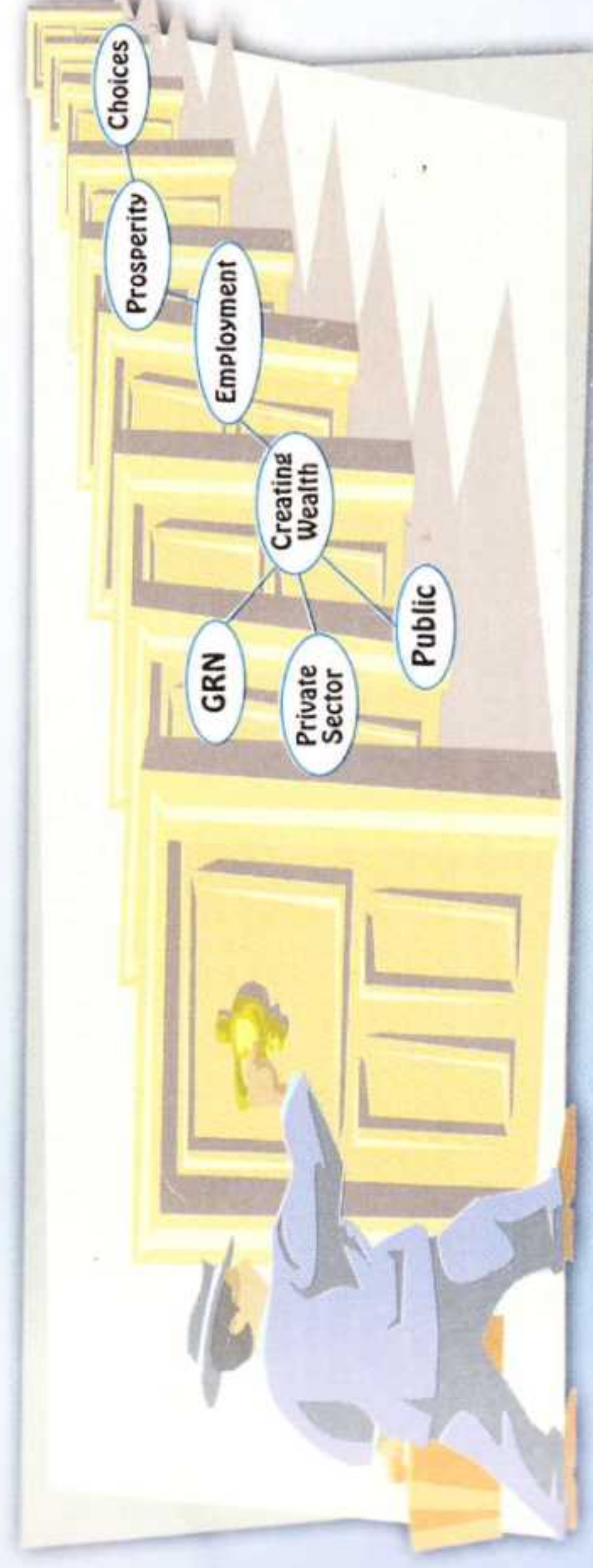




National Policy on Research, Science & Technology



Education + Training + Science + Research = Technology + Added value = Jobs + Products + Services + Wealth & Prosperity for All



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Research, Science & Technology Policy of the Republic of Namibia, 1999

Includes: Foreword by Hon Nahas Angula, Minister, Higher Education
Charts and tables linking Science, Technology and Education output to national and Sectoral performance.

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| 1. Research and Development | 2. Science Policy |
| I. Technology Policy | II. Earle Spencer Taylor |
| III. Alfred van Kent | |
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S&T Policy

This Science and Technology (S&T) policy may be viewed as "the set of principles that will guide the nation in how it generates, contributes to, and benefits from scientific knowledge and technology. It should serve not only to influence the pace and quality of our economic and social development but equally the process of acquisition, absorption, adaptation, utilization and further development and application of science and technology for the purpose of achieving our national development objectives". In this regard, Namibia's S&T policy encompasses not only R&D but addresses a wide range of national issues, circumstances, activities, actors, opportunities and constraints that are critical to the concerns of individuals, corporations and government. The concerns, inter alia, includes, the following main features and aspirations:

- S&T education at all levels, as a lifelong learning activity
- S&T strategy in human resource capacity development
- S&T strategy in sectoral and national development
- Role of technical and vocational education in our industrialization
- R&D system and its sustainable funding
- Production and productivity systems and appropriate technologies
- Effective value adding linkages and development
- S&T information system and dissemination
- S&T innovation system to support entrepreneurial activities
- Market development and commercialization and of S&T innovations
- Strategic Planning for technical change
- Environmental considerations for sustainable S&T applications
- Protection of S&T property, rights and traditions, especially: community-based knowledge systems
- gender equity and youth sensibilities in S&T development
- Equity in regional and rural development of S&T resources
- Regional and international cooperation in S&T development

In principle, the S&T policy will be shared vision and responsibility of three major partners: government, non-profit organizations and the private sector, with international organizations playing an increasing role as broker. Empirical evidence indicates that most industrialized countries are investing in excess of 1% of their GDP in S&T policy directed through S&T education, R&D in government and private sector and other investments that have proved to be significant both in wealth creation, job creation, knowledge creation, income generation and real citizens empowerment.

In its review, The OAU at its 1997 Summit took note of Africa's low rate of S&T investments and their returns. In particular, it noted the wide disparity and clear inconsistency between countries and within sectors, and agreed unanimously to target from FY1999/2000 onwards, at least 1% of National GDP towards research and innovation and S&T education to enhance, promote and sustain national, sectoral and balanced regional development.

Namibia has accepted this challenge. And accordingly, it will seek aggressively to implement this charter, and put into full effect this enlightened S&T policy within a conducive social, political and economic environment.

Developed by the Ministry of Higher Education, Vocational Training, Science & Technology under the Commonwealth Fund for Technical Cooperation, with technical assistance provided by Prof. Earle S. Taylor, Commonwealth Adviser on Science, Technology and Research Development.

31 May, 1999

List of Acronyms and Abbreviations used

BON	Bank of Namibia
BOS	Bureau of Standards
CFC	ChloroFluoroCarbons
CFTC	Commonwealth Fund for Technical Co-operation
COMESA	Common Market for East and Southern Africa (formerly known as PTA)
CNBA	Council for Namibia Biotechnology Authority
CNQA	Council for National Qualifications Authority
CRII	Council for Research and Industrial Innovations
CSO	Central Statistics Office
CSTE	Council for Science and Technical Education
CVIT	Council for Vocational and Industrial Training
DRFN	Desert Research Foundation of Namibia
DRST	Directorate for Research, Science and Technology
FRST	Foundation for Research, Science & Technology
GDP	Gross Domestic Product
GNP	Gross National Product
GRN	Government of the Republic of Namibia
GSD	Geological Survey Department, Ministry of Mines & Energy
HED	Higher Education Directorate
RIC	Regional Innovation Centres
MAWRD	Ministry of Agriculture, Water & Rural Development
MBEC	Ministry of Basic Education & Culture
MET	Ministry of Environment and Tourism
MOHSS	Ministry of Health and Social Services
MHEVTST	Ministry of Higher Education, Vocational Training, Science & Technology
MME	Ministry of Mines & Energy
MOF	Ministry of Finance
MRC	Multidisciplinary Research Centre
MRI	Marine Research Institute
MTE	Ministry of Tourism and Environment
MTI	Ministry of Trade & Industry
MWTC	Ministry of Works, Transport & Communications
NBS	Namibia Bureau of Standards
NCCI	Namibian Chamber of Industry and Commerce
NCRST	National Commission on Research, Science and Technology
NDPI	National Development Plan or First National Development Plan
NEPRU	Namibia Economic Policy Research Unit
NES	Newly Emerging Sates
NIC	Newly Industrialized Countries
NIED	National Institute for Educational Development
NPC	National Planning Commission
NQA	Namibia Qualification Authority
OP	Office of the President
OPM	Office of the Prime Minister
PON	Polytechnic of Namibia
PSIP	Public Sector Investment Programme
R&D	Research & Development
S&T	Science & Technology
SADC	Southern Africa Development Community
SEDI	Small Enterprise Development Initiative
SME	Small and Medium Enterprise
SMIE	Small, Micro & Informal Enterprises
STIC	Science and Technology Information Centre
STIF	Science & Technology Innovation Fund or the (FIST)
STP	Science & Technology Park
TCs	Teachers Colleges
TCC	Technology Consultancy Centre
TDC	Technology Demonstration Centre
TIDU	Technology Incubators and Demonstrations Unit
UNAM	University of Namibia
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
VA	Value Added
VETD	Vocational Education & Training Directorate
VTC	Vocational Training Centers

Foreword

I am deeply encouraged by the tone of the national debate and nation's growing appreciation for science, technology and vocational education. Today, the most searching question facing us is: how best may we integrate science and technology into our education and work systems, and more interestingly, how to make these interventions relevant to the needs of industry, commerce, public service and the public at large. Public dialogue has rightly underlined the urgency for us to evolve a national policy on science and technology (S&T). And the indications have been quite clear that we should, inter alia, promote the study of science and mathematics, build up our technical competencies to teach these subjects and to use science as a national development tool. If this S&T initiative is to help us achieve our goals we need to put research high on the national agenda, and embed it deep into our culture and every day life for meaningful and sustained benefits. This commits us to a major shift toward technical education and the sciences. Many of you have argued, rightly, that S&T policy should not only impact development at the national level but that it should equally underpin sector strategies. Toward this end, many formal and informal consultations and meetings were held, ending with the National Conference on Science and Technology in September 1998. Among its many achievements, this Forum generated wide support and drew inputs from local, regional scientists, and experts from as far as New Zealand, Germany, Sweden, the UK, RSA, Botswana, Zambia and the Commonwealth Secretariat.

On the basis of these inputs plus those we received subsequent to the Conference, the Ministry was able to consolidate the various viewpoints into this final document. We believe that this S&T Policy is a fairly good synthesis of the consensus views but we realize also that much work lies ahead to translate the policies and principles into practical and useful programmes. Our industrial and commercial sectors will need time to transform them into appropriate actions of high impact and benefits for our country and people. To realize our dream, it is important for all of us - scientists, teachers, employers, workers, students, professionals, small and large entrepreneurs, government, civil servants, consumers, international and multinational organizations to play our respective parts, and for all of us to work steadfastly, purposefully and harmoniously to ensure that this S&T policy, and our S&T resources and our collective efforts yield maximum to all our Namibian stakeholders and partners.

As I have said on many previous occasions, for Namibia's economy to grow and flourish in this competitive environment, science and technology must be the key change agent. This is our only hope and chance to build an internationally relevant and stable economy. Therefore, we need urgently this national S&T policy to guide our concerted efforts and to achieve our goals and objectives. This requires us to make a paradigm shift in how we do business, how we teach and what we learn, how quickly we adapt our production systems, adjust individual and corporate work attitudes and attributes for higher added value and productivity. This information and technological environment challenge us to improve our capacity to use and develop our human talents, our local raw materials and to maintain a competitive infrastructure for development. Science and technology must be at the centre of our development to provide us tools and means to re-equip, produce and market high value added goods and services and to open new opportunities for employment and investment. This is critical if we are to engage the old and new entrants into our labour markets and the competitive niches. Science and technology must give us the where-with-all to raise production outputs, personal and corporate incomes, exports and ultimately the national wealth and Namibia's GDP.

For such an achievement, it is important for us to have good technical skills and competencies. This forces us to tilt our education system in the direction of science and technology. How quickly we do so, and how well we absorb and apply science and technology will determine the pace of our progress and our place in a scientific and knowledge-driven society. For a start, we need to double the number of qualified teachers and learners in mathematics, science and in the technology fields. Equally, we need to see a compatible shift in attitude and the response of our business sector and for business, teaching and research institutions to link efforts and resources to complement the education system and ensure that the skills they provide fit the demand of industry and commerce. Of course, we expect greater role and leadership from our University and Polytechnic. These institutions must lead the way and thinking, harness the synergies within the various technical training institutions while they give due regard to their individual needs, mandates and competencies. We should not ignore the value and strength of an interdependent S&T system, nor fail to optimize the country's finite physical, economic and organizational resources.

With these basic principles fully embedded in this S&T Policy can only commend all of you who laboured to bring consensus and vision into this national policy. I look forward with pleasure to present, on your behalf, this important document to Cabinet, and eventually to Parliament. Finally, let me take this opportunity again to commend staff in my Ministry, the various taskforces, international and bilateral organizations, and especially the Commonwealth Secretariat. I look forward to your continued support interest and guidance in transforming this policy into practical actions and beneficial outcomes for all of us in Namibia.

Nahas Angula,
Minister, Higher Education, Vocational Training, Science & Technology



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"Namibia's further development hinges on how well the country conserves, manages, harvests and uses its natural and human resources. To an equal measure, the capacity of our economy to support improvements in the standard of living of its citizens will be greatly affected by the works of our scientists, technologists and entrepreneurs.

For these works to be fully effective, visible and pervasive in the society it is necessary not only that our local scientists and entrepreneurs strive constantly to widen and improve their knowledge base, and for our technologists to better their skills and know-how but also that the society as a whole share in this experience and also in funding the process and in reaping the results. Therefore, the society should be willing to invest in and be able to access our science and technology facilities to innovate, in order to raise their skill levels and productivity and to add meaningful value to raise the competitiveness of our industries competitive and to make our economy more robust and buoyant" Rolyat.

1. NATIONAL VISION

Contemporary development criteria position Namibia within the group of small emerging states (SES). Within this context, we have clear vision of the Namibian economy and people emerging among the top performers and suppliers of the SADC Sub-Region, not only producing high value added products and services for Namibia but to the Continent and the global marketplace. We will do so by pursuing incisive, decisive and intelligent public policies, reinforced by knowledge-based, interactive and market-oriented development programmes.

It is our hope to harness, mobilize and utilize, to the fullest extent possible, Namibia's natural resources, assets, skills and talents. We will pursue this vision with care and concern for Namibia's mixed heritage, rich cultures and its very sensitive environment. With enlightened public policy, up-to-date economic, social, political infrastructures we hope to advance Namibia's status to that of a newly industrialized country (NIC).¹ by Year, 2021²

Vision: To secure steady rise and balanced growth in GDP activities as we expand national wealth and income, spread prosperity and advance the quality of life of Namibians. These impacts will be sustained through a national system of innovation, improving skills and knowledge, systems for S&T management and coordination, and the use of Science and research to integrate technical education with production, commerce and our resources.

to induce a culture of innovations in all sectors of economy in which entrepreneurship and productivity are the driving fundamentals. It is in this way we see our S&T policy being able to move the economy and our people forward toward our development goals - and for them to realize the fruits of our shared vision and labour.

In line with our national development goals (high rate of economic growth, social integration and stability), we expect science and technology investments and innovation initiatives to raise the level of productivity of both individuals and corporations. This process should also induce opportunities for high value added products, raise producer efficiency and generate a wide range of competitive trade services and providers. It should open access to additional markets and stimulate new linkages between and among economic sectors. In this way the country will generate valuable revenue and employment as well as create other outlets for innovative and entrepreneurial activities throughout the economy and across the country.

¹ The term NIC is used advisedly here to describe countries that are currently enjoying per capita income of US\$4,000 and above with stable policies and governments. Several countries in South East Asia and Latin America are placed in this category.

² Namibia's achieving NIC status by year 2021 is based on projected annual average GDP growth of 5 per cent. The 1997 GDP estimate showed per capita income of NS11,4000 or approximately US\$2,020.

2. THE GUIDING PRINCIPLES

- 2.1 Science and technology must be used as fundamental change agent to imbibe a new culture in our society for production, and which should propel and sustain our economic and social development. In this regard special dispensation is needed to develop school curricula, laboratories, training and incentives schemes, and programmes to facilitate work and on-the-job experience for learners. This will enable the country to attract, retain and motivate teachers, learners and our work force in science, mathematics and technical fields. Our efforts should start at the primary schools and carried through to secondary and tertiary levels.
- 2.2 Social and economic programme must be well coordinated and kept in line with the country's resources, and paced to match our technical and absorptive capacities.
- 2.3 Our ability to adapt and relate technologies to the needs of the society must be among our overriding goals. The private sector is expected to lead this process with the State playing a complementary, facilitating and catalytic role. S&T innovations must result in practical and functional outcomes that impact the lives and status of the Namibian citizens and stakeholders.
- 2.4 S&T investments made in public and private sectors should improve prospects for balanced sectoral growth and expand domestic value added. They should generate opportunities for both formal and informal employment. In doing so, there is need for education planners to redirect S&T education and training to ensure adequate priority and resource for the competencies desired by government, business and the service sectors. More and better products of high quality and value should result from the use of our raw materials.
- 2.5 S&T-based investments cannot remain static; we will make no compromise of the country's long term goals, or for that matter, stress our fragile environment for the sole purpose of capital gain and accumulation.
- 2.6 The economic trade-off that the nation expects should consider both the short term and long term interest of citizens, as well as producers and investors, and which ultimately provide social harmony, equity and economic prosperity for all.
- 2.7 The public expects that S&T efforts will result in applications that will facilitate continuous diversification of the economy and promote the effective utilization of the country's natural endowments. S&T outcome should be visible in employment options for citizens in all walks of life. Similarly, our innovations should target indigenous small and micro enterprises as these areas promise tremendous growth and scope for local technical, vocational and business skills.
- 2.8 On its part Government, through Ministries and public agencies, will do all it can to influence the priority and pace of integration of S&T in the education system. Public agencies will work harmoniously with private sector entrepreneurs to facilitate better public infrastructure and services and to maintain these at internationally competitive levels. Government agencies will assist as far as possible the mobilizing S&T investments to expand job creation prospects for citizens. Public policies and sectoral programmes will promote better access, use and acquisition of science and technology resources and to engage more local skills. Public resources will be used wisely to encourage appropriate adaptation of technology, bearing in mind the spiraling advances occurring in the telecommunication, microelectronics, computer and information sciences.
- 2.9 Greater proportion of public funds will be channelled into S&T-related investments and into those areas and activities that will: (i) generate a high level of economic impact; (ii) improve community services, especially in rural areas; (iii) preserve community knowledge systems, (iv) increase

efficiency of public services; (v) promote private sector development; (vi) increase industrial productivity and innovation. National and regional governments will maintain competitive developmental infrastructures to support growth industries within the various communities and sectors across the country. Public policy will seek to integrate S&T in sectoral development, protect our environment, and support a positive climate for local S&T innovations. In this way our S&T policy will enhance local capacity and generate opportunities for our young people and the less privileged in the society.

2.10 We expect private business policy to converge with public policy on common and long term developmental issues and that the energies of both will be engaged maximally to exploit the country's finite resources.

2.11 The public sector through the Ministry of Higher may qualify for repayment relief or for full concessions. Institutions identified as or undertaking scientific research and technological investigations will be able to access the fund for innovation in S&T (FIST).

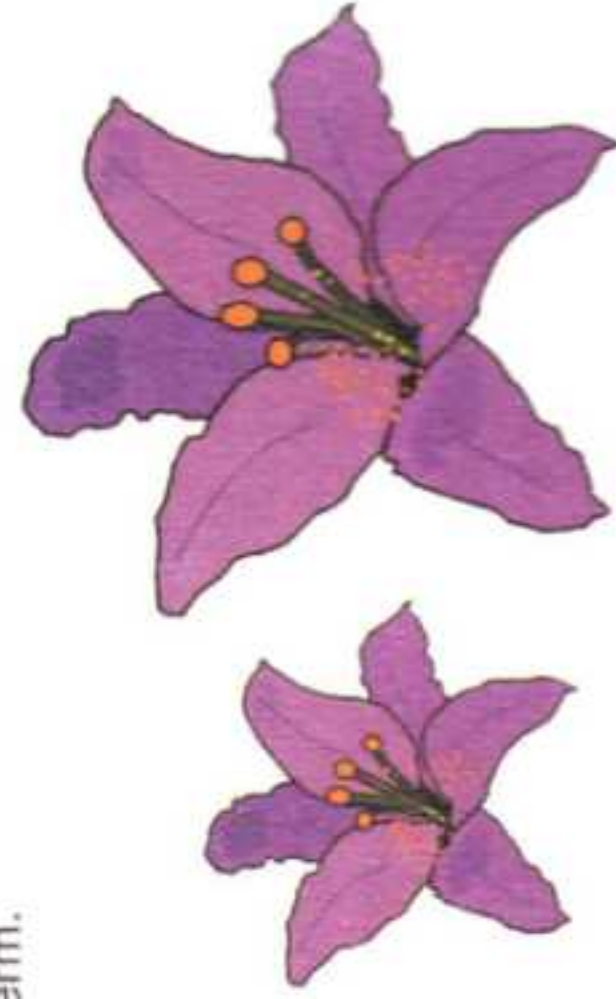
2.12 S&T investments in research, science and technology are expected to contribute positively to GDP growth and to produce tangible benefits, in terms of raised living standards, price affordability and broad availability of domestic goods and services. The process and results should not, in any case, compromise environmental health, and safety standards. We expect S&T investments to increase the range, quality and competitiveness of our product and services, and to the extent create meaningful jobs and opportunities for more Namibians.



