was provided for the project which amongst others include, GPS, HPGe detector, survey meters, alpha counters, radon gas monitors, and sampling equipment provided a number of equipment. The project was not successful, but it is anticipated that a similar project will be initiated with the Regulatory Body and that equipment will be transferred to the Radiation Protection Services.

5. PROJECTED PROGRAMME OUTLINE

5.1 Near-Term Core Programme

Human Resource Development Strategy

In the context of the on-going and future TC Programmes between the Government of Namibia and the Agency, human resources development is and will remain a key factor to ensure the sustainable development of nuclear technology related activities and to further increase the impact of IAEA assistance in the country. Namibia requires a strategic national programme for training to be supported by the Agency mainly through offering opportunities for alternate (combination of local & overseas) educational training to young Namibians in major university disciplines relevant to the IAEA mandate in technology transfer. In addition, to address the present under-staffing of most of the nuclear related institutions in the country, the University and the end-user sectors (mainly health, livestock and water, radiation safety) will consider developing a better approach towards the involvement of students as qualified manpower to carry out activities related to the relevant IAEA TC project. The aim will be to promote and enhance the on-the-job (OJT) training modality in nuclear science and technology by using the facilities already established through the Agency's assistance in these sectors.

In this context there will be a clear need to upgrade and strengthen the skills and capabilities of human resources within the broad spectrum of the applications of nuclear science and technology at (i) the University in order to enhance and strengthen the national infrastructure in nuclear science and technology and (ii) other higher educational establishments. Among the objectives of the University of Namibia (UNAM) are: (a) to be an eminent centre of higher learning, and to train high-level specialists in critical areas for national development and (b) to undertake basic and applied research, with a view to contributing to the social, economic, cultural and political development of Namibia. The following mechanisms can be employed for the mainstreaming of nuclear science and technology into all projects;

- (i) promotion of special training programmes for young professionals in support of the Government's long-term training programme.
- (ii) holding of special sessions (workshops, seminars, etc) in a particular field at higher educational establishments
- (iii) supporting the introduction of new subjects either within an existing curriculum in a science discipline or as a completely new discipline (radiation physics, nuclear analytical techniques, etc) by the fielding of international lecturers/trainers
- (iv) encouraging research associated with postgraduate training, whereby fellows would enrol for MSc or PhD programme by thesis research at the relevant UNAM faculty, which will involve training on a nuclear technique application before embarking on the research. The research will be conducted under the supervision of UNAM but in collaboration with the relevant Ministry.

The objective of these initiatives will be to develop Namibia's human capacity needs in general, but more specifically to augment Government Agencies in their efforts to address gaps in meeting national developmental goals under programmes in human health, agriculture, water resource management, crop production, environmental monitoring and radiation protection.

5.1.1 Agriculture and Food Security

Human Resources Development for the Agricultural Sector

Cooperation between the Government and IAEA in respect of the identified areas for the near term (control of major epizootics) and medium term (crop improvement; and soil nutrient and water management) will be severely constrained by inadequate human capacity - in terms of both numbers and expertise in the Ministry of Agriculture, Water and Forestry. The problem of human resources is highlighted in the National Agricultural Policy (1995) as “One of the prime movers to achieve the country’s agricultural policy objectives is the development of human resources at all levels. The institutional capacity to providing agricultural training at colleges and the Faculty of Agriculture and Natural Resources of the University of Namibia will be developed and strengthened”. In this regard, a major input required from the Agency, in accordance with the HR development strategy, would be the provision of funds to support comprehensive training of staff at laboratories, as well as the introduction of relevant teaching programmes at the University.

Animal Diseases

According to the National Agricultural Policy (1995), to support sustainable livestock production, processing and marketing, the Government will provide effective and efficient livestock disease control, meat hygiene, livestock inspection, epidemiological, diagnostic and extension and training services. Thus, livestock disease control and eradication will remain important goals of the Government’s veterinary service. Key diseases are Food and Mouth Disease (FMD) and Contagious Bovine Pleuropneumonia (CBPP). Diagnostic methods are essential for any disease control or eradication campaign. ELISA (Enzyme Linked Immunosorbent Assay) and PCR (Polymerase Chain Reaction) are key nuclear related methods that are essential for disease diagnosis.

For several years the IAEA has assisted the Central Veterinary Laboratory (CVL) in Windhoek to strengthen its capacity in ELISA and PCR and recently the setup of the veterinary laboratory in Ondangwa. This has not yet produced major impact in the northern communal areas. The National Agricultural Policy (1995) is focused on paying “... increased attention in terms of staffing and funding will be allocated to the communal areas. Such emphasis will be placed on developing the institutions and physical infrastructure necessary to bring veterinary services to the communal areas”. Thus, cooperation between Namibia and the IAEA in the medium term will focus on continuing to establishing capacity for ELISA and PCR in the northern communal areas and strengthening the capacity already established at the Central Veterinary Laboratory.

The CVL participated in a CRP on drug residues in livestock and livestock products. The basic capacity to perform these analyses is established. For the export of livestock products this activity will have to be expanded to meet international trade requirements.

Crop Production

Crop production in the northern communal areas is severely constrained by very low soil fertility and the sandy nature of the soils, made worse by the semi-arid conditions.

In accordance with the priorities and policies established in the National Development Plans (NDP2 and ongoing NDP3), Namibia have focused the activities of the ongoing TC programme on developing improved soil, water and nutrient management (SWNM) technologies for increasing crop production and resource use efficiency in the northern communal areas (NCAs) through experimental work using nuclear-aided techniques.

Integrated soil fertility management strategies as followed are needed to address the problem of low soil fertility: exploiting nitrogen fixation through use of legumes such as cowpeas and groundnuts, optimizing application of nutrient sources such as chemical fertilizers and locally available organic products. Research will be undertaken to find ways of (a) optimizing the benefits of legumes through inter-cropping or rotation with cereals and proper agronomic management and (b) optimizing fertilizer and organic products use by determining the best method and timing of application. The research currently being conducted cannot produce the necessary results due to, among other things, shortage of qualified staff and the lack of appropriate methods such as isotope tracing. Cooperation with IAEA would involve introduction of isotope tracing method, e.g. involving N-15, to enhance the effectiveness of the research.

