THE PAPUA NEW GUINEA

UNIVERSITY OF TECHNOLOGY

RESEARCH REPORT

2014

Compiled and Edited
by

Professor Shamsul Akanda

Department of Agriculture

THE PAPUA NEW GUINEA

UNIVERSITY OF TECHNOLOGY

RESEARCH REPORT

2014

Compiled and Edited by

Professor Shamsul Akanda

Department of Agriculture

CONTENTS

FOREWORD

I am delighted to present the 2014 Research Report of the Papua New Guinea University of Technology. In spite of some disruptions of classes at the start of the 2014 academic year, Unitech research activities were a big success in 2014.

Research activities at Unitech are spurred on by having the largest postgraduate program in the country. There are currently 141 postgraduate students, including 9 at PhD level. Unitech also hosts 8 PG students from Caribbean and Pacific through Erasmus Mundus Program of the European Union. The presence of research students creates an atmosphere that is conducive to research. Supervision of postgraduate students and doing research go hand in hand. A postgraduate seminar program during October 13 – 14 resulted in 55 postgraduate students presented their research work that was attended by staff and students from across Unitech and beyond.

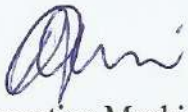
There is a well-attended weekly research seminar at Unitech. This is organised by the Dean of Postgraduate Studies and Research, Professor Shamsul Akanda. I am very grateful to him for his commitment to the seminars and to the postgraduate program as a whole. A total of 23 research seminars were organized in 2014.

A major seminar, known as the Huon Seminar, is held at Unitech every two years. The last one was the seventh one and it was held in November 2013. Its proceedings have been published in a book form.

Unitech has a Research Committee that funds research projects and staff attendance at national/international conferences. In 2014, a total of K114, 462 was given out by the Research Committee for research projects, and K41, 699 was used to support staff attendance at national and international conferences. Nonetheless, many requests for research funding and attendance at international conferences were turned down by the Research Committee, due to a shortage of funds. These funds need to be tripled or quadrupled. That would be a good investment.

This Research Report is a compilation of research activities at Unitech. It describes the research work of each department and lists the academic papers that were published, department by department.

I would like to take this opportunity to thank all heads of department and members of the Research Committee for their fruitful work during the year 2014. I also commend the SEMT for their continued support and commitment of funds even when the university budget is under stress. Above all, I thank the Dean of Postgraduate Studies and research, Professor Akanda, for preparing the 2014 Unitech Research Report.



Dr Augustine Moshi
Pro Vice Chancellor Academic and
Chairman of the Research Committee

THE RESEARCH COMMITTEE OF THE ACADEMIC BOARD

1. TERMS OF REFERENCE

In order that research activities within the University may be encouraged, coordinated, funded and monitored efficiently, the Academic Board set up a Research Committee under the following terms of references:

(a) To promote and encourage research and development;
(b) To formulate an overall research policy and appropriate guidelines;
(c) To allocate funds for research and development within the University;
(d) To prepare an annual report on the research conducted by the University.

2. CONSTITUTION

Ex-Officio Members

a. Vice Chancellor
b. Pro Vice Chancellor (Academic)

Appointed Members

c. One person appointed by the vice Chancellor who shall be the Chairman of the Committee
d. Six persons appointed biennially by the Academic Board

MEMBERSHIP

Ex-Officio Members

Dr Albert Schram
Associate Professor Augustine Moshi

Appointed Members

Associate Professor Augustine Moshi (Chairman)
Professor S. Akanda
Dr. G. Arpa
Dr. K. Pirapaharan
Dr. K. Mulung
Dr. S. Gopalakrishnan

In Attendance

Deputy Bursar
Mr Gabriel Paul, Executive Officer

DEPARTMENTAL RESEARCH PROGRAMS

DEPARTMENT OF AGRICULTURE

Head of Department: Professor Abdul Halim

INTRODUCTION

The Department of Agriculture is committed to delivering quality teaching, research and out-reach activities. Besides the regular 4-year Bachelor of Science in Agriculture (BSAG) course, the Department offers a 2-year Bachelor of Agriculture and Rural Development (BARD) course in distance-learning mode, which is for upgrading qualifications of agricultural professionals holding Diploma and Post Certificate Diploma (PCD). The postgraduate programmes include: Post Graduate Diploma (PGD), Master of Science (MSc), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD).

The department's capacity to conduct agricultural research is strengthened by 18 highly qualified Academic Staff (currently 10 with PhD's, 4 PhD's on study leave, 3 MPhil's), 11 technical staff, 5 farm staff and 17 casual labourers working in the farm. It has well guided activities including research thrusts stipulated in the department's Five year Strategic Development Plans (2005 – 2010 and 2011 – 2015) based on the University's Vision 2030 and Mission. The curriculum is enhanced through regular and periodic review in consultation with clients in the public and private sector. The Department has established strong collaborative research links with aid donors and the stakeholders including NARI, Trukai, and in the past with ACIAR and NZAID.

Efforts to further develop the agriculture research program in the department has received significant enhancement recently with acquisition of updated virus detecting, PCR, tissue culture and DNA finger printing equipment through funding from the Office of Higher Education (OHE) . The OHE funding has also helped improve research facilities such as the expansion of Biotechnology Centre. Similarly, the department has a state of the art Analytical Laboratory equipped with ICPOES and the Combusting Analyser. The Department also has a 39-hectare Farm to support field research in crop science, animal science, agriculture engineering and aquaculture. The Department actively pursues its outreach extension program through its extension arm, the South Pacific Institute for Sustainable Agriculture and Rural Development (SPISARD). SPISARD acts as a vehicle that bridges the link between the department and the rural communities through the "Educational Institutional Approach" enhancing sustainable rural development through action research and lifelong skills training.

Regular publication of the scientific journal '***NIUGINI AGRISAIENS'*** and publishing of scientific papers regularly by academics confirmed the department's strong commitment in research at UNITECH. Strong collaborative research activities with PNG NARI, University of South Pacific (USP), CSU (Australia), National Research Institute (NRI) of Greenwich University (U.K), South Australian Research and Development Institute (SARDI), Australia and other NGOs, industries and institutions further cements our strong leadership in agriculture research. Other publications, compilation of abstracts of research done by the post graduate students, Annual Reports, Farm Reports and Strategic Plan on annual basis also strengthens the department's research capacity.

Based on the above background, resource availability and practicability of execution, the following research focus areas have been identified:

1. Crop Science
2. Animal Science
3. Agricultural Economics

4. Agricultural Extension and Rural Development
5. Post-harvest technology

The selection of the above research focus areas are in line with PNG Vision 2050 national research priorities in agriculture. These research focus areas also provide an effective framework as well as topics to carry out the post-graduate researchprogram.The following are some of the major projects in the priority areas:

RESEARCH FOCUS AREAS

1. **CropScience**

- Crop improvement and adaptation to stress environments caused by climate change.
- Use of *Trichoderma* spp. as a biocontrol agent against some selected soil borne pathogens.
- Studyof the production technology and practices of selected crops by farmers in different agro-ecological regions of Papua New Guinea.
- Study of the production technology and practices of selected vegetables by farmers in different agro-ecological regions of Papua New Guinea.
- Development of a maize seed system for PNG.
- Gene discovery in PNG wild rice: Seed and Grain characteristics.
- Genetic transformation of taro.
- Evaluation of promising rice variety for Papua New Guinea.
- Quantification of greenhouse gases (GHG) emissions from soils under major cropping systems of Papua New Guinea.

2. **Animal Science**

- Conservation of farm animal genetic resources.
- Utilization of crop wastes and agro-industrial by-products for feeding livestock and poultry.
- Determine digestibility of locally available feed and fodder.
- Determination of anti-nutritional factors in the fodder crops of PNG.
- Develop a suitable weaner diet for piglets.