By processing more of our local raw materials, we anticipate a wide array of new opportunities for our technically skilled craftsmen and professionals. This should encourage more mobility and sustainable links between industry, trade and the trade support and service sectors, and with the education, training and research institutions. The country's production and export sales should show significant rise in value, earnings and GDP contribution.

Our national and sectoral plans and policies will give cognizance to the dynamic nature of regional and global markets and the growing interdependence among SADC member States. In this regard, Namibia's growth strategy will seek to promote strategic linkages with neighbouring countries, and to the maximum extent possible, advance technical, scientific and investment cooperation in areas that are of strategic relevance to Namibia's growth and long term socio-economic stability. Within this vision, science and technology must empower our people to find individual and collective solutions to find or create employment, to resolve fuelling rural-urban migration, gender inequality, disease, skewed income distribution, as well as address issues relating to product and market development, productivity and the environment.

As a newly emerging nation, Namibia has to increase its investment in science and technology and this must include research as a critical component in all undertakings. Investments in this area are important if the economy is to develop the capacity to respond to growing national demand for competitive goods and services. Equally, we expect that the social impacts of S&T initiatives will be positive and supported by balanced sectoral growth over the medium and long term.



S&T policy must enable our industrial, agricultural and tertiary sectors to grow and compete by raising add value and generating new linkages within and across economic sectors. Its benefits should impact the entire nation and should be discernable, not only in broadening the range of consumption goods but in heightening the quality of our public services, export earnings, import savings and productive investments. Similarly, S&T investments should make our public utilities more efficient and its services more affordable.

3.0 MISSION AND POLICY STATEMENTS

S&T Mission:

- foster a culture of partnership and strategic purpose among S&T training, research and employer institutions, and to link their services to S&T providers, purchasers, users and consumers for meaningful added value goods and services, greater job opportunities, sustainable earnings and rising living standards.
- promote a sense of commitment in public and private sector institutions and individuals toward research and technological innovations as basis for human development, business success, national wealth creation and international competitiveness.
- secure an appropriate mix of resources and that steady funding and priority are devoted to research, and for the engagement of science and technology in both public and private sectors.
- facilitate the development of Namibian citizens and enterprises through the provision of up-to-date technical advice, business support and S&T extension services and maintenance of a critical core of technical competencies in country with the skills and know-how needed by the society for efficient management of our S&T resources and assets.

3.1 THE S&T MISSION

With individual and corporate attention clearly focused on our shared national vision, four intermediate goals are identified in our mission to guide the nation toward a sustainable growth path, and for which S&T must act as the propellant. How well we achieve these goals will depend on how effectively we harmonize and integrate science and technology into our education system, our work places, and in sector policies and programmes.

For this level of integration to take place and be sustainable, S&T innovation measures and activities must provide the means to raise the country's production capacity and to enable the economy to achieve favourable balance in its merchandise trade of goods and services. These

initiatives should enable us to produce, not only consumption items but also high value capital and durable goods. They should enhance our capability to adapt technology and to add value to local and imported materials. This will demonstrate the effectiveness of our science and technology training and our investments in human resource development.

Therefore, national S&T policy interventions will, among other things, seek to (a) broaden participation of local scientists and technologists in the country's economic management. This should be evident in the rising quality and number of sci-

ence students, graduates, and teachers and in S&T facilities; (b) advance industry's capacity to innovate. This should be evident in new products and processes; (c) widen use and distribution of S&T personnel and resources. This should be evident in improved quality of public and private sector services; and (d) a significant advance in women's involvement in S&T-related matters.

Management, and in all S&T-related activities, at all levels and stages of the S&T development and implementation process. Our achievements in this area should be visible in schools, private businesses, industrial workplaces, parastatals, and in public administration and government.

Through this policy and well designed S&T inno-

ministry and public agency a critical core of qualified Namibians and will encourage similar development in the private sector. And to this end, Government will initiate urgent reform in customs, trade and industry and labour policy as well as in the educational delivery system. We expect that our technical and professional services sector will respond positively to these measures and bring about a new set of products in line with current and emerging technologies, identifying and packaging S&T solutions to existing processes, raw materials, capital equipment, market intelligence and trade information.

It is clear that Namibia's long term development hinges on how well the country conserves, manages and uses its natural and human resources. Equally, the capacity of the economy to support improvements in the standard of living of citizens will be greatly affected by the works and collaboration of professionals - scientists, engineers and technologists. Such a collective solution obligates the public and private sector to work closely to avoid unproductive duplications of resources and repetition of efforts.

This collaborative approach is critical, especially given the high costs involved to effectively harness and benefit strategic sectors such as minerals, (including precious and semi-precious gems), agro-industry products, energy and environmental resources, forestry and marine products.

2.2 GENERAL S&T POLICY STATEMENT

Namibia's economic policy seeks, inter alia, to promote stable, balanced and incremental GDP growth over the medium and long term, and which should throughout the process, generate maximum employment, investment and income producing opportunities. The S&T policy will facilitate the achievement of the above goals by promoting the relevant environment for S&T innovations, equipment and facilities, database, training, and through the maintenance of a core of relevant and technically skilled manpower, to service public, parastatal, private sector and their various communities.

vation programmes the nation will be better positioned to exploit and benefit the country's natural resources. These impacts should be evident in increased value added, greater use of our indigenous skills, entrepreneurs, resources and facilities.

The programmes should also widen the scope for both product diversification and new services, and improve options to boost national earnings. This will be evidenced in higher export sales, reduced quantities and dependence on unprocessed primary products such as mining, cattle and fishing, and lastly they should create a paradigm shift in individual and corporate attitude toward production and productivity and international competitiveness.

As the nation mobilizes its economic resources, the national S&T mission will seek to advance the use of science and technology in all economic sectors. This policy initiative will give stakeholders wider choices and at the same time provide citizens with more opportunities to enjoy the fruits of their investment and productivity and to be aptly rewarded for their innovation and entrepreneurship.

Namibia's S&T policy should stimulate new commitments from existing enterprises as well attract new and potential investors. Policy-makers and executing agencies will need to be conscious at all times of this dual objective and keep S&T policy at the cutting-edge of the market and competition. At the same time policy measures will be developed to address fundamental concerns of social equity and other systemic weaknesses. Creative mechanisms will be used to motivate and reward skills, talents and corporate achievements as well as to reinforce areas for our collective responsibilities.

Notwithstanding the country's enormous potential, and not discounting the achievements we have made thus far, it is important that all citizens recognize the amount of work still ahead. In this regard, it should be clear that our success in using S&T to pivot the country's development rests on how quickly we can harness and engage our human and natural resources. To achieve this Government will maintain in each

To facilitate the delivery of the S&T policy objectives, Government, on its part, will evolve an enlightened mix of economic and social strategies that will be market-driven and well-harmonized with science and technology-based initiatives and actions. Government's social and economic programmes will be developed in concert with our major development partners and our national resources will give priority to activities that contribute to public sector efficiency while the latter seeks to deliver efficient services and catalytic support toward the development of a healthy and vibrant private sector economy. In effecting the S&T policy public resource will seek to:

S&T Innovation Policy Initiatives

- Build and strengthen national S&T capacity (human, institution and enterprise) to organize, motivate and to carry out investigative research; to appraise, develop, adapt and promote technologies and processes that are appropriate for Namibia; and to propagate the benefits and results of scientific investigations and outcomes for their best technological applications.
- Promote strong national consciousness and commitment to preserve Namibia's rich and diverse ecology and the natural habitat; to maximally harness resources; and manage and protect its fragile environment.
- Advance to the extent possible indigenous small and medium scale enterprises (SME) and help them to link up with larger firms nationally and regionally so that both groups can develop synergy and a new culture for efficient production of high value added goods and services and sustained thrust toward continuous innovation.
- Promote gender sensitivity and balance in developing, using and apply science and technology and to promote full participation and integration of women at all levels and stages.
- Enhance traditional and home-grown technologies used in small, micro and informal

(SME) sectors; and assist firms and entrepreneurs to acquire, adopt and apply these technologies.

- Establish and operate an up-to-date S&T Information exchange service, and stimulate the development of local area S&T databases both regionally and nationally for access by producers, traders, researchers, teachers and students.
- Increase retention of trained and qualified Namibian technicians and scientific personnel
- Enhance productivity and innovation in new products, processes, publications and patents.

3.3 Policy Reform & Adjustments

In order to support these S&T policy initiatives, Government will introduce reforms in the public sector and expects that there will be urgent practical reforms and adjustments, not only in respect of sectoral policies but also in the systems for local processing, distribution and expansion of the value added chain of products and services by the private sector.

Toward the above goals, the catalytic role of local S&T personnel as well as that of our public research institutions will be critical in guiding existing public enterprises and for providing them with systems and practical support to raise competence levels, service factor, efficiency, corporate productivity and enterprises' outputs.

The above processes envisage early review and re-alignment of our industrial, investment, trade, labour and employment laws and related policies and practices. Equally, it requires new commitment to re-orient trade promotion efforts, the composition and strategy of foreign missions, and regional and international representations.

In order to re-align and energise the country's productive capacity, public resource will be available to facilitate the necessary reforms.

Policy adjustments to:

- Harmonise trade, investment, industrial and labour legislation and related policies.
- Re-orient the programmes of our foreign missions and international organisations.
- Induce shifts in value addition, industrial processes and in traditional trade practices.

The above policy adjustments should be seen as positive measures to improve Namibia's business environment. This will influence both capacity and the terms and direction of our trade, and how we use existing capital, raw materials, and finished and intermediate imports. More critically, it will determine when and how we engage local and foreign technical expertise in our national development efforts.

In our policy adjustment phase we expect to stimulate a substantive increase in local production, not only of consumer goods, but also capital and durable goods. Equally, we envisage higher quality in all locally made products. We expect that raw, intermediate materials and factor imports will be used selectively and efficiently to compete with open inward trade.

R & D support will be made available to all entrepreneurs from publicly funded institutions on a cost plus basis to increase value added contribution and product competitiveness. This effort is intended to support reform and technological adaptations and as well as the unpacking and dissemination of technologies.

Government agencies will ensure that public research funds are available to producers to develop new and improved processes and products, and to stimulate innovations. To facilitate speedy access to the innovation fund (FIST), the NCRST will do periodic evaluations and certify public and private sector firms and laboratories that are engaged in research activities. In addition, such firms may also qualify for special incentives that accrue to increased output, innovations, processes and products. Specific procedures will be defined during the

elaboration of sector policies. However, special tax reductions will be allowed to end users of S&T equipment and imports that are intended for use in schools, training institutions. This benefit is also available to individuals and companies. Trading agencies in the sale and distribution of S&T consumables, durable and capital goods should be sufficiently equipped to provide high quality post-sale services including to repairs, testing, upgrade and to make operational adjustments. The S&T policy will obligate such traders to (a) operate individual or shared common service facilities (b) employ technically competent personnel in their businesses and location, or to have on call acceptable arrangements.

Additionally, the S&T policy will obligate suppliers of technical and scientific goods to have accompanying their goods and wares the relevant technical support, and information on packaging and labeling that complies with national and SADC rules, including technical specifications and manuals. These should be normally available in English and technical personnel interfacing with the public should also be able to communicate verbally in English.

It is recognized that the Namibian economy has been exposed, from time to time, to shortages of skills and specialized technical expertise. To enable the country to continue its development initiatives Government will make every effort to train, recruit and retain qualified Namibians. However, until such times as the shortages are relieved Government will facilitate the expeditious acquisition of skills and recruitment of technically qualified and competent S&T personnel. Government will do all it can to attract and stimulate local citizens to replace non-citizen expatriates over time. Local training institutions and commercial enterprises are requested to give preference to recruiting qualified Namibians. The National Planning Commission (NPC) and the Ministry of Labour will jointly operate a system to continuously appraise the country's technical manpower needs and to monitor how effectively public and private initiatives are working to resolve this critical development link.

In light of the above, the S&T policy should result in new value added products and linkages through all sectors of the economy, and in particular, stimulate productive activities and employment opportunities in the private business sector. It should facilitate the operations of the business community, and with their collaboration the science councils and business firms should be able to address:

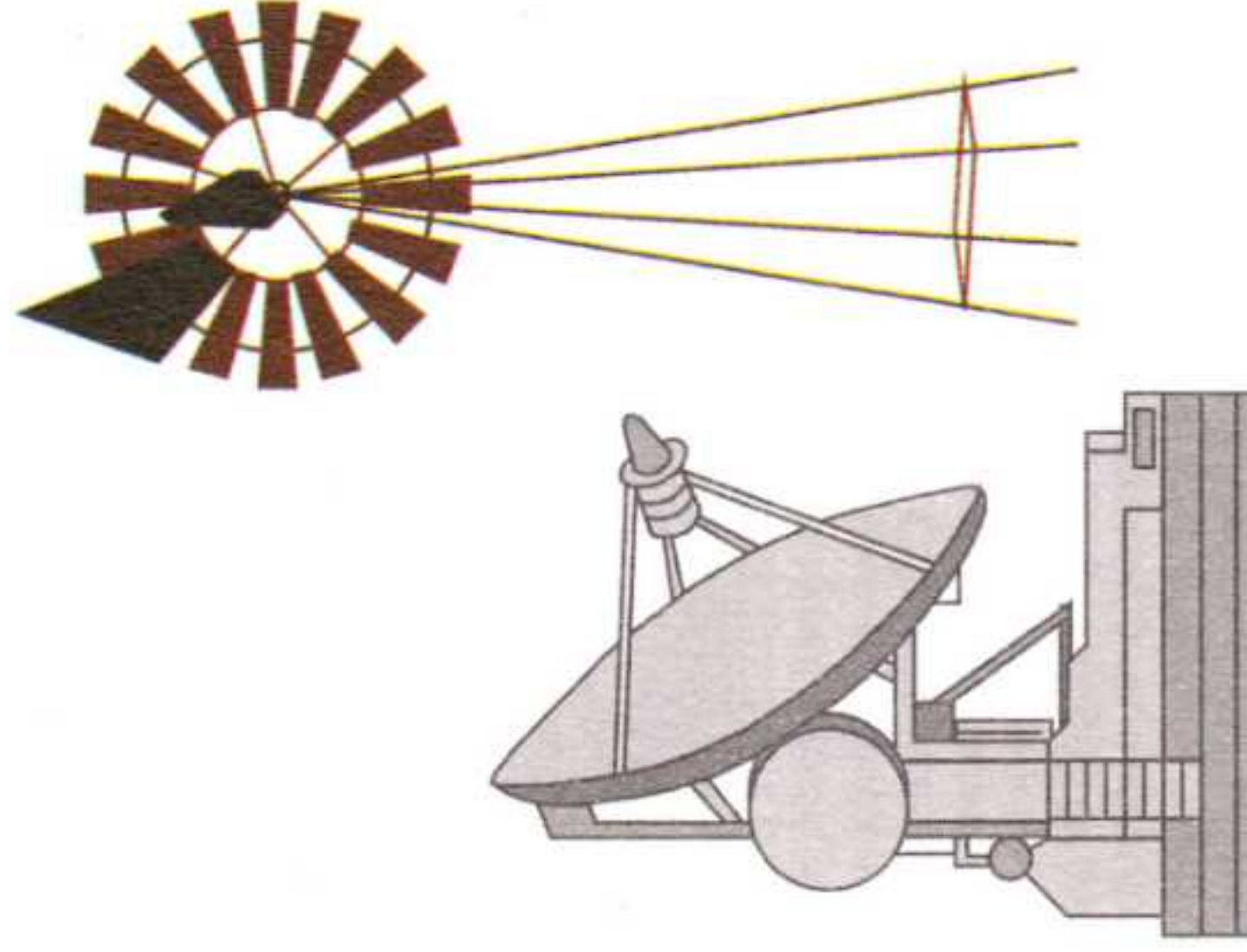
Specific Targets of the S&T Policy

The Negative list

- Wasteful duplication of economic activities,
- Recurring fragmentation of effort in S&T resource, management and investments,
- Lack of coordination and communication between and among public and private sector institutions,
- Inadequate acquisition and diffusion of best practice technologies and experiences,
- The low utilization of R&D investments in the private sector,
- Perceived reluctance of private sector motivation and commitment to pursue value adding and general S&T objectives.

The positive list

- Promotion of a production and performance culture and to further national appreciation for on-going productivity improvements,
- Improve value adding job options and opportunities as well as income earning capacity for Namibians through perpetual supply of needed skills, know-how and market-based competencies.



SCIENCE & TECHNOLOGY POLICY	REPUBLIC OF NAMIBIA
marketable to competing interests in an open market. Government will ensure that public S&T resources are used to:	Specific Strategies: • Revamp and rejuvenate capacities of publicly-funded institutions and enterprises to undertake agreed and approved public good research activities; to appraise, develop, and adapt technologies and processes that are appropriate for Namibia; and to use all available means to propagate the benefits and results of scientific investigations as well as their technological implications and applications. • Adapt appropriate technologies to fit the indigenous Namibian culture and through relevant technical training to balance the competitive demand of production and commerce with traditional social values. • Promote traditional and indigenous technologies through research and facilitate the development, integration and application of these technologies to advance efficiency of small scale businesses. • Operate an up-to-date S & T Information Centre, develop relevant databases, and facilitate public access to national and world wide networks of S&T producers, traders, researchers and teachers. • Establish systems and innovative programmes to train, develop, absorb and retain technical and scientifically qualified personnel in Namibia.
Policy reforms: • To the current educational system to give greater emphasis on science and mathematics and to provide for their full integration in school curricula, from basic levels through to tertiary level institutions; • To introduce quality teaching, experiments, in-school and after-school work experience • To encourage research activities in approved tertiary level teaching and research institutions, private laboratories and Regional Innovations Centres; and • To promote sound and environmentally friendly technologies in industry and commerce.	Currently, there is a variety of S&T innovation policy and models working in both developed, emerging and developing countries. Many of these, however, are carte blanche duplications of models used by the industrialized nations. In the formats they are acquired, the technologies often offer very little flexibility for unpacking or real technology transfer, and usually lack sensitivity and relevance to the local situations in which they are to be used. As a result, effective adaptation often pose difficulty and lead to failure as very little durable linkages are created in the host countries, sectors or enterprises. Namibia's quest for a different approach is critical, and to this end, it is Government's desire to learn and draw positive experiences from other countries, both within and outside the Subregion, to avoid costly mistakes and unproductive repetition of trials. It is our desire to introduce a S&T model that is appropriate to the Namibian needs, capacity and circumstances. For this reason, public resources earmarked for S&T innovation programmes will be used systematically and strategically to develop new knowledge, appraise and adapt technologies which will assist our entrepreneurs to acquire new facilities, new products, new production methods, and processes, as well as to spur innovations, and eventually patents. Because we are operating market-based policies in a global environment, our S&T investments as well as our development projects should be guided by commercial considerations, consumer friendly, and be
4.0. STRATEGY TO EFFECT NATIONAL S&T POLICY	4.2 LOGISTICS FOR S&T POLICY IMPLEMENTATION
4.1 STRATEGIC OBJECTIVES In promoting this S&T policy Government development objectives will be achieved through a national system of innovation. Essentially, this system will define the critical cluster of scientific institutions, technical organizations in public and private sector and set an enlightened framework for S&T policies and institutions to interact in pursuit of agreed goals and objectives deemed to be of strategic and important to national development. The system of innovation will put explicit emphasis on the design of market-based policies, to stimulate public inputs and responses that are necessary to produce, support and sustain an innovative and competitive economy, giving due regard and access to all active stakeholders. The approach will facilitate collective and multidisciplinary programmes where needs and capacity have been articulated in the national interest.	4.2.1 INCENTIVE SCHEMES AND SYSTEMS Fiscal incentives will be an important but not the only means to be used in the public sector to effect the S&T policy. Other measures such as: modernizing our physical infrastructure, providing stable system of governance, conducive macro-economic and encouraging good labour and industrial relations practices will be pursued to achieve long term stability and our development goals. Selective incentives may also be profited by some Ministries to induce specific industrial and commercial innovations.