Besides the integrated soil fertility management strategies outlined above, optimum soil water-nutrient interaction at the plant rooting zone needs to be considered. Both legume biological nitrogen fixation and utilization of applied nutrients by cereal crops are constrained by a lack of adequate soil moisture. The support from the Agency in the use of isotopic and nuclear techniques to develop integrated soil water-nutrient management practices under a range of cropping sequences is important to address the constraint of both soil fertility and water scarcity in crop production. The specialised training of qualified personnel to better managed soil water and improves its conservation in the rain fed areas is much needed. A good nuclear safety framework for the safe use and transport of soil moisture neutron probe (SMNP) to ensure the device can be used safely in the country is also needed.

Water Resources

With its semi-arid to arid climatic and hydrological conditions, Namibia is the driest country in the sub-Saharan Africa. Any development to achieve the Government's broad objectives of employment creation, better education and health conditions, and the resulting social welfare will be strongly dependent on the optimal and sustainable utilization of the available water resources. A National Water Policy is currently under development. A White Paper on this Policy has been prepared wherein the needs and requirements as well as a strategy for policy implementation are described. The White Paper recognizes that an accurate understanding of hydrological processes, particularly aquifer recharge, and groundwater flows, is essential for effective resource management. Further the Paper recognises that there are imbalances and gaps in the present understanding of these processes for the water resources of Namibia as a whole.

The Department for Water Affairs and Forestry (DWAF) has developed a water resources assessment and management plan for the medium term. It is envisaged that the IAEA will help support the national programme in Groundwater Assessment and Management, which aims to carry out investigations into the Platveld, Hochfeld, Cuvelai Basin and Oanob Aquifers. One crucial element for success in this field, based on previous collaboration, will nevertheless be the ability of DWAF to recruit and retain new staff that can form the basis for a timely restructuring of the water management team.

The University through the Multi Purpose Research Centre will also be encouraged to support the implementation of these projects

5.1.2 Public Health

Nuclear Medicine

The objectives of the nuclear medicine services programme in Namibia are to increase accessibility and to ensure that the services are optimally delivered. There is a demand to expand the services offered by nuclear medicine through introduction of various new and state of the art diagnostic and therapeutic procedures. Currently, the national TC project *NAM/6/006 – Expansion of Nuclear Medicine Services* aims to expand nuclear medicine capabilities in Namibia through the establishment of a nuclear medicine facility at the Oshakati State Hospital and to upgrade available capability in nuclear medicine specialities at the Windhoek Central Hospital and thereby give access to about 800 000 people. However, in order to achieve this target, suitable medical staff have to be recruited and trained to compliment the refurbishment of the new centre with new equipment so that proper nuclear medicine services can be offered. Currently this has not happened and the government intends to accord top priority to tackling this challenge.

It is nevertheless expected that when nuclear medicine services are provided in the north at Oshakati, consultation from experienced medical staff at Windhoek will be required.

To support this initiative, the continuation of high quality diagnostic service and uninterrupted nuclear medicine services at the Windhoek Central Hospital /Nuclear Medicine Unit has to be maintained. It is therefore essential that the government pays keen attention to allocating sufficient resources for hiring staff whose skills can be enhanced through teaching programmes supported under IAEA TC projects.

Radiation Therapy

Radiation Therapy continues to make a significant impact and visible contribution to the overall improvement of health care in the country. However, ageing of equipment and inadequate quality control measures threaten the optimal delivery of the cancer treatment programme. The radiotherapy unit serves a national population of almost 2 million people. Equipment installed in 1996/97 was meant to handle superficial lesions, deep seated lesions and lesions requiring intra-cavitary radiotherapy. As the machines get old, so do the number of equipment breakdowns. Notably, the unit for superficial lesions (HVX) has been non-functional for more than 3 years and as its repair is not considered to be cost-effective, a replacement should be prioritised. The same can also be said for the Cobalt-60 unit, which after 9 years of use, is becoming more and more expensive to repair.

Options that need to be considered include, upgrading the Co-60 unit with acquisition of a new source or a linear accelerator. A linear accelerator has the added advantage of producing both photons and electrons that will cater for both superficial and deep-seated lesions. Also critical to the optimal provision of radiation therapy is the refurbishment of the radiation planning system. The current treatment planning system is non-functional and from a recent expert assessment, it is believed to be obsolete.

The on-going technical cooperation project, *NAM/4/002 - Improving Repair and Maintenance of Equipment in Radiation Therapy* to build capacity in the area of equipment maintenance should strengthen the department's capability to troubleshoot equipment failures and reduce machine downtime. However, it is critical that this project be complemented by additional services contract and the identification and training of suitably qualified technical maintenance and service personnel.

However, as with nuclear medicine, in order for Namibia to maintain the delivery of quality cancer treatment care, additional staff such as one more radiation oncologists, two medical physicists and at least 2 more radiographers/technicians will be needed together with the upgrading of equipment. Support for training these key staff as well as the purchase of new equipment items would be needed from the Agency on a cost share basis with the Government.

It must also be strongly emphasised that one key factor for Agency assistance in the field of radiation therapy remains the availability of a strong radiation protection culture, essential for the safety of both patients and medical staff. This will be monitored first hand by the proposed new NRPA and by the Agency.

5.1.3 Uranium Mining

The uranium mining industry provides the basic stimulus for infrastructural development and growth in Namibia. In particular, the uranium mining industry is experiencing an accelerated expansion in the country. Concurrent with this positive development, the mining industry is also a contributor to environmental degradation and there are also health and safety concerns associated with the industry. However, there is a lack of adequate policies and strategies by Government to exercise control over the industry. The Ministry of Mines and Energy (MME) intends to build capacity to carry out independent self-sustained environmental assessments and audits regarding health, safety and environmental impact of the Namibian mining industry, especially the uranium mining industry.

Within the context of minimising environmental impact and ensuring health and safety in the mining industry, the Government needs to develop capacity to:

- (i) define environmental management policies and strategies;
- (ii) develop environmental management systems;
- (iii) regulate exploration and mining activities to ensure that they are performed effectively and meet health, environment and safety standards;
- (iv) establish training programmes in all mining-related aspects of environmental management.
- (v) develop a uranium mining policy.

The experience of the IAEA and uranium producing countries would be helpful to the development of the above.

5.1.4 Energy Planning

Given the current scenarios and the unabated power crisis Namibia is considering various options to augment its electricity supply. The IAEA could assist Namibia in developing energy

planning systems, including consideration of nuclear energy for electricity generation to meet its industrial development goals as stipulated in the National Development Plan and Vision 2030.

