ANNUAL RESEARCH REPORT 2009

Compiled by:
Isaac Mapaure, Gilbert Likando and Pam Claassen

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UNIVERSITY OF NAMIBIA MISSION
To provide quality higher education through teaching, research and advisory services to our customers with the view to produce productive and competitive human resources capable of driving public and private institutions towards a knowledge-based economy, economic growth and improved quality of life.

UNIVERSITY OF NAMIBIA VISION
To be a beacon of excellence and innovation in teaching, research and extension services.
MESSAGE FROM THE VICE-CHANCELLOR

Research as one of the core functions of the University of Namibia (UNAM) is central to the advancement and dissemination of knowledge pivotal for the country’s social and economic development. Given this huge responsibility UNAM has taken deliberate steps to increase funding to support research for academics to enhance research development and innovation. Concomitant to the global trends, UNAM consistently evaluates and reviews its operations and performance in the area of research in order to improve service delivery in accordance with national needs.

UNAM’s research agenda is based on National Development Plans (NDPs) and Vision 2030 and other national policies such as the Research, Science and Technology Act of 2004. As an institution of higher learning UNAM has forged several collaborative research partnerships with other institutions both regionally and internationally. Thus, instruments such as the 1997 SADC Protocol on Education & Training; which aims to encourage regional universities to take the necessary steps to strengthen basic and applied research and consultancy, and to forge links with the private sector for determining priority areas of research, set an agenda for strengthening research capacity at UNAM.

In line with its institutional research strategy, UNAM has significantly enhanced research collaboration and mentorship within the academic fraternity. Endowed with academics capable of conducting research in all relevant disciplines and coupled with the urge to increase research capacity and output, UNAM has established centres that are dedicated to carry out research. These include the Multidisciplinary Research Centre (MRC) and the Dr Sam Nujoma Marine & Coastal Resources Research Centre (SANUMARC). Critical to say, these centres offer opportunities for researchers to develop their skills, create new knowledge and avail platforms for mentorship and skills transfer for young researchers and the opportunity for commercializing economically viable knowledge.

Thus, in order to showcase UNAM’s immense contribution in the area of research and publications the Research and Publications Office (RPO) under the ambit of the Office of the Pro-Vice Chancellor for Academic Affairs and Research (PVC:AA&R) has dedicated this publication to the University fraternity. This, I regard as a noble endevour not only for showcasing our achievements in 2009 but also highlighting our challenges that need urgent attention in the area of research and publications in our effort to contribute to development and socioeconomic transformation of the Namibian society.

Prof. Lazarus Hangula
Vice-Chancellor: University of Namibia
MESSAGE FROM THE PRO VICE-CHANCELLOR: ACADEMIC AFFAIRS & RESEARCH

The University of Namibia (UNAM) has continued to take the lead in research performance in the country. Our academics in all our various Centres and Faculties have engaged in various research activities. The year under review has seen a total output of 394 publications from the University, 23% of which are peer-reviewed journal articles and 11% are books and book chapters. This is a commendable output and achievement by our academics and their post-graduate students. UNAM’s research output gears for greater heights in the years to come as we continue to create a more conducive research environment in various ways. After a year of inactivity, the Namibia Development Journal (NDJ), a UNAM publication, published Volume 2 Issue 1 in September 2009 containing papers of high significance to the development of Namibia and beyond.

UNAM’s responsibility in contributing to the socio-economic development of this country is immense; hence the production of high quality products through teaching, research development, innovation and community service is our utmost priority. One of the major roles of institutions of higher education such as UNAM is to teach and conduct research necessary to generate new knowledge that enhances sustainable development. Thus, my Office is encouraging staff members to engage in research that directly influences policy leading to positive impacts on livelihoods of communities that continually face various challenges including poverty, HIV & AIDS, land degradation and desertification, climate change, social exclusion and marginalization, gender-based violence, among many others. UNAM’s Research Strategy strongly encourages the formation of research teams dealing with research on specific challenges. These teams are the building blocks of Centres of Excellence, conducting needs-driven research in line with national priorities as outlined in Vision 2030.

The Research & Publications Office (RPO) is tasked with the overall coordination of research activities undertaken by all UNAM staff. The RPO is spearheading the development and maintenance of research-related policies, procedures and guidelines in consultation with relevant stakeholders. These policies will create a better and more conducive environment for our academics to conduct research and publish their work. They will also enable UNAM to quality-assure and benchmark our research products in keeping with global trends and standards. My Office has continued to disburse research funds to deserving applicants approved by the Research & Publications Committee. I would like to see more academics submitting research proposals in national priority areas of research. We have also continued to fund academics to attend and present papers and posters at Conferences and Symposia.
worldwide. There has been a significant increase in conference attendance in the year under review. Of much significance, is the participation of young academics in these activities, for which I am happy to note.

I would like to congratulate all our researchers for these achievements. UNAM is grateful to all funders, collaborators and partners who contributed to the excellent research results of 2009. I would like to wish all academics and the UNAM community at large a more academically rewarding 2010.

Prof. Osmund D. Mwandemele
Pro Vice-Chancellor: Academic Affairs & Research
MESSAGE FROM THE RESEARCH AND PUBLICATIONS OFFICE

The Research and Publications Office (RPO) provides research support in the areas of research planning, policy development and implementation, management of internal and external research grant funding, research quality assurance, academic promotions, including facilitation of training programmes such as research training and academic writing. During the year under review, staff in the RPO consisted of the Research Coordinator, Prof. Isaac Mapaure, the Deputy Coordinator Dr. Kenneth Matengu, and the Research and Publications Officer, Ms. Pam Claassen. The Research Office falls under the Office of the Pro Vice-Chancellor: Academic Affairs & Research.

In an effort to improve research quality, the Terms of Reference of the Faculty/Centre Representatives on the University Research and Publications Committee were reviewed during the year. The objective is to have a more hands-on approach to research matters within the University. Several visits were also conducted to various Faculties and Centres. The objective of the research visits was to get an overview from Deans and Directors about their current research programmes and their publication outputs. Matters that came to the fore were the need to clearly define Research Focus Areas, the formation of research teams, including inter-departmental and inter-faculty research collaborations. These research collaborations are reflected elsewhere within this Report under the various Faculties and Centres.

A workshop on online publishing for authors was conducted during the year. This was done in view of the challenges authors were facing while submitting articles to the Namibia Development Journal, which is a refereed journal managed by an Editorial Board whose Secretariat is based in the RPO. The workshop was attended by various staff members within the various Faculties and Centres. All three staff members in the RPO are members of the Editorial Board of the Namibia Development Journal and Prof. Mapaure serves as the Chief Editor of the journal.

Through close collaboration with the University Research and Publications Committee, the Research and Publications Office funded a number of research activities. The funding allocated towards research and publications comes primarily from the Ministry of Education. However, the University also engages in research collaborations with various other donor agencies. During the year under review, many staff members from the various Faculties and Centres, attended conferences where they presented papers from their research activities. The University was rated 26th amongst other African Universities. This a positive rating for a young University compared to other well established universities on the continent. A
total of 394 (including 89 journal papers) publications were produced in 2009 and the breakdown of research output is summarized in the graphs below.
It is envisaged that in 2010, the research output of the university will improve significantly as the university takes further steps to address the challenges being faced by the academic staff.