3. **Agricultural Economics**

- Economic Impact Assessment of Honeybee –Coffee Integrated Farming in Eastern Highlands Province.
- An Analysis of Marketing Costs and Margins Spread of Sweep Potato Sales Produced From the Highlands of Papua New Guinea.
- Measuring the Economic Impact of Climate Change on Coffee and Cocoa Production in Papua New Guinea: A Ricardian Approach.
- Handbook on Relevant Production, Trade and Price Statistics on Agricultural, Livestock and Poultry Products of Papua New Guinea.
- Agriculture Sectorial Growth in Papua New Guinea since Political Independence.

4. Agricultural Extension and Rural Development

- Study to evaluate the on-going extension approaches in PNG and their effectiveness in rural livelihood improvement.
- Problems and Prospects of Retaining Youth in Agriculture in PNG.
- Technology Transfer Problems in Rural Communities of PNG.
- Study to identify the present farming systems in different regions of PNG and scope for improvement.
- Examining household food security in peri-urban settlements.
- Livelihoods of settlers in peri-urban settlements.

5. Post-harvest

- Survey on current status of mechanization in Papua New Guinea: Impact study of mechanization on rural livelihood and environment impact.
- Development of Post-Harvest Technology and Post-Harvest management systems for horticultural crops in Papua New Guinea.

RESEARCH FUNDED BY THE UNIVERSITY

1. MSc research project supervised by Dr. M. Maino
   a) MSc Student: Ms. Anne Warra

2. MSc research project supervised by Dr. V. Bue
   a) MSc student: Mr Philemon Nahuet

3. MSc research project supervised by Dr. K. Elahi
   a) MSc student: Ms Priscilla Polona

4. MPhil research project supervised by Dr. M. Sattar
   a) MPhil student: Ms Josephine Giwar

RESEARCH FUNDED BY INDUSTRIES

1. Trukai Industries LTD

a) Evaluation of 39 local and introduced rice varieties in Lae, Morobe province, Papua New Guinea.
   Total Amount: K 300,000.00
   Two PGD students already graduated and two MPhil and 1 PGD students are working under the stipend from this project.

b) Trukai Scholarship Scheme
   Total Amount: Kina 150,000.00
   3 PGD students are working under this scheme and one has been upgraded to do MPhil in 2015.

2. SARDI Project

Title: Enhancing role of small scale feed milling in the development of the monogastric industries in Papua New Guinea (http://aciar.gov.au/project/ASEM/2010/053)
ACIAR project: ASEM 2010/053. Four years project duration. Total cost: AUD 798,863.00
Partners: South Australian Research & Development Institute (SARDI); NARI; CLTC, LDC

LIST OF PUBLICATIONS

Peer-reviewed Journals

Rao, R. B. K. (2014). Effects of land use changes on kinetics of potassium release in sweetpotato garden soils of the highlands, Papua New Guinea. *Solid Earth Discussions*, 6, 2843-2865 DOI: 10.5194/sed-6-2843-2014.

Kaupa, P. and B. K. Rajashekhar Rao. (2014). Nitrogen Mineralization and Efficiency from Co-applied Animal Manures and Mineral Fertilizer in Sweet potato under Humid Tropical Conditions, *Field Crops Research*, 168, 48-56. DOI:10.1016/j.fcr.2014.08.011.

Lapauve, L. and Danbaro, G. (2014). Effects of Urea-Molasses-Mineral-Blocks (UMMB) on the growth performance of goats (*Capra hircus*) maintained on natural pastures in Papua New Guinea. Accepted for publication in Papua New Guinea Journal of Agriculture, Forestry and Fisheries.

Mumbiangke A J. and Danbaro, G. (2014). Growth of beef steers fed on urea-molasses- mineral block supplement in Papua New Guinea. *Niugini Agrisaens*, **6**: 33-38.

Nivi, J., Maino, M.K. and Dotaona, R. (2014). Efficacy of *Steinernema* spp. against sweet potato weevil, *Cylas formicarius*. *Niugini Agrisaiens*, **6**: 45-50.

Conferences/Workshops/Seminars

Besari, F., Danbaro, G., and Glatz, P. (2014). Overview of the layer hen feeding trials in PNG. Proceedings of the ACIAR PROJECT (ASEM/2010/053) on enhancing the role of small scale feed milling in the development of the monogastric industries in Papua New Guinea. Six monthly review meeting year 3. NARI Headquarters, Lae, PNG, Wednesday 29 October 2014.

Elahi, K. (2014).Controversy over Customary Land Ownership: An Overview from Political Philosophy Perspective. A paper to be presented at the UUM Governance Conference, 29-30 November 2014, at Flamingo Hotel by the Beach, Penang, Malaysia.

Elahi, Khandakar (2014).Governance and the Nation-State: Rousseau's Relevance in the Era of Globalisation. A paper to be presented at the 5th International Conference on International Studies, 01-02 December 2014, at the Royale Chulan Hotel, Kuala Lumpur, Malaysia.

Richard Q. Alepa and Rajashekhar Rao B.K.(2014)**.**Land Use, Food Security and Sulphur Status in Food Garden Soils Associated with Smallholder Oil Palm Farming Systems in the Humid Lowlands of Papua New Guinea, Paper to be presented atPNG Research Science & Technology Conference 2014, Port Moresby, PNG. Abstract No A33, Pillar 2.

Bue, V. (2014). Problems faced by women in income-earning activities and their training needs for family livelihood improvement in a selected village in Papua New Guinea. Paper accepted and published in ICERI2014. 7thInternational Conference of Education, Research and InnovationSeville - 17th-19th November 2014. Spain. ISBN: 978-84-617-2485-7.

Maino, L., Sar, L. and Maino, M.K. (2014). Communication in rice innovation systems: A case in the Morobe Province. A paper presentation at *'The Our Media International Conference'* held on 21-25 July 2014 at the University of Goroka, Eastern Highlands Province.

Maino, M.K. (2014). Purpose, law, and order in a melting pot. Paper accepted for the Science and Technology Conference to be held on 17-21 November, 2014 at the University of Papua New Guinea.

FINAL YEAR RESEARCH PROJECTS, 2014

No	Research Title	Student Name	Supervisor
1	A study on farmers' production practices with improved taro varieties from Nari in Situm , Morobe Province.	Jacob Makins	Dr Sattar
2	A study of cassava production practices of selected farmers in Busama ,Morobe Province.	Vagi Walo	Dr Sattar
3	Evaluation of tomato varieties under lowland humid conditions.	Elvira Gele	Dr Wamala
4	Effect of shade tree (glyrecedia spp) intensity on the population of cocoa bugs-mirids causing damage to cocoa pods at Unitech agriculture department farm.	Jelma Wesley	Dr Wamala
5	Screening ten upland rice varieties for salinity tolerance.	Vegata Tau	Dr Wamala
6	Sweet potato pollen culture for haploid cell line production.	Fugi Kunini	Dr Okpul
7	In-vitro generation of potato micro tuber: variety x media.	Talitha Geob-Daniel	Dr Okpul
8	Embryo rescue and geno-typing of endosperm- mutant maize (*Zea mays*)	Fabian Gena	Dr Okpul
9	Investigating the presence of transposable elements in taro (*Colocasia esculenta)* (L) Schot.	Malcolm Kabiwaga	Dr Okpul
10	Studying the growth of Trichoderma on waste spent grain from SP Brewer	Melanie Pitiki	Prof. Aknada
11	Studying the effectiveness of *Trichoderma* as a bio-control agent against collar rot of aibika under greenhouse condition.	Aloma Motamota	Prof. Aknada
12	Limiting effects of two biochar materials on soil acidity.	Stefani Geyesa	Dr Rao
13	Influence of two biochar materials on Phosporus fixation capacity of soils.	Tine Kaman	Dr Rao
14	Assessing postharvest losses of tomatoes at Lae main market, Morobe Province.	Brigita Kindiwa	Mr Vidinamo
15	Peanut Oil Extraction (The collage Industry Method).	Bernadette Okoa	MrVidinamo
16	Duckweed as feed supplement for Tilapia fingerings.	Christopher Kau	Mr Nano
17	Using Gambusia (Mosquito fish) as a protein source in fish feed.	Sonya Ivirami	Mr Nano
18	Performance of tilapia fingerings fed different levels of luceana leaves as a source of protein.	Clyde Bayau	Mr Nano
19	Effect of dietary fibre on growth performance of broiler chickens.	Somah Winuan	Dr Danbaro
20	Survey of morphometric characteristics of indigenous chickens in Finschaffen district of PNG.	Noelyn Somu	Dr Danbaro
21	Taro farming in Huon Gulf, Morobe Province: A linear programming approach.	Joel Labani	Dr Manus
22	Profitability of egg production at PNG Unitech farm.	Lawrence Ishika	Dr Manus
23	Assessing the financial benefits for Zifizang cattle ranches option to continue producing cattle or lease the cattle ranch.	Kevin Mana	MrKewa