Should it be a viable option, the Government seeks to be provided with the core engineering, technological and management support in the field of nuclear power, with specific emphasis on electricity generation. Namibia's expectations are to benefit from information and expertise on internationally accepted proven engineering and management practices in all relevant areas such as technical and human performance, change management, implementation of management systems and a total quality management approach to nuclear power plant operations.

The Ministry of Mines and Energy is proposing a feasibility study that will evaluate the possibilities of nuclear power within the national context against other modalities of electricity generation. The feasibility study should aim to adequately cover (a) the technical, financial, safety and environmental specifications applicable to a project of this nature (b) the viability and commitments associated with nuclear energy in the context of plans for national and socio-economic development and (c) the possible international cooperation both within and outside Africa. The studies should include considerations on the following:

- Develop a comprehensive nuclear legal framework covering all aspects of the peaceful uses of nuclear energy, i.e. safety, security, safeguards, and liability, in addition to the commercial aspects related to the use of nuclear material;
- Establish and maintain an effective regulatory system;
- Develop the human resources for the State organizations and also for the operating organizations required to effectively supervise and implement the nuclear programme;
- Ensure adequate financial resources for the construction, sustained safe operation and decommissioning of the NPP, as well as radioactive waste management;
- Develop a programme for all aspects of operation, decommissioning and radioactive waste management;
- Manage nuclear materials for the long term;
- Communicate in an open and transparent manner with the public and the neighbouring States about the considerations behind the introduction of nuclear power

With regards to the implementation modality for such projects, the Ministry of Mines and Energy should be aware that a prerequisite for such feasibility studies include (a) the setting up of an Inter-Ministerial Committee together with implementation unit and (b) a draft strategic outline for the study.

5.1.5 Radiation and Waste Safety Infrastructure

The near term priority of the government is to operationalise the Atomic Energy and Radiation Protection Act, *Act No. 5 of 2005*. The Regulations in support of the implementation of the Act have yet to be enacted. The Agency has reviewed the draft Regulations, and has encouraged the competent Namibian authorities to complete the procedures for their promulgation.

The operationalisation of the 2005 Act would also include the establishment of the Atomic Energy Board (AEB) and National Radiation Protection Authority (NRPA). This includes obtaining approval for the proposed institutional infrastructure and financial resources for

both the NRPA and the AEB. In support of the institutional infrastructure the Government will recruit staff for both the NRPA and AEB. The IAEA will be called upon to support the training of new staff and also to provide the necessary equipment to equip the staff members with the technical skills to effectively fulfil authorisation and inspections requirements. The support may include short duration training course, scientific visits and fellowships.

Concurrent with the establishment of the institutional infrastructure is the development of all encompassing regulations and codes of practises that will govern the framework under which authorisations are issued and enforcement actions are taken. The IAEA's expertise may also be required here for the development of the complimentary legislative framework.

With regards to the improvement of waste infrastructure in Namibia, this needs to include effective actions to establish technical and human capabilities to manage radioactive waste, including Naturally Occurring Radioactive Waste (NORM) as well as disused sealed radioactive sources (DSRS). Since there are mining and other industrial activities in the country, both waste categories are likely to occur in Namibia.

The application of a certain technology/methodology to deal with NORM wastes, for instance, will depend on specific conditions and therefore, there will be a need to examine the radiological problems raised by NORM in the local environment and to determine the situations in Namibia will implement and/or improve the management strategies of these wastes by the generating industries as well as to implement comprehensive remediation programmes whenever applicable.

Due to this, support may be given by means of the dissemination of feasible technologies to be implemented in the appropriate management of the generated NORM wastes and in the cleaning-up (remediation) of contaminated sites, if considered to be necessary. This can be achieved by means of training courses as well as dedicated projects within the framework of the Agency's TC Programme.

Sealed radioactive sources for gauging and process control are used in the industry and need regular checking and proper management when they become disused. Beside the industrial sources, cancer therapy also involve radioactive sources that will become disused when the activity decays below a certain level.

Regarding the proper management of DSRS the Government plans to establish a group of dedicated experts to follow the entire life cycle of radioactive sources in Namibia, enforce the users for reliable record-keeping and to maintain the inventory of the existing radioactive sources. The group needs to be provided with appropriate infrastructure and annual budget for long-term management of DSRS-issue in the country. Participation in regional activities in the subject is seen as very important.

5.1.6 International Treaties and Conventions

Namibia remains committed to bringing the Additional Protocol into force as soon as possible as well as to enhance its status vis-à-vis the Agency's legal framework including, in particular;

- the Amendment to the Convention on the Physical Protection of Nuclear Material,
- the Convention on Early Notification of a Nuclear Accident,

- the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management
- the Convention on the Safety of Radioactive Waste Management.

Namibia intends to continue to participate in the Agency's legislative assistance activities under, for example TC project *RAF/0/015 - Legislative Assistance for the Safe and Peaceful Uses of Nuclear Energy*, which aims to promote adherence to and implementation of international agreements, guidelines and recommendations and to support Namibia in its efforts to establish, develop, or review its national laws and regulations governing the safe and peaceful uses of nuclear energy and in adopting implementing legislation for the international instruments to which Namibia has or intends to adhere

A priority in the near term will be to set up, within the framework of the new legislative infrastructure, a State System of Accounting for and Control of Nuclear Material (SSAC) that will see to it that Namibia meets all its obligations under the international treaties and conventions. It is intended that the SSAC will have the adequate number of personnel who will be equipped with the skills to implement its programme of activities in the medium term.

5.2 The Medium-Term Core Programme

5.2.1 Agriculture and Food Security

According to the National Agricultural Policy (1995), more efforts should be placed in developing the northern communal areas, where agriculture offers the greatest potential for intensification and diversification. With the right programmes, focusing in these areas will lead to increased productivity and the stabilisation of yields, and will contribute towards the attainment of household food security. Thus, the objective of one of the government programmes for the northern communal areas identified in NPD3 is to support crop and livestock production and diversification. The programme aims to bring about increased productivity of traditional farming by improving crop varieties and production methods, livestock husbandry and breeds, and range management practices. Farmers in the northern communal areas practice mixed farming involving extensive livestock production (mainly cattle, goats and sheep) and crop production (mainly pearl millet, sorghum, maize, cowpeas and bambara nuts). In order to achieve the objective, the National Agricultural Policy (1995) recognizes the importance of agricultural research: "Increases in agricultural output and productivity will depend to a large extent on a strong and practical programme of research..."

Based on the discussions with national specialists and Government authorities, it was agreed that the programme of cooperation between Namibia and IAEA in the medium term should focus on the areas listed in the subsequent paragraphs.