SCIENCE & TECHNOLOGY POLICY	REPUBLIC OF NAMIBIA
better capacity to achieve all its stated socio-economic goals. With an improved S&T database and active information exchange, government expects that that technical skills and know-how will attract higher relevance, visibility and that society will be willing to reward these skills on basis of performance, productivity and yield. Value added content of trade, construction and tourism products, and as well as in other tertiary sectors should show significant rise as a result. S&T policy interventions will seek to improve facilities returns, access, and to spread the distribution of technical skills throughout government and hopefully induce same in the private economy. Positive programmes will be promoted in research institutions to enhance public awareness on the role and benefits of science and technology; to remove stigmas and anxieties surrounding the study, use and application of science, technology and mathematics. Such strategies will include (a) developing simplified and widely-disseminated S&T literature, (b) popularizing the use of museums, science films, television and radio stations as S&T information centres, (c) promoting discussion groups, science quizzes, tours, science parks, laboratories; (d) encouraging science and technology prizes as well as awards for individuals and firms for performance and achievements in science and technology. To encourage a positive culture for S&T innovation, Government, through its research and funding mechanisms will support all national initiatives that are geared to develop value added production and services. It will encourage enterprise reform and the technical adjustments necessary to achieve internationally competitiveness and standards compliance:	Strategic objectives • Steady rise (of at least 5 per cent) in annual GDP growth and at least 7 per cent in added value contribution from prime economic sectors • Better use of S&T resources - personnel, imports and raw materials. • Raising labour and plant productivity levels • Wider use, application and transference of appropriate technology to small scale entities. • More technically trained and available local skills and competencies. In this regard Government expects technology investments to stimulate innovations and generate new economic activities of high durable value. Government policy anticipates selective and progressive improvements in production areas by private sector firms, or initially through joint venture firms with public-private interest in manufacturing, agriculture and mining sectors. With enhanced technical skills, improved S&T facilities, better use of scientific tools, local and imported materials, trained local scientists, science teachers and local technicians, Namibia will have a
4.0. STRATEGY TO EFFECT NATIONAL S&T POLICY	4.2 LOGISTICS FOR S&T POLICY IMPLEMENTATION
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Other specific actions may be used, from time to time, to support specific sector initiatives and to redirect and retain S&T investments in key locations and strategic areas. In addition to fiscal and monetary benefits Government and private sector will need to work out a national system to reward and honour individuals and corporations for excellence in works and achievements; and through bursaries to re-orient career paths and attitudes of the Namibian work force.

To meet the above goals, government budget will devote appropriate resource to:

- Incentives for S&T innovations will be used to:**
- facilitate training, recruitment, promotion and transfer, and recognize and award individuals and corporations for outstanding achievements in the field of science and technology,
 - facilitate the use, advancement and integration of science, mathematics, communication, informatics and computer technologies in Namibian industry, commerce and education,
 - give priority treatment in the procurement and use of appropriate technologies, products and services that are intended for use in schools in training, re-training and skills upgradation,
 - generate local and community interests and awareness in science and technology,
 - build up/strengthen basic facilities to promote and monitor quality and standards in both products and services,
 - strengthen national capacity to assess skill levels, achievements, technical qualifications, and to establish and monitor set standards.
 - Facilitate the promotion of qualified Namibians in all fields of S&T, especially scarce skills in science and technology.

To support the new S&T initiatives, Government will introduce legislation to establish a National Fund for Innovation in Science & Technology (FIST)³. This facility will provide the public and private sector with catalytic funding for targeted research and conservation in priority areas as

use of our natural resources. Public policy and public sector institutions will seek to motivate and support compatible efforts of the private sector in this direction and to boost S&T activities in the private and parastatal sectors.

It is a well documented fact that countries that have successfully used science and technology to add value have been able to propel their GDP to astonishing levels. Many are now categorized as the newly industrialized countries (NICs). This achievement is not beyond Namibia capacity and potential. Consequently, the Namibian Government has set itself the task of formulating a comprehensive development strategy which will elaborate in the second National Development Plan (NDP2). Among other things, this strategy will place high priority in attracting and retaining technical skills in the country and to encourage more Namibians to invest in research and productive investments. Personnel policy and packages will be revised to reward performance as well as achievements.

Skills that are in high demand will attract special premium until the shortage is relieved. Legislation and regulations will be put in place to reinforce the rationalization of national S&T resources among public and private research institutions on basis of capacity and competence in delivery of beneficial research outputs and results. Government will provide a supportive political framework and environment for this transition, and where necessary, make catalytic S&T interventions in the public interest.

In order for the nation to acquire best practice techniques a vastly different approach to business will be needed in both public and private sector. Government will take steps to balance operational demands on its resources to give scope to long term development programmes. Such a policy shift will change the conventional image of our public enterprises and also the role of our Parliament. It will obligate the nation, not only to evolve shared vision, but to build and mobilize new resolves toward the promotion and balancing of current demands with those needed to achieve sustainable development and growth.

4.2.3 COMPETITIVE S&T INFRASTRUCTURE
The S&T environment in Namibia is dynamic but is also under-exploited as well as vulnerable. Being open to international trade, the economy is quite exposed to multi-level competition and this makes it quite susceptible to unfair trade practices. This implies that Namibia has to maintain constant vigilance on traded products, technology processes and their environmental impact, as well as the need for market skills.

To facilitate timely and compatible adjustments to our economy and infrastructures, government will maintain effective public sector investment programmes (PSIP). Besides infrastructures, the programmes will encourage technical and professional development of our human resources. It will promote training systems as well as establish appropriate authorities to assess and appraise programmes, outputs, qualifications, institutional capacities, and to test and verify qualifications and competencies. In all cases the country's needs must be in line with demands and with international trends.

Our approach to marketing and the management of information systems will be facilitative and aimed at engaging computer and communication technologies as far as is practical and effective. If science and technology is to penetrate our development plans and programmes and keep them competitive both public and private sectors have to develop and work interdependently. Our communication infrastructures must ensure full harmony with and seek the fullest integration of S&T in the various economic sectors. Public sector involvement and investment must be properly planned and coordinated to facilitate efficient support services to entrepreneurs, producers and service providers. In this way, local enterprises, and the economy as a whole, will be empowered to reach their most competitive levels and at the same time allow consumers to gain maximum utility from the dollars they earn and spend.

With regard to the above, it is important to define the role of the National Planning Commission (NPC) and the Office of the Prime Minister (OPM). Both offices are critical if S&T measures are to be integrated in sector policy, and in particular since both share responsibility for the harmoni-

zation of national and sector plans. In planning and articulating public sector investment programme (PSIP) both offices provide guidance in allocating and re-focussing of public resources to address strategic growth centres.

For competitive sector development, Government has identified six important S&T development imperatives, namely:

1. ensuring that S&T is intimately structured and fully integrated into national and sectoral policies and across the education system and spectrum,
2. providing the most cost-effective and appropriate economic infrastructure and conditions to spur innovation, individual creativity, invention and to advance S&T knowledge and skills and their applications,
3. determining on regular basis national S&T priorities for general and selective actions and facilitating smart S&T acquisition, partnerships and transfers of technologies,
4. building a critical core of well qualified and competent S&T personnel in each Ministry and to ensure their distribution throughout each economic sector.
5. Promoting, preserving and protecting Namibia's rich culture & heritage, its fragile ecology, environment, indigenous and traditional technologies, and community-based knowledge systems;
6. Empowering women to participate fully in S&T development and management.

4.2.4 SUSTAINED S&T FUNDING

It is a well accepted fact that the progressive economies in the world have developed ways and means and special programmes to fund science, and to facilitate public good research.

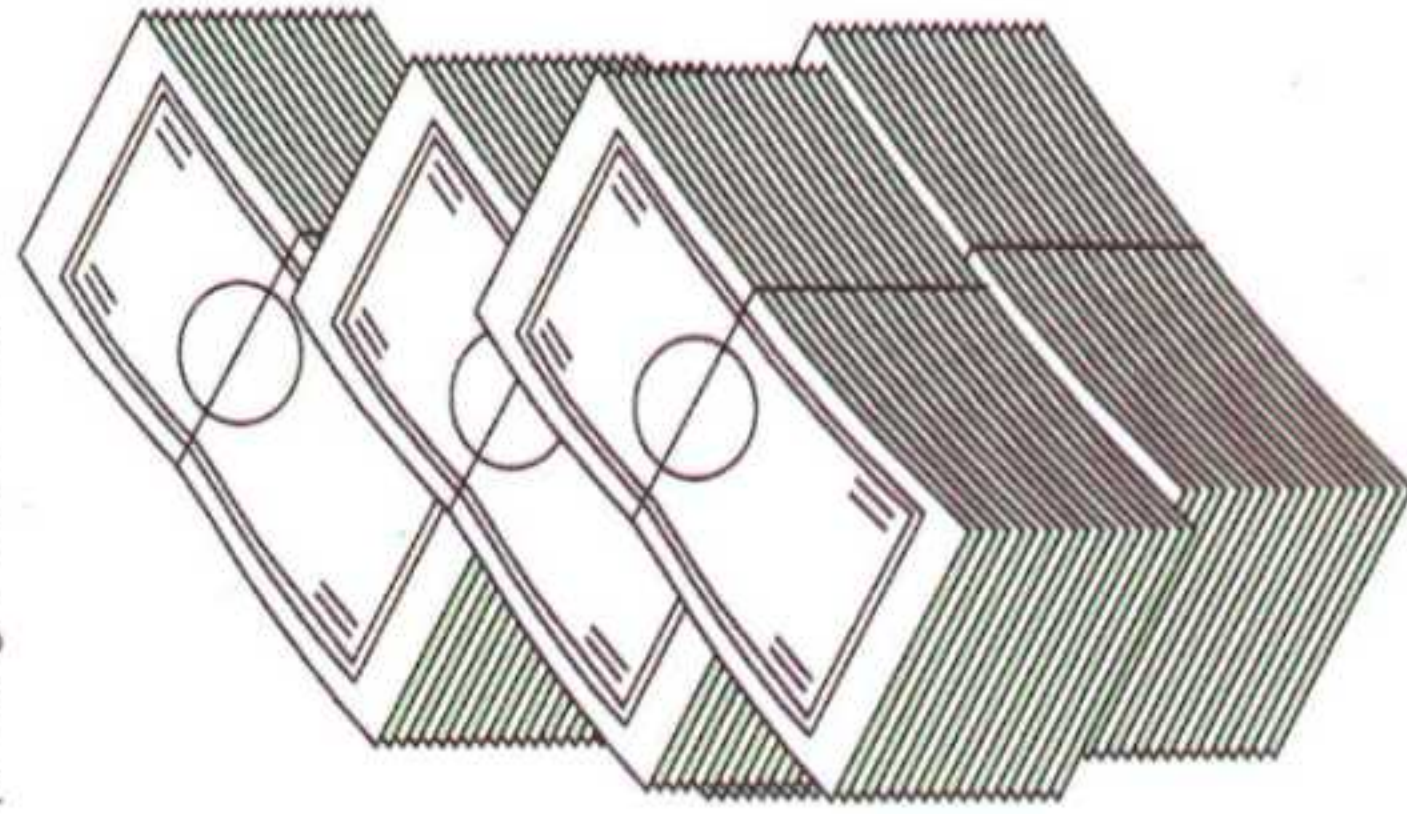
These initiatives are important to ensure that there is predictable stream of both public and private funds, and the collaborative actions between the public and private sector auger well for public-private sector cooperation.

Furthermore, this relationship ensures that funds are used more effectively and to achieve specific S&T objectives, which are of commercial value and in the national interest. In this way the nation can make its contribution to advance knowl-

development banks, large S&T-related private enterprises and parastatals, international, bilateral and multilateral development partners.

In line with its commitment to making Namibia a science and technology-driven economy, and to give an early start to this initiative, Government will deposit an initial amount of seed money into the Fund for Innovation in Science & Technology (FIST). This amount shall be the equivalent of two years of the determined annualized project budget to be discussed and approved by joint Boards of the National Commission on Research, Science and Technology (NCRST)⁵ and the FRST. This budgeted resource will be accessible to all the approved participating S&T institutions.

For sustained operations of the FRST, the Fund for innovation in science and technology (FIST) and any other to be established under it will require a minimum gestation period of two years to build up usable proceeds. During the period of build-up, it is expected that Government will investigate the feasibility of introducing a cess on selected consumer products to facilitate research, resource conservation, S&T innovations, and ongoing public good research.



This resolution will be assessed, discussed and agreed with the respective representatives of industry and trade associations and concerned citizens. Proposed structure, management and operating procedures of the FRST are discussed under the section dealing with core institutions.

5.0 POLICY COORDINATION AND EXECUTION

5.1. Coordination Mechanisms

Government efforts to spur innovations in science and technology are spread over the public and private sectors. However, these are still poorly coordinated and frequently lead to under-recognition of their full impact and potential in national development. In order to correct this anomaly the Ministry of Higher Education, Vocational Training, Science and Technology was created, and a Research, Science and Technology Directorate (RSTD) established under it in late 1996 to manage the day-to-day coordination efforts.

5.1.1 MINISTRY OF HIGHER EDUCATION, VOCATIONAL

TRAINING SCIENCE & TECHNOLOGY (MHEVTST)

The Ministry of Higher Education, Vocational Training, Science and Technology is operating as the main government agency responsible for science, technology and research policy. It will be the main coordinating institution in the country. Its role will essentially be one of facilitation.

The MHEVTST will collaborate with various government ministries, agencies, and public and private sector institutions to periodically review the national mission for science and technology and to promote the most competitive environment for its growth. It will also oversee effective S&T policy translation and implementation.



⁴ The Fund for Innovation in Science & Technology (FIST) will develop from the FRST legislation to fund R&D projects based on national priorities.

⁵ The NCRST is the highest advisory body in the country on science and technology policy. It will be established by the President. Its operation is discussed under institutional arrangements for S&T implementation.

To foster S&T policy adherence the Ministry will urge and support public and private programmes that popularize science and technology and especially those that integrate S&T in education and work systems⁶. Through its various functional Directorates⁷ the Ministry will monitor the operations of S&T teaching and research institutions as well as how S&T is being applied in the various workplaces in the country. MHEVTST will achieve its mandate and strategic objectives through regular consultation with public and private sector institutions. The keys ones and their roles are identified below.

5.1.1.1 Research, Science & Technology Directorate (RSTD)

The RSTD is tasked to evolve and operationalize the national S&T policy, in addition to acting as the focal point to provide effective coordination between the various S&T policy institutions, initiatives and programmes in public and private domain. This policy will provide the necessary directions and guidance on important national issues such as research and S&T priority, funding, respective roles of key implementing, executing and collaborating institutions, including definition of their functions, structural arrangements and relations.

5.1.2. GOVERNMENT MINISTRIES AND PUBLIC AGENCIES

Government recognizes that the establishment and promotion of S&T programmes require the cooperation and commitment of ministries, parastatals, public as well as non-governmental, non-profit and private sector institutions. Through public funds and public-funded science and technology-based organizations, the State will make catalytic interventions, in the public interest, and to the extent that the priority activities are not being undertaken by private and non-profit organizations. To do this effectively, S&T-related insti-

tutions will be technically strengthened, revamped and/or refocused. Government will provide MHEVTST and NCRST with resources to facilitate their coordinating roles and to establish appropriate links with private sector as the major player.

To provide an enabling environment for effective S&T implementation, State resources will be deployed in a collaborative way with industry and commerce in the lead to achieve incremental growth and advance in appropriate technology.

This approach will also apply to new S&T institutions, and to the composition or reconfiguration of boards. Government will take leadership role in policy development process and will leave the private sector to lead the S&T policy implementation process.

To facilitate meaningful S&T programmes, it is important for government to appraise the capacity and competencies of existing S&T institutions as well as their current activities. This review will be done prior to the reform or formation of any new institution. To support the S&T policy, government will establish a Parliamentary Committee with membership from both Chambers of Parliament to deal with Science and Technology matters.

Not only will this initiative confirm government's commitment to broad consultation it will set the stage for more effective partnership between public and private sectors. It will encourage collaboration within the business community. This process will also help harmonize the fragmented initiatives of tertiary level training and research institutions to achieve greater synergy in the fields of science, engineering, trades and vocational training.

The MHEVTST and its agents will articulate key structural links with other S&T-related Ministries and public-funded S&T institutions which may have under their mandate, such as the planned Bureau of Standards or specialized research units engaged in national defense and security.

⁶ Provision has been made in the proposed structures of MHEVTST for the Directorates (HED, RSTD, VETD, NQA) to provide secretariat service to their respective Councils and Boards. While this represents an interim arrangement it is in the interest of both Ministry and Councils to formalize the arrangement as soon as the S&T system becomes operational.

⁷ The Ministry currently has four S&T related Directorates: Higher Education (HED); Research, Science and Technology (RSTD); National Qualifications Authority (NQA) and Vocational Education and Training.

5.2 EXECUTING AND IMPLEMENTING INSTITUTIONS
Government is committed to the steady development of science and technology and for S&T innovations to permeate the entire society. For this to occur, public policy will encourage regular consultation with private sector and evolve mechanisms for efficient collaboration between public institutions, service providers and their private sector counterparts. The latter objective will be achieved through the establishment of Boards of Management comprising relevant public and private sector officials. The Boards will provide policy advice to the Minister and management oversight of the enterprises. Boards will be responsible for instituting policies, monitoring policy adherence and appraise performance of participating institutions, in line with contractual agreement and targets.

Composition of existing Boards will be reviewed, and where new ones are found to be necessary, the MHEVTST will establish specific criteria and an harmonized terms of reference. The following coordinating institutions have so far been identified as critical to the S&T innovation process.

Main S&T Co-operating Institutions

- National Commission on Research, Science and Technology (NCRST).
- Foundation for Research, Science & Technology (operators of the Fund for Innovation in Science & Technology (FIST)*).
- Council for Research and Industrial Innovations (CRII)*.
- Council for Science and Technical Education (CSTE);
- Council for Vocational and Industrial Training (CVIT);
- S&T Information Centre (STIC)⁸.

Notes on the schematic diagrams shown in the charts 1-8 explain the critical relationships that will enable core S&T institutions to function in a harmonized S&T system. In developing core S&T institutions care will be taken to appraise existing structures to see how their mandates, capacity and competencies relate to the new S&T

policy requirements. Necessary changes will be made in both the structure and relations to ensure proper system for S&T policy coordination. Some initial proposals are presented in the S&T policy for refinement during implementation phase.

5.2.1. NATIONAL COMMISSION ON RESEARCH, SCIENCE AND TECHNOLOGY

The National Commission on Research, Science and Technology (NCRST) shall be a broad base, composite and constituent organization with 16 members, excluding the chairperson. It shall have a standing membership comprising chairpersons of various approved councils, e.g. CRII, CSTE, etc., Professional Engineers Association, NCCI, UNAM Pro-Vice Chancellor for science and technology, Ministries/Agencies responsible for Science and Technology; Finance and National Planning. In addition, the President shall appoint another five members to represent on a rotating basis following key sectors: Mining, Energy and Environment, Agriculture, Marine and Fisheries, Construction and Public Utilities). Sectors shall be represented by their constituent bodies or strategic individuals chosen by them. Two other members shall be nominated by the President on their own merit to represent regional, non-governmental, community-base organizations and Trade Unions. Members of the Commission will be ratified by Parliament. The Ministry through RSTD will provide secretariat services.

The NCRST will have the status of a Presidential Commission, reporting to and providing policy advice to the President through the Minister. It will table its report, twice per year to Parliament on S&T programmes, budget, performance and achievements. In exercising its oversight responsibility for S&T policy it will instigate, where necessary, reformulations of on-going S&T policy, impact assessment studies and set S&T funding levels. NCRST will oversee the development of harmonious and coordinated science and technology frameworks as well as provide general guidance and oversight of research, and S&T conservation programmes.

To provide the latter services, NCRST will establish the Foundation for Research, Science and Technology (FRST) and the Science and Tech-

⁸ Unless otherwise directed these institutions are predominantly implementing organisations with some specific coordinating responsibilities

nology Information Centre (STIC). To assist its deliberations, the NCRST will hold public briefings to gain first hand sensitivity of the country's development and S&T needs, the constraints, sectoral aspirations and potential. The NCRST Chairperson with four rotating members shall serve on the Board of management of the FRST for a maximum period of two terms with the first term being 3 years and two years for the second term. The NCRST chairperson shall preside over the FRST Board of management.