Prof. Isaac Mapaure
Research Coordinator
FACULTY OF AGRICULTURE AND NATURAL RESOURCES (FANR)

Objectives of the Faculty

The Faculty is guided by the following key objectives:

- To provide education and training, aimed at producing graduates in the fields of agriculture and natural resources who will be well equipped with knowledge, skills and attitudes that will help improve agricultural productivity and promote sustainable development, wise use of resources and increase Namibia’s food security;
- To conduct research aimed at extending the frontiers of knowledge relevant to Namibia’s environment, natural resources and agriculture;
- To provide advisory, consultancy and extension services on the proper and sustainable use of Namibia’s agriculture and natural resources to the communities;
- To catalyse increased production and productivity of Namibia’s natural resources;
- To help create meaningful employment in both the public and private sectors including self-employment;
- To promote an environment that will enhance equity and access to education and training in
agriculture and natural resources;

- To establish a self-sustaining management structure that will allow increased efficiency and productivity, as well as to encourage a spirit of teamwork in the Faculty.

Research Partnerships

The Faculty has several Memoranda of Understanding (MOUs) with several international institutions of which the Joint Declaration of Cooperation between Tokyo University of Marine Science and Technology, The Agreement of Cooperation between the Norwegian College of Fishery Science, University of Tromso are good examples. Among the objectives, these two agreements focus on exchange of information on research as well as the development of collaborative research projects.

The Faculty has academic linkages with SANTED partners, RAEIN Africa, RUFORUM, Ministry of Agriculture, Water and Forestry, Meat Board, Ministry of Environment and Tourism Ministry of Fisheries and Marine Resources (MFMR) and the Sam Nujoma Marine & Coastal Resources Research Centre (SANUMARC), Agronomic Board of Namibia, UNDP and FAO. New linkages will continue to be explored with regional and international universities. The Faculty continues to explore new linkages with other international institutions on collaborative research.

Current Research Focus Areas
The research output of the faculty continues to grow and makes various significant impacts at national and international levels. The Faculty research work is mainly in the following areas: Climate change and livelihoods, Crop Improvement and diversification, mushroom cultivation, Conservation Agriculture, Alternative methods for tick control, Animal Productivity studies, Rangeland condition and productivity of livestock, Grass and fodder trials, Aquatic eco-toxicology and pathology, Freshwater fish biodiversity survey of inland waters, Aquaculture nutrition studies, Seaweed/algal diversity, Seaweed utilization and cultivation, Mari-culture, Fisheries Oceanography, Marine Ecosystem Functioning, Bio-security policies for exported and imported seafood products and Agriculture and Natural Resource Economics.

Research Output

Journal Papers


Conference Papers and Proceedings


**Dissertations and Theses**


FACULTY OF ECONOMICS AND MANAGEMENT SCIENCES

Goals and Mandate

The mandate of the Faculty of Economics and Management is imbedded in the Faculty’s goals which are to:

- promote excellence in teaching and research;
- inculcate a critical disposition and an ability for creative problem-solving;
- educate and train high level human resources in support of sustainable development and community service;
- produce responsible citizens with a healthy respect for human dignity; and
- mount seminars and short courses through the Centre for Public Service Training (CPST) for the civil service and the local Non-Governmental Organization (NGO) sector with a view towards enhancing both capacity and performance.

Research Output

Journal papers


Books, Book Chapters and Study Guides


Editors/Compilers

Conference Papers & Proceedings


Kakujaha-Matundu, O., (2009). Paper presented at conference on Regional Integration at the University of Botswana entitled “Competition Policy and Growth in the Southern African Customs Union”. Selected papers will be published in SAJEM.

FACULTY OF EDUCATION

Goals and Mandate

The Mandate of the Faculty is to prepare effective and efficient teachers for Grades 0 – 12, as well as community development practitioners for Namibia and beyond.

In this regard research will be used as an important vehicle in informing our practise in the preparation of effective and efficient teachers and community practitioners for the Namibian education system and society at large. It is this desire that drives our desire to be at the forefront of knowledge generation as far as teacher preparation is concerned. In this context the goals of the Faculty as far as research is concerned is divided into short-term, medium-term and long-term goals:

Short term research goals

The short term goals of the Faculty are to:

- enhance research capacity of staff through joint research, seminars/workshops and conferences;
- identify cutting-edge research areas in all areas of interest in the Faculty and highlighting emerging areas;
- maintain its position as a national asset for the education of young researchers.

Medium term research goals

The medium term goals of the Faculty are to:

- be actively involved in the preparation of textbooks and/or study guides for students in all areas of teacher preparation;
• strengthen research teams in the Faculty and encourage establishment of others;
• encourage joint research activities with other institutions of Higher education in the region;
• complete pending research;
• encourage staff to apply for research funding from the University and elsewhere;
• carry out research on needs assessment to determine future programmes.

Long term research goals

The long term goals of the Faculty are to:

• carry out Tracer study on a four year cycle;
• actively be involved in preparing proposals for possible research and funding.
• ensure a sustained research output in the Faculty;
• continue carrying out research with colleagues across Departments and in our other campuses and initiate them in the culture of research;
• encourage staff to publish research in reputable journals;
• increase annually the scholarly capacity, capability, recognition, and impact of researchers in the Faculty;
• accelerate campus-wide development of applied research through collaborations with industries, agencies, such as schools, Ministry of Education, and other educational service providers.

Research Partnerships & Collaborations

During the year under review (2009) the Faculty through its various Departments are in the process of forming partnerships with tertiary institutions in the region and beyond. For example the Department of Educational Psychology hopes to have one through the EDULINK project to include the participants in the project from Finland, Zambia and Kenya. It is hoped the research will be carried out on learning difficulties in these countries. The Department of Educational Foundations and Management is involved in the North-South-South Higher Education Network on Quality Teacher Education as a Cornerstone for Sustainable Development. The Network includes the University of Oulu, University of Namibia, University of Cape Town, University of Zambia, the former Windhoek College of Education and the University of Dar es Salaam.

Research Areas

Research in the Faculty covers the following research areas:

• Educational and school management;
• Critical issues in adult education, lifelong learning and community development;
• Broad issues in curriculum instructions and assessment;
• Issues in mathematics, science and sports education;
• Issues in psychology and science and inclusive education; and
• Issues in Early Childhood Development
Research Output

Journal Papers


Books, Book Chapters and Study Guides


**Editors/Compilers**


**Conference Papers and Proceedings**


Research Reports


**Dissertations & Theses**


**FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY**

**Goals and Mandate of the Faculty**

To train professional engineers in various disciplines and carry out applied research in engineering and information technology so as to enable Namibia realize vision 2030

- In the short term, the Faculty intends to continue with research in nano-technology (production of carbon nanotubes, nanoballs and nano-composites), information technology (artificial intelligence), electro-refining of blister copper and solid waste management.
- In the medium term, the Faculty intends to carry out research in renewable energy, climate change, conservative agriculture technologies, corrosion and corrosion control, establishment of small and medium scale manufacturing industries in the country as well as water and flood management.
In the long term, the Faculty intends to carry out industry-based projects that will be undertaken by our own M.Sc. and PhD students as well as post doc fellows in various fields of engineering on offer at the Faculty, with special emphasis to the mining industry, the construction industry, water management, electric power generation including nuclear power, environmental engineering, value addition of Namibian natural products, telecommunication engineering and technologies, electronics, information technology, computer engineering and appropriate technology.