Livestock Disease Control

In order to enhance efforts to control an outbreak of Foot and Mouth Disease (FMD) and CBPP in the North of Namibia, thereby leading to a lifting of the cordon rouge and giving access to the export market for all livestock producers, the diagnostic capacity of the Ondangwa Veterinary laboratory and its extension service should be strengthened.

It must be highlighted that the IAEA has worked previously with Namibia in trying to build the capacity at the Ondangwa Laboratory, but more needs to be done in terms of building efforts to extend the coverage of the disease surveillance to respond timely to potential outbreaks and establish a monitoring programme on vaccination coverage. In this regard, the IAEA will be requested to support the establishment of Quality Control procedures through expert advice and training in order to ensure that the staff at Ondangwa are able to closely monitor and deal with any outbreaks in an emergencies.

Development of Drought Tolerant Crops

Food security is one of the major priorities of the Government in its developmental plans. Most crop varieties grown by farmers grow for a long time. This makes the crops vulnerable to end-of-season droughts, characteristic of the northern communal areas. The objective of the national crop improvement programme is to investigate new techniques for breeding different varieties of key crops (pearl millet; sorghum, cowpeas, bambara nuts), which can mature early and therefore avoid end of season drought and/or which are drought resistant. Only conventional breeding is currently being used in Namibia at present. However, under an on-going TC project, *NAM/5/008 - Increasing Crop Productivity and Resource Use Efficiency in the Northern Communal Areas*, the Ministry of Agriculture, Water and Forestry has been acquiring the skills to employ nuclear techniques to develop improved soil, water and nutrient management (SWNM) for increasing crop production and resource use efficiency in the northern communal areas (NCAs) through experimental work using nuclear-aided techniques.

The improvement of drought tolerance levels of cultivatable crops like pearl millet, cowpeas and sorghum using mutation breeding and gamma radiation techniques could also contribute to ensuring food security for the Namibian society. The aim of the University is to supplement the Ministry of Agriculture, Water and Forestry programmes in enhancing activities to build food security in order to contribute to its VISION 2030 goals. In order to achieve this objective technical capacity is needed and at the initial stage a laboratory will be needed and will require equipment including X-ray cassettes; radiation machine / source; 80 °C freezer; 96-well PCR machine; incubator (with shaking option); laminar flow hood; hybridisation oven; Geiger counter; Scintillation counter; Microfuge (with cooling ability); Plant growth chamber; electrophoresis tanks; PAGE gel electrophoresis equipment; UV-Gel documentation system; Epindorff sample boxes.

The Government would also like the IAEA in cooperation with the University of Namibia to investigate the introduction of radiation mutation and related biotechnology in the breeding programme in order to increase its efficiency. Such an exercise will highlight how the growing season of particular crops can be reduced as well as providing the farming community with a wider variety of crops to choose from.

Water Resources

Namibian Water Authority (NamWater) plans to build a seawater desalination plant to reduce the water supply from the seemingly over-exploited Kuiseb Aquifer – a main aquifer that supplies the western part of Namibia with water. Currently, modelling of the aquifer is ongoing in order to gain a better understanding of the discharge of the palaeo-channels to the sea, which appear to be significant and currently not properly understood. The use of isotope hydrology techniques could be used to assist in understanding the discharge and analysing the set-up.

Okavango River Study - In line with the Master Water Plan, water for the Central Areas will eventually be obtained from the Okavango River. The IAEA could assist in terms of expertise with various hydrologic studies that may have to be carried out on the Okavango River within the next years.

Other activities related to the IAEA TC Programme may include (i) support to the national programme on hydrogeological mapping and integration of databases; (ii) review and validation of national groundwater and water quality/ecology databases; and (iii) review and upgrading of the national groundwater monitoring system.

However, the main challenge facing the government in the field of groundwater management remains the insufficient allocation of resources for hiring qualified staff. The Geohydrology Division of the Department of Water Affairs and Forestry (DWAF) currently has 2 assistant Hydrogeologist and 1 senior Hydrogeologist. This level of staffing is much too low for efficient management of the different projects. It is essential that the Government of Namibia allocates sufficient funds to increase the professional staff of DWAF. In addition the following should be considered to help build capacity in ground water management at both the educational level and the practical working level:

- Local Expertise: should benefit through the cooperation of DWAF and the IAEA with the sending of experts either during missions for existing projects, or as and when needed to hold short courses for general technology transfer.
- Specialist Training: the Department will continue to benefit from more intensive courses held by the IAEA for a few selected individuals who could be trained in isotope hydrology. Approximately 2 individuals per annum could be the target.
- Student Involvement: DWAF will continue to encourage students from UNAM to do vacation work so as to stimulate interest, create awareness and as a result be able to assess candidates for future employment.
- Isotope Hydrology Module at UNAM: The possibility of establishing an Isotope Hydrology module within the Geology curriculum at UNAM will be considered. UNAM should then use DWAF projects for field exercises.

5.2.2 Human Health

Nutrition

In view of the severity of nutrition problems in Namibia, especially among children, it is very important that the use of stable isotopes be considered for developing and evaluating nutrition intervention programmes. Stable isotope techniques can be used to evaluate national interventions aimed at improving nutritional status of vulnerable populations whilst providing scientific evidence to help senior policy and programme planners make informed decisions on what nutrition programmes to adopt and implement. In addition, these techniques are accurate tools for assessing mineral bioavailability and can be used to evaluate child feeding/complementary feeding programmes.

Relevant areas of applications and possible collaboration should include the following:

- i. Undertaking micronutrients bioavailability studies of fortified food products by exploring the fortification of meals with iron; cooking oil or peanut butter with Vitamin A where applicable
- ii. Comparing growth and body composition of infant and young children born of HIV positive mothers and those born of HIV negative mothers.
- iii. Assessment of Food composition analysis

5.2.3 Radiation and Waste Safety Infrastructure

The legislative infrastructure developed recently needs to be supported by an effective and capable technical infrastructure. This includes well qualified personnel and specialised equipment to fulfil the requirements under the law. In particular, skills development is necessary in the development of procedures and processes of inspections and authorisations (notification, registrations and licensing). Although capacity exist for inspections and authorisations in the medical field, this need to be expanded to include not only diagnostic radiology, but also radiotherapy, nuclear medicine, dental surgeries and other institution where x-ray technologies are applied. In order to strengthen this function, equipment such as a CT inspection kit; Mammography inspection kit; dark room inspection kit and quality assurance tools for medical exposure control should be acquired. The technical capability to inspect and authorise nuclear gauges in industry also needs to be developed and for this purpose a survey meter and contamination meter or alpha counting system should be acquired. The expertise and skills in the techniques of inspections and general management of authorisations need to be strengthened by specialised training of the core group of radiation protection inspectors. Such training should also include development, implementation and auditing of quality assurance programmes in practises in order to control medical exposures as well as management of sealed sources in industry.