24	A study of Garlic marketing and pricing at Lae main market (PNG).	Justin Nulai	Dr Elahi
25	Measuring food quality in daily diets of the households in tent city, peri urban settlement of Lae	Beddie Akisawa	Dr Bue
26	Measuring food security in daily diets in peri urban settlement of Lae, Morobe Province.	Luke Rubin	Dr Bue
27	Rural youth in Agriculture: case studies of Lae City.	Gideon Bill	Prof. Halim
28	Effective of supplementing fodder tree leaves on the growth of kids.	Stallone Kemp	Dr Jayaprakash
29	Electrolyte concentration of serum at different age groups of goat	Moliana Kelokelo	Dr Jayaprakash

POSTGRADUATE RESEARCH PROJECTS, 2014

No	Program	Research Title	Student Name	Supervisor
1	PhD3	Study the effectiveness of *Trichoderma* spp. as bio-control agent against selected soil borne fungi.	Gwendolyn Ban	Prof. Akanda
2	PhD4	Effects of Root-knot Nematode, *Meloidogyne incognita* on Sweet potato in Papua New Guinea.	Macquin Maino	Prof. Akanda
3	PhD1	The use of *Acacia magnum* in the rehabilitation of mined out sites in Hidden Valley.	Lawrence. H. Lewis	Dr Rao/Prof. Hossain
4	PhD1	Socio-economic determinants and constraints influencing Land Settlement Scheme (LSS) oil palm & Village Oil Palm Production systems in WNB & Oro provinces of PNG.	Cletus Tumba	Dr Manus
5	MPhil2	Impact of intervention of the Lake Murray Village Rubber Project on farmers' livelihoods in Western Province, PNG.	Josephine Giwar	Dr Sattar
6	MPhil2	Investigating gene flow between cultivated and wild taros.	Jeffery Waki	Dr Okpul
7	MPhil2	Baseline study on the occurrence of some heavy metals in fish tissues in Yonki Reservoir, Eastern Highlands Province.	Samuel Kapia	Dr Rao
8	MPhil2	Screening of 36 upland and lowland rice varieties for drought tolerance under glasshouse conditions.	Enara Enara	Dr Wamala
9	MPhil2	Investigation into the Biology of *Segestidea defoliaria defoliaria* (uvarov) and it's Egg Parasitism by *Doirania leefmansi* Waterston	Tabitha Manjobie	Dr Ero
10	MPhil2	Development of composting protocols of cocoa pod-based composts and their efficacy.	Chris Fidelis	Dr Rao

11	MPhil1	Prevalence of Salmonela and Campylobacter of zoonotic importance in chicken in Papua New Guinea.	Lydia Tasi	Dr Jayaprakash
12	MPhil1	Evaluation of promising rice varieties under irrigated and rain-fed conditions.	Henry Maino	Dr Okpul
13	MPhil1	Effect of Urea Molases Mineral Block (UMMB) Supplementation on Feed Lot Cattle.	Arenu Mumbiangke	Dr Jayaprakash
14	MSc2	Marketing of broiler chicken by small holders: an economic study of some selected commercial enterprises in the Eastern Highlands.	Priscilla Polona	Dr Elahi
15	MSc2	Perceptions of Village Oil Palm (VOP) farmers in the Markham valley on the impact of their involvement in oil palm production on their livelihoods.	Philemon Nahuet	Dr Bue
16	MSc2	Efficacy of entomopathogenic nematode-associated bacteria as biopesticide.	Anne Warra	Dr Maino
17	PGD	Evaluation of the susceptibility of 36 introduced rice varieties to Brown Plant Hopper (BPH) and Stem Borer under upland rain fed and lowland irrigated condition.	Charlie Suruban	Dr Wamala
18	PGD	Evaluation of organoleptic and physico-chemical characteristics of 36 rice varieties.	Redley Opasa	Dr Okpul
19	PGD	Effects of incorporation of rice polish in broiler performance and carcass composition at Unitech Farm.	Joseph Kimagl	Dr Jayaprakash
20	PGD	Analysing carbon stock at five selected land used sites at Unitech Agriculture Farm.	Viti Oso	Dr Rao
22	PGD	Investigating the impact of late-acting self-incompatibility on Cocoa (*Theobroma cacao*) production.	Mathias William	Dr Okpul

UNITECH RESEARCH SEMINAR PRESENTATION

1. Assessing policy impact on the smallholder rice based cash crop production systems in Papua New Guinea - **Mr Nick Kewa**

2. Postgraduate Scholarship Opportunities under BULA (Building University Links for Action) Project – **Professor S. Akanda**

3. The effect of pruning on the growth of acacia plantations and the utilization of biomass to produce biochar – **Mr Lawrence Hillary Lewis, PhD student**

4. The status of household food security at Hoskins and Bialla Land Settlement Schemes, West New Britain Province – **Dr V. Bue**

5. Betel nut - Should we destroy it or find alternative commercial uses? – **Dr M. Maino**

DEPARTMENT OF APPLIED PHYSICS

Acting Head of Department: Dr. Gabriel Anduwan

The Department of Applied Physics runs two courses; the Applied Physics with Electronics and Instrumentation course and Radiation Therapy. These two courses are completely different courses that the department offers. On top of these courses are the service courses that the department offers to almost 10 departments out of the 13 departments in this University.

The Applied Physics course with electronics and Instrumentation related to the principles of Physics that are imparted to students with more emphasis on electronics and instrumentation. However, Radiation Therapy deals with cancer treatment which is run by our department in collaboration with Angau Hospital. At the completion of the course, the students are expected to work with the Health department.

The departments teaching and research by each academic and some of our technical staff are;

Final Year (Undergraduate) Projects supervised and research conducted by;

Dr. Gabriel Anduwan
Senior Lecturer

1. GSM Based Home Security System

Abstract

Home security has been a major issue where crime is increasing and everybody wants to take proper measures to prevent intrusion. In addition there was a need to automate home so that user can take advantage of the technological advancement in such a way that a person getting off the office does not get melted with the hot climate.

Introduction

The project is aimed at developing the security of Home against Intruders, Gas Leak and Fire. In any of the above three cases any one met while you are out of your home than the device sends SMS to the emergency no provided to it.

The report consists of a background into the area of 8051 microcontroller and mobile communication, how they are interfaced to each other and AT (Attention) commands set used in communication.

2. Fault-Tolerant and Thermal Characteristics of Quantum-dot Cellular Automata Devices

Abstract

The defects and fault tolerance study is essential in the QCA devices in order to know its characteristics. Knowing the characteristics, one can understand the flow of information in a QCA system with and without manufacturing and operational defects. The manufacturing defects could be at device level or cell level. At the device level, the cell could be rotated, displaced vertically or horizontally, the cell could be missing or the size of the cell could be different. At the cell level, there could be a missing dot, dot could be displaced from its position or the size of the dots could be different. The operational defects are due to its surrounding, such as temperature or stray charge. Each of these defects and fault tolerances can be studies in detail in order to find the optimum working conditions where the information can be safely transmitted to the appropriate locations in the device.

The theoretical studies have shown that at absolute temperature and without any defect, the QCA devices are operational. But it is almost impossible to manufacture a perfect or defect free device, and also it is impractical to think about operating a system at absolute zero temperature environment.