Research Partnerships and Collaboration

Department of Mining and Metallurgical Engineering

Professor F.P.L. Kavishe was instrumental in initiating a network of university researchers in materials science and engineering that culminated in the formation of the African Materials Science and Engineering Network (AMSEN). The network is made up of Wits University; University of Namibia; University of Botswana; University of Nairobi, Kenya; and the Federal University of Technology Akure (FUTA), Nigeria. Professor Kavishe is the Secretary General of AMSEN.

The aim of AMSEN is to encourage participating universities to put in place mechanisms to develop and retain faculty members through joint research in materials science and engineering as well as postgraduate training. AMSEN is a network under the auspices of the Regional Initiative in Science and Education (RISE). RISE is supported by a grant from the Carnegie Corporation of New York. Mr. Willem Nashidengo, an SDF in the Department of Mechanical and Industrial Engineering, is one of those who obtained an AMSEN scholarship for MSc studies at Wits University, where he is expected to study corrosion along the Namibian coast. Through AMSEN, the Department will also acquire lab equipment for the production of carbon nanotubes in Namibia.

Through the contacts made in the AMSEN project, Professor Kavishe is the co-supervisor of the following postgraduate students, all of whom have submitted their research proposals at their respective universities:

Mr. John Mwero - PhD student (University of Nairobi Kenya): “An investigation of sugar cane waste ash as a cementing material.”

Mr. Bernard Odera - PhD student (Wits University South Africa): “Investigation of selected quinary alloys based on an optimum quaternary alloy from the Platinum-Aluminium-Chromium-Rubium alloy system.”

Mr. I.O. Oladele - PhD student (Federal Univ. of Technology Akure Nigeria): “Development and characterization of natural fibre reinforced polymer composites.”

Mr. Lloyd Nyemba - MSc student (Wits University South Africa): “Reinforcement of synthetic rubber with carbon nanoballs to produce nanocomposite ion exchange membranes.”

Mr. Odilonllunga - MSc student (Wits University South Africa): “Thermo-mechanical behaviour of electro-refined Blister Copper from the Tsumeb Smelter in Namibia.”
Mr. Graham Bathgate - MSc student (Wits University South Africa): “Continuous production of single-walled carbon nanotubes using a Swirled Floating Catalytic Chemical Vapour Deposition Reactor.”

Department of Mechanical and Industrial Engineering

With low number of Academic and Technical staff in the Department, it was difficult to carry out Research as most of the staff efforts were directed to teaching and administrative duties. Consequently, research and publications output was low. Dr Ogunmokun was involved in two collaborative studies with staff from the Faculty of Agriculture and Natural Resources on climate change coping strategies as well as research on Integrated Mariculture and Agriculture Youth Project at the Town of Henties Bay for the National Youth Services.

Department of Electronics and Telecommunication Engineering

The staffing level during the year under review for this department was very low. The remaining staff dedicated most of their effort to teaching. Consequently, no research or publication was carried out. However, Mr. E. Ruhunga was able to make arrangements for collaborative research with the northern electricity distribution company (NORED), who are willing to work with this department and carry out joint research in electric power engineering and renewable energy. This department will also benefit from a signed MOU between UNAM and NamPower with respect to joint research activities in electric power engineering and energy in general.

Research Output

Books, Book Chapters and Study Guides


FACULTY OF HEALTH SCIENCES: SCHOOL OF NURSING & PUBLIC HEALTH

Goals and Mandate

The mandate of the School of Nursing and Public Health is imbedded in its research goals which are divided into three, namely short term, medium term and long term goals.

Short term goals

The short term goals of the School are to:

- conduct high quality research through a range of creative and appropriate methodologies;
• provide a high profile forum for seminars, symposia, workshops, lectures and conferences;
• prepare professionals to become knowledge generators in nursing and public health;
• foster inquiring critical thinking and researchers who are capable of independent research activities;
• provide research skills at different levels and in team context to students & lecturers;
• prepare professionals for their role as authors and peer reviewers in academic journals and other media;
• continue to foster conducive environment in terms of supervision in research & mentoring;
• support and build capacity of new researchers to acquire the knowledge, skills and experience necessary to lead research in future;
• continue to share research generated knowledge to inform policy, practice and education in nursing and health care;
• increase inter-institutional collaboration, in particular with national and international centers of excellence.

Medium term Goals
The medium term goals of the School are to:
• promote research performance at the school of nursing and public health;
• coordinate research with the assistance of partnerships, teams and networking;
• promote dissemination and implementation of successful research initiatives;
• monitor research performance within the school of nursing and public health;
• conduct joint/team research with other agencies/institutions;
• establish a research team and facilitate mentorship in research and academic writing.

Long term Goals
The long term goals of the School are to:
• co-ordinate and facilitate research output;
• establish partnerships with health providers and other centers of excellence in research;
• build international research links to improve the health care delivery in the Namibian

Research Partnerships & Collaborations
The School of Nursing and Public Health has benefited in terms of research from several partnerships and collaborations with national, regional and international institutions. These include: School of Medicine; Ministry of Health and Social Services; NGO's in health; Polytechnic of Namibia; Private health sector; University of Washington; University of Johannesburg; Department of Pharmacy via INRUD chapter; EDCCPT (European Developing Countries Clinical Trial Partnership); Fogarty International Center; PEPFAR (President’s Emergency Plan for AIDS Relief); School of Medicine; University of Toronto; Equinet (Equity in Health in East and Southern Africa Health Community); University of Stellenbosch. Furthermore, the School has special research networks with regional and international institutions in the following areas. Clinical trials in tuberculosis: networking with University of Stellenbosch, London (School of Hygiene & Tropical Medicine), Ethiopia, The Gambia, Uganda,
Research Focus Areas

Based on the mandate of the School, several research areas has been as identified as pivotal in achieving its goals. These include but not limited to the following:

- Radiography research
- Malaria
- Clinical trials in tuberculosis
- HIV/AIDS research
- Improving patient treatment adherence in the field of HIV/AIDS & TB
- Health worker retention
- Mother and child health:
  - Teenage pregnancies;
  - Attendance of ante- and post natal clinic;
  - Women and child abuse;
  - Adolescent motherhood;
- Application of PHC principles
- Congenital cardiac problems in children
- Male involvement in reproductive health
- Reflection on nursing practice in the day-to-day health care delivery;
- Student nurses perception of OSCE;
- Physical disability resources;
- Clinical supervision;
- Professional nurses’ compliance with their independent functions; and
- Clinical trials to promote diagnosis of active tuberculosis.

Research Output

Journal Papers


**Books, Book Chapters and Study Guides**


**Research Reports**


**Dissertations & Theses**

Goals and Mandate of the Faculty

The FHSS research agenda seeks to affirm the role that Social Sciences and Humanities play in Namibia’s socio cultural and economic development. The specific objectives are as follow:

To become and remain an outstanding teaching & research Faculty that is capable of addressing the human and social science challenges facing our society.

To provide high quality student centred and stakeholder driven academic and research programmes in the human and social sciences.