An area of grave concern is the radiological exposure monitoring in the mines and especially in the Uranium industry. In order to develop capacity in this area, equipment need to be acquired which should include a germanium spectroscopy system (HPGe), alpha counting system, survey meters, radon gas monitors and sampling equipment. This will enable monitoring of exposure levels through sampling and sample analysis, monitoring of airborne radioactivity and radon gas measurements for the purpose of occupational and environmental protection. It is essential that the appropriate expertise is developed for this purpose by recruiting and training at least two staff members with suitable educational profiles. The same equipment could be used to expand the radiation monitoring exercise to include monitoring for radioactivity levels in water and food stuff as well as in inhabited environments or other places where the need exists for radiation exposure monitoring. This additional exercise has to be accompanied with the recruitment and training of an additional staff member.

With regard to the development of the occupational radiation protection programme the current individual dosimetry system has to be upgraded to improve the efficiency of the service as well as to cater for all radiation workers in the employ of both the State and private practices. As such the dosimetry service needs to be supported with a database that will enable efficient management of individual and area monitoring dose results. Complimentary

to the individual monitoring service is workplace monitoring which has to be enhanced by procuring thermoluminescence (TL) dosimeters for environmental monitoring in the workplace.

In the long term, consideration will be given to the development of a radiological and nuclear emergency response and preparedness plan. Again, this will require development of skills and capacity in the preparation and regular testing of the plan. This plan has to be complemented by an education, communication and training programme that will sensitise the Namibian society on the advantages and disadvantages of ionising and non-ionising radiation.

5.2.4 International Treaties and Conventions

Following the setting up of the SSAC in the near term, the SSAC will be tasked to ensure that Namibia ratifies the Additional Protocol (AP) and will be responsible for making declarations pursuant to requirements of the Additional Protocol in relation to Articles 2 and 3. SSAC will be tasked to follow up implementation of Namibia's obligations under the Convention on the Physical Protection of Nuclear Material (CPPNM), the implementation and control of Physical Protection Measures.

Following the setting up of the SSAC in the near term, the SSAC will be tasked with ensuring that Namibia brings into force its Additional Protocol and with making declarations pursuant to Articles 2 and 3 of the Additional Protocol once it has entered into force. The long term objective of the SSAC will be to ensure that Namibia becomes party to the international legal instruments mentioned in section II.3.7 above as well as to the Pelindaba Treaty for Africa.

Legislative assistance, including under the regional TC project *RAF/0/015 - Legislative Assistance for the Safe and Peaceful Uses of Nuclear Energy*, is available to assist Namibia to meet the above objectives.

5.2.5 Nuclear Knowledge Management

Nuclear Information and Nuclear Knowledge Management

The International Nuclear Information System (INIS) is the world's leading information system on all aspects of peaceful applications of nuclear science and technology. INIS maintains and makes available to Member States valuable nuclear information resources on these topics. These information resources include the INIS Database, with over 2.8 million references, and a unique INIS collection of over 600,000 full text documents. INIS is operated by the IAEA in close cooperation with its Member States.

The national INIS Centre is the focal point in each Member State for all INIS related activities. An active national INIS Centre is crucial to supporting the country's national nuclear programme. In particular, it ensures the provision of information services to potential users in the country, i.e. scientists, researchers, universities and students; and ensures the preservation of national nuclear knowledge for future generations. It also ensures worldwide visibility of national input through dissemination of information through INIS products and services. In addition, an active national nuclear information centre has a significant impact on building the capacity of staff members working in the INIS Centre in all aspects of information handling and processing. As a result, the national INIS Centre is able to have an

active and important role in supporting the national nuclear program for sustainable development and enhances public awareness and understanding on the benefits of nuclear energy.

Namibia joined INIS in 2006. The Government of Namibia will provide the space needed to host the national INIS Centre, as well as qualified staff members to manage the Centre and its participation in INIS.

The IAEA will provide the expert advice necessary to set up the Centre, provide on-the-job training for INIS information processing and other relevant subjects at well-established national INIS Centres, and provide necessary equipment such as personal computers and related hardware.

Nuclear Knowledge Management

Developed and developing IAEA Member States face knowledge challenges and Namibia is no exception. With a population of fewer than 2 million people and with nuclear technology knowledge very scarce in the country, it is imperative that Namibia endeavours to adopt a nuclear knowledge management (NKM) programme. Sufficient experience has not yet been gained by all. Developed countries are the custodians of nuclear knowledge accumulated over decades. There is a consensus that actions need to be taken to preserve key parts of that knowledge.

A second challenge is the effective transfer of knowledge between generations of workers, and the need to sustain and develop sufficient human resources to continue the operation of existing facilities, and to prepare for a possible expansion in the future.

Developing countries like Namibia face different knowledge challenges: capacity building, as well as access to and transfer of knowledge to the “country of growth”. Knowledge and human resources need to be built up for new nuclear power programmes, which further needs to be sustained and not be brain-drained.

The IAEA’s strategy for future and planned activities in the short and medium term to help Member States manage nuclear knowledge comprises of the following activities:

- Providing guidance for policy formulation and implementation of nuclear knowledge management, including the implementation of effective knowledge management systems;
- Strengthening the contribution of nuclear knowledge in solving development problems, based on the needs and priorities of Member States;
- Pooling, analyzing and sharing nuclear information to facilitate the creation of knowledge and its utilization;
- Preserving and maintaining nuclear knowledge through specific projects in the subject area; and
- Enhancing nuclear education and training.

Another important role for the IAEA in this regard will be to assist Namibia in the transfer of knowledge from “centres of competence” to “centres of growth”. This requires effective networking and communication - all stakeholders have to be encouraged to work together and the IAEA can provide a mechanism and platform for doing so. The potentially high risk of knowledge loss and the additional cost of future generations must be avoided.