Therefore, it is important to investigate the fault tolerant properties with defects and higher temperatures to see how far the QCA device can operate safely. Many studies have been done to investigate the fault tolerant properties in QCA devices. However, these studies have not completely exhausted the study of defects and temperature effects. In this study, the dot displacement and missing dots with temperature effects are investigated for the basic QCA devices and a Full Adder. In order to study fault tolerant properties, the existing theoretical model and computer simulation programs have been expanded and used. The defect characteristics have been simulated using normal distribution.

One published in 2013 not reported

***Journal of Applied Mathematics and Physics*, 2013, 1, 7-15** http://dx.doi.org/10.4236/jamp.2013.13003
Published Online August 2013 (http://www.scirp.org/journal/jamp)

Final Year (Undergraduate) Projects supervised and research conducted by;

Mr. Roberto Soto
Senior Lecturer

- **Project Environ:**
- **Objective:** To acquire, process, analyze, transmit, and display environmental conditions sensed at remote locations and transmitted to a base station.
- This Weather Station will be designed to be a remote data acquisition system that gathers environmental data from a set of sensors mounted on a small remote platform.
- The data will then be transmitted through a radio frequency link to a base station where it can be uploaded to a PC for further analysis.
- A Control System is required to protect the UV sensor from direct sunlight. It might consist of a DC stepper motor, an opaque UV shield, photo-sensors, and a proximity sensor to indicate the shield position.
- The communications interface will require two units to transmit data from the remote station to the Base (transceiver).
- A micro-controller will govern the operation of the remote station.
- A software user interface is needed to display the environmental data.

- **Designing a Capacitance Meter**

  The objective of this Research/project is to build an automatic capacitance meter using two 8-bit counters (using the 74LS469). The description of the building process and the conceptual design was discussed with the students; a simple way of cascading the counters and to drive or trigger the counters, and RC oscillator need to be designed where an oscillator's component is the capacitance to be measured. (the oscillator will be designed via the use of the 7555 IC).

- **Research/Prpject on Bio-gas Generation**

  The objective of this research is first to prove the concept that bio-gas can be generated from chicken manure. The second objective is to quantify the gas by measuring the amount of gas generated per kilogram of manure. And the third objective will be to determine the calorific value of the gas to estimate its quality for using it for cooking.

- **Model/Design of a New Processing Sago Machine**

  Sago is a local's staple food apart from yam, banana, and kaukau. It is the major staple food for the lowland people of New Guinea and especially the Sepik people. Sago is a starch extracted from the spongy centre or pitch of various tropical palm stems. The proposed model for construction of the machine will consider the traditional sequence of steps or the traditional method of sago extraction. The machine will contain electrical/electronic components like sensors, rotating blades to cut the sago starch, PLC to control the electrical/electronic components involved, etc.

- **Model of a New Cocoa Fermentary**

  New design, therefore at this stage only an idea or description of the fermentary could be written, but basically, the final evaluation of the fermentary will be to try to produce quality dry cocoa beans for export purposes.

Final Year (Undergraduate) Projects supervised and research conducted by;

Suame Ampana (Mr.)
Lecturer

1. **Pre- and Post-eruptive deformation at the Rabaul Caldera, Papua New Guinea modeled using PALSAR and PALSAR-2 time series.**

***Project Description*:** This project utilizes the "Interferometric Synthetic Aperture Radar" (InSAR), a space based geodesy technique to detect surface deformation at Rabaul caldera related to subsurface magmatic activity. SAR images obtained by PALSAR antenna onboard Japanese ALOS satellite are used. The antenna transmits radio signals that are echoed of the earth surface and received on the same platform to form a coherent SAR image. Two Temporally varying SAR data of Rabaul upon interference reveals phase differences related to volcanic deformation.

Time series of 21 ALOS PALSAR Fine Beam SAR images of Rabaul acquired between 27/2/2007 and 10/3/2011have been processed. Preliminary results indicate persistent caldera wide uplift and subsidence signals through multiple epochs. Some temporal slices of incremental displacement correspond with eruptive behavior witnessed by RVO. Forward models making use of analytical expressions for elastic deformation in a half space for various source geometries will be tested to place bounds on the pressure change (and hence volume change) in the magma chamber at each epoch in the time series with a view to establish link between subsurface activity and surface eruptive activity.

● This is a collaborative project between Geoscience Australia and PNG Department of Mineral Policy and Geohazard Management funded by the Australian Department of Foreign Affairs and Trade.

2. Revealing Crustal Subsurface structure by Seismic Reflection technique

***Project Description*:** Seismic Reflection technique is the single most important technique used for probing the Earth's subsurface. It is massively used by hydrocarbon exploration industry for oil and gas prospecting. Ultrasound seismic vibrations propagate into the earth's interior and are reflected from subsurface boundaries and received and recorded by geophones/hydrophones on the surface. By measuring two-way travel time of the signal, velocities of subsurface layers can be determined from Normal Move out (NMO) hyperbolas on the time-depth (t-x) graph enabling reflector depth to be calculated. Signal processing of the seismic trace is carried out over the entire seismic section to produce seismic image of the crustal subsurface structure. The technique can detect internal stratigraphy, faults, folds, oil and gas reservoirs and ground-water resources. Seismic reflection data produces results of the subsurface that look a lot like actual "geologic cross-section", hence offers a cheaper way to explore the subsurface.

In this final year project, the following are envisioned; the student is expected to

i) discuss the principles involved in seismic wave propagation and ray/reflection ray geometry; the Move out (MO) and Normal Move out (NMO), Velocity Stacking and Migration – important processes in seismic data processing.

ii) make use of Fourier transformations, convolution and deconvolution operations in signal processing to improve seismic signal to noise ratio and

iii) process real seismic data using Seismic Unix (SU), a unix-based seismic data processing software. The final seismic image of subsurface reflectors should be interpreted.

3. Revelation of Shallow Crustal Structure by Ground Penetrating Radar (GPR) Technique.

***Project Description*:** The GPR technique for exploring the earth's shallow subsurface similar to Seismic reflection except for the following; it uses electromagnetic source (microwaves) and reflections at subsurface boundaries occur as a result of change in relative permittivity of transmitting media. A microwave, transmitted at the surface is reflected from subsurface boundaries and received by receivers placed offset to the transmitters. Subsurface layer velocities are inferred from measurement of two way travel times to reveal reflector depths.

In this project, the following are envisioned; the student is expected to

i. Understand and discuss the principles involved in electromagnetic wave propagation and reflection; the Normal Moveout (NMO), Migration and Velocity Stacking in GPR data processing.

ii. make use of Fourier transformations, convolution and deconvolution operations in signal processing to improve signal-to-noise ratio and

iii. process real GPR data using SU, a unix-based seismic data processing software. Final image should reveal subsurface reflectors that provide an opportunity for interpretation.

4. Non-Destructive Testing (NDT) of Parts by use of Eddy Current Testing on the basis of Impedance Analysis

Project Description: The Eddy Current Technique (ECT) for non-destructive testing of conductive specimen operates on the principle of electromagnetism; electromagnetic induction (Faraday's law) and Lenz's law of pole reversal. Passage of a.c current in the primary coil generates an a.c magnetic field. If a conductive test specimen is placed in the vicinity of the coil, secondary voltage is induced in it which drives eddy current. Eddy current in turn generates secondary magnetic field cancelling a portion of magnetic flux in the primary coil (Lenz's law). The net effect is the reduction of total magnetic flux in the coil circuit, causing the voltage, current and impedance of the circuit to change. This project will make use of impedance analysis of the primary coil to detect presence of defects or cracks, discontinuities, foreign inclusions etc in the specimen to establish its integrity/worthiness.

In this project, the student should be able to

i) Explain the operational principles of ECT (electromagnetism, Faraday's and Lenz's laws)

ii) Characterize defect in a specimen via impedance analysis based on actual tests performed in the laboratory.