To effect the S&T policy, Government will establish four core S&T institutions under the general guidance of the NCRST. Though not limited to, these institutions will include (a) a Council for Research and Industrial Innovations (CRII), (b) a Council for Science and Technical Education (CSTE), (c) a Council for Vocational and Industrial Training (CVIT), incorporating the existing Vocational Training Board (CTB) and (d) an S&T Information & Resource Centre (STIC). Structures of the core institutions are shown in Chart 3 and linkages are shown in Charts 1 & 2.

5.2.1.1 FOUNDATION FOR RESEARCH, SCIENCE & TECHNOLOGY

The Foundation for Research, Science and Technology (FRST) is an essential support organization to the S&T development strategy. As such it will be one of the first executing agencies to be established under the NCRST, the other two being the CRII and the STIC. The FRST will have responsibility for the administration of the Fund for Innovation in Science & Technology (FIST). It will be the principal organization in Namibia to solicit, receive and oversee the management of Innovation fund allocated, earmarked or obtained through public subscription.

Funds allocated to the Foundation are intended to support public good research⁹. Appropriate legislation will be developed in consultation with major S&T benefactors. Specific procedures and criteria for accessing the Fund for Innovation in Science & Technology (FIST) will be developed in consultation with S&T partners.

The core structure for the FRST is shown on

⁹ Public Goods research refers to research activities and approved technical or scientific investigations whose direct or ultimate outcome is of public interest and which results are available to the general public.

5.2.2 COUNCIL FOR RESEARCH AND INDUSTRIAL INNOVATIONS

The CRII shall be a composite and constituent organization embodying relevant persons and representatives of S&T-related public and private sector institutions. The CRII will operate under an executive order¹⁰, firstly, as a coordinating forum for Research Institutes that benefits from public sector funding. In addition, the CRII will operate a business development unit to establish, promote and transfer to communal ownership S&T innovations Centres in strategic locations. The CRII will undertake itself or through its agencies clinical research to stimulate necessary industrial linkages and facilitate downstream production, process improvement and raw material development through the designated research institutes.

Working in conjunction with small scale industrial enterprises, relevant ministries and their associations, CRII will establish the need for and location of Regional Innovations Centres (RICs) at strategic locations over the country. Through these Centres, directly, or indirectly through the Research Institutes, the CRII will assist small and medium scale enterprises to acquire, update, and adapt appropriate technologies and to introduce productivity enhancement schemes that will increase labour and enterprise performance.

The CRII will assist research and teaching institutions to develop linkages and to prioritize research projects submitted to it for funding under the Fund for Innovation in Science & Technology (FIST). Other major functions of the CRII will be to promote the commercial outputs, research findings and publications of the various Research Institutes and Regional Innovations Centres and to liaise with the Science & Technology Information Centre (STIC) for the development of public information programmes and collection and coding of technical publications.

The CRII Board shall comprise, as standing members, the Chief Executive/Chief Operating Officers of the principal research institutes, the Uni-

versity of Namibia and/or Polytechnic of Namibia, the Director for Research, Science and Technology Policy and a representative of the Ministry of finance or National Planning Commission. Other members shall be nominated on their own merit by the Minister from among private individuals, relevant S&T-related ministries, institutions and civil associations representing the key stakeholders and S&T interests. Membership will be limited to thirteen persons excluding the chairperson who preferably, shall be from the private sector. Specific objective of the CRII will include:

CRII Operational goals:

- increasing volume and quality of S&T information available to the public,
- improving individual know-how and enterprise knowledge and understanding of the physical, biological and social environment in which they operate and secure their raw materials and labour supply.
- developing, maintaining and increasing available technical skills for productive use and for product innovation.
- Expanding capacity of Namibian enterprises to produce and compete in an increasingly technological and rapidly liberalizing marketplace.

Besides advice and counseling, the CRII and its Institutes are expected to produce outputs that generate tangible benefits to Namibians. As such Research Institutes will undertake/organize S&T training programmes, foster information exchanges and facilitate skills and technology transfer arrangements. Through its constant interaction with the private sector it will adapt appropriate commercial technologies for the use of small and medium scale enterprises. RICs operating under the Institutes will define their work programmes in concert with the private sector (NCCI and others) with the endorsement of the CRII. These activities are intended to stimulate new products, processes and services that can be produced cost-effectively in Namibia.

¹⁰ In the context of contemporary management an executive order is an order that establishes an agency, department or ministry of government to operate with commercial principles and, in the process to give due recognition to public policy and national interests.

Key Areas for S&T focus

- meat, bones, skins, etc
- birds, fish and marine products
- fruits, roots, tree crops, horticulture,
- oils, medicine, cosmetics and perfumes, etc,
- mined products, marble, & earth-based materials,
- mineral processing, semi-precious gems, ornaments
- building and construction materials & technologies
- wood & metal furniture, wood, leather & stone carvings,
- information technology, telecommunication software programmes,
- tertiary manufacturing applications, including electric & electronic assemblies
- alternative energy, as solar, wind, biomass, waste management, etc
- bio-technology, bio-mass and related applications
- computers, software and programme development
- human, animal, plant & environmental studies
- social, economic, policy & cultural studies
- community-based knowledge systems
- Traditional technologies

Along with the NCRST and FRST, the CRIL will be established upon the approval of the S&T policy by Parliament. In establishing the CRIL, Government will give due recognition and considerations to existing research facilities.

However, it should be noted that no decision will be taken to re-position any existing S&T institution or department. This decision will be taken only after careful cost benefit investigation. Such re-positioning will not necessarily or automatically lead to the physical relocation of the research facility. What is critical here is that the S&T link is well defined and its role clearly articulated within an harmonized system for effective S&T coordination. The proposed link arrangements for the CRIL and other key S&T facilities are shown in Chart 5.

5.2.2.1 RESEARCH INSTITUTES

There are about 14 public research institutes operating under Ministries, Parastatals and independently as statutory bodies. (For fuller discussion on their role see section 6.2 below).

5.2.2.2 REGIONAL INNOVATIONS CENTRES & SMALL ENTERPRISE DEVELOPMENT INITIATIVE

Regional Innovations Centres (RICs) will be established by the CRIL at strategic locations throughout the country to support small enter-

prises and manufacturing efforts in rural communities.

Prior to their establishment, CRIL will undertake scoping studies of existing institutions and propose the focus for each RIC. In general, RICs will focus research based on local needs and on the use regional resources and materials on a cost-recovery basis. Public goods research will focus on the following key areas:

5.2.3 COUNCIL FOR SCIENCE AND TECHNICAL EDUCATION (CSTE)

Like CRIL, the CSTE will be a composite body (private and public sector) focusing on the development of an effective environment for teaching, learning and integrating science, mathematics and computer technologies in schools, education and training systems.

In addition, the CSTE will provide policy advice and guidance to the Ministries of Education and also to Labour, Finance and the NPC, through the NCRST. It will be composed of officials/institutions engaged in science teaching, technical education, curriculum planning and development, accreditation and certification and quality assurance. It will advise the Minister on ways to enhance mobility between and within schools and programmes and how to increase efficiency in

the total education delivery system.

The CSTE will seek, among other things, to promote centres of excellence in the science, mathematics, technology and computer literacy throughout the education system. Its scope will include basic, secondary, post secondary through to tertiary and professional training. The proposed structure for the CSTE is shown on chart 6. Its links with other S&T organizations are shown on Charts 1a, 1b, 2 and 3 below.

The CSTE will have standing membership comprising: Vice or Pro-Vice Chancellor, University of Namibia, Rector, Polytechnic, Director General of National Planning Commission, a nominated representative (Principal/Rector) of Teachers Colleges, Chairman of Vocational and Industrial Training Board, two representatives of the Education Ministries (Permanent Secretary, or Director), Chairman of NQA Council, Director of NIED, representative of OPM and the Regional Council.

Five other members will be appointed by the Minister on nominations to represent the following sectors/areas: Health, Labour, Industry, Information, Environment, Agriculture, NCCI, Trade Union, and Science Students Association.

In addition, the Minister may appoint two other persons, in their own rights, to serve on the Council. The Board will be limited to seventeen members excluding the chairperson. It will have powers to compose technical committees as necessary, to be drawn from the broader society.

5.2.4 COUNCIL FOR VOCATIONAL AND INDUSTRIAL TRAINING

The CVIT will be formed from constituent organizations and relevant individuals in the public, private and non-governmental sectors. It will operate as a coordinating body to focalize the devel-

opment and integration of vocational skills and industrial training practices throughout the country.

In this capacity, the CVIT Board will oversee programme delivery of vocational, commercial and industrial skills and ensure that these are in line with current labour market demands, trends and official projections of manpower needs as may be developed by themselves, or in consultation with National Planning Commission, the Ministry of Labour, and other important private sector organizations such as the Namibian National Chamber of Commerce and Industry (NCCI).

The core structure of the CVIT is shown in chart 7 and its S&T linkages are illustrated in Charts 1 and 2. Standing membership of the CVIT shall comprise one representative of the Ministry of Labour, Trade and Industry, National Planning Commission, Polytechnic of Namibia, two representatives of the Education Ministries and, on a rotating basis, two officials from VTCs, Representatives of National Qualifications Authority, NIED, NCCI, Trade Unions and Regional Councils.

Other members shall be nominated by the Minister on their own merit to represent the private sector, trade unions, or other relevant community interest. Membership shall be limited to fifteen members excluding the chairperson.

5.2.5 SCIENCE & TECHNOLOGY INFORMATION CENTRE

The S&T Information Centre (STIC) will be a common resource facility. Its resources will be shared by all the above-named institutions, with full access to the public. The operational structure is



Engineering Block, Polytechnic

SCIENCE & TECHNOLOGY POLICY	REPUBLIC OF NAMIBIA
stitutions. The CRII will be the main national instrument to promote industrial innovations and enhance public good research. Besides initiating the regional innovations centers (RICs), CRII may commission research activities deemed to be of national priority which are not being done by research institutes or private sector group. It may do so directly, or through the RICs or in conjunction with a private research institute. To achieve a well focused system for practical research and innovation, the CRII, in addition to its oversight functions, may initiate experiments or projects to benefit the national materials and determine from results the comparative and commercial values. In the same light, the CRII will facilitate innovation programmes in private sector aimed at raising enterprise added value, productivity and modern technology inputs. It will assist in quality monitoring until the National Bureau of Standards (NBS)* is operational. Within the national S&T innovation system the Research Institutes under the CRII will be specifically challenged and, inter alia, tasked to: Mission of Research Institutes: - strengthen processes and enterprise productivity in order to raise the competitiveness of operating businesses in production, commerce and provision of trade services. It will do so by providing information, technical advice or by facilitating the flow of available or appropriate modern technologies and supporting enterprises with up-to-date technical information. It will provide or source direct expertise to advance the use and to increase the value adding capacity of domestic enterprises to further benefit local raw materials. CRII should assist sectors to achieve their annual GDP growth targets and through carefully designed training programmes enable citizens to increase their contribution to domestic supply, export production, and product diversification. - Improve the range, quality and content of Namibian products and service offered to Namibians and the society at large.	Special effort is to be made to strengthen the technology and practices used in small businesses and rural communities, and where feasible, to facilitate technology, procurement and marketing links with larger domestic and international firms. In doing they will: - Provide relevant technical information, appropriate extension services, systems and decision support to encourage self-employment opportunities, expansion and re-investments in areas outside of urban centres and existing development cluster. - Advance the application of science and strengthen the link between technical education and vocational training and technological research and innovations. Institutions engaged in public good research, scientific and technology innovations will be required to assist sectors to articulate affirmative economic policies, and in monitoring the practice and progression of product quality, and services. (For operational linkages, see charts 1-9 below). 6.1.2 UNIVERSITY OF NAMIBIA The University of Namibia (UNAM) embodies the most comprehensive S&T complex in the country for teaching, training and multi-disciplinary research. At the Apex of Namibia's educational system, UNAM is expected to provide both academic leadership and technical innovations in a variety of fields and areas directly relevant to the country's developmental needs. Innovations in science and technology are foremost in that expectation. As the university addresses its response it must recognize the structural shifts that have taken place in the job market in the last decade; the changing profiles of employers, of employment, and of students. These have enormous implications on faculty, staffing, funding, programmes and outreach. This situation will be further compounded by increased regional and global competition and the rapid advances in telecommunication, information technology and computer science. With limited innovations these challenges will heighten

SCIENCE & TECHNOLOGY POLICY	REPUBLIC OF NAMIBIA
shown on Chart 8 and its linkages are illustrated in Charts 1 and 2. The structure comprise a management Board selected from among relevant S&T institutions, government, private sector, trade unions, and non-governmental organizations. Membership will be limited to fifteen persons including the chairperson. The STIC will be responsible to collect, code, archive, store and disseminate S&T information. In addition, it will provide the public select services in Internet connectivity, search, training and publication. 5.3 COLLABORATING INSTITUTIONS In addition to the main cooperating institutions (public sector) identified above, there are a host of private sector owned and operated S&T institutions as well as S&T-related or affiliated institutions in the parastatal sector. These are scattered throughout the country in several areas and niches. The Ministry and its cooperating institutions, through its various consultative mechanism will need to foster effective collaboration arrangements to ensure efficient use of national assets, and where necessary, to encourage complementary use of public and private resources. 6.0 MAIN S&T IMPLEMENTING INSTITUTIONS & ROLES 6.1 MINISTRY OF HIGHER EDUCATION VOCATIONAL TRAINING, SCIENCE AND TECHNOLOGY The Ministry of Higher Education, Vocational Training, Science & Technology (MHEVTST) is tasked to coordinate S&T policy in government and private sector. In the absence of the S&T policy research activities have remained highly fragmented. With the passage of the necessary S&T legislation MHEVTST will have a better basis to promote S&T development and a better resource base to establish core mechanisms, and the capacity to facilitate research and policy compliance. For implementation it will be assisted by a number of agencies: S&T Implementing Organisations - CRII & Research Institutes - UNAM & PON - FRST, STIC and BOS* - Private Sector Industries - Private Sector Laboratories In a competitive market environment, cooperation and collaboration are not mechanical functions. Coordinating agencies need the critical support and authority which legislation provides. It is recognized that Namibia needs to shift some poor S&T practices, to encourage new S&T investments and to foster longer term investment planning. Under the current scenario S&T-related investments are unlikely to increase or make their optimum contribution to GDP, and worse, they may even fail to withstand the pressure of international competition. With appropriate legislation and the required technical institutions MHEVTST will have the capacity and authority to be an effective coordinator of S&T policy. In essence this will give the MHEVTST the capacity to monitor the impact of economic policy on S&T activities and vice versa, to conduct S&T policy impact studies and initiate, when necessary, proposals for S&T policy shifts and to provide technical advice to S&T-related ministries, agencies and enterprises. The Ministry will be better able to influence policies and practices that currently impact or impinge on trade, production, service, utility, technical human resource development and research. 6.1.1 RESEARCH INSTITUTES AND THEIR ROLES In terms of scientific investigations and research, there are currently thirteen (13) main research institutions operating in the public domain under various ministries, as parastatal organizations or departments. These include: National Marine Information & Research Station, Namibian Institute of Mining and Technology, Desert Research Foundation of Namibia, Central Veterinary Laboratory, Forensic Laboratory, National Forestry Research Centre, National Botanical Research Institute, Geological Research Department, National Museum or Archives, Multi-Disciplinary Research Centre, UNAM. A formal framework (see CRII) will be established to facilitate policy and to coordinate research activities in these in-	

cognitive demands and the institution's response to mass education, gender ascendancy and the expanding role of science and technology.

In this complexity, UNAM has a pivotal role to play in the preparation, development and delivery of the nation's high level technical and professional manpower. While its relevance will be especially tested in fields directly related to science education, basic, social and applied sciences and in technology management it will increasingly have to adjust itself to respond to the high demand for enterprise and professional studies.

Accordingly, a greater role is envisaged from the university, not just for the provision of multidisciplinary teaching and publications, but for pragmatic leadership in cooperative research and promotion of collaborative programmes with other relevant Tertiary Institutions and Industries. Equally, UNAM will need to increase its engagement with and impact on the wider community through well crated outreach programmes, jointly developed and operated to improve community leadership and life long skills upgrading and acquisition.

The multi-dimensional response to teaching and research requires dynamic leadership, good mix of core competencies and an energetic capacity to spur innovation in university laboratories and through outreach programmes to industry and commerce. In this regard UNAM is expected to assume a leadership role in revalidating its own vision, mission and comparative advantages and to set the stage for a greater degree of cooperation and collaboration with strategic institutions both within and outside Namibia.

The adoption of joint delivery strategies with counterparts within and outside of Namibia is a necessary strategy to avert course collusion, unnecessary and of unproductive use and duplication of resources. University of Namibia is expected to assist teachers colleges, respective Ministries, and among others things, to timely review and articulate and synchronize academic curriculum, teaching methodologies, learning outcomes, and research and technical publications. As a research institution it will have full ac-

cess to resources under the Fund for Innovations in Science and Technology (FIST).

6.1.3 POLYTECHNIC OF NAMIBIA

The Polytechnic of Namibia is another major national initiative to build up our human capacity and technical competencies. As one of the principal tertiary level institutions in the country it will target and deliver both professional and vocational training, building on multi-level and multidisciplinary entrants from conventional high schools, vocational, trade training centres, technical high schools and the business sector.

It will develop a strong programme orientation toward functional education and core competencies to provide both technological and professional training as well as to undertake research and S&T innovation activities.

As the 'people's institution' the Polytechnic develop programmes directly related to community needs while working closely with industry, commerce and government to deliver a wide range of disciplines and skills to cope with the changing dynamics of the labour market.

The institution will focus attention, initially on building up competencies in hard technical engineering and professional disciplines while it delivers high quality graduates to industry and commerce, based on demand surveys, identified needs and market trends. It will utilize its internal capacity to strengthen and develop linkages with vocational, technical high schools and industrial enterprises to facilitate effective feeders and value added linkages.

While graduates of the Polytechnic are expected to achieve high academic credentials, they should equally be well trained and equipped with entrepreneurial skills to function on their own in, and to take a lead in creating self-employment opportunities as viable options to formal and structured employment.

Given the broad scope, and at times the overlapping mandates of both UNAM and the Polytechnic it is important that both institutions coordinate their development programmes, respect-

ing in the process, complementarities, each other's core mandates and competencies. The Polytechnic is expected to further its involvement in applied science, research and technical publications as it develops infrastructure and technical competencies.

As a designated research institution the Polytechnic will be have full access to resources of the Fund for Innovation in Science & Technology (FIST) for approved projects. Like UNAM, it will work closely with scientific institutions and research laboratories in the country to carry out its academic and research pursuits. (Please see charts 1-7 which show operational linkages and relationship with other key S&T agents).

6.2 OTHER PUBLIC AND PRIVATE SECTOR TEACHING & RESEARCH INSTITUTIONS

Convergence is desired by the public and private sectors where common and joint actions are determined to be in the country's best long term interests. As facilitator of the national development process, government, on its part, and MHEVTST, in particular will ensure maximum public and private sector dialogue relating to S&T policy and its implementation.

This involvement will occur at all levels in the policy dialogue and at all stages of the policy implementation process, engaging the respective ministries, associations, agencies, corporations, spokespersons and professionals. Equally, it is expected that this dialogue will be maintained at the operational, institutional and funding levels, embodying advice on S&T structures and arrangements, and evolving new perspectives and consensus on national S&T issues, policies and strategies.

6.3 NEW INITIATIVES TO PROMOTE SCIENCE AND ENGINEERING

In the development of science and engineering programmes and UNAM and PON, highest consideration should be given to the spatial distribution of Namibia's population¹¹. At the present time the most feasible course of action, in the

areas of science and engineering is to promote the concept of (a) "common core engineering facility" at one campus and the "common core science facility" at the other. This means that national efforts and resources would not be duplicated unnecessarily. Rather, the country's limited resources will be used to build centres of excellence and encourage synergies between both UNAM and PON campuses.

Management of the "common core engineering facility" should be jointly developed in the spirit of collaboration, although operationally the facility will be managed by one institution - which in all likelihood will be the Polytechnic. Similarly, the "common core science facility" will operate on a collaborative basis with the responsibility for management and operations entrusted to UNAM. These strategies should be facilitate sharing of faculty and facility and may be formalized by a memorandum of understanding between the two cooperating institutions. In any case the modus operandi for the collaboration will be dictated by functionality, mandates and competencies.