6 OTHER SUPPORT ACTIVITIES

6.1 Radiation Physics

The Physics Department at UNAM is setting up a teaching and research nuclear laboratory where all final year physics students will use the laboratory for practical work in a half-semester nuclear physics course. First year physics students are also introduced to radioactivity and perform experiments in radiation detection and measurement. It is expected that one candidate will pursue a Master's degree in Nuclear physics using the facility in the laboratory for his research. As proposed in the *2001-2006 CPF*, the natural radioactivity in the soils of different parts of the country is being studied using the same nuclear laboratory. To date a study on the soils of the capital city, Windhoek, has been completed and published in an international scientific journal (*Radiation Protection Dosimetry*).

The current research work aims to determine the concentrations and distribution of selected radionuclides in soils, water and rocks in different regions of the country. However, the project will now include the routine analysis of samples and the training of certificate, undergraduate and postgraduate students in gamma spectrometry. At present, liquid nitrogen has to be purchased and used to operate the equipment (HPGe, etc.) in the laboratory when doing research work. For the routine analysis and training of students, the cost of the liquid nitrogen needed will be very high. It is therefore necessary to acquire an electrically refrigerated cryostat (Canberra's Cryoelectric II) which does not use liquid nitrogen for such routine analysis and training. Other resources that will assist in strengthening of this project include academic fellowships to train staff members in nuclear and radiation physics as well as scientific visits for staff members to acquaint themselves with technical developments in similar operating departments.

The University, in collaboration with the Ministry of Mines and Energy (MME) and the Ministry of Health and Social Services (MHSS), is developing a two-week (eighty hours) certificate course in radiation monitoring and safety in mines and nuclear facilities. This course is part of the efforts to build capacity in the country for sustainable provision of expertise in radiation monitoring and safety in mines, hospitals, laboratories and other facilities where ionising radiation is applied. The target groups are Mine workers, Custom Officials, Police, Hospital and Laboratory staff and those who could come across radioisotopes or ionizing radiation in their line of duty. It is hoped that the stakeholders will approve and encourage their employees to participate in the course. There is a plan to upgrade the course to a University Diploma course in the near future.

The IAEA will be requested to review the curriculum as well as provide expertise to help with the teaching of the course on a short-term basis and at appropriate intervals.

6.2 Environmental Geology

The Geology Department is setting up an environmental laboratory for the Science Faculty at UNAM to cater for environmental geology and other related projects concerned with environmental monitoring and protection of natural resources in Namibia. The environmental geology project will focus on the environmental impacts associated with the exploitation of mineral and water resources in active and ancient mining districts of Namibia. Research activities will include pollution monitoring, management of waste disposal sites and mining

waste dumps, environmental effects of open pit and underground mining, resource management and identification and protection of catchment and groundwater recharge areas. In order to develop capacity in effective environmental monitoring and protection, an XRF machine is required for quantitative analyses of soils, sediment, water, metals, minerals and rocks. The XRF equipment should include two radioisotope sources or X-ray tubes to analyze elements from Na to U; a detector (5-mm Si(Li) coupled with an amplifier and cooled by a liquid nitrogen or thermoelectrically cooled silicon drift detector); a PC-based multi-channel analyzer for collecting data and software for spectral analysis and certified IAEA standards for calibrating the measuring setup. Other resources include laboratory equipment for sample preparation including Jaw crusher (replaceable jaws); Disk Mill pulverizer; Pelletizing press; Fused glass bead preparation equipment (including Pt crucibles). Also needed will be the human resources development component which includes fellowships for academic/research staff and technicians

6.2.1 Marine Resources

The fisheries and marine resources is an important contributor to the national GDP and it is all the more important to create, ensure and sustain an environment conducive for exploitation of the marine while safeguarding against sources that could deplete this essential national resource.

Namibia is part of the Benguela Current Large Marine Ecosystem and its marine productivity is based, mainly, on the up welling produced in this region, which can be studied using tracer techniques. In addition, coastal pollution problems due to coastal cities and agricultural and industrial activities can be effectively dealt with in the framework of a coastal zone management project, including pollution monitoring and control.

Shellfish Poisoning due to the occurrence of Harmful Algal Blooms has a significant socio economic impact along the Benguela region. The earliest support of the regional IAEA project on Coastal Zone Management- Phase I (RAF/7/005) and its new Phase II (RAF/7/007) addressed the monitoring of Paralytic Shellfish Poisoning through the use of a nuclear method. Under this project the Ministry of Fisheries and Marine Resources conducts research and monitoring of harmful algae in seafood using nuclear technology.

This project could be extended with the same technology to detect and quantify other neurotoxins produced by harmful algae. The future cooperation with IAEA would focus on Amnesic Shellfish Poisoning through regional activities.

The University of Namibia also plans to use stable isotopes to assist in the development of optimum feeds and monitor food pathways in the polyculture of marine organisms. In particular the objectives of this project will be to (i) to develop least cost (in both monetary & environmental terms) feeds for marine aquaculture species (fin fish & gastropods) in Namibia, using stable isotopes to measure protein utilization (ii) to use the isotopes in the uneaten and egested feed of the organisms to trace uptake and inclusion of waste feed in co-cultured bi-valves and (iii) to trace uptake of waste food nitrogen in co-cultured macro-algae. In order to develop the capacity to realise this objectives the University needs to build the human capacity which includes fellowships for MSc student and technicians, scientific visits for researcher/academic staff to visit appropriate research centre in the Southern African region as well expert mission to assist and guide in the development of the programme.

6.2.2 *Establishment of Sequencing Laboratory*

The objective is to establish a national sequencing laboratory at the University of Namibia that will be used to train students as well as to provide the facilities and the technical know-how to all the national scientific institutions that are involved with protein/gene analysis. This laboratory would offer a high output option in gene/protein sequence determination, genotyping (using micro satellites and mini satellites) and mutation analysis using energy transfer style dye terminator chemistry. As the country does not have such a laboratory, Namibian scientists will have to rely on exporting their samples to South Africa for analysis. The laboratory will require a sequencing facility with sequencing software and reagents.

6.3 Regional Cooperation Programmes

In general, assistance from the Agency is delivered under two mechanisms; national and regional technical cooperation (TC) programmes. Whereas under the national programme, assistance from the Agency can be very focused, under the regional, the focus can be wider. However, this does not mean that the regional TC programme cannot meet individual Member States' needs. For some knowledge areas, a regional project is the most optimum channel for assisting an IAEA Member State. The obvious cases are where a particular problem is transboundary, like animal diseases. However, under a regional project, problems and ideas for tackling those problems can easily be generated in regional forums, either at regional training courses or meetings. For this reason, Namibia has been a member of the AFRA group and will continue to support AFRA and be an active participant in AFRA and non-AFRA regional programmes. In this regard it is anticipated that Namibia will continue to receive assistance under the IAEA regional programme. However, this needs further development, especially with participation. Namibia will be encouraged to participate more actively in the IAEA regional programme based on the priorities highlighted in this CPF together with plans for future development of nuclear knowledge preservation and education at more junior levels in academia.