Mr Michael Gaoma

Lecturer

2015 RESEARCH TOPICS

Year	Research Topic	Brief description	Objectives	Comments
	Analysis of Grade 12 Physics HSC Results 2012 -	To examine the Grade 12 Physics HSC exams results from 2012 to 2014 and compare	To identify areas of weaknesses and explore strategies for improvements in	To be completed by the end of semester 1 2015

2015	**2014** **Analysis of First Year Physics Student's Results for Semester 1 at PNG Unitech 2013 – 2015.**	them with the results of Chemistry, Biology and Advanced Mathematics. Data will be collected from the Applied Physics Head of Department office. Examination of the physics students' results for semester 1 at PNG Unitech. Data will be collected from the academic departments of Applied Physics, Maths & Computer Science, Civil Engineering, Electrical & Communications Engineering, Mining Engineering, Mineral Processing and Mechanical.	Physics teaching and learning in secondary schools in Papua New Guinea. To compare the results with the results of Grade 12 Physics HSC results of the same students.	To be completed by the end of semester 2 2015

Final Year (Undergraduate) Projects supervised and research conducted by;

Edmond Nagombi

Research Project Topic: Automatic Bottle Filling System Using Plc's (Allen Bradley Micrologix 1200) Project .

Abstract

The application of PLCs (Programmable Logic Controllers) is widely known and use in this

digital world PLC's application is obviously applied at the industrial sector. Normally, the PLC's that have been used at the industrial field is usually to control a mechanical movement either of the machine or heavy machine in order to create an efficient production and accurate signal processing. In this research project, a discussion about PLC application will be explained in more details and specified. Thus, to design and build a mini automatic bottle filling machine for student laboratory.

Final Year (Undergraduate) Projects supervised and research conducted by;

Mr. David Kolkoma
Lecturer

1. Marijuana Electronic Detector

This is an on-going research work done in 2013 by the Department of Applied Physics First ever Masters Student, who graduated in March 2014. The optical properties of the essential oil are utilized to find the *Cannabis* spectrum at which the molecular compound Beta-caryophyllene(BCP) ($C_{15}H_{24}$) absorbs the radiation. The result established has promising outcomes which will be utilised in future research for *Cannabis* detecting system. This stage of the project focus on the detection of the odour of the cannabis which is a compound called Beta-caryophyllene (BCP) By detecting the odour of this organic material which absorb energy(radiation) at a certain frequency range in the Electromagnetic Wave Spectrum we can design an electronic sensor(detector) to pick up the frequency which we are interested in as we know *Cannabis(*Marajuana) in Papua New Guinea (PNG).is a hidden cancer that is indirectly responsible for many deaths and families scattered around the nation.It is anhinderance to the social, economic and spiritual development of this great nation.

2. Feasibility Study on Applied Physics Department establishing a Dosimetry System

The exposure of industrial and clinical workers, general public and patients to ionization rays such as x-rays, gamma rays, beta particles and neutron sources at level high than the threshold can cause biological effects to the body. It is an international regulation that any worker whose

work environment involves exposed to radiation to have radiation meters to monitor the level of radiation the body absorbs.

Currently there is no facilities in PNG to do the calibration for the dose meters or badges the workers used, hence done overseas particularly in Australia. The Department of Applied Physics with the assistance from International Atomic Energy Agency is working to establish such facilities in the country. This investigation will determine the credibility of the department and university of technology to establish such a facility.

3. Possibility of Applying Electronic Portal Imaging Devices in Brachytherapy at Angau RT Center

The use of Electronic Portal Imaging devicers (EPIDs) for dosimetry purposes has matured over the last 15 years and is now a reliable and accurate dose verification method that can be used in a large number of situations in a radiotherapy department.
Since EPID images contain dose information investigation on their use for radiotherapy dose measurement are ongoing. With the introduction of new panels such as the amorphous-silicon EPIDs, the interest in EPID dosimetry has been accelerated because of the favourable characteristics such as fast image acquisition, high resolution, digital format, and potential for in vivo measurements and 3D dose verification.

With this on-going development of EPIDs we can extent their application to dose verification of brachytherapy source positioning at Angau National Cancer Center. This investigation is to verify its compatibility in this application, what panels are more appropriate and the costing involved for installation.

DEPARTMENT OF APPLIED SCIENCES

Acting Head of Department: Dr Janarthanan Gopalakrishnan

The Department functions with two sections: Applied Chemistry and Food Technology. Food Technology courses are only offered in PNG University of Technology in the whole of the South Pacific. Our department, based on the current market scenario and other developments, keeps track on the curriculum, and suitable changes and revisions to the curriculum is done. Applied Chemistry Section revised the curriculum and implemented the changes effective from the year 2011. Now, based on certain requirements, another revision is being done during 2013. Food Technology Section revised the curriculum this year (2013) and being implemented from 2014. The research activities of the two sections are provided below.

Research Output

Peer Reviewed Journals

1. Gopalakrishnan, J. (2014). Electron impact mass spectral fragmentation patterns of two six-membered Phosphinimino cyclothiazenes, (Ph)[$(C_6H_{11})_2N$](R_2N)PN-S_3N_3 – A comparison, *Phosphorus, Sulfur, Silicon and the Related Elements*, **DOI: 10.1080/10426507.2014.938744**. ISSN: 1042-6507.

2. Yamini Sudha Lakshmi, S., Mala, D., Gopalakrishnan, S**.**, Banu, F. and Brindha, V. (2014). Antimicrobial activity of silver nanoparticles from *Pithecellobium dulce*, *Indian Journal of Nano Science*, 2, 1–3. ISSN: 2320-9682.

3. Yamini Sudha Lakshmi, S., Banu, F., Brindha, V.,and Gopalakrishnan, S. (2014). Antimicrobial activity of silver nanoparticles from *Swietenia mahagoni*, *Indian Journal of Medicine & Healthcare*, Vol 3. ISSN: 2278-2966.

4. Yamini Sudha Lakshmi, S., Mala, D., Gopalakrishnan, S., Banu, F. and Brindha, V. (2014). Green synthesis and characterisation of Silver nanoparticles from the medicinal plant *Pithecellobium dulce*, *Indian Journal of Nano Science*, Vol. 2. ISSN: 2320-9682.

5. Banu, F., Dawood, N., Yamini Sudha Lakshmi, S., Gopalakrishnan, S**.** and Brinda, V. (2014). Antioxidant activity of geraniol on N-Nitrosodiethylamine-induced Hepatocarcinogenesis in Wistar Albino rats, *Indian Journal of Oncology Radiation Biology*, 2, 4–9.

6. Yamini Sudha Lakshmi, S., Banu, F., Brindha, V. and Gopalakrishnan, S. (2014). Antimicrobial activity of *Aegle Marmelos* (Correa) Linn. silver nanoparticles. *Indian Journal of Drugs & Diseases*, Vol 3, ISSN: 0974-5645.

7. Rubiang-Yalambing, L**.**, Arcot, J., Greenfield, H., Holford, P. (2014). Aibika (*Abelmoschusmanihot* L.): genetic variation, morphology and relationships to micronutrient composition, *Food Chemistry*, **DOI: 10.1016/j.foodchem.2014.08.058. ISSN: 0308-8146**.

Conferences / Symposia / Workshops

1. Pumwa, J., Nigo, R. and Okpul, T. (2014). University of Technology biofuel research activities. Biofuels task Force Consultation Workshop, Department of Public Enterprises, Port Moresby, PNG

2. Hundang, K., Gopalakrishnan, J**.**, Sakulas, H., Pue, A. and Werry, L.P. Exposure of food crops and fishery products to cadmium in the volcanic areas of East New Britain province and their potential risks, Society of Environmental Toxicology and Chemistry (SETAC) Asia / Pacific 2014 Conference held in Adelaide, Australia, 14-17 Sept. 2014.

3. Gopalakrishnan, J**.** Salt tradition as a rich culture in Papua New Guinea: past, present and future, 14th International Congress of the Society of Ethnopharmacology (14th ISE Congress) and VIII International Symposium of Natural Products Chemistry and its Applications, Puerto Varas, Chile, 23-26 Sept. 2014; [paper accepted for oral presentation, but couldn't get funds to travel]

4. Gopalakrishnan, S. Green synthesis of silver nanoparticles, characterisation and antimicrobial activities of biologically synthesised silver nanoparticles of Pittosporum f. Dryand, International Pacific Health Conference 2014, Auckland hosted by Health Research Council and Ministry of Health, New Zealand, 3-5 Nov. 2014. This paper was selected as the best presentation in Innovation and Technology session.