Research Partnerships and Collaborations

The various Departments in the Faculty have partnerships and collaborations within and outside the country. These include:

- Information and Knowledge Management (IKM) Research Programme
- International Federation of Library Associations & Institutions (IFLA)
- Desert Research Foundation of Namibia (DRFN)
- National Planning Commission (NPC)
- Ministry Of Health and Social Services
- Standard Bank Namibia Ltd
- Volkswagen Foundation
- University of Cape Town
- Multi-Disciplinary Research Centre (UNAM)
- University of Bologna
- University of Stellenbosch
- North West University, South Africa

Research Focus Areas

The faculty has the following research focus areas developed in the research agenda 2010. Each focus area will be spearheaded by one of the FHSS Departments.

- Studies on language, cultural development and globalization (Department of languages and literature Studies)
- Studies on Namibia’s transition to a knowledge based society (Department of Information and communication studies)
• Studies on societal roles of the arts (Department of visual and performing arts)
• Studies on development management (Department of Sociology)
• Studies on Namibian environment, historical development and tourism and culture (Department of Geography, history and environmental studies)
• Wellness and wellbeing in society (Department of Human Sciences)

In addition, the research focus has the following three cross cutting issues:

• Poverty eradication
• Impact of educational programmes of the faculty and relations with potential employers
• Gender relations

**Research Output**

**Journal Papers**


http://www.sagv.org.za/eDUSA/eDUSA_4-09-1/eDUSA_4-09-1_Gesamtausgabe.pdf Seite 22-36


**Books, Book Chapters and Study Guides**


**Editors/Compilers**

Conference Papers and Proceedings


Conference Papers & Proceedings


Smit, T.C. (2009). The Academic Language Proficiency of First-Generation Entrants at the University of Namibia Windhoek English Conference, held in May, 2009


**Dissertations and Theses**


**Works of Art**


**FACULTY OF SCIENCE**

**Goals and Mandate of the Faculty**

The key mission of the Faculty is to consolidate, teach and disseminate scientific knowledge in order for Namibia to achieve science-led development. Given the past history, which did not encourage and promote effective teaching of science and mathematics, especially in the formerly disadvantaged communities, the Faculty particularly aims at promoting student interest in the learning and teaching of science; and producing good quality science graduates, who will help to build a science culture in society.

The Faculty’s principal objective is to promote the development of science, technology, and environmental studies, and to encourage and facilitate research activities which address the new demands of the national economy.

**Short term research goals**

- In the theory of translation planes, subplanes and in particular Baer subplanes play an important role. A translation plane may have affine subspaces of higher dimension. It seems that this phenomenon has never been systematically investigated. In any case, the notion of affine subspaces has applications, for example, to Ostrom’s process of deriving a translation plane and to Andre planes.
- The Department of Biological Sciences (DOBS) plans to produce a vast cohort of MSc and PhD graduates in the various decorations of biological sciences. The targeted number is 15 graduands. In the long term DOBS plans to be hosting a marama bean deep sequencing consortium (MBDSC) and a state of the art Malaria Research laboratory. These will serve as
multifaceted teaching and research vehicle for undergraduate and postgraduate tuition. DOBS also plans to deepen its research collaborative linkages and financial resource mobilization locally and internationally via vigorous applications for research funding for competitive grants and international collaborative links.

- The Department of Biological Sciences plans to bolster its Applied Biotechnology research, Malaria Research, *Hydnora* research, Conservation genetics and various Environmental Biology research themes such as Wildlife Feeding ecology, Climate change to mention a few. Parallel to all these research themes, the Department of Biological Sciences continues to run the MSc Biodiversity Management and Research programme.

- The Department of Computer Sciences undertook teaching and research programmes. The research and publications output from the Department had slightly improved. The Department managed to do some research and managed to publish at least five (5) papers to International Conferences. However, the Department felt this was not enough for they needed more papers from the Journals. Nevertheless, the staff members did submit some papers to Journals and were waiting for the results.

**Medium term research goals**

- The department of Mathematics is to do work in localic paratopological groups, in collaboration with colleagues at the University of South Africa, and those at the University of Cape Town. To make a considerable contribution to the ongoing work in search of a solution to the well-known M3 versus M1 Problem in General Topology.

- To establish an active Mathematics research group in Topology and its applications here at UNAM where regular seminars will be organized. Furthermore, the department intends to link the group with other researchers in this branch of Mathematics and related fields where experts, especially those in South Africa, Europe and USA that we already have connections with, will be invited to share their work with our colleagues and students.

- Build Environment, Sustainable Energy, Climate Change Adaptation and Mitigation: Under the environmental chemistry theme, we envisage to look at the application of green chemistry (synthetic organic chemistry), specifically in alternative reaction media (including solvent-free synthesis) and alternative activation (e.g. microwave, ultrasound, etc.). Other researchers in this group are currently focusing on wastewater treatment, resource efficiency measurements and carbon foot printing, climate change technologies, carbon management, environmental management systems and ISO standardization of organization. Researchers are also working
on issues relating to environmental policy, renewable energy sources and environmental radiochemical analysis.

**Long term research goals**

- The Department of Physics would like to develop and use nuclear techniques to study radioactivity in soils and materials in different parts of the Country, to establish the applications of lasers in wide range of fields, to study the high energy non-thermal universe through the detection of high energy gamma rays from outer space and to develop and use Geophysical techniques to study the physical characteristics and properties of the earth.

- The long-term goal for the department of Mathematics is to facilitate the establishment of a “Topology and its applications” research group here at UNAM.

- DOBS is planning to strengthen its research in traditional medicines for HIV and opportunistic infections in collaboration with the NEPAD/SANBio, undertaking research in water quality improvement from various water sources in Namibia. DOBS plans to extend phytopathological aspects of indigenous trees like *Acacia*, *Syzigium*, baobab and other trees along the Kavango river basin helping to expand the microbial culture collection facility in the Department.

- Indigenous Knowledge Systems linked improvement and value addition of Plants, Crops (Food Chemistry): Researchers are exploring the interphase between IKS and food chemistry to enhance and add value to local plants, crops and food products. Research in this area includes biochemical, chemical, nutritional evaluation and molecular characterization of indigenous food products. Some researchers are focusing on the screening, isolation, purification and characterization of novel enzymes from microorganisms and plants, studying the fermentation/cultivation conditions for the production of enzymes and other functional compounds produced by microorganisms, in particular fungi. Researchers are also looking at plant environment interactions (signal transduction) and adaptation strategies to enhance the coping strategies of communities to climate change variability.

- Indigenous Knowledge Systems and Medicinal Chemistry: Researchers in this group are currently looking at the synthesis of coordination complexes containing thio-based ligands. They are also looking at the synthesis of coordination complexes containing nitroxylic ligands, screening for biologically active products in medicinal plants and subsequent chemical, biochemical and pharmacological studies on plant secondary metabolites. Others are working
on the establishment of seasonal occurrence of algal marine biotoxins along the central Namibian coast.

- Computational Chemistry and Bioinformatics: Researchers in this group are looking at the electronic structure of semiconductor clusters, computational modeling of the interaction of ozone with thio-phenol, seleno-phenol. They are also looking at the bioinformatics approaches for small scale genome project for local species, in particular x-species hybridization and developing database of gene ontologies in Namibia.