ANNEX I: APPROACH TO TECHNICAL COOPERATION

1. BACKGROUND

1. One of the key issues discussed during the Third Policy Review Seminar in September 1994 was how best to ensure that the Agency technical assistance is in line with Member States' national development goals and priorities.

2. There was agreement that Medium Term Country Plans for the application of nuclear technology to support national development objectives could provide the desired frame of reference and strategy for a country's technical cooperation programme with the Agency. Member States were encouraged to prepare such Medium Term Plans. In the absence of formal Medium Term Plans other relevant documents could be used depending on conditions and practices prevailing in different countries to prepare a strategy for the future cooperation.

3. It was also agreed that based on Medium Term Country Plans or other relevant documents and information received from Member States, the Secretariat should elaborate a concise Country Programme Framework (CPF) for Agency technical cooperation with each recipient country. The paper would show the key areas where nuclear applications can play significant role in reaching national development objectives and where the Agency should concentrate its technical cooperation efforts and resources. The Frameworks, covering a period of 4-6 years, will have to be established in close cooperation with, and endorsement of, the country concerned. They would provide a frame of reference for individual project but would not in themselves have to be project-specific so that flexibility can be maintained.

4. In all of the above, the IAEA Secretariat has taken note of the view expressed during the Seminar that in some cases, for example in countries without an established institution responsible for planning the peaceful uses of nuclear energy, the involvement of national planning authorities may be desirable and useful in establishing Medium Term Country Plans involving technical cooperation with the Agency. This should be left to the judgment of the Agency's designated national counterparts in each country. These would, where appropriate, initiate and carry out such internal consultations.

5. This particular Country Programme Framework outlines the 5-year strategy for focused IAEA technical cooperation efforts in Namibia. Once agreed, it should reflect the considered view of all concerned parties on how best to utilise assistance from IAEA and national counterpart institutions in supporting the current country's goals and priorities.

6. In particular, the document is intended to:

- (i) facilitate a dialogue between the Government and IAEA for programme development and implementation;
- (ii) maximise co-ordination and complementarities of IAEA technical cooperation with other donor assistance;
- (iii) maximise harmonisation of technical assistance with other forms of assistance; and
- (iv) assist in undertaking "programme-driven" resource mobilisation within the international community for the purposes of social and economic development of the country.

2. BASIC PRINCIPLES OF TECHNICAL COOPERATION

7. The basic principles of technical cooperation under this Country Programme Framework are:

- The actions to be funded under this programme are an integral part of and support the sectoral priorities established by the Member State. Therefore, the national planning authorities and Atomic Energy Commissions or equivalent organisations play a key role in assessing the priority needs of the countries, identifying the priority sectors and areas for cooperation, and subsequently evaluating and proposing the projects to be funded under the bi-annual Programme Cycle;
- The Country Framework covers at least a two programme cycle period (4 years);
- In order to achieve impact, this technical cooperation pursues a limited number of sectoral objectives;
- Technical cooperation is implemented on a decentralised basis. The national recipients of assistance are closely involved in the preparation and later on will have the main responsibility for the execution of the projects;
- Particular attention will be paid to the involvement of the Government and private institutions, nuclear research institutes and universities in the implementation of the projects, notably in association with national organisations where the necessary infrastructure is available;
- The final selection of the projects to be funded by the IAEA within the framework of this technical cooperation is the responsibility of the Department of Technical Cooperation of the IAEA. The basic aspects for consideration during the appraisal of projects for approval are as follows:
 - The project oriented towards the end user;
 - The project responds to a major need of the country;
 - The project is realistic;
 - The project has strong Government commitment (sustainability);
 - Nuclear technology plays a role;
 - The project has visible social or economic impact.

8. During the process of the evaluation and appraisal of the proposals submitted by Member States, the *Central Criterion* of Government commitment is increasingly used in the prioritisation and selection of projects. A project meets the Central Criterion if it addresses an area of real need in which there is a national programme enjoying strong government commitment and support. Such projects take two forms: (a) those that produce a tangible socio-economic benefit in an area in which nuclear technology holds a comparative advantage; and (b) those that clearly support an enabling environment for the use of nuclear technologies (such as safety infrastructures or energy planning).

9. The Technical Assistance project requests presented by Governments to the Agency will be detailed in those co-ordination between the Agency and the national counterparts, in case they are approved by the Agency, bearing in mind the above features and possibility for attracting funds from international financial institutions and possible donor countries. In so doing, collaboration with other International Organisations will be sought and duplication of efforts will be avoided.

10. Country Programme Frameworks will not only facilitate a development oriented national TC programme but will also provide an opportunity to initiate a regional programme where the distinct benefits can be derived through cooperative activities. Such activities will normally cover three or more recipient Member States. These Regional Projects are in addition to the activities planned under the Regional Agreement AFRA.

ANNEX II: LIST OF ON-GOING IAEA-SUPPORTED TECHNICAL COOPERATION PROJECTS IN NAMIBIA

Active National Projects (7)

<u>Project Number</u>	Title	<u>1st Year of Approval</u>
<u>NAM0003</u>	Human Resource Development and Nuclear Technology Support	2003
<u>NAM3003</u>	Environmental Control, Audit, and Safeguarding of Namibian Uranium Industry	2001
<u>NAM4002</u>	Improving Repair and Maintenance of Equipment in Radiation Therapy	2007
<u>NAM5007</u>	Control of Animal Diseases in Northern Namibia	2003
<u>NAM5008</u>	Increasing Crop Productivity and Resource Use Efficiency in the Northern Communal Areas	2005
<u>NAM6006</u>	Expansion of Nuclear Medicine Services	2005
<u>NAM8005</u>	Application of Isotope Techniques to Assess the Groundwater Quality, Recharge and Return Flow Mechanisms In The Platveld Aquifers, Central Namibia	2007

Active Regional/Interregional Projects (29)