Projects

Ongoing projects

1. **The study of CCA treated timber and its exposure or effect to the environment.** It is mainly done through final year research projects and by MPhil research. Principal supervisor: Prof. S. Akoitai

   Status: Chromated copper arsenate (CCA) is an inorganic arsenical (composed of arsenic, chromium and copper) that is used as wood preservative. Constituents of CCA are known to be toxic to humans, aquatic life and plants. The greatest potential for environmental impacts is considered to be from leaching of preservative chemicals over various time periods under specific conditions from the treated timber to the soils thereby impacting the soil quality, surface water quality and possibly groundwater quality. Also importantly is the combustion of the CCA treated timber that releases these toxic constituents that are very dangerous. Initial studies are centred on treated timber and exposed soils via a student MPhil research and undergraduate projects.

2. **Tertiary butyl based sterically hindered bidentate ligands: synthesis and coordination studies** [5000 USD, funded by PNGUT Research Committee] – undertaken by Mr. Rahamie Par for M.Phil. degree (Jul '14, under progress). Principal supervisor: Dr. Janarthanan, G.

Status: Initial trials were carried out to synthesize the known tertiary butyl based sterically hindered bidentate ligand in order to understand the difficulties associated with the ligand synthesis. Once these conditions are optimized, further complexation studies would be carried out.

3. **Studies on simple and cost-effective water purification methods using plant products: studies with banana peels** – to be undertaken by Mr. Stanford Tandop for M.Phil. degree under Graduate Assistantship Program [3500 USD, to be funded by PNGUT Research Committee] - from Feb ’15. Principal supervisor: Dr. Janarthanan, G.

   Status: It has been found that the dried and pulverized peels of banana could remove the heavy metals from water by the complex formation between the metal ions and the amide oxygens and nitrogens of the peels. A study would be conducted based on which attempts would be made to device a simple and cost effective water purification method.

4. **Studies on simple and cost-effective water purification methods using plant products: studies with tuber products** – to be undertaken by Mr. Kaupa Philip for M.Phil. degree under Graduate Assistantship Program [3500 USD, to be funded by PNGUT Research Committee] -from Feb ’15. Principal supervisor: Dr. Janarthanan, G.

   Status: It has been found that the dried and pulverized peels of banana could remove the heavy metals from water by the complex formation between the metal ions and the amide oxygens and nitrogens of the peels. Similarly, the pulverized peels of tuber products like tapioca, taro and yam are also expected to show the same results and Papua New Guinea is rich in these tuber products. A study would be conducted based on which attempts would be made to device a simple and cost effective water purification method.

5. **Studies on traditional vegetal salts produced in Enga, Western Highlands, Southern Highlands, Madang, East Sepik and West Sepik Provinces of Papua New Guinea** - to be undertaken by Ms. Hannah Kurua for M.Phil. degree under self-sponsored category [2300 USD] - from Feb '15. Principal supervisor: Dr. Janarthanan, G.

   Status: Papua New Guinea (PNG) is very rich in traditional practices by making use of the rich floral varieties. One such practice is producing salts from plants and many provinces in PNG have produced such salts and few places are still producing them. The project focuses on collecting more information on the salt production method, collect salt samples and plants that produce them, conduct physicochemical analyses of these salts, carry out interviews and sensory evaluations to gauge and grade the salts in order to correlate ionic constituents with tastes and preferences.

6. **Biological Assessment of Phytosynthesized Silver Nanoparticles** - undertaken by Mr. David Timi for Ph.D. degree under LNSDC - from Feb '14. Principal supervisor: Dr. S. Gopalakrishnan

Status: Out of four different approaches of synthesizing AgNP, that of sunlight demonstrated fast and high yielding result. Leave extracts of all three plants gave high yields of the AgNPs and high toxic activity against indicator bacteria (two G^+ and two G^- bacteria) than the bark and stem samples. Based on these results, subsequent analysis was focused on the leaves and a total of 12 medicinal plants have been utilized for the study. There are three components to the biological assessment of the AgNP. These include activity of the AgNP against (a) pathogenic microorganisms, (b) agricultural insect pest and (c) antimalarial activity. Out of the twelve samples, the AgNPs obtained from five plants showed strong activity against both bacteria and fungi (inhibition zone 12 mm and above), four showed moderate activity and three showed no activity. Further work is in progress.

7. **Cholera project.** Principal investigator: Ms. Elizabeth Nasing.

   Status: The project is done at Unitech in collaboration of PNGIMR. A total of 22 cryotubes are currently stored in the freezer. The results of the microbial analyses and water quality were sent to Dr A.R. Greenhill (Monash University), one of the co-investigators. The present task is to send the cryotubes to PNGIMR Goroka in a cryogenic dewar for molecular analyses.

8. **Hybrid solar wood drying system for agricultural comedies such as coffee and cocoa.** Principal investigator: Mr. Reilly Nigo.

   Status: A prototype hybrid drying system has been developed and the preliminary studies have indicated very good and promising performance. Performance studies using different food commodities and possibilities of upgrading the performance need to be carried out. Funded by Department of Applied Sciences.

9. **Biogas development from household and market wastes.** Principal investigator: Mr. Reilly Nigo.

   Status: A prototype design has been completed and preliminary data collected. The project has potential of reducing organic wastes around markets and household within Lae city. Further work is needed on different feedstocks to evaluate the yields. Funded by the Department of Applied Sciences.

10. **Renewable and clean energy: solar sorption development from local materials.** Principal investigator: Mr. Reilly Nigo.

    Status: Work jointly funded by ACIAR (Post Harvest) and the Department of Applied Sciences. A proto-type solar freezer has been developed and is to be further researched before trial run in rural areas and possibility Department of Health and interested communities. Several modifications have been made but still needed to conclude.

11. **Renewable and clean energy: biodiesel.** Principal investigator: Mr. Reilly Nigo.

    Status: Working with Dr. Aisak Pue (UNRE), Mr. Andrew Puy (POM) and Prof. Samson Akoitai on process development and design of biodiesel production in PNG. This project is funded by Madang Provincial Government. The project is in its final

stage and awaiting a new fulltime staff at research officer level to complete the project.

12. **Fish Feed Development in Papua New Guinea.** Principal investigator: Mr. Reilly Nigo.

    Status: This is a joint project with ACIAR, NFA and Unitech through Department of Applied Sciences. Other members from Unitech are Prof. S. Akoitai and Mr. J. Narimbi. The project involves profiling and development of fish feed in the country. Several progress reports were submitted to the partners to be included in the ACIAR annual report. The project is to be concluded by this year.

13. **National Fisheries Authority Project.** Team leader: Mr. Reilly Nigo.

    Status: The project looks into setting up of National Food Testing and Monitoring Centre at the Department of Applied Sciences (Unitech). During the course of the project, (i) laboratory accreditation confining to international standards, (ii) upgrading of the rooms and power supply of the whole department would be considered. Currently the second item is in progress. Around PGK3.5 million has been allocated to this project. The target for lab accreditation is June, 2015.

14. **Potato seed standing.** Principal investigator: Ms. Sogoing Denano.

    Status: Working with NISIT and FPDA. Expected date for completion of the final draft: March 2015, and proposed place for meeting is Goroka.

15. **Development of Quality Management Manual for LAE biscuit Company.** Principal investigator: Ms. Sogoing Denano.

    Status: A manual is being developed for the use of Lae biscuit factory. Target date for completion is October 2015.

16. **Development of draft Food safety policy.** Principal investigator: Ms. Sogoing Denano.

    Status: Jointly working with the National Department of Health.