Both UNAM and the Polytechnic, within their respective competencies, are expected to develop and undertake new programmes to build up the requisite number and range of high quality science teachers for the entire spectrum of the educational delivery system in Namibia. They will work individually and cooperatively to facilitate this end and to encourage production and publication of science literature, teaching materials, as well as science texts.

It is expected that core facilities of engineering and sciences will include appropriate lecture halls, laboratories, materials, teaching and research facilities to cater to the development needs of the country. Faculty, computer facilities and up-to-date S&T libraries are to be developed as mutually and complementary resources.

Until Namibia develops its own independent national standards laboratory, the laboratories of both UNAM and Polytechnic are expected to engage their technical equipment for testing and certification as may be required by industry and commerce or assist compliance with government laws, international standards and good business

¹¹ CSO estimates Namibia's 1997 population at 1.78 Million and projects a population of 2 million by year 2003.

practices. Both institutions (UNAM & PON) are expected to train and develop professional and technical skills in line with market demand and to match the competitive profiles of business and government.

6.4 SCIENCE AND TECHNOLOGY OUTREACH
To build up and provide S&T skills and competencies in areas of national priority, and to encourage innovation and entrepreneurship for SME¹² development, three new concepts will be promoted. Essentially these are: (1) Technology Consultancy Centres (TCC), (2) Technology Incubators and Demonstration Units (TIDU) and (3) Science and Technology Parks (STP). Initiatives to establish and operate any of these facilities could be undertaken by UNAM, Polytechnic, Research Institutes, Private Sector, Non-governmental organization or by Government, as part of its industrial estates development or export processing zones.

The TCCs will be legally-organized mechanisms providing coordinated response to problems of a wide range of industries, business enterprises or communities. They will engage multidisciplinary as are available in university and research institution's setting, and for which both participating consultants and institutions will share in responsibility and benefits.

The TIDUs will operate essentially as experimental or pilot units to demonstrate the efficacy and relevance of technology innovations to small and micro enterprises. These will be based on results of research on local materials, new and improved processes in product or services aiming making integrating their applications and commercial use.

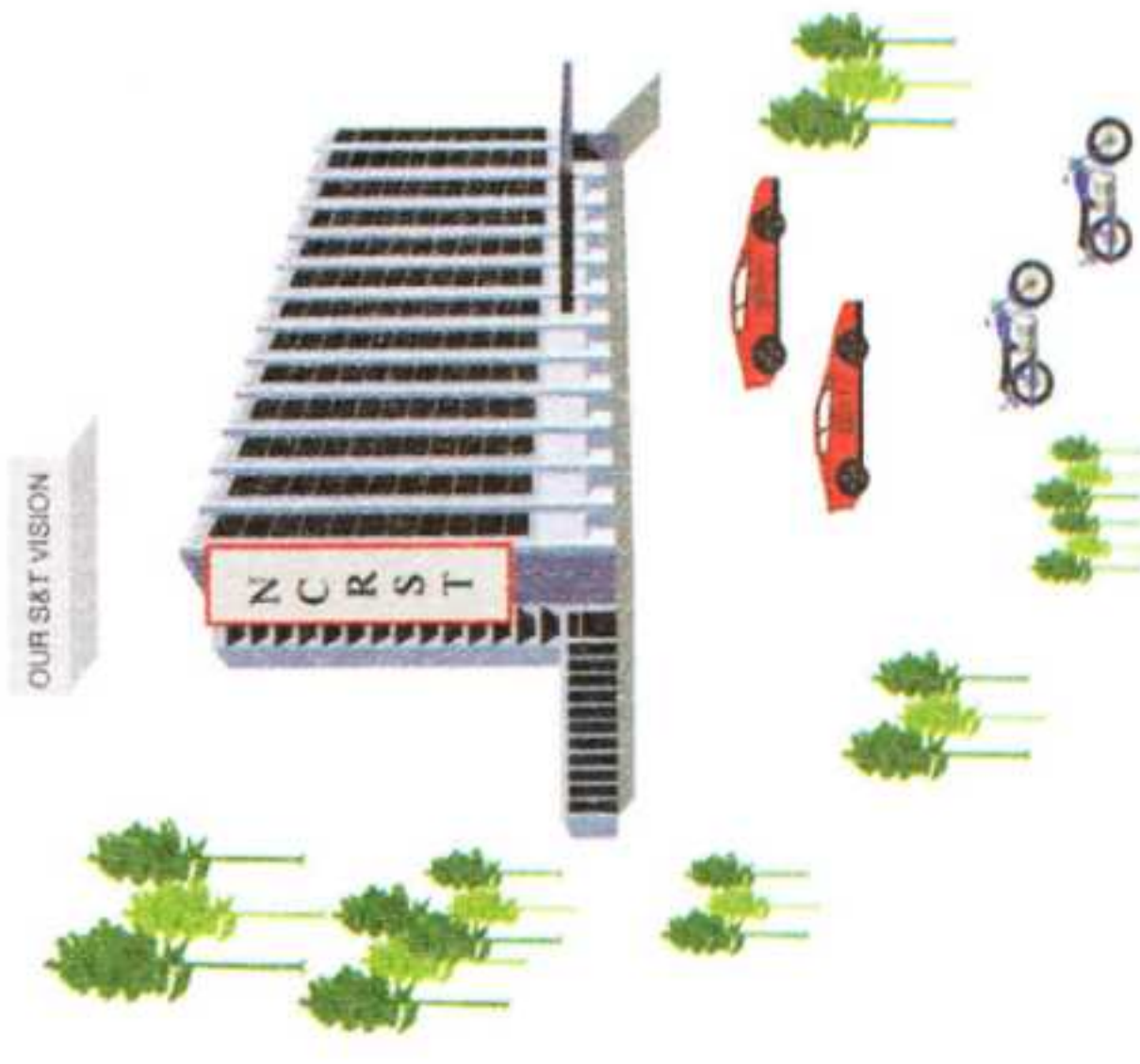
The STPs will be operated as extensions to research activities of the University, Polytechnic or Research Institutes. They may be effected as deliberate activities by a government executing agency to broaden public awareness of the application, use and impact of appropriate science and technology. They will essentially target rural communities.

¹² SME's refer here to small and medium enterprises as opposed to MSE's, meaning: micro and small enterprises.

is envisaged that the private sector will work closely with, and collaborate in areas where mutual and common interests dictate. In this regard, research projects jointly developed and pursued will have equal access to public Innovation fund.

6.6 INTERNATIONAL AND TECHNICAL CO-OPERATION
Namibia shares borders with five countries and the Atlantic sea. Opportunities for inter-land and overseas trade represent a major investment attraction to Namibia. As such, Namibia is an important inlet for trade and outlet for high value added products and services. As a member of the Southern Africa Development Community (SADC) and the Common Market for Eastern and Southern Africa (COMESA) Namibia's economic and social stability is integrally linked with the social and economic development of these five countries and the two regional trading blocs. Equally, Namibia operates a liberal economy in which trade will continue to play an important role for our development and for our active participation in the global economy.

In pursuit of our social and economic goals, it is essential that we build good and friendly relations with our neighbours and with the international economy through intelligent diplomatic and other cooperation mechanisms. This relation is critical to our stability and growth as a develop-



ing country. In these regard, the role of science and technology will be given high priority in our foreign policy and our domestic institutions, both public and private will be encouraged to forge positive alliances with regional and international, research scientific and technology networks.

It is of national and strategic importance that the public as well as our parastatals and private sector investments utilize the most relevant and appropriate technologies in their operations, and that our industries, trade and education systems are adjusted accordingly to facilitate the technology transfer of skills and maximum inter-firm synergy and cost-effective outcomes. To build our international competitiveness, our business firms will need to acquire and maintain an intelligent mix of both cutting edge and appropriate technologies and manpower. These imperatives should underlie business decisions and reinforce the production capacity of our international sector. In turn, they should help to create more value added links with our small and medium scale domestic enterprises.

Namibia's international relations and foreign policy will support the national S&T policy. Work programmes of foreign missions will seek and actively promote cooperation with countries and institutions that fall within the country's strategic vision. Greater focus will be devoted to those governments, ministries, regional, international, multilateral agencies and private establishments of excellence that offer significant benefits to Namibia. Diplomatic and trade missions abroad will be technically strengthened for the tasks. Whilst it is Namibia's strong desire to strengthen technical ties with development institutions and countries we must also recognize that the country is both small and developing. Therefore we need to rationalize our global representation to give maximum scope to those that fit closest to country's strategic goals and interests.



INTEGRATING THE S&T POLICY IN SECTOR STRATEGIES

7.0 SECTOR SPECIFIC OBJECTIVES & STRATEGIES

Science and technology objectives and strategies are intended to strengthen individual sector policy so as to achieve the highest level of efficiency, sector value added contribution and sustainable development. The S&T objective and strategy framework provided here is to be incorporated in the policy for each economic sector and this process is best developed with the leading sector players.

7.1 SCIENCE & TECHNOLOGY POLICY IN INDIVIDUAL SECTORS

7.1.1 FRAMEWORK FOR S&T DEVELOPMENT

Namibia's science & technology policy is intended to enable citizens - individual and corporate - to achieve their maximum output and potential. Through functional research, intelligent acquisition, efficient use and application of science, human knowledge, ingenuity and productivity will be significantly heightened to enable individuals and companies to harness and benefit our natural and economic resources.

Through this process we can create new job and investment opportunities to generate income and uplift the standard and quality of life of Namibians.

In the engagement of science and technology are used as means to expand production, enhance processes, to diversify and to push the economy to a higher development plain. For the results to be sustainable it is important that our strategies recognize and protect Namibia's fragile environment and ecology and every effort is necessary to preserve our rich and diverse heritage.

Science and technology strategy should be carefully incorporated in sector policy and which, among other things, is intended to provide a conducive framework for the development, coordination and management of sector policy:

Framework for Sectoral S&T Policy

- Notable rise in the level of added value by increasing the content of knowledge and skill in the product application and processes;
- Notable increase in the level of productivity of labour and capital by improved skills and technology for the conversion of raw and intermediate materials;
- Notable expansion of industrial and commercial linkages through effective and efficient organization, management and planning of the flow and utilization of resources and of market opportunities. The above strategy implies putting in place the right mix of core institutions, defining functional and structural relations, and their capacity to undertake public good research, and deliver public services and infrastructures.

- Assist the Namibian public in making smart S&T investment choices and adaptations; and to unfold, diffuse, demystify and transfer complex technologies and processes and assist in the timely dissemination of S&T information to small, medium and micro entrepreneurs.

- Advance human understanding and knowledge about the use, potential and practical applications of science and technology with the aim of raising output, quality and value of national production, productivity and exports.

- Promote awareness and optimal use of local raw materials and economic resources. This process should give special attention toward integrating, upgrading and preserving traditional technologies and community knowledge systems for more effective use and yields.

7.2. STRATEGY TO INTEGRATE S&T POLICY IN SECTOR DEVELOPMENT

Our ability to achieve and sustain a 5 per cent average annual growth rate in the Namibian economy will depend on the efficiency of our producing and trading sectors and the extent they

are able to develop synergy and balance within and between competing sectors. It is expected that the growth sectors in the economy will embed science and technology into their core programmes and that R&D activities will be used to reinforce and drive sectoral strategies.

7.2.1 FRAMEWORK FOR SECTOR S&T STRATEGY DEVELOPMENT

The set of core strategies identified below is intended to facilitate better coordination and intersectoral harmony as well as to guide priority setting, resource allocation, use and deployment of national S&T capacity and resources in sector policies. It is logical to expect that those sectors that are technology-based will be more proactive in the delivery and coordination of S&T resources. Consequently, they will require more services from public S&T institutions and to reinforce sector policy. They will be charged to:

Developing & Promoting Sector S&T Strategy

- Identify and strengthen the role of traditional technologies.
- Facilitate the improvement and integration of appropriate technologies, and promote their widest diffusion and application to small, medium and micro enterprises. Special emphasis and responses will be devoted to assist in technical upgrading of rural and peri-urban communities and entrepreneurs.
- Develop Namibia's human resource capacity, at all levels, to enable citizens to acquire skills, professions and technical competence in areas such as policy development, science teaching, computer systems, operations and information management, research and industrial production and material beneficiation.
- Promote, develop and maintain our basic and essential development infrastructures to support, induce and retain science and technology investments, products and services.
- Establish and oversee efficient systems and equitable arrangements for the development, oversight and protection of Intellectual and



8.0 EXAMPLES OF SECTOR SPECIFIC S&T STRATEGIES

8.1 MINING, MINERAL AND EARTH-BASE RESOURCES

8.1.1 Strategic Sector Issues
Namibia is well endowed with a wide range of precious and semi-precious minerals and other yet-to-be explored earth-bound resources. Over a number of years the economy has operated with an unhealthy reliance on the mineral sector as the main source of economic wealth -

Mining & Mineral (18% to GDP & 4% of Labourforce/1997)

- Diamond, uranium, gold, copper, zinc, lead, copper, silver, tin, marble, stone, sand, clay and variety of semi-precious gems; marble and salt.

for foreign exchange revenue and employment generation. Down-line processes to do further material beneficiation has remained literally unchanged up to and since independence. In the meantime regional and worldwide competition for unprocessed mineral products have grown stronger and fiercer at the international level and which situation is adversely affecting Namibia's traditional niche markets and negating our trade terms.

Namibia recognizes that mineral reserves are finite. Accordingly, the sector has to maintain a strategic plan to guide exploitation and value-added developments in ways that will optimize benefits to the nation. The mineral sector therefore will develop sectoral links and diversify in new products as other sectors in the economy are encouraged to take on greater role.

Currently, the mining and mineral sector contribute between 15 and 20 per cent of GDP, 40 per cent of total formal employment and over 60 per cent of the country's foreign exchange. Continuing the economy's monolithic dependence on the one sector in a global environment that suggests vulnerability and transience is to encourage development that is self-defeating and limiting. Thus, the need to diversify the economy is strong and where possible and feasible to explore opportunities for value addition and further invest-

ments.

8.1.2 S&T Strategies in the Mineral Sector
Namibia's Mining and mineral sector will need to explore technologies that are appropriate to small and medium businesses and to expand opportunities to local persons and firms. Current training and skill-development initiatives are recognized but these will need to be extended to widely to facilitate the conversion, diversification, development and use of value added services.

To achieve sector goals requires that new processing methods and technologies be employed. While we identify and exploit new resources and reserves, we must at the same time maintain and heighten our vigilance to preserve and protect our fragile environment, and to balance our beneficiation with concern for stable and long term development. In this regard, the sector will promote and monitor environmental laws and practices, and reconcile between economy, nature and generational demands:

Specific Sector Strategies

- Identify best technological practices in and for the exploitation and beneficiation of mined and processed mineral products.
- Extend recruitment/ employment opportunities to attract and engage more locally trained and foreign trained Namibians into the industry.
- Undertake and/or support a greater level of local research activities focussing on the mineral sector, undertake strategic studies and investigations, to determine commercial feasibility of upstream/down stream processing.
- Monitor production, product & market trends and technology developments in the industry.
- Increase plant and employee productivity in all aspects of mining, mineral production and marketing.
- Increase in-company and in-house training for craftsmen, technicians, and engineers and to provide support to local institutions engaged in functional and professional training and research, especially applicable to the sector.
- Promote the use of clean industrial processes, environmentally-sound technologies and sound waste disposal practices, in order to protect life and property and thereby minimize health risks and environmental degradation.

8.2 AGRICULTURE, FORESTRY, LIVESTOCK AND MARINE RESOURCES

8.2.1 The Strategic Issues

In terms of physical size, Namibia is quite a large country. It covers over 825,400 Sq. Kilometers with over 1,570 Km of coastline. However, the country is arid¹³, sparsely populated, desert prone and suffer extreme periods of drought and unpredictable rainfall.

As a result of the climatic conditions, agricultural

Agriculture (15% GDP & 49% Labourforce) /1997

- Livestock - cattle, goat, game, sheep
- Fishing - catch potential over 1 million m-ton p.a.
- Others: Millet, sorghum, groundnuts, mahango.

output is limited to defined areas in the North and confined to specific crops. Main commercial opportunities in this sector are in marine products, cattle farming and their derivatives that are currently not developed nor fully exploited. Main product farming is concentrated in the North where the rainfall is more reliable.

8.2.2 S&T Strategies in the Agricultural Sector

Given the aforementioned background, it is clear that science and technology interventions are critical to promote and optimize specific niches and opportunities in the sector. These relate to (i) improving land yield and productivity; (ii) conserving water and containing soil erosion; (iii) harnessing and developing safeguards for our biotechnology resources; (iv) protecting plant and animal stock from disease and extreme climatic conditions; (v) improving technologies for irrigation and water development; (vi) developing and disseminating disease control and resistant technologies; (vii) maximizing human, capital and material productivity on the basis of intensive technical training, (viii) increasing access and use of appropriate technologies; (ix) developing inter-sectoral linkages with agricultural research institutes and adjust products and services to meet

¹³ Irrigated land is approx. 80 Sq. Km. Arable land is approx. 1.5%. Permanent pastures is approx. 46%. Forest and woodland reserves are approx. 22% based on 1996 Ministry of Lands survey.

market demands; (x) developing information systems for trade in agricultural outputs and where economically feasible, (xi) encouraging downstream value addition products.

To foster balanced growth in the Agricultural sector, the following S&T interventions should be considered as necessary to:

S&T Strategy in Agriculture

- Develop and/or upgrade agricultural research facilities and refocus their work programme to develop resistant crops, trees and plant stock to improve land coverage, food and crop yield;
- Undertake soil research to identify use and development opportunities.
- Undertake focused research to categorize existing plant/tree stock inventory and improve the technologies in use;
- Provide technology advice and support to improve farming systems, and link agriculture with industrial processing and markets;
- Assess existing agricultural practices and introduce environmentally sound processes;
- Strengthen research links, extension services and technical training;
- Provide testing and verification laboratory services;
- Assist conservation and preservation efforts to protect the country's natural genetic resources and promote bio-diversity;
- Monitor importation and use of chemicals, additives and track impact of genetically modified food and other manipulated organisms.
- Adopt, develop and promote effective harvesting, storage and production technologies, processes and practices.



8.3 INDUSTRY AND TRADE SECTOR

8.3.1 The Strategic Issues

Industry and trade are two of the most critical development sectors in the economy. Unfortunately, without proper support and guidance, they do not automatically grow in a congenial or in a balanced way for the long term national benefit. In the context of a market economy both sectors need each other for competitive but harmonious growth and for stable economic development. Science and technology interventions will be critical to facilitate this process, especially for the (a)

- Industry (12% of GDP & 8% of Labourforce)/1997

 - Fish processing, meatpacking, dairy products, tin, diamond, lead, zinc, uranium, silver, tungsten, copper,
 - Leather, beverages, furniture, light manufactures
 - Batteries, motor cars & light electronics
 - Trade (9% GDP)
 - Consumables (food, clothing, drugs, etc)
 - Energy (oil)
 - Durables (vehicles, electronics, etc)
 - Capital goods (machinery, communication)
 - Personnel (Engineers, Accountants, etc)

cost-effective importation of capital, consumption goods and services. Here, the emphasis is on product safety, standards, quality, etc to ensure compliance with national and international specifications, and health, physosanitary and environmental requirements , (b) delivery and development of technical skills relevant to the market needs and trends and capable of contributing to technical and scientific knowledge and innovations.

8.3.2 S&T Strategies in Trade and Industrial Sectors

To encourage individual growth sectors and at the same time seeking to achieve harmonious development between and among competing sectors requires the support of an effective system of S&T institutions:in imports and local production cycling technologies.

S&T Strategy in Trade and Industry

- Maintain a core of qualified and experienced scientists, technologists and skilled technicians to engage public good research and to transfer innovations to local businesses;
 - Doing technical audits and value analysis studies of products and services in current production to monitor local material inputs and local value addition potential;
 - Maintaining technical and scientific information centre for product, technology and market research;
 - Unpacking and simplify complex technology processes for small and medium scale enterprises;
 - Operating laboratory facilities to transfer technical and scientific knowledge and skills to improve existing processes, develop new ones and new commercial products and services;
 - Monitoring the use and scale out of CFCs in imports and local production
 - Providing technology advice and support to improve farming and industrial systems, and link agriculture with industrial processing and markets.
 - Strengthening research linkages, outputs, extension services and technical training;
 - Providing testing laboratory services to monitor standards and quality of in-coming goods and materials and those that are locally produced, giving special attention to those intended for the export markets.
 - Managing of industrial waste and promoting waste management techniques and recycling technologies.