<u>Project Number</u>	Title	<u>1st Year of Approval</u>
<u>INT0060</u>	Technical Co-operation Between Developing Countries	1995
<u>RAF0011</u>	Human Resource Development and Nuclear Technology Support	1995
<u>RAF0015</u>	Legislative Assistance for the Safe and Peaceful Uses of Nuclear Energy	2001
<u>RAF0016</u>	Sustainable Energy Development in Sub-Saharan Africa	2001
<u>RAF0018</u>	Human Resource Development and Nuclear Technology Support	2003
<u>RAF0019</u>	Country Programme Review	2003
<u>RAF0021</u>	Nuclear Security Implementation Support (AFRA I-3)	2003
<u>RAF0022</u>	Sustaining the Managerial Capability of AFRA Member States (AFRA V-5)	2005
<u>RAF0024</u>	Sustaining African National Nuclear Institutions (AFRA V-4)	2005
<u>RAF0025</u>	Country and Regional Programme Review	2005
<u>RAF0027</u>	Consumer Safety and Trade Development through Competent Nuclear Testing and Metrology Laboratories (AFRA IV-13)	2007
<u>RAF0028</u>	Strengthening Planning Capabilities for Sustainable Energy Development (AFRA VI-1)	2007
<u>RAF4015</u>	Strengthening Waste Management Infrastructure (AFRA I-1)	1997

<u>RAF4017</u>	Sustaining Regional Capability in Maintenance and Repair (AFRA IV-4)	2001
<u>RAF5056</u>	Field Evaluation and Dissemination of Improved Crop Varieties Using Mutation Breeding and Biotechnology Techniques (AFRA II-5)	2007
<u>RAF6024</u>	Management of the Most Common Cancers in Africa (AFRA II-4)	2001
<u>RAF6026</u>	Application of Nuclear Medicine Techniques	2001
<u>RAF6027</u>	Strengthening Regional Capability in Medical Physics (AFRA II-5)	2001
<u>RAF6030</u>	Diagnosing Diseases Using Clinical Nuclear Medicine (AFRA II-9)	2005
<u>RAF6035</u>	Enhancing Accessibility and Quality in the Care of Cancer Patients (AFRA II-10)	2007
<u>RAF7005</u>	Coastal Zone Management, Phase I (AFRA II-6)	2003
<u>RAF7006</u>	Using Isotope Techniques to Assess Nutrition Intervention Programmes Related to HIV/AIDS in Africa	2003
<u>RAF7007</u>	Coastal Zone Management, Phase II (AFRA II-11)	2007
<u>RAF8028</u>	Investigating Dam and Reservoir Leakages and Safety (AFRA IV-5)	1999
<u>RAF9031</u>	Strengthening National Regulatory Infrastructure for the Control of Radiation Sources	2005
<u>RAF9032</u>	Development of Technical Capabilities for the Protection of Health and Safety of Workers Exposed to Ionizing Radiation	2005
<u>RAF9033</u>	Strengthening Radiological Protection of Patients and Medical Exposure Control	2005
<u>RAF9035</u>	Education and Training in Support of Radiation Protection Infrastructure	2005
<u>RAF9037</u>	Strengthening Nat. Infrastructure for Control of Public Exposure with Emphasis on Safety in Mgmt. of Radioactive Waste	2007

ANNEX III: LIST OF PARTICIPATING INSTITUTIONS IN THE COUNTRY TC PROGRAMME

The **Ministry of Health and Social Services** provides services as the National Liaison Office in Namibia (including AFRA Projects) as well as being the focal point for Radiation Protection, Radioactive Waste Management and Nuclear Security through the National Radiation Protection Authority.

EDUCATION

Field of Activity	Institutions
Human resources capacity building	Ministry of Health and Social Services University of Namibia

AGRICULTURE

Field of Activity	Institutions
Livestock diseases	Central Veterinary Laboratory, Windhoek Ondangwa Veterinary Laboratory
Plant breeding and genetics	Ministry of Agriculture, Water and Forestry

HEALTH

Field of Activity	Institutions
Radiotherapy and Nuclear Medicine	Windhoek Central Hospital Oshakati Central Hospital

WATER RESOURCES

Field of Activity	Institution
Groundwater and surface water resource assessment	Ministry of Agriculture, Water and Forestry (Department of Water Affairs/Geo hydrology Division)

ENERGY AND MINING

Field of Activity	Institutions
Sustainable Energy Development	Ministry of Mines and Energy
Fuel Cycle and Waste Management (Safeguarding uranium industry)	Ministry of Mines and Energy / Ministry of Health and Social Services

OTHERS

Field of Activity	Institutions
Nuclear Instrumentation, Electronics and Reactor Control	Ministry of Health and Social Services
Marine Environment and Coastal Zone Management	Ministry of Fisheries and Marine Resources (National Marine Information and Research Centre)

ANNEX IV: MULTILATERAL AGREEMENTS

IAEA Multilateral Agreements

	Title	In Force	Status
<u>P&I</u>	Agreement on the Privileges and Immunities of the IAEA		Non-Party
<u>VC</u>	Vienna Convention on Civil Liability for Nuclear Damage		Non-Party
<u>VC/OP</u>	Optional Protocol Concerning the Compulsory Settlement of Disputes		Non-Party
<u>CPPNM</u>	Convention on the Physical Protection of Nuclear Material	2002-11-01	accession: 2002-10-02
<u>CPPNME</u>	Amendment to the Convention on the Physical Protection of Nuclear Material		Non-Party
<u>NOT</u>	Convention on Early Notification of a Nuclear Accident		Non-Party
<u>ASSIST</u>	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency		Non-Party
<u>JP</u>	Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention		Non-Party
<u>NS</u>	Convention on Nuclear Safety		Non-Party
<u>RADW</u>	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management		Non-Party
<u>PVC</u>	Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage		Non-Party
<u>SUPP</u>	Convention on Supplementary Compensation for Nuclear Damage		Non-Party
<u>RSA</u>	Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA (RSA)	1991-10-30	Signature: 1991-10-30
<u>RCA</u>	Third Agreement to Extend the 1987 Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA)		Non-Party
<u>AFRA</u>	African Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA) - Third Extension	2005-04-04	acceptance: 2005-03-24
<u>ARCAL</u>	Cooperation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL)		Non-Party
<u>ARASIA</u>	Cooperative Agreement for Arab States in Asia for Research, Development and Training Related to Nuclear Science and Technology (ARASIA)		Non-Party

Last updated on 2007-10-17 by OLA

Safeguards Agreements

Reg.No	Title	In Force	Status
1699	Agreement between the Republic of Namibia and the IAEA for the Application of Safeguards in connection with the NPT	1998-04-15	Signature: 1998-03-19