17. **Nutrition research: formulation of Protein-Energy Rich Feed for the HIV/AIDs malnourished children.** Principal investigator: Ms. Rag Gubag Sipou (till 2014); Dr. Lydia Yalambing (from 2015). Funded by the National Department of Health, PNG [9,400 USD].

    Status: Trials were carried out. Drying of starchy tubers, peanuts and soybeans as well as fish is the most important unit operation of the whole project. Thus due to unavailability of drying equipment there was limited trials done. Micronutrients will be sought from a supplier in Singapore. Project due date: June 2016.

Completed projects

1. Green synthesis of silver nanoparticles, characterisation and antimicrobial activities of biologically synthesised silver nanoparticles of Pittosporum f. Dryand [1200 USD, funded by PNGUT Research Committee] – Jul ’13 to Sep ’14. Principal investigator: Dr. S. Gopalakrishnan.

2. Exposure of Food Crops and Fishery Products to Cadmium in the Volcanic Areas of East New Britain Province and Their Potential Health Risks [3100 USD, funded by PNGUT Research Committee] – undertaken by Ms. Kundo Hundang for M.Phil. degree (Feb ’13 to Nov ’14). Principal supervisor (from Jun '14 to Nov '14): Dr. Janarthanan, G.

3. Studies on traditional salts used in Eastern Highlands and Morobe provinces of Papua New Guinea [3900 USD, funded by PNGUT Research Committee] – Jul ’13 to Nov ‘14. Principal investigator: Dr. Janarthanan, G.

Applied Chemistry Section – Ongoing research projects with final year students, 2015

No.	NAME	Project Topic	Supervisor
1	JOE Apala	Pharmacological Studies on *Piper celtidiforme*Opiz.(PIPERACEAE).Phase 2: Bioassay guided isolation of active constituent(s)	Mr. J. Wau
2	VERONICA Api	Studies on *Morinda citrifolia* oil. Phase2: Validation and comparison of *Morinda citrifolia* “noni” oil against existing claims and results	Mr. J. Wau
3	UNDIAX Ben	How safe is our drinking water on campus?	Mrs. Puy
4	RAYMOND Enep	Determination of Minimum Inhibition Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of Silver Nanoparticles	Mr. D. Timi
5	JASON Iyap	Determination of Minimum Inhibition Concentration (MIC) and Minimum Bactericidal Con centration (MBC) of Silver Nanoparticles	Mr. D. Timi
6	MAX Kambase	Determination of Phytochemicals, Syntheis of AgNps from Bryophyllum inophylum, and comparison of size of AgNps	Dr.S.Gopal
7	KAVIE Kambiri	Syntheis of AgNps from Alstonia Scholaris and Antifungal activities	Dr.S.Gopal
8	LEONNIE Kanau	Preparation and analysis of vegetal salts from two foliage collected from Aseki village	Dr.G.Jana
9	LUCINDA Karagu	Assessing the loss of chromium from CCA treated timber	Dr.S.Akoitai
10	MARSHALL Kilala	Syntheis of AgNps from Bridelia Minutiflora Hook and studies on Antimicrobial &Antifungal activities	Dr.S.Gopal
11	IAN kuta	Oxalate content in common vegetables	Dr.G.Jana
12	Maria Mai	Gold Analysis in Asaro River Waste Heavy Sand	Mr.D.Timi
13	PRISCILLA	Syntheis of AgNps from Acalypha Wilkesiana muell and Antimicrobial activities	Dr.S.Gopal
14	MARTIN	Studies on essential oils. Preliminary: Mathematical	Mr.J.Wau

	Marca	derivation and optimization of *Cymbopogon citratus* oil extraction method	
15	ANNA Mopio	Assessing the loss of copper from CCA treated timber	Dr.S.Akoitai
16	DEHU Nelson	Analysis of volcanic ash obtained from Mount Tavurvur of East New Britain Province	Dr.G.Jana
17	JEAN Novulu	Diosindigo A – A Possible Taxonomical Marker of the Family Ebenaceae	Mr.D.Timi
18	FLORENCE Ongoglo	Production of lye solution from ashes continuation from last year	Mrs.Puy
19	JEREMIAH Raymond	Chromium in soils around CCA treated soils	Dr.S.Akoitai
20	TIM Walker	Preparation and analysis of vegetal salts from the garden foliage of Unitech campus	Dr.G.Jana
21	DUNU Zavitave	Copper in soils around CCA treated poles	Dr.S.Akoitai

Food Technology Section Final Year Ongoing Research Projects, 2015

No.	Student Name	Project Title	Supervisor
1	Joyce Bilua	The microbiological quality of water/cordial	Rag Gubag Sipou
2	Michael Nano	Further studies on second generation biofuel development from cocoa pod wastes	R. Nigo
3	Maur Veronica	Concluding Studies on design and manufacture of solar sorption refrigerator	R. Nigo
4	Stephanie Joppa	Further Studies on Operation of mini Digestor for BIOGAS PRODUCTION using factory (fish), market and farm wastes as a alternative for clean energy source in food processing	R. Nigo
5	Vennesa Abo	Animal Feed (Pallet) Feeds using Hybrid Drying System: Feed Production Using Solar-Wood Hybrid Drying System	R. Nigo
6	Joshua Tame	Zero Waste Approach to Biodiesel Production from Coconuts	R. Nigo
7	Theresa Moris	Further studies on mineral content of indigenous green leafy vegetables of PNG.	Dr. L. Yalambing
8	Tanya Silingin	Micronutrient fortification and formulation studies	Dr. L. Yalambing
9	Kaka Kautia	Determination of fat and NaCl in canned meat products sold in Lae.	Dr. L. Yalambing
10	Henry Krisby	Determination of beta-carotene content (chemical method)of indigenous banana varieties of PNG	Dr. L. Yalambing
11	Naroko Ada	Nutrition survey; data collection on malnutrition and micronutrient deficiencies in and around Lae, Morobe Province.	Dr. L. Yalambing

12	Dickson Tombo	Further Studies into the Antibacterial Properties of Selective Indigenous Vegetables and Fruits in Lae.	E. Nasing
13	Joa Krihive	Quality Assurance studies : Nestle PNG Ltd	E. Nasing
14	Stephanie Lema	Food Product Development and Safety Studies on Molases: Ramu Agro Industries	E. Nasing / R. Nigo
15	Venesa Vindu	Further Studies on Virgin Coconut Oil (VCO) extraction using enzymes (mannanase) from digestive gland of Giant African Snail (GAS).	Z. Toksy
16	Kolkia Kerenga	Further Studies on Formulation of protein-energy rich feed for children to elevate malnutrition	Z. Toksy / L. Yalambing

DEPARTMENT OF ARCHITECTURE AND BUILDING

Acting Head of Department: Mr. Daniel Wasi

Research interest for the staff members from the Architecture and Building Department are as follows;

Academic Staff	Research Interest
Daniel Wasi *Principal Technical Instructor & Acting HOD*	1. Building Construction Waste in Papua New Guinea 2. Motivation and Performance of Indigenous Contractors. 3. Small National Contractors Management skill development 4. Safety and Cultural obligation of Small National Contractors 5. Motivation and Productivity of Small National Contractors 6. Growth of Small national Contractors
Professor C Gonduan *Architecture Course Director*	1. User Behavior in Institution Housing: a periodic observation and assessment of indigenous user behavior in PNGUOT housing. 2. Environmental Stress: An assessment of the built environment wear and tear in response to user overload. 3. Shifting Cultural Influence in Domestic Architecture Design in Indigenous Environments and Societies 4. Bamboo Ply as alternative Building Material in Rural PNG.
Dr. Andrew Sariman *Senior Lecturer*	1. Thermal Performance of UNITECH Housing 2. Design Faults in Existing Housing 3. Climatic Data for Architects in Papua New Guinea 4. Effectiveness of Shading Devices 5. Design Studio Learning 6. Thermal Performance Comparison Between Steel Metal and Traditional Thatched Roofs 7. Quality of Concrete Masonry Block Manufactured form Sand Obtained from Sea Shore around Papua New Guinea 8. Building Energy Studies
Ali Bou *Principal Tech Instructor*	1. Natural Preservation of Wooden Marine House Pile for Coastal PNG 2. Convenient Roofing for Rural PNG 3. Mangrove Farming: Future Sustenance for Coastal Rural PNG 4. Convenient Flush Toilet for Coastal Rural PNG
Jerry Walliah	1. The utilization of Building Quantity Surveying and Estimating