8.4 ENERGY & WATER SECTOR

8.4.1 Strategic Issues

Energy in Namibia represents a critical determinant of economic activities and the quality of life of Namibians. Notwithstanding the fact that the country's land mass is extensively stretched across large open spaces and sparsely populated areas, there is need to provide alternatives, and to extend affordable energy supply especially to rural population and communities. The current use of wood as a primary fuel source in an arid environment is not only unsafe but unfriendly to the fragile ecology and desert-prone environment.

- Energy (oil & coal) 1.35% of GDP and <0.5% of labour force)

 - Domestic Consumption: 1,900GWH p.a.
 - Domestic Production: 1,240 GWH (1996)
 - Prospect of producing natural gas: Good
 - Import of electricity/Fuel - approx 70% (1997)
 - Generation capacity 500 - 750 MW (1996)
 - Consumption per capita 1000kwh (1996)

Compared to its population, energy consumption is relatively low as over 50 per cent of homes is not yet electrified. Electricity supply is well managed and systems service reliability is quite high compared to most developing countries, with average availability exceeding 85 per cent.

Selective exploration for coal, gas and oil needs to be intensified, and at the same time investigations for appropriate technology solutions should be engaged for their beneficiation if finds prove to be commercial. In order to diversify and optimize current energy resources training and research need to be positively encouraged both in the laboratory as well as in the field. This is especially important given the vulnerable and unpredictable climatic conditions, rainfall pattern and unreliable hydro sources. Research in energy conservation practices and alternative energy sources have to be given high national priority for S&T innovation efforts to focus on these above areas and the probable solutions.

8.4.2 S&T Strategies for the Energy Sector

Specific S&T responses should facilitate widening the electricity network to rural communities. However, given the large land space and low

population density outside of the main city centres, more reliable alternative energy supply will be needed to provide cost-effective energy solutions. The main sector strategy will include:

- S&T Strategy in the Energy Sector

 - Research in renewable and energy alternatives especially in the area of wind, Solar, hydro and biomass.
 - Research in energy-efficient sources and the applications to Namibia
 - Research in energy use and conservation practices,
 - Build capacity to undertake risk assessments associated with exploitation, processing and use of conventional and alternative energy sources.
 - Promotion of conservation techniques and best industrial technologies and practices,
 - Research in energy technologies, equipment and best practice applications,
 - Perform audit of major energy users and energy technologies and assess supply/distribution facilities,
 - Exploration of conventional and new energy supply, especially natural gas and best extraction technologies,
 - Demonstration of appropriate energy technologies,
 - Research and analysis of waste and recycling options and system of management.
 - Appropriate adaptation of technology, through design and research activities to enhance manufacturing capacity for production and use of solar and other renewable forms of energy.



8.5. EDUCATION AND HUMAN RESOURCE DEVELOPMENT

8.5.1 The Strategic Issues

The pace of Namibia's development will be greatly influenced not just increasing the numbers of courses, annual output or number of persons trained in our education institutions but more so by the content, level and quality of training that are provided. A good education system in the new Millennium must enable learners to think, to innovate and to multiply knowledge gained through text, research, teacher exposure and practical examples and experience. To this end, education planners and programme delivery should seek to empower learners with life long skills and creative attitudes.

General Education Literacy rate: 48% - 65%	
Male (58%): /1997	
Female (48%): /1997 est.	
Tertiary System: Total enrolment: 23,000 p.a. Or approx. 6% of the total tertiary level output)	
Polytechnic: 1 with day capacity <8,000	
Teachers Colleges: 4 in number	
Vocational Centres: 7 in number	
Nursing Colleges: 3 in number	
Agricultural Colleges: 3 in number	
Research Stations/Units: 13 in number	
University: 1 in Windhoek with most faculties and campuses in the North & Southern Regions	
Current day capacity <8,000	

Although general training and education are desired and highly necessary in Namibia, the new emphasis in technology and information sciences put special demands on and for teachers with these competencies. Equally important and urgent is the need for our educational system to be flexible so that its output is multi-disciplinary, with focus on science and technology and new attitudes toward production, productivity and functions.

Teaching methodologies and facilities have to integrate science, technology and industrial arts to a greater extent into the learning process. Programmes and strategies must be introduced to provide technically-oriented skills and produce attributes that steer learners to both formal and self-employment options and opportunities.

S&T Strategy in the Education Sector

- Develop a clear track for persons pursuing technical education as a viable option and not as a default choices;

- Promote and support the use of science, mathematics and numeracy in schools;

- Popularize the development of S&T curricula from basic and early childhood education through to primary, secondary and tertiary institutions;

- Develop affirmative programmes for science and mathematics and technical teachers

- Intensify teacher training efforts and output in technical and scientific fields;

- Develop technical manpower database and capacity to survey, assess and monitor demand and supply;

- Establish and operate a national criteria and the appropriate authorities to assess training programmes and institutions, technical competencies, qualifications and develop a competitive reward and compensation system;

- Promote the optimal use of locally trained skills in public service and positively encourage the same in the private sector;

- Provide opportunities and facilities to encourage minority groups, and physically and mentally disadvantaged individuals and to promote gender sensitive education;

- Promote the use and integration of modern telecommunication and computer technologies as are used and demanded in trade, industry, transportation, broadcasting, communication, and services.

- Strengthen content of technical and scientific programmes, as well as the teaching, training and research facilities at both UNAM and the Polytechnic of Namibia.



- Promote and strengthen S&T education linkages with private sector and between and among the University, Teachers Colleges, Polytechnic, Vocational Training Centers, Technical and conventional high and secondary schools to facilitate better access, mobility and progression between them;
- Promote general public libraries with high content of technical and scientific books, periodicals, research papers, publications and journals.

8.6 INFORMATION AND COMMUNICATION SECTOR

8.6.1 The Strategic Issues

The information and communication technology sector (ICT) are among the fastest growing in the world economy. Developments in Namibia in these two sectors are quite advanced, especially in trade and commerce. However, much more effort is needed to integrate ICT with manufacturing and production and within the education sector.

Information & Communication Sector

- Telephone Lines: 174,000 (1997 est)
- Micro wave relay links: established in major towns and expanding automated digital network in progress
- Television broadcast: 3 stations (1997);
- Television Recipients: 57,000 (1997 est)
- Radio broadcast: AM - 4; FM - 40; Short wave - 0
- Radio recipients: 323,000 (1997)

Namibia operates a market-oriented economy and its ability to cope with imports and compete in the global arena will be greatly influenced by our use of ICT innovations. Thus, the country must give ICT a strategic emphasis to facilitate competitive and on-going developments and to augment our economic and social systems, infrastructure, networks and build up our personnel and national capacity to innovate.

8.6.2 S&T Strategies for the ICT Sector

Our S&T interventions in the ICT sector will be guided by regional and global market trends and paced to match national absorptive capacity. Such S&T interventions require changes and adjustment in the public sector, business sector, schools, training and research institutions.

Strategy for Information and Communication Sector

- Develop clear track for the role that technical education must play in meeting current and future challenges in the sectors for the survival and growth of industry, commerce and the living standards of our citizens;
- Promote a competitive technology base for relevant communication infrastructure that will foster a sound environment for international business, healthy personal and corporate growth and relations;

- Facilitate the growth and local integration of electronic and non-electronic communication systems as means to ensure appropriate mix and use of local talents and resources;

- Make special promotion effort to attract and retain communication investments and technologies that will provide add value services;

- Promote and popularize the use and integration of science, computer literacy in schools and in our various workplaces;

- Intensify training efforts especially in technical and scientific fields to advance absorptive and understand of the technologies. This initiative must positively influence our local capacity to use, adapt, service, apply and to introduce new programmes, products and services;

- Encourage efficiency and productivity in the use, operations, and development of telecommunication and information delivery services;

- Operate a modern S&T resource centre with library and internet support, for coded, uncoded and decoded S&T publications, studies, investigations and reports;

- Establish a network of S&T-supported libraries at strategic locations throughout the country to provide access to students, teachers and researchers and to link them with other S&T information sources such as museums, government departments, UNAM, Polytechnic, Teachers Colleges, Secondary Schools, VTCs, and so on;

- Facilitate efficiency and competition in developing and divesting of the information and telecommunication sector.

S&T IMPLEMENTATION ARRANGEMENTS

THE PROPOSED STRUCTURES, ARRANGEMENTS & RELATIONS TO FULLY EFFECT THE NATIONAL S&T POLICY

The following schematics and diagrams are intended to intended the S&T core structures, the critical linkages and their necessary relations to foster an enabling environment for S&T innovations in Namibia. When fully implemented these arrangements will force inter-organisation communication on common issues and create a better climate for building stakeholder understanding and consensus. In consequence, inter-ministry coordination and public-private sector collaboration are more likely to succeed. This in turn will improve the culture for science, technology & research and make S&T in implementation smoother and more impacting.

CHART 1A
Operational Arrangement for the National Commission on Research,
Science and Technology (NCRST)

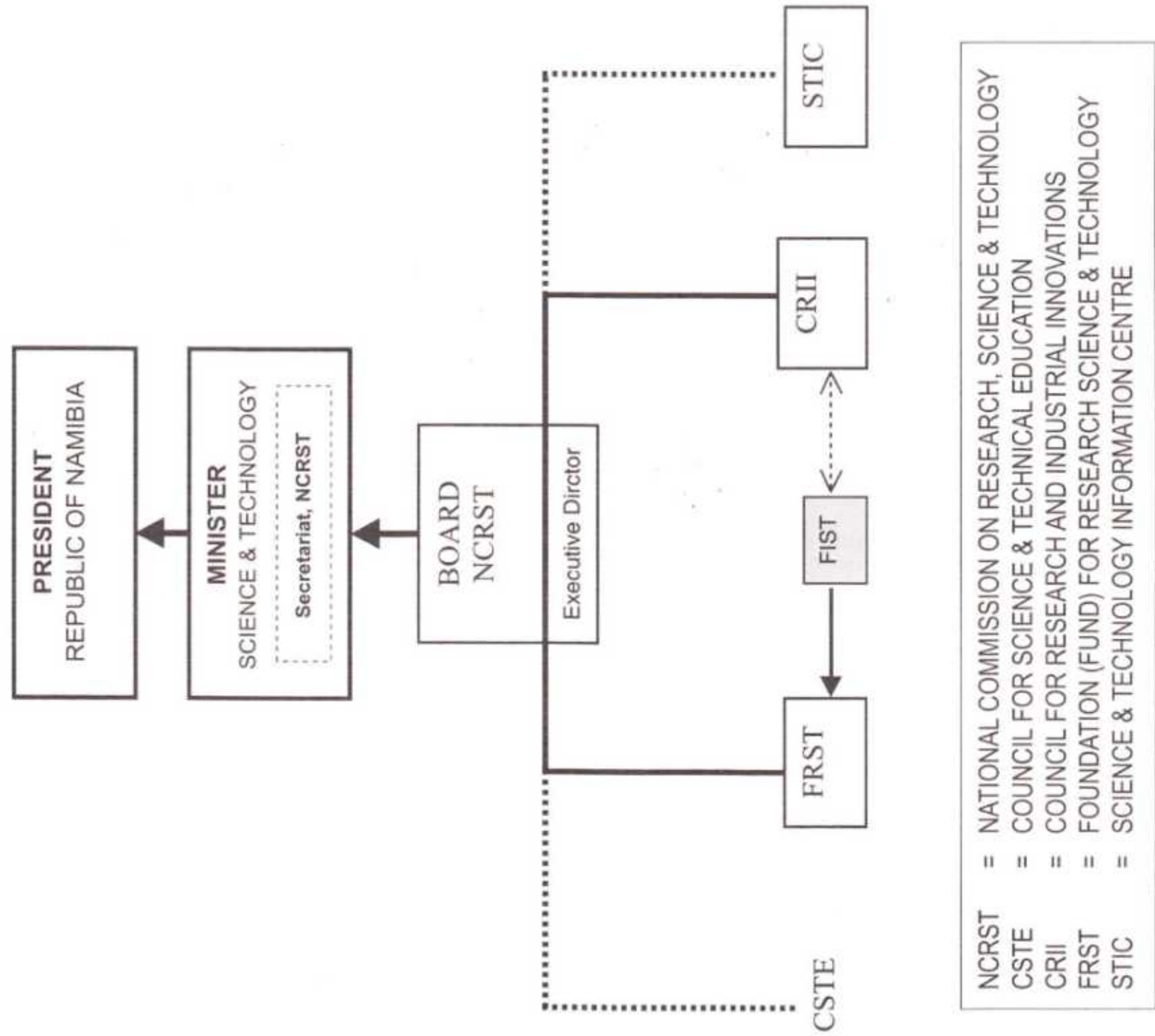
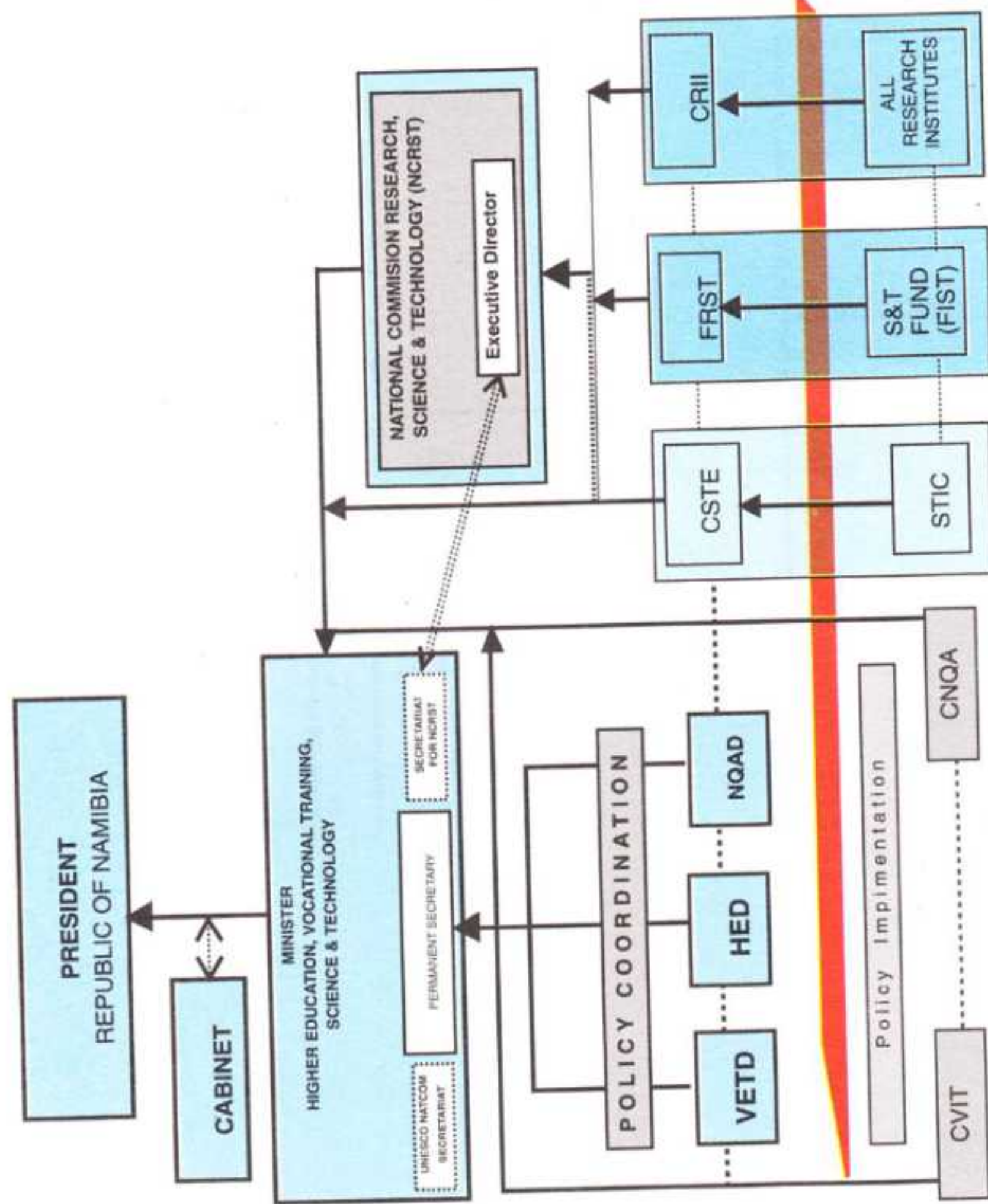


CHART 1B
THE NCRST IN RELATION TO EXISTING STRUCTURES IN THE MHEVTST

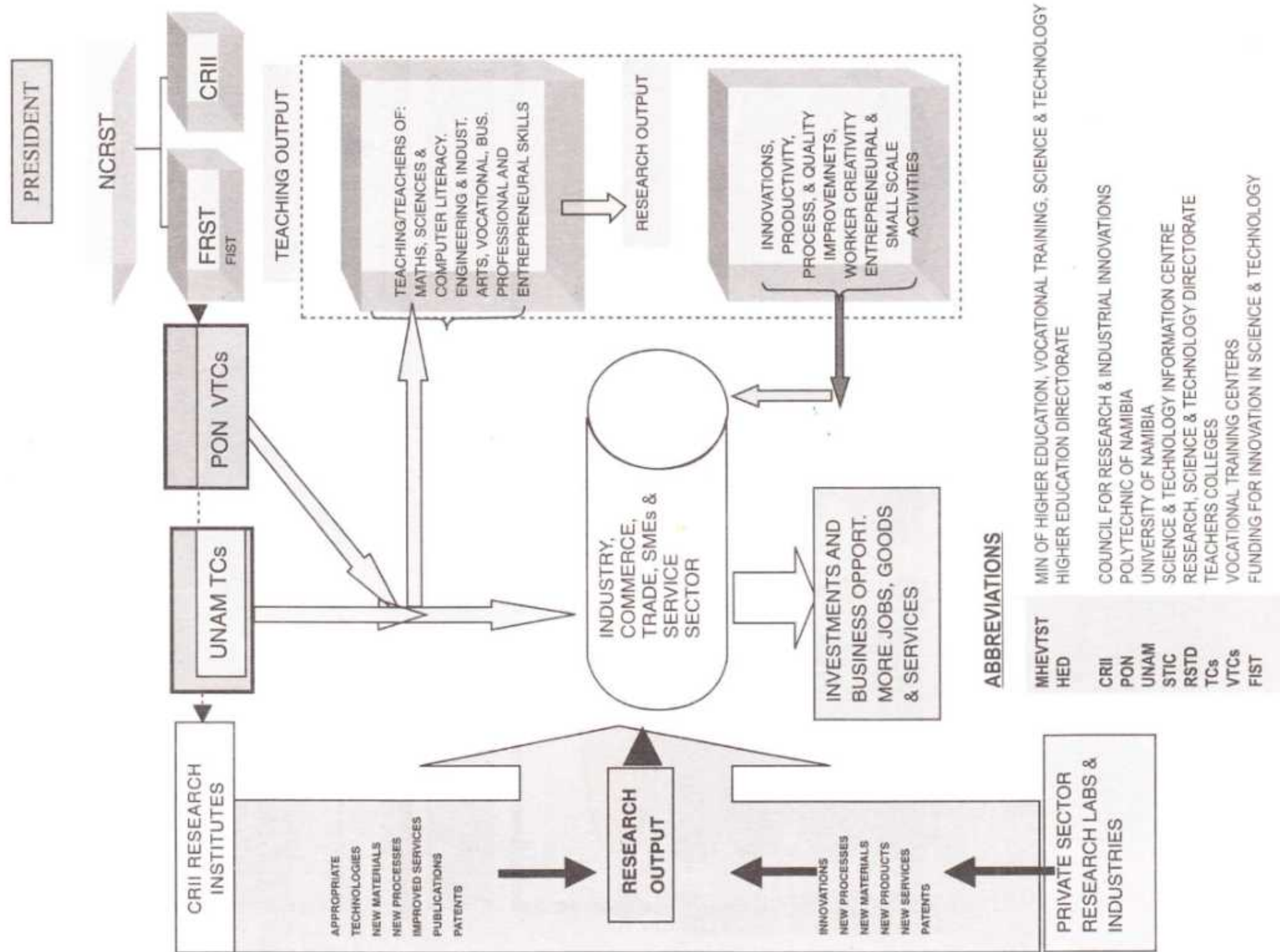


ABBREVIATIONS

- MHEVTST MIN OF HIGHER EDUCATION, VOCATIONAL TRAINING, SCIENCE & TECHNOLOGY
- CVIT COUNCIL FOR VOCATIONAL & INDUSTRIAL TRAINING
- HED HIGHER EDUCATION DIRECTORATE
- NCST NATIONAL COMMISSION ON RESEARCH, SCIENCE & TECHNOLOGY
- CSTe COUNCIL ON SCIENCE AND TECHNICAL EDUCATION
- CRII COUNCIL FOR RESEARCH & INDUSTRIAL INNOVATIONS
- STIC SCIENCE & TECHNOLOGY INFORMATION CENTRE
- FRST FOUNDATION FOR RESEARCH, SCIENCE & TECHNOLOGY
- VETD VOCATIONAL EDUCATION & TRAINING DIRECTORATE
- RSTD RESEARCH, SCIENCE & TECHNOLOGY DIRECTORATE
- FIST FUNDING FOR INNOVATION IN SCIENCE & TECHNOLOGY
- NOAD NATIONAL QUALIFICATION AUTHORITY
- CNQA COUNCIL FOR NATIONAL QUALIFICATIONS AUTHORITY
- CNBA COUNCIL FOR THE NATIONAL BIOTECHNOLOGY AUTHORITY