- Industrial Chemistry and Nanotechnology: Nanotechnology is newest area in development in the department. The focus currently is on curriculum integration and establishment of nanomaterials approach in industrial chemistry.

Research Partnerships and Collaborations

The Department of Statistics entered into a partnership agreement with the University of Southampton, UK through EduLink Project to collaborate on a programme entitled “strengthening training & regional networks in demography”. The Project will run for three years. Other partners involved are University of Witwatersrand; University of Botswana; University of Malawi and University of Zambia.

The department is collaborating with Prof. H.-P. Kunzi of University of Cape Town, recently published an article entitled Topological ordered C-(resp. I-) spaces and generalized metric spaces in the journal called Topology and its Applications. The group is working on C- and I-ordered topological spaces with emphasis on the M3 versus M1 problem. They are also working on stratifiable frames in consultation with Prof. J. Gutierrez. Garcia, Universidad del Pais Vasco, Spain. General Topology: Quasi-uniform spaces and Frolicher spaces, with Prof. A. Batubenge, UNISA. Members of the Maths Department are also working with Dr Alfred Kamupingene of Namibia Equity Brokers and others on Differential equations, and modeling differential equations.

A research group in the Department of Physics participates in the H.E.S.S. (High Energy Stereoscopic System) project which is a multinational collaboration of scientists from eight countries including Germany. Another group in the Department participates in research projects in the Department of Biological Sciences of the University of Namibia.
Department of Biological Sciences (DOBS) has research collaborations with following institutions: University of Pretoria, University of Stellenbosch, University of Zimbabwe, University of Leeds, Case Western Reserve University, National University of Science and Technology, University of the Western Cape, the CSIR in RSA, University of Bremen, Old Dominion University, Municipality of Windhoek, University of California, Central Veterinary Laboratory and Rothamsted Research. In addition, DOBS has faculty cross cutting research partners in the Chemistry and Biochemistry Department, Faculty of Agriculture and Natural Resources, The Multidisciplinary Research Centre (MRC) and the School of Medicine.

Research cooperation in the framework of the German Research Priority “System Earth” was initiated during a workshop held in November 2009. The focus of this initiative involves studies on South Atlantic margin evolution, as well as the influence of Climate Change on weathering rates in the southern African region. The involved partners include Dr. R. Trumbull (GFZ Potzdam), Prof. Dr. V. Ittekkot (Centre for Marine Tropical Ecology, Bremen), Dr. J. Harms (Research Centre Juelich), and Prof. Dr. N. Juergens (University of Hamburg).

Collaboration with AREVA NC (France) with regard to student training at postgraduate level continued in 2009 with the sponsorship of seven geology UNAM graduates for further studies in France under the AREVA-GRN agreement. Collaboration also continued in 2009 with Dr. Sebastian Luening, RWE Germany, on Petroleum Systems in the Orange Basin, a project currently being undertaken by the MSc student, Ms. V. Sibeya of NAMCOR.

**Current Research Focus Areas**

The department of Mathematics is working on *Categorical Topology*, working with structured frames called nearness frames.

Gamma spectrometry (measurement of radioactivity in the soils of selected towns in western Namibia), laser applications (laser induced fluorescence), Astrophysics (a *study of stellar X-ray binary systems (XRBs)*) and associated periodicity data analysis of gamma-ray emissions.

DOBS is focused on: Malaria research, Marama domestication research, Marama starch research, Plant pathology research, *Ganoderma lucidum* research, Microbe Culture collection, Research on Endocrine disrupting chemicals, Hydnora flora biology, Traditional medicine research, Vegetation
ecology research, Feeding ecology of Kudu, Small mammals research, Anthrax research, Hantavirus research and medical microbiology research

Exploration guides for mineral deposits in Namibia: 2009 Field work at the Omitiomire Cu deposit; Student transport and subsistence partially supported by Craton Mining.

Environmental-geochemical project in mining areas: Continued with data interpretation and synthesis and preparation of articles. Analytical expenses Funded by the Czech Geological Survey: Collaborators: Dr. B. Kribek, J. Pasava (Czech Republic), Dr. B. Mapani (UNAM), R. Ellmies, F. Sibanda, L. Kawali (Geological Survey of Namibia).

UNESCO-IGCP Project 580: Magnetic susceptibility, correlations and paleoenvironments: Leaders: Dr. Anne-Christine da Silva, Dr. Frédéric Boulvain (Belgium); First IGCP meeting held December 2009 in Liege, Belgium

The Naukluft Groundwater-Isotope-Structural integrated project. (B.S. Mapani, -UNAM J.A. Miller-University of Stellenbosch, C. Rowe- UCT; and C. Harris-UCT)

Detrital Zircon and structural evolution of the Southern Margin Zone, Damara belt (D. Foster, University of Florida; B. Goscombe-Australian consultant; B.S. Mapani, University of Namibia and E.Muvangua ; Geological Survey of Namibia)

Estimation of Climate change parameters in Namibia using groundwater, soil and Honey (B. S. Mapani, University of Namibia; P. Chimwamurombe, University of Namibia; I. Mapaure, University of Namibia; J. Miller, Stellenbosch University, M. Mileusnic, University of Zagreb).

IGCP 529: Groundwater management and environmental aspects of six SADC cities: Leaders : Prof. I.A. Nyambe, University of Zambia & Dr B.S. Mapani, University of Namibia

**Research Output**

**Journal Papers**


Editors/Compilers


Books, Book Chapters and Study Guides


**Conference Papers and Proceedings**


Chimwamurombe P.M. & Kandawa-Schulz M.A. (2009). Developing marama bean as a new crop for Southern Africa: Climate change triggering the need for crop diversification. 49th IFT Conference 6-11th June 2009 Anaheim, California, USA.


**Dissertations and Theses**

RESEARCH ACTIVITIES OF ACADEMIC CENTRES

CENTRE FOR EXTERNAL STUDIES (CES)

Goals and Mandate

The Centre for External Studies (CES) at the University of Namibia is one of the leading service providers in Open and Distance Education in Namibia. CES is committed to Vision 2030 to ensure that Education for All is indeed accessible to all to reach their full potential and take their place in Namibia. As a Distance and Open Learning Centre, we are committed to quality education that would contribute to the optimal development of individuals, simultaneously the socio-economic growth of Namibia. Apart from striving to produce quality research and publications, the Centre has also the following objectives at heart, namely to:

- Improve quality service to distance education students through research;
- Explore how technology could be used to improve student support;
- Collect empirical evidence to strengthen policy and practice in distance education;
- Establish research activities with other faculties within the university and ODL institutions; and to
- Develop research activities with the purpose to grow as academics.

Research Partnerships and Collaborations

Although the CES mainly conducts research in the area of open and distance education it also has research links with the various faculties within the University of Namibia. The vast majority of staff has expertise in diverse areas; for example education, nursing, psychology, HIV/AIDS and Science among others. Hence, CES has established research links with UNESCO, Ministry of Health and Social Services, WIMSA and City of Windhoek. Staff members belong to various research bodies for example, DEASA, NERA and NOLNET. There are existing networks with the University of Botswana, the Commonwealth Institution of Open Learning and Fern University in Germany.