..... COORDINATION → DIRECT REPORTING PERIODIC REPORTING

CHART 1C
OUTPUT & FLOW OF NAMIBIA'S INNOVATION SYSTEM



ABBREVIATIONS

- MHEVTST MIN OF HIGHER EDUCATION, VOCATIONAL TRAINING, SCIENCE & TECHNOLOGY
- HED HIGHER EDUCATION DIRECTORATE
- CRII COUNCIL FOR RESEARCH & INDUSTRIAL INNOVATIONS
- PON POLYTECHNIC OF NAMIBIA
- UNAM UNIVERSITY OF NAMIBIA
- STIC SCIENCE & TECHNOLOGY INFORMATION CENTRE
- RSTD RESEARCH, SCIENCE & TECHNOLOGY DIRECTORATE
- TCs TEACHERS COLLEGES
- VTCs VOCATIONAL TRAINING CENTERS
- FIST FUNDING FOR INNOVATION IN SCIENCE & TECHNOLOGY

CORE STRUCTURES AND INSTITUTIONAL ARRANGEMENTS

CHART 3: National Commission on Research, Science & Technology (NCRST)

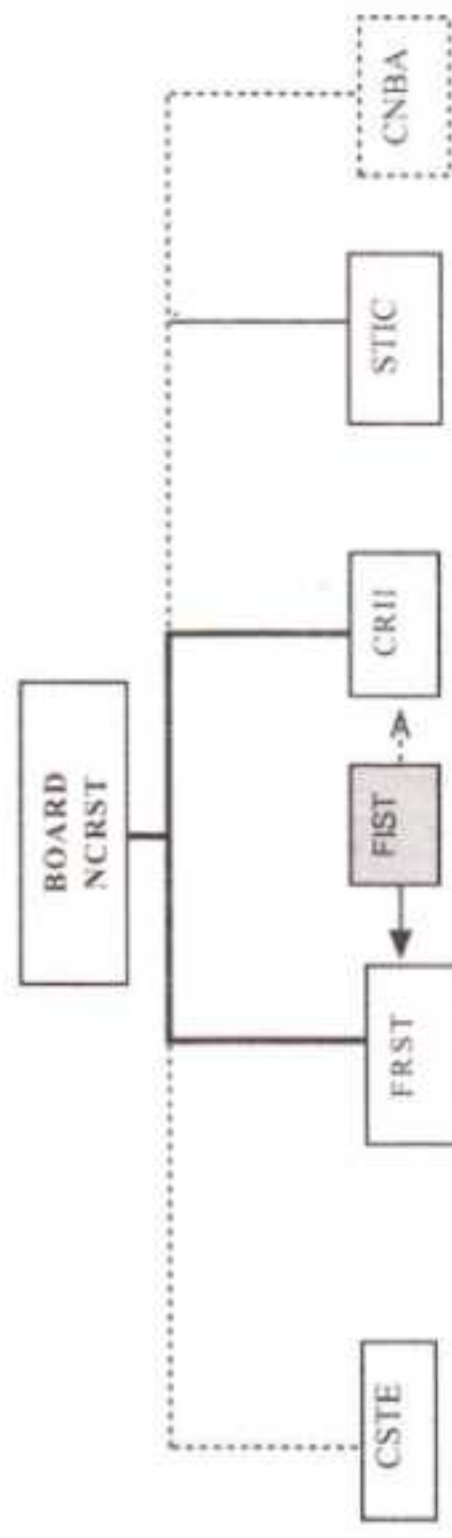


CHART 4: Foundation for Research, Science & Technology (FRST)

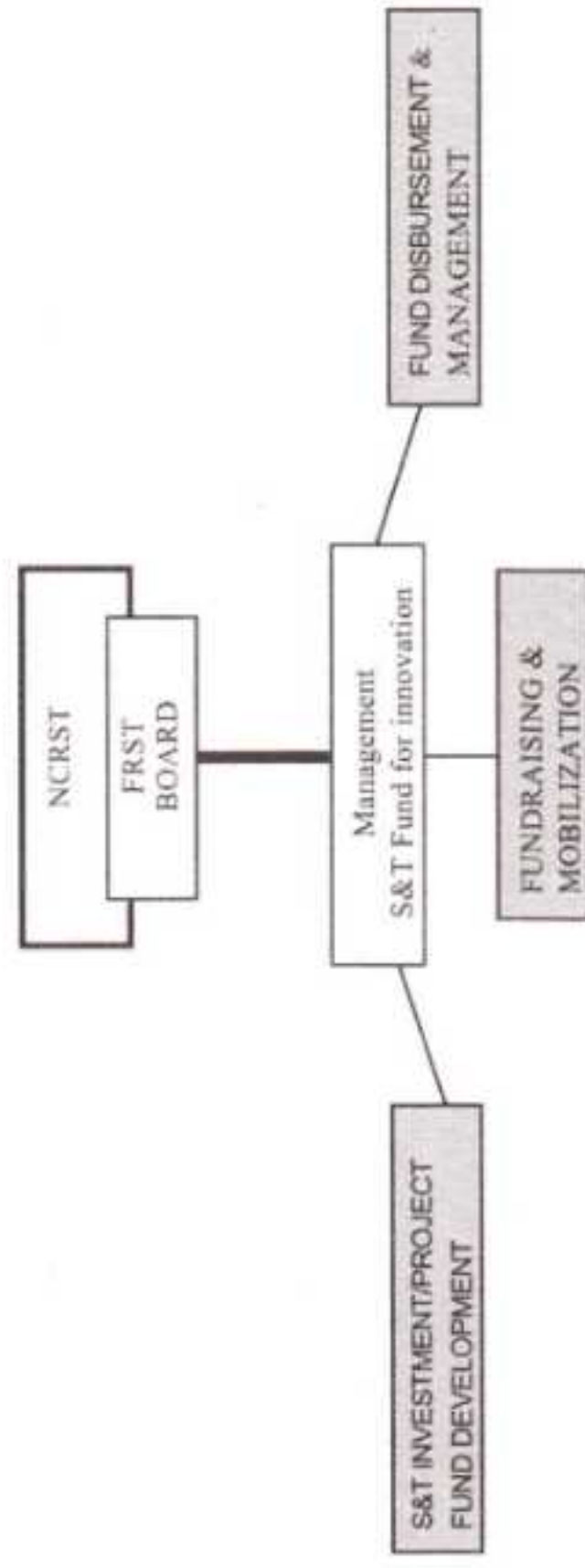
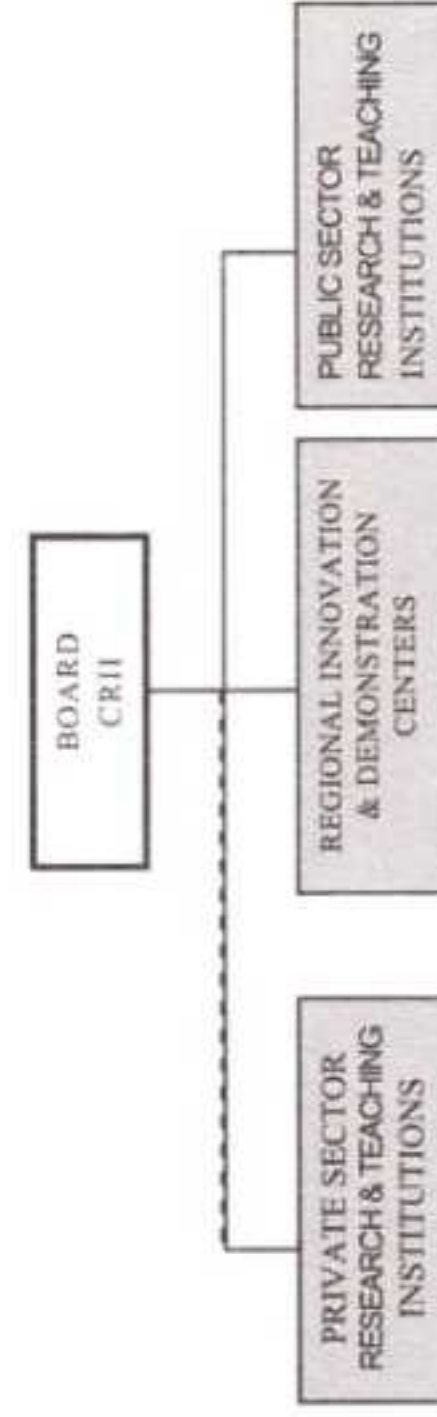


CHART 5: Council for Research & Industrial Innovations (CRII)



TC's
VTC's
FIST

TEACHERS COLLEGES
VOCATIONAL TRAINING CENTRES
FUND FOR INNOVATION IN SCIENCE & TECHNOLOGY

CHART 2
System to fund & focus Science & Technology Research

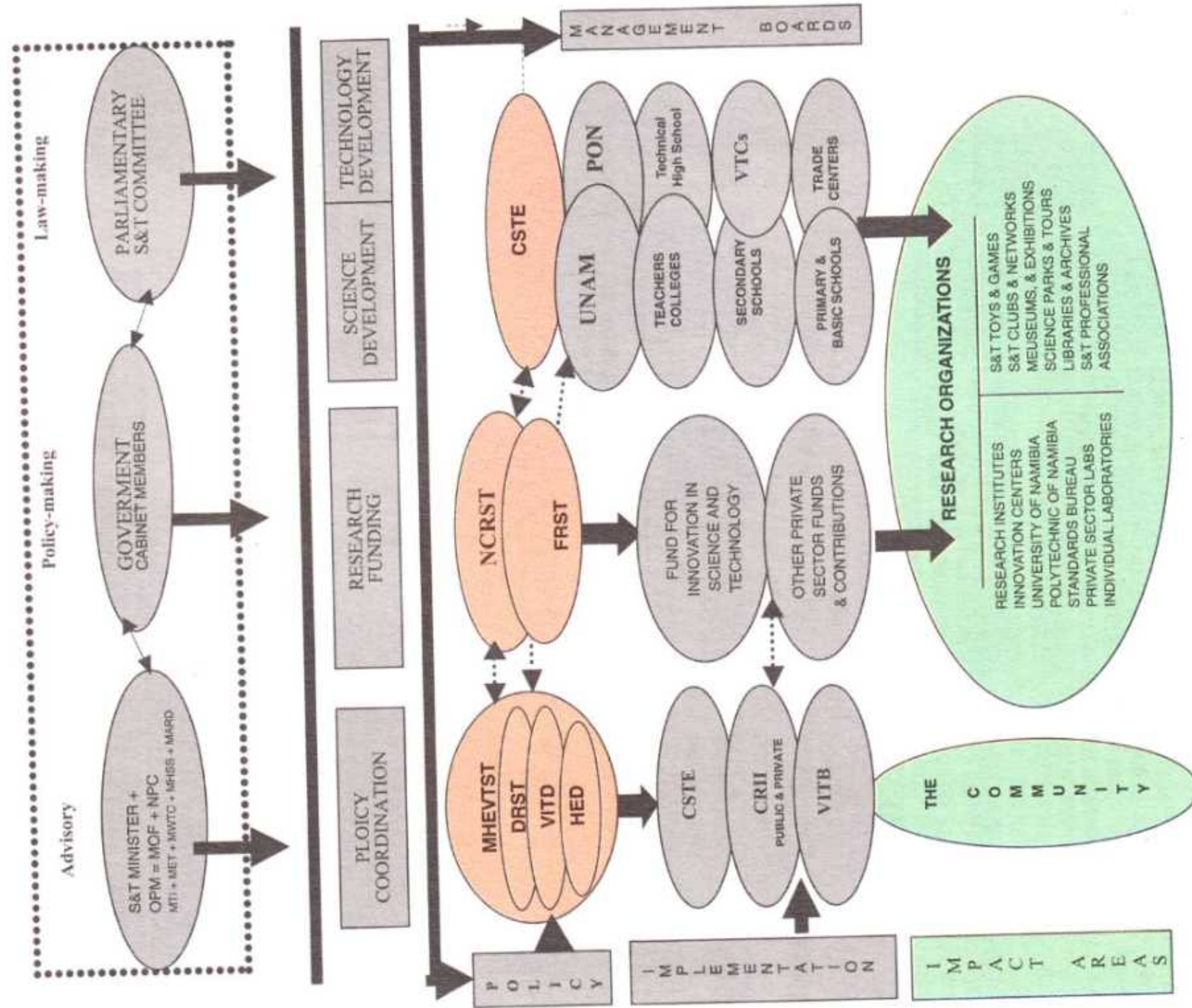


CHART 6: Council for Science & Technical Education (CSTE)

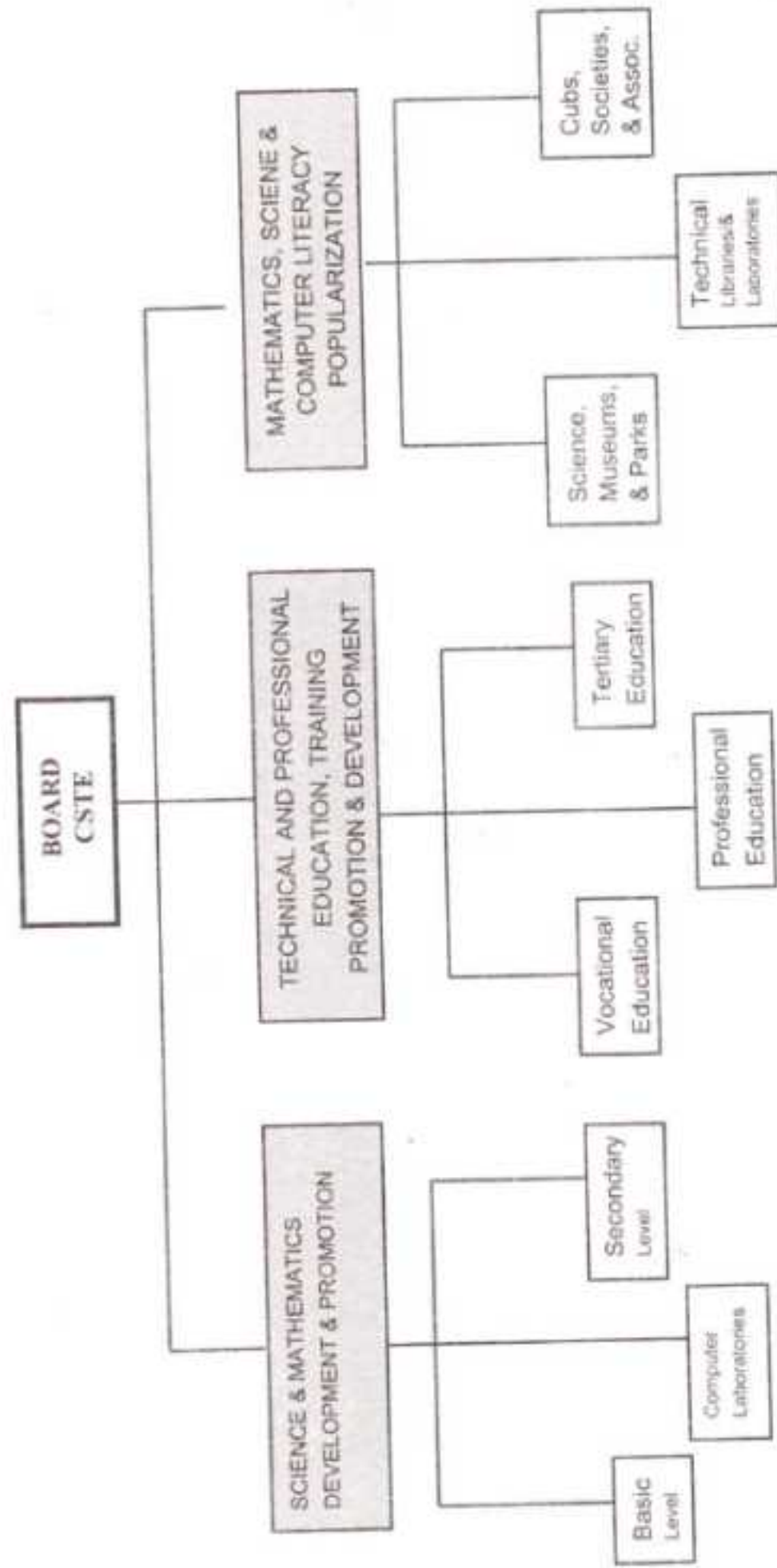


CHART 7: Council for Vocational & Industrial Training (CVIT)

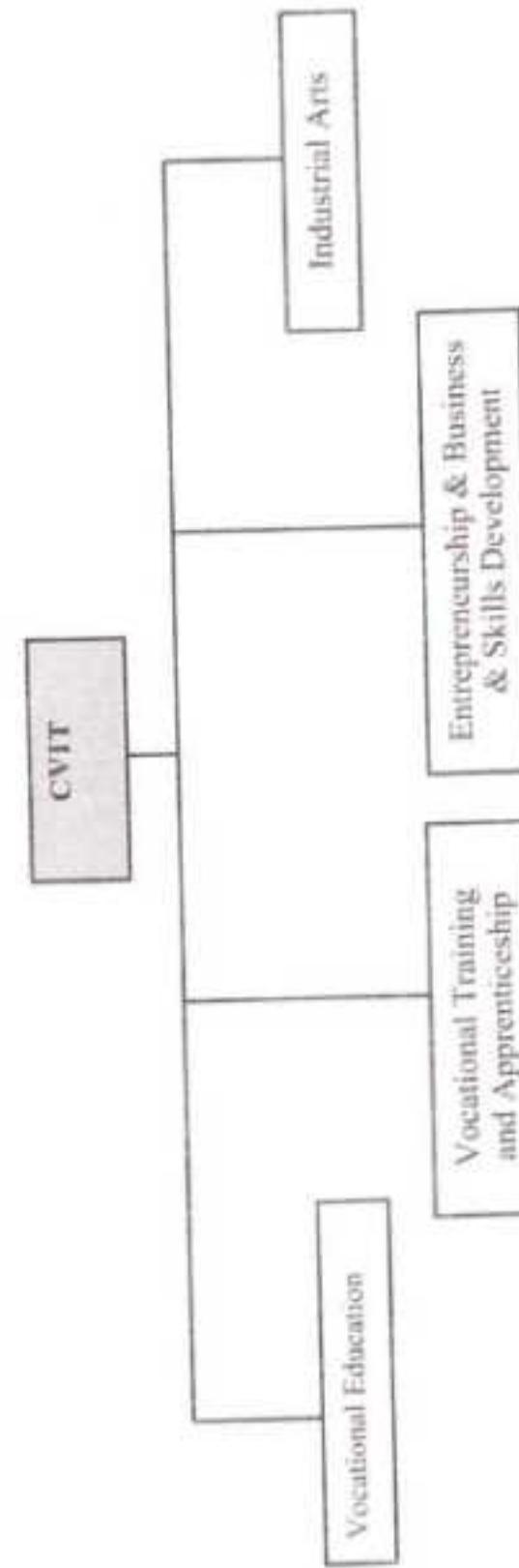
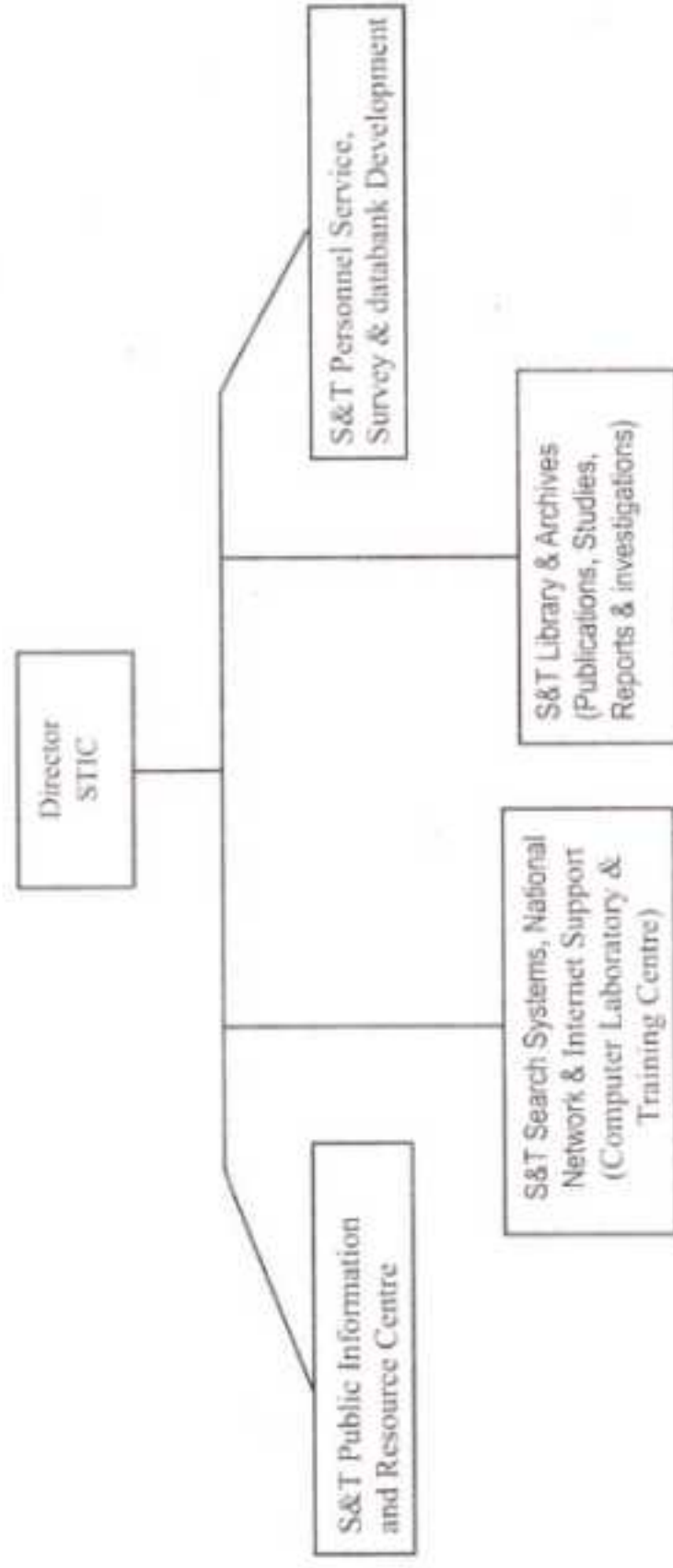


CHART 8: Science & Technology Information Centre (STIC)



See also Charts 3 & 6



Chart: 9. LOGICAL FRAMEWORK AND BUDGET FOR S&T IMPLEMENTATION

Institutional Mechanism	Strategic Objectives & development Goals	Envisaged Outputs & Expectations in Goods and Services	Providers/Suppliers of S&T Services & S&T Technical Support	Budget NSM Est. p.a.	Project p.a.
NCRST	S&T Policy Framework	S&T Legal Framework	Individual Researchers	2.0	4.0*
MHEVTST (DRST)	S&T Policy evolution	S&T Infrastructure	DRST Policy Analysts, Planners, Programmers & Researchers	2.0	
	Establishing science Centres of Excellence in schools & innovation Centres in strategic locations and regions	Policy coordination & Innovation Centres for better research linkages to SMEs to improve added value.	Public R&D Institutes - Private R&D Institutes UNAM & PON		
NCRST(FRST)	Sustained S&T Funding	S&T Project Funding	Approved R&D Institutions	0.5	21.0*
CSTE:	Popularization of maths	Implementation of S&T	MHEVTST, MBEC,	1.5	1.0*
MBEC	Science, numeracy and computer literacy in schools, workplaces and communities	Policy in schools & preparation of Guidelines for S&T curricula reform	UNAM, PON, NIED, VTCs, Teachers Colleges, Tech Secondary, Tech High and Basic Schools	1.0	0.75
PON				1.0	0.75
NIED				0.5	0.25
CRIL:	Material Development	Technical Advice, lab Support, appropriate Technologies, value analysis, productivity	Research Institutes	1.0	2.0*
DRFN	Product Development	Support, appropriate Technologies, value analysis, productivity	UNAM Facilities -	1.5	2.0*
NIMT	Process Improvement	Studies, new products	MRC	1.5	2.0*
FAR	Technology Transfer	new materials, new and improved processes	Sciences	1.5	1.0*
MRC	Increased added value		Agriculture	1.0	2.0*
UNAM	More SME linkages		PON Facilities	1.5	1.0*
PON	High quality & raised productivity levels		Private laboratories Industries	0.5	1.0*
BOS				0.5	1.0*
Others					0.5*
CVIT	Entrepreneurial skills bank	Formal Job skills Functional skills Vocational skills	Trade, Vocational & Technical Schools Innovations Centres	1.0	
	Life long learning		Private Industries, Private Workshops Parastatals		
	Life skills transfer	Entrepreneurial skills SME Business skills Self-employment skills			
	S&T knowledge and know-how transferred to productive sectors				
STIC	Classified & coded S&T information, Regular S&T surveys, S&T data processing, storage, retrieval and archiving Internet connectivity Gateway access, S&T Information data bank	Technical Library, reports, searches, research publications and archiving S&T information clearing house	National Archives UNAM Library PON Library Libraries at Research Institutes, Teachers Colleges, Professional Associations, Public Libraries & Museums	1.5	1.5*
Estimate of recurrent and project budgets				\$21M	\$21M
Total Annual Estimated Budget for S&T development				NS 42.00M	

* Biannual Project budget will be established by NCRST on basis of approved projects and the level of establishment funding, i.e. based on formula agreed for Approved Establishment.

CHART 10: PROGRAMME FOR DEVELOPING & INTEGRATING SCIENCE & TECHNOLOGY in Namibia

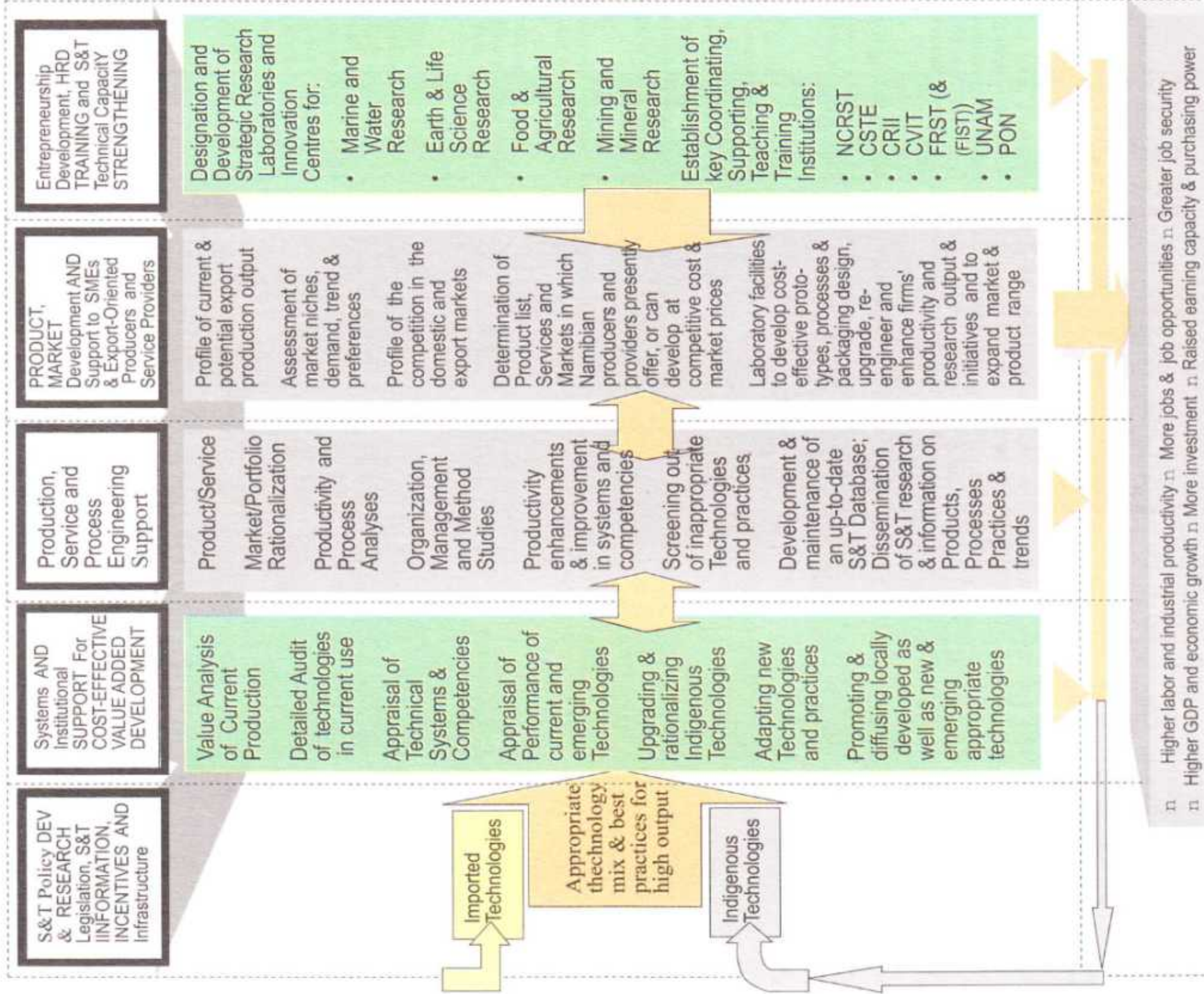


Chart 12: Glossary of unusual terms used in document

Science & Technology Policy

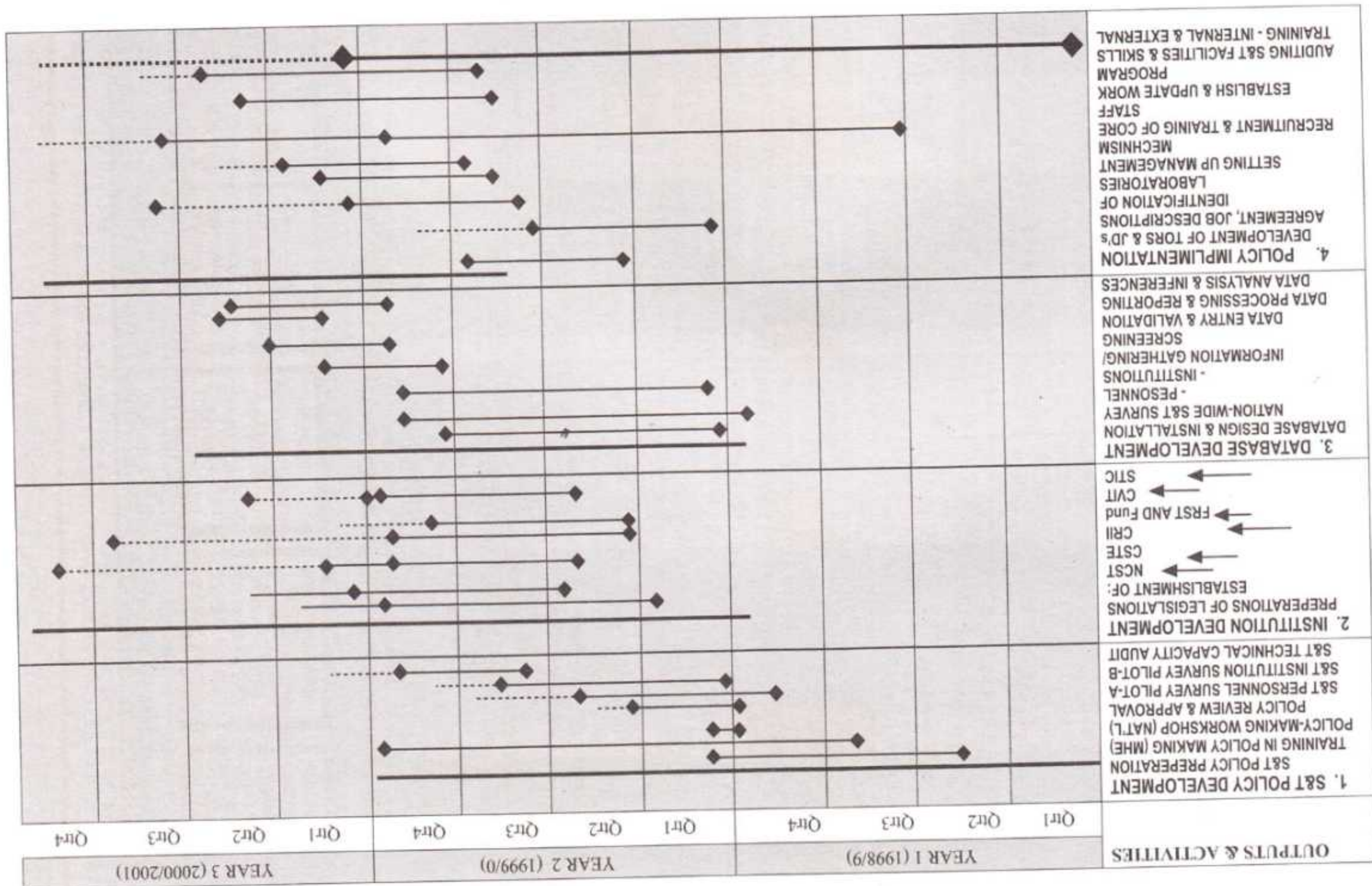
Beneficiation is a term used by scientists, especially in experimental research, to describe the series of processes and steps to extract and derive full use, utility and benefit of products or raw materials. It refers to the down-line or up-line benefits. To beneficiate ... means to derive the full use, utility and benefits and purpose. Biomass refers to all of the living materials in a given area. It often refers to vegetation or organic non-fossil material of biological origin, such as trees, plants. Biotechnology refers to techniques that use living organisms or parts thereof to produce a variety of products, (from medicines to industrial enzymes) to improve plant or animal health, stock or state of fitness, or to develop micro-organisms for specific use, such as removing toxins from bodies, from water, to counteract bacteria, viruses, or as pesticides. In recent times the technique is used to make genetic alterations to plants and animals. Catalytic describes an action that is intended to launch, to kick off or give a push to a process that will have subsequent longer term and multiplied benefits. Chlorofluorocarbons or CFCs refer to a family of inert, non-toxic and easily liquefied chemicals used in refrigeration, air-conditioning, packaging, insulation, or as solvents, paint, pesticides, and aerosol propellants. Because CFCs are not destroyed naturally they drift into the upper atmosphere where their chlorine components destroy the ozone layer which is necessary to protect life from over exposure to radiation and its consequences. Deforestation refers to the process or practice that results in the change of forested lands to non-forest uses, achieved through excessive burning, grazing or cutting. Desertification refers to the progressive destruction or degradation of existing vegetative land cover with long exposure to direct radiation, heat, or chemicals resulting in a desert. Ecology refers to the natural balance and relationship of living things to one another and to the natural habitat and environment, or to the study of such relationships and natural balance. Executive order is a new term used in government circles to instruct ministry, department of government or a parastatal enterprise to perform its functions and deliver services using the same strict criteria as a commercial operator would. The entity under executive order is obligated to operate within its own or given resources and to make statutory returns and profit to its shareholders like a private firm. In case of a non-tradable service provider, the entity is expected to breakeven, that is, its costs should be contained within the approved budget.	Gross Domestic Product (GDP) is the market value of all final goods and services produced by the country during the fiscal year. Gross National Product (GNP) is the market value of all the goods and services traded in and by the country irrespective of the source or final destination of the goods and services. It differs from GDP by the extent to which the country's export receipts exceed or lags its merchandise imports. Inflation is the instability that occurs when prices of basic goods and services (basket) consumed by the public rise over time (month or year). It reflects the rate of change in prices and is measured by (in the case of Namibia by the Central Statistics Office, National Planning Commission and/or Bank of Namibia through regular assessment of the movement of Consumer Price Index (CPI). A high rate of change (over 50% pa.) is termed super inflation and it is observed when there is excess supply of money relative to the supply of goods. Productivity refers to increased output and/or quality obtained through the engagement of labour, management, technology and capital to convert inputs to products and services. It is a good measure of the efficiency of labour and capital. Partial measures are expressed by labour productivity, capital productivity and the total measure is expressed by total factor productivity. Public Policy refers to Government's broad macro-economic framework. It represents a harmonized set of measures designed to influence the country's long term growth/stability prospects and to moderate economic fluctuations (i.e. rates of growth, inflation, employment, taxation, etc). It is managed by the government administration and requires setting level of taxation as allocation of public (government) spending. Public Good Research refers to research activities done with public funds/public resources, and whose outcomes are intended for use by, or to benefit the general public, or large sections and communities. Value added refers to the value improvements created or realized by contribution of process, labour, management, research innovations, capital use or a combination of the above. It is said to be effective (effective value added) when the cost of local inputs (domestic resource cost) result is a product price that is equal or less than the price of the finished goods delivered at the border or the equivalent import. Waste refers to material lost, unused, unwanted, burnt up or insufficiently burnt, producing refuse of liquid, solid or gas from human, animal or from industrial and manufacturing plants and processes.
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Chart 11: TIMEFRAME FOR EVOLVING & IMPLEMENTING KEY ELEMENTS OF S&T POLICY

SCIENCE & TECHNOLOGY POLICY

REPUBLIC OF NAMIBIA

October to December represent 1st Quarter (.25); Jan to March '98 represent 2nd Quarter (.5) April to June represent 3rd Quarter (.75) July to September represent 4th Quarter



RELEVANT INFORMATION & SOCIO-ECONOMIC DATA

FOR SCIENCE & TECHNOLOGY PLANNING & DEVELOPMENT IN NAMIBIA

The following charts and tables were assembled from a variety of databases and sources to convey to policy makers important statistical, geographical, democratic and socio-economic information on and for Namibia's development. They are relevant to policy evolution and dialog and will be equally important for policy implementation, and the subsequent policy reviews, assessments and reforms.

Readers are specially advised to kindly note that due data assembled from various sources and for varying time periods, information may not be immediately comparable with data and information obtained through and by other means and sources.

[illegible]

Age structure: 0-14 years: 44% (male 362,310; female 354,386) 15-64 years: 52% (male 414,281; female 426,921) 65 years and over: 4% (male 27,001; female 37,429) (July 1998 est.)

Birth rate: 35.84 births/1,000 population (1997 est.) Death rate: 23.82 deaths/1,000 population (1997 est.)

Net migration rate: 0.1 migrant(s)/1,000 population (1996 est.)

Sex ratio: *at birth*: 1.03 male(s)/female; *under 15 years*: 1.02 male(s)/female

15-64 years: 0.97 male(s)/female; 65 years and over: 0.72 male(s)/female (1996 est.)

Infant mortality rate: 58 deaths/1,000 live births (1996 est.) Total fertility rate: 4.99 children/woman (1996)

Life expectancy at birth: *total population*: 62 years; *male*: 59 years; *female*: 66 years (1996 est.)

Ethnic groups: black 86%, white 6.6%, mixed 7.4%

Note: about 50% of the population belong to the Ovambo tribe and 9% to the Kavangos tribe; other 7%: Damara 7%, Nama 5%, Caprivian 4%, Bushmen 3%, Baster 2%, Tswana 0.5%

Religions: Christian 80-90% (Lutheran 50% at least, other Christian denominations 30%), native religions 10-20%

Languages: English 7% (official), Afrikaans common language of most of the population and about 60% German 32%; indigenous languages: Oshivambo, Herero & Nama

INDEX OF KEY CONCEPTS USED

Agriculture sector and products	37, 57	Mining sector	36
Angula Nahas	3	MSIs	12
BOS	28	mission of research institutes	29
biotechnology	53	national system of innovation	15
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