Research Focus Areas

Research into the best practice in the areas of learning materials, academic support and technologies that would meet the individual needs of students.
Research Output

Conference Papers and Proceedings


Dissertations and Theses


Mbukusa, N. (2009). Barriers to remote rural students’ access of distance education support services offered by the Centre for External Studies, at the University of Namibia. Doctoral theses, University of South Africa.


LIBRARY

Goals and Mandate

Through innovative use of resources and technologies the Library provides appropriate information and supports learning, teaching and research to empower the nation and enhance educational output.

Research Focus areas

- Collection Assessment Studies Model
- Developing standards for collection evaluation;
- Developing a standard model for evaluating library collections in terms of relevance to the curriculum and research, currency, effectiveness, breadth and depth of each collection per discipline;
- Pilot study on collection assessment;
- Thorough collection assessment studies faculty by faculty, from 2010 until completed.
- User Needs Assessments
- Review the “User Perception of Library services at the University of Namibia” final report, 2008 and the Executive Summary
- Develop standard research instruments for future user needs assessment surveys
- Carry out user surveys every 4th year
- Library Benchmarking Criteria for performance measurements of Library staff
- Research on Library performance measurements;
- Establish Standards for Library Services and set Benchmarks per service area (Input/ Output);
- Research into Information Literacy (IL) Training Standards for Academic Libraries
- Research into each theme and develop Information Fact Sheets for wider dissemination.
- Research into standard presentation of Library Statistics
- Develop standard instruments which add qualitative data (express opinions and perceptions) of users in addition to the Circulation figures that are generated by the Millennium System. The current circulation statistics only show usage rate per subject, but do not show from which faculty the users are and which materials are active within a particular collection.
- Digital Libraries: Research into University Library projects on digital libraries
Research Output

Books


Conference Papers and Proceedings


MULTI-DISCIPLINARY RESEARCH CENTRE

Goals and Mandate

The Multidisciplinary Research Centre (MRC) of the University of Namibia was established with a view to enable the University of Namibia to best serve the people of Namibia. The statutes governing the functions and duties of the MRC was officially approved by the Senate of UNAM on the 28th April 1994. The key mission of the MRC is to promote, conduct and coordinate applied and academic research; provide advisory services to the Namibian public, in consultation with UNAM faculties. Among others,
when the University Research Policy was approved in 2005, MRC was mandated to support, manage and coordinate the multidisciplinary research activities in priority areas of national development as well as contribution to capacity building of high level human resources. The mandate of the MRC is to:

- Conduct and promote high level applied scientific research;
- Support and coordinate the implementation and management of multidisciplinary research in national priority areas across UNAM in partnership with relevant UNAM research units;
- Promote and coordinate the implementation of specialized postgraduate research fellowships and capacity building in national priority areas;
- Promote and coordinate the implementation and management of commercialization of targeted MRC R&D activities such as scientific research, product development, innovation, patenting and value-addition;
- Disseminate MRC research publications and other outputs;
- Carry out teaching and advisory services for the public;

**Research Partnerships and Collaborations**

In line with its mandate to coordinate research and build research capacity, the MRC received funding to the tune of N$5 million to establish a Collaborative R&D program. The funds were availed towards the end of 2009. The program was implemented jointly with faculties at UNAM. These included the faculties of Economics and Management Science, Science, Education, Agriculture and Natural Resources, and Humanities and Social Sciences.

**Research Focus areas**

1. Social sciences
2. Science, technology, value-addition and innovation
3. Life sciences

**Research Output**

**Commissioned Technical Reports**


Conference Papers and Proceedings


Books, Book Chapters and Study Guides


Training Manuals


Radio Educational Programmes

Developed and recorded 15 radio programmes on gender issues for the Nolnet Education Radio Project for Namcol which was aired on the following radio stations: NBC, UNAM Radio, Radio Live in Rehoboth.

Fact Sheets


OSHAKATI CAMPUS

Goals and Mandate

Oshakati Campus is committed to become and remain an outstanding teaching and research centre in northern Namibia. Oshakati Campus will extend higher education to inhabitants outside the national capital through teaching, research and advisory services with the view to impart knowledge and develop skills essential for knowledge based economy and sustainable development. The campus aims to:

- Review and align the research unit policy framework with that of the overall UNAM Policy
- Identify key research areas in the country and specifically in the north-central regions.
- Develop a research database linked with the main campus research activities.
- Pursue excellence in research on socio-economic challenges, human developments, historical and cultural issues and provides public interpretations.
Research Partnerships and Collaborations

Even though the Oshakati Campus mainly conducts research in various areas in the region, it also has research links with various faculties within the University of Namibia, other sister institutions and research entities local, regional and international.

The vast majority of staff has expertise in various areas for example education, nursing, library sciences, information studies, HIV/AIDS, business management, distance education and science amongst others. Therefore, the Campus has established research links with Ministry of Health and Social Services, Regional and Local Authorities, business communities and other educational institutions inside and beyond the borders of Namibia. Staff members belong to various research bodies for example, DEASA, NERA, NOLNET and others. The campus was not very active with research activities during the year under review, it is vital to mention that with the establishment of the research unit many staff members will be motivated to do research in future. Oshakati Campus did not establish research teams and the research focus area is generic, focusing on various research fields.

Research Focus Areas

- Feasibility studies on Industrial and Business opportunities in the north central regions.
- Tracer studies on Science Foundation students and monitor students’ progress and develop student support services.

Research Output

Conference Papers and Proceedings


**Books, Book Chapters and Study Guides**


Goals and Mandate

SANUMARC aims to achieve excellence in science and technology research in marine and coastal resources, in order to contribute to global efforts to promote food security and eradicate poverty. The Centre aims to promote sustainable development and responsible utilization of marine and coastal resources through sound research, for the benefit of Namibia and the people of the SADC Region.

The research programmes carried out at the Sam Nujoma Marine & Coastal Resources Research Centre (SANUMARC) are informed by Namibian marine and coastal stakeholders. These stakeholders gather once every five years at a Stakeholders Workshop in Henties Bay to review the work carried out, and to inform SANUMARC staff what research activities they would like to see undertaken at the Centre. These activities are summarised and incorporated into a Five Year Development Plan (FYDP) for research.
Short-Term Research Goals

SANUMARC’s main short term research goal is to initiate the activities listed below:

**Marine Science**

- **Abalone**
  - Submit abalone feeding trials experiments for publication
  - Broodstock sourcing of *H. midae* and *H. discus hannai*
  - Comparison of growth of *H. discus hannai* with *H. midae*

- **Finfish**
  - Investigate the reproductive biology of silver kob
  - Spawning induction of silver kob
  - Description of egg & larval development
  - *Larviculture* of silver kob
  - Weaning, growth and survival of juvenile silver kob
  - Some environmental preferences for silver kob juveniles

- **Shellfish**
  - The effect of sulfide & hypoxia on oyster survival
  - Methods of mitigating the effect of sulfur eruptions on oysters
  - Investigate the feasibility of culturing clams in Namibia
  - Spawning of local shellfish species

**Marine Algae**

- **Harvesting**
  - Write up regrowth after harvesting project and submit

- **Utilization**
  - Chemical & nutritional analysis of Namibian seaweed
  - Evaluate different seaweed as a livestock feed supplement
  - Extracting agar from *Gracilariaopsis* for use as mushroom culture
  - Investigating pilot scale integrated culture of seaweed/abalone/fish
  - Cultivation of local seaweed in onshore ponds

- **Microalgae**
  - Isolation of local marine microalgae species
  - Maintenance of live feed species
Mushrooms

- Growing of alternative mushroom substrates
- Evaluation of Agaricus spp for culture in Namibia
- Evaluation of straw mushrooms for culture in Namibia
- Evaluation of effectiveness of mushroom houses, including a clay house
- Evaluation of sterilizing techniques for mushroom culture
- Development & maintenance of mushroom spawn bank
- Mushroom culture training courses

Agriculture

- Bio-saline agriculture
  - The salinity tolerance of wheat & barley for coastal cultivation
  - The effect of brackish and saline water on vegetables grown in hydroponics
  - Evaluation of alternative land uses in the Erongo coastal area
- Biodiversity
  - Collection of desert plants
  - Investigate methods to cultivate !Nara at the Centre
  - Assessment of the influence of soil salinity on plant diversity in the Erongo region
- Forestry & dune stabilization
  - Study & obtain information on the cultivation of the sandy dune stabilization plants
  - Continue with cultivation of old man salt bush
- Horticulture
  - Establish an organic vegetable garden with soil condition project

Renewable energy

- Size, material and gas production evaluated
- Pathogens testing
- Social studies

Water

- Evaluation of fog harvesting designs for use in the coastal environment
- Investigate potential research projects with NamWater& others
**Environment**

- A study of corrosion problems along the Namibia coast
- Consolidation of meteorological data and local publication of summary data

**Medium-Term Research Goals**

SANUMARC’s medium term research goals are determined by our stakeholder informed FYDP, set out below.

**Marine Sciences**

- Mariculture
  - Shellfish: To conduct research to support local exotic shellfish cultivation
    - Introduction of local & exotic potential mariculture species
    - Brood stock conditioning
    - Captive propagation
    - Genetic breeding programme (e.g. oysters)
    - Larval rearing
    - On-growing studies
    - New uses for product (e.g. mussels)
  - Abalone: To conduct research to support abalone cultivation
    - Feeding trials
    - Introduction of new species
    - Brood stock conditioning
    - Captive propagation
    - Larval rearing
    - On-growing studies
  - Finfish: To develop and demonstrate techniques to cultivate finfish
    - Feeding trials
    - Develop husbandry techniques
    - Captive propagation
    - Screening and disease trails
    - Medication
    - Assessment of markets and market costs
- Seaweed
  - Cultivation: To develop techniques for the cultivation of economically important seaweeds in Namibia
    - Collect plant material for culturing
    - Evaluate growth rates of various species under different conditions
    - Develop onshore culture technologies
    - Assess the nutritional and medicinal qualities of various seaweeds
    - Investigate seaweed culture integrated with other aquaculture production
  - Utilization: To promote better use of seaweed and seaweed products
    - Evaluate seaweed as an improvement to soil conditions
    - Evaluate seaweed as a livestock feed supplement
    - Education awareness on the usefulness of seaweeds
- Micro-algae: To research, evaluate and access potentially useful micro-algae species for cultivation
  - Collect and maintain stocks of useful species of micro-algae
  - Isolate potentially important local micro-algae
  - Evaluate different micro algae species for medicinal and nutritional purposes
  - Create awareness of potentially useful algae species
- Biogeochemistry: To research the biological, geological and physical processes that drive the chemical cycling in marine systems and their effect on living organisms
  - The effect of HAB and sulphur eruptions on shellfish physiology
  - The development of an early warning system for sulphur and HAB events

Mushrooms

- Substrates: To promote and develop mushroom production
  - Evaluate organic materials to be used as substrates
  - Test different combinations of substrate on mushroom growth
  - Test quality and nutritional value of mushrooms grown on various substrates
  - Analyze economic viability of mushrooms cultured on different substrates
  - Assess mushroom yield per mass of substrate
- **Species**: To collect, identify and evaluate medicinal & nutritional value of indigenous mushrooms
  - Document local mushroom distribution and indigenous knowledge of their uses
  - Collect local mushroom species from the field
  - Isolate and cultivate spores of local species
  - Fortify exotic mushrooms with nutrients such as iodine, zinc, selenium, etc
  - Chemically analyze indigenous mushrooms
  - Dry and keep reference samples of indigenous mushrooms
  - Test exotic mushroom species for suitability to local climate

- **Techniques and production systems**: To develop small, medium and large scale facilities for mushroom production
  - Carry out desk top study of various mushroom house designs
  - Test low cost building methods
  - Test environmental control of facilities
  - Carry out production trials
  - Test and standardize the production environment
  - Assess the impact of CO$_2$ and O$_2$ ratios in different types of fruiting rooms
  - Evaluate substrate sterilization methods
  - Evaluate optimal packaging of substrate
  - Work with NSI to develop national mushroom production standards
  - Determine economic viability of various production systems

**Coastal Agriculture and Biodiversity**

- **Bio Saline Agriculture**: To identify and cultivate useful, salt tolerant plants
  - Obtain already patented plant material for testing
  - Investigate indigenous saline tolerant plants
  - Carry out Irrigation and growth trials to evaluate saline tolerant crops
  - Monitor soil condition and develop techniques to avoid salt build-up
  - Investigate the genetic modification of salt tolerant genes in plants
  - Use effective micro-organism (EM) technology in determining the impact of salt build-up in plants/environment
  - Investigate the effect of irrigation on salt build up in soils and plants
• Biodiversity: To identify and develop the cultivation of useful indigenous desert plants
  o Collect materials for the herbarium & update database
  o Ethno-botanical survey of desert / coastal plants
  o Test different propagation techniques for desert / coastal plants
  o Monitor the effect of climate change on biodiversity in established permanent research quadrants
  o Identify pharmacologically active ingredients in desert medicinal plants
• Forestry and dune stabilization: To identify and propagate plants that are fast growing and water efficient for desert greening and dune stabilization.
  o Identify & select potential indigenous plants for windbreaks & dune stabilization
  o Carry out growth trials and assess water use efficiency in selected plants
  o Carry out large scale planting and monitor dune stabilization species
  o Investigate the feasibility of developing a desert farm
• Horticulture: To develop efficient techniques for the cultivation of high value plant species
  o Evaluate different hydroponics systems
  o Promote peri-urban agriculture and evaluate its effects
  o Investigate the effect of seaweed as a bio-fertilizer on soil and crop productivity
  o Identify potential crops & varieties for adaptation to coastal conditions

**Renewable Energy**

• Wind energy: To test and promote the use of wind energy
  o Collect wind data along Namibian coast
  o Gather data available from Min. Fisheries & Marine Resources and Min. Mines & Energy
  o Develop / customize a pilot wind power Generator, and install at appropriate locations
  o Evaluate performance of wind generator, including economic viability
  o Promote production of wind power generators in Namibia
• Bio-gas: To promote and produce the use of bio-gas from domestic waste
  o Build various types and sizes of bio-digesters from various materials
  o Collect and test various locally available organic materials for production of bio-gas
  o Investigate availability & sustainability of local materials
  o Test the quality of the effluent water
Test gas purification and safety measures
- Test uses of grey water (e.g. irrigation)
- Test uses of sediment from digesters
- Evaluate the economics of bio-gas, compared to other energy sources
- Promote, publish and demonstrate the use of bio-gas

- Wave energy: To promote wave or tidal energy as an alternative source of energy
  - Complete research on monitoring wave height and variability at coastal stations
  - Customize the technology to Namibian coastlines and establish a pilot plant

- Solar energy: To promote development and use of solar energy for electricity generation and water heating
  - Investigate performance of Photovoltaic Panels (PVP) for electricity generation and solar thermal collectors for water heating
  - Install off-the-shelf photovoltaic panels
  - Purchase and install various solar water collectors and study them
  - Combined research on better / cheaper solar cells with Engineering Faculty

Water

- Desalination: To develop cost effective desalination methods to be used for the production of fresh water for the Namibian coast.
  - Build solar distillation stilts
  - Monitor water production under various conditions
  - Monitor and evaluate water quality before and after filter feeders
  - Investigate optimum arrangements of filtration by shellfish

- Harvesting: To investigate and develop alternative freshwater sources at the coast.
  - Design and test various alternative fog harvesters
  - Theoretical and desk study of the feasibility of cold water condensation
  - Test various materials and surfaces for water collection
  - Investigate factors influencing fog formation
Environment

- Climate change: To monitor climate change and its effect in Namibia
  - MRC to coordinate research programme between SANUMARC, Meteorological Institute, Geography Dept., Min. Environment & Tourism and Min. Fisheries & Marine Resources
- Coastal micro-climate: To monitor the climatic conditions around Henties Bay with an analysis of micro-climate variations
  - Monitor on a continuous basis all data from local weather stations
  - Data analysis
  - Deploy and monitor mobile weather stations
  - Mapping of different micro climates
- Corrosion: To study various ways of corrosion prevention along the Namibian Coast, including protective coatings
  - Study corrosion mechanisms along the coast
  - Carry out chemical analysis of seawater & fog
  - Investigate corrosion prevention methods
  - Investigate feasibility of implementing local authority by-laws to reinforce use of anti-corrosion coatings on buildings
  - Invite coating companies and interested people to submit products for testing
  - Obtain SABS standards and test data for various coatings
  - Test various coatings
- Geomorphology: To determine the changes in land coastal landscape over time and identify the causes
  - Identify areas and processes of concern
  - Monitor changes continuously
  - Study effects of changes on settlement

Community Outreach

- Horticulture: To develop various horticulture income generating projects for local communities with the view of coastal expansion of such activities
  - Use Tulongeni Gardens as pilot / demonstration project for training purposes
- Promote better management and financial skills
- Carry out training on the cultivation of new high value crops
- Assist communities to explore markets
- Monitor soil condition and production

- **Mushroom**: To expand existing and develop new mushroom production projects for job creation
  - Provide training in mushroom production technologies
  - Solicit funds for the expansion of mushroom cultivation in the communities
  - Propagate spawn to supply producers
  - Provide technical advice and extension services

- **Bio-gas**: To promote bio-gas technology as an alternative source of energy
  - Initiate engineering study for the manufacture of large scale bio-digesters
  - Test and evaluate locally available material for use in bio-digesters

- **Seaweed**: To promote the utilization of beach cast seaweed
  - Collect beach cast seaweed
  - Evaluate different species for different uses
  - Monitor seasonal volumes of beach cast seaweed

- **Science and Technology Promotion**: To stimulate an interest in science and technology in all Namibians, especially youth.
  - Promotion of science and technology to schools
  - Participate in science and technology fairs
  - Encourage and support competitions within and between schools
  - Assist with the identification and support of school projects
  - Provide basic laboratory training and facilities

**Long-Term Research Goals**

SANUMARC’s long term research goals are to become involved in large, international projects that incorporate, but extend beyond the scope of the Centre’s Five Year Development Plan. To this end, we are actively seeking international research partnerships.
**Research Partnerships and Collaboration**

During the last two years, SANUMARC has made a concerted effort to develop relationships with local, regional and international institutions. These relationships range from the formal, where Memoranda of Understanding have been signed, to large programmes, to more *ad hoc*, project based interactions. A list of these institutions is presented below.

<table>
<thead>
<tr>
<th>INSTITUTION</th>
<th>RELATIONSHIP OR PROGRAMME</th>
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<tbody>
<tr>
<td>CoRiSSIA (University of Palermo)</td>
<td>ACP S&amp;T Biofuel Oil Project</td>
</tr>
<tr>
<td>Geological Survey (Namibia)</td>
<td>DESIGN / SPACES Programme</td>
</tr>
<tr>
<td>Helmholtz Centre Potsdam (Germany)</td>
<td>DESIGN / SPACES Programme</td>
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<tr>
<td>Kuiseb Fishing Enterprises (Namibia)</td>
<td>M.O.U.</td>
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<tr>
<td>Marine &amp; Coastal Management (DEAT, South Africa)</td>
<td>BCC Science Programme</td>
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<tr>
<td>Marine Biological Association of the United Kingdom</td>
<td>ACP S&amp;T Biofuel Oil Project</td>
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<tr>
<td>Namibian Mariculture Association (Namibia)</td>
<td>Joint Project</td>
</tr>
<tr>
<td>National Marine Information &amp; Research Centre (Namibia)</td>
<td>DESIGN / GENUS / BCC</td>
</tr>
<tr>
<td>NEPAD Mushroom Centres of Excellence Initiative (SADC)</td>
<td>NEPAD COE (Mushrooms)</td>
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<tr>
<td>NEPAD Water Sciences Initiative (SADC)</td>
<td>NEPAD COE (Water)</td>
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<tr>
<td>Rossing Foundation (Namibia)</td>
<td>M.O.U.</td>
</tr>
<tr>
<td>Senckenberg Research Institute (Germany)</td>
<td>DESIGN / SPACES Programme</td>
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<tr>
<td>Tokyo University of Marine Science &amp; Technology, in Japan</td>
<td>M.O.U.</td>
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<tr>
<td>University of Bremen (Germany)</td>
<td>DESIGN / SPACES Programme</td>
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<tr>
<td>University of Frederico II (Naples, Italy)</td>
<td>M.O.U.</td>
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<tr>
<td>University of Ghana</td>
<td>ACP S&amp;T Biofuel Oil Project</td>
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<tr>
<td>University of Greenwich (United Kingdom)</td>
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</tr>
<tr>
<td>University of Hamburg (Germany)</td>
<td>DESIGN/SPACES &amp; GENUS Programmes</td>
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</tbody>
</table>
Research Focus Areas

Currently, SANUMARC is carrying out its second Five Year Development Plan, and the activities are divided into six research and development focus areas or “Thrusts”, including Marine Science, Mushrooms, Coastal Agriculture and Plant Biodiversity, Renewable Energy Sources, Water resources, and the Coastal Environment. The seventh Thrust is Community Outreach, incorporating aspects of all the R&D Thrusts.

Research Output

Journal Papers


Conference Papers and Proceedings


Ninth Bi-annual Conference of the Aquaculture Association of Southern Africa, held at the Swakopmund Hotel & Entertainment Centre, Swakopmund, Namibia; 8 – 13 September 2009

Dissertations and Theses