Senior Tech Instructor & Building Course Director	skills in PNG 2. The Building Construction Health and Safety Practices: Understanding the structural construction safety practices in PNG 3. The suitable portable concrete block machine for rural development 4. The suitable portable concrete paving machine for rural development
George Elisha *Senior Technical Instructor*	1. Construction defects in small scale building construction in Papua New Guinea. 2. Cost economics of small scale building superstructure.
Austin Polin *Lecturer*	1. PNG Vernacular Spatial Domestic Design Experience, "Formal versus Informal" – A Potential knowledge base towards "Melanesian Academia". 2. "Floating Architecture" of the Titan People of Manus - Past, Present & Future 3. Bamboo Ply as alternative Building Material in Rural PNG. 2009 – 2013 (Co-study with Prof. C. Gonduan) 4. Culture as a Social Indicator in Melanesian Spatial Architecture – A Case Study on Alhoga Village, Misima Island
Christopher Dobunaba *Technical Instructor*	1. Urban development and Land-use in Papua New Guinea 2. Urban design and urban landscape architecture in urban PNG settings.

List of Publication

There are not staff publications in 2014, due to heavy teaching load and review of the course (Architecture and Building Course). This is a major review that will see a reduction of the undergraduate architectural program from five years to three years with the introduction of a Masters of Architecture program in the last two years. The reduction is in line with the major shift in architectural education in the region, where architectural schools in the region have reduced their undergraduate program to three years.

DEPARTMENT OF BUSINESS STUDIES

Acting Head of the Department: Mrs Frieda Siaguru

Priority Research Areas of the Department

Research in broad areas of accounting, general management, economics and information technology are encouraged in the department.

Work in Progress

Yamarak, L. (Working paper): The Effects of Rural-Urban Migration on Household Livelihoods in Rural Communities: A Case in Point of Wau – Bulolo Communities: PNG University of Technology, LAE, Morobe Province, PNG.

Yamarak, L. (Working paper): The Effects of Rural-Urban Migration on Household Livelihoods in Urban Communities: A Case in Point of Port Moresby: PNG University of Technology, LAE, Morobe, Province, PNG.

Mainga, W. Project learning in Project-based firms in Papua New Guinea. Data Collection Stage.

Frieda Siaguru, Generational Effects on Training and Development in Papua New Guinea

Frieda Siaguru, Students Perception on Distance Learning in Papua New Guinea

Interest for future research

Londari Yamarak

- Inflation & Poverty: It's Relationship
- Poverty Mapping: How Poor are people living close to Mining Areas?
- Secondary School Fighting and its Impacts on the Students Attending Universities – A Case of First & Second Year Business Studies Students, PNG University of Technology.

Frieda Siaguru

- Training Needs Analysis of employees at PNG University of Technology
- Perception of Students on Student Services and Welfare in PNG Universities
- A Market Driven Approach to Service Quality in Higher Education

UG students' project & Supervisors,

As part fulfillment, final year students across the four programs supervised by faculty are involved in undertaking research work particularly in the area of management and economics.

Executive MBA students

Two students, BOGAN Nohoranie Norah and TODD Sarah graduated in 2014 and a further thirteen students listed below have fulfilled the requirements in 2014 and will graduate in April 2015.

AIDAN, Emily M
ALOIS, Brian
BASSYNU, Robin G.
CHALAU, Polapoi
ENARE, Emete
IBITALI, Patrick
ISMAEL, Albert
NOESE, Ivan
ONNEVAGI, Vincent
ROCKAYA, Taffo
SISSIOU, Gwen
TEREMA, Nelson
TOMALA, Kemas

Conferences

Yamarak, L. (2014). The Net Economic Impacts of HIV/AIDS in the Presence of HIV Treatment and Community Based Care: A Case of Papua New Guinea: Conference Paper at Research Science & Technology Conference 2014. University of Papua New Guinea.

Yamarak, L. (2014). Impacts of Migrations on the Livelihoods of Urban Settlers: A Case of Port Moresby: Lae, Morobe Province. [UNISTAFF 9222] Unitech Research Committee Seminar 7/2014.

Gipe G J, (2014), Trends and changes of Gross Domestic Product and Budget Expenditure of PNG: Has economic development also been taking place? 2014 PNG Update Conference: PNG Economic Boom; Opportunities and challenges, Jointly organized by School of Business Administration and Australian National University, 12th and 13th June 2014, UPNG, Book of Program and Abstracts, p. 10.

Gipe G J, (2014), Sustainability of Long-term Total Public Debt of Papua New Guinea, 6th Research Science and Technology Conference, Promoting responsible sustainable development through Science and Technology, The PNG Way, 17th-21st November 2014, UPNG, Conference Abstracts and Information Handbook, Abs A73_PR_3: p.127.

Gipe G J, (2014) The Keynesian Marginal Propensity to Consume and Consumption Function, An application with respect to Gross Domestic Product and Budget-Expenditure of Papua New Guinea, 1967-1990, 2ND International conference on Pure and Applied Mathematics, ICPAM-Goroka (2014) 8 - 12 December, 2014 p.9

Frieda Siaguru, (2014) Generational Effects on Training and Development" PNG Human Resource Institute Annual Conference, Prot Moresby, Papua New Guinea

Mainga, W. & Muuka, G. (2014) Technology, Wage Premiums and Learning in South African Manufacturing Firms: Lessons for other Emerging Resource-based Economies, Six Economic Pillars Global Business Conference, Lae International Hotel, LAE, Morobe Province, Papua New Guinea, 11-14th November 2014

Publications

Mainga, W. (2014) Project Learning in Project-based firms in UAE; Lessons for other PBFs in Resource-based Economies, Australian Institute of Project Management National 2014 Conference, Brisbane, Australia, 12-15th October 2014. (Unpublished, but currently under Journal review, see Journal details below)

Adimuthu .R, (2014) Examining the Role of Educational Leaders in Higher Education System in Papua New Guinea: Issues and Challenges, Journal of Education and Human Development June 2014, Vol. 3, No. 2, pp. 775 – 791 ISSN: 2334 - 296X (Print), 2334 - 2978 Copyright © The Author(s). All Rights Reserved. Published by American Research Institute for Policy Development.

Sun Z, Strang K & Yearwood J (2014) Analytics service oriented architecture for enterprise information systems, CONFENIS 2014, 4 - 6 Dec 14, Hanoi. i*n:* Proceedings of iiWAS2014, ACM, pp. 506-18, http://dx.doi.org/10.1145/2684200.2684358

Currently under review for Journal Publication

Mainga, W. (2014) Project Learning in Project-based firms in UAE; Lessons for other PBFs in Resource-based Economies.
Submitted to "International Journal of Project Management".

Mainga, W. & Muuka, G. Technology, Wage Premiums and Learning in South African Manufacturing Firms: Lessons for other Emerging Resource-based Economies.
Submitted to "Academy of Business Review"

Unitech Research Committee Seminar Presentation:

1. **Londari Yamarak**. Impacts of Migration on the Livelihoods of Urban Settlers: A Case in Point of Port Moresby

2. **Wise Mainga**. An Exploratory Study of Project Learning in Project-based firms in UAE; lessons for other Resource-based Economies

3. **Enrico C. Mina**. The University of Perpetual Help System DALTA (Philippines) Environmental Management Program

DEPARTMENT OF CIVIL ENGINEERING

Acting Head of Department: Mr Chris Kobal

Research interests for the staff members from the Civil Engineering Department are as follows:

Chris A Kobal, *Principal Technical Instructor and Acting Head of Department.*

Research Interests:

1. Coconut Timber – as a structural material. Coconut timber is currently not included in the Timber structures Design Code list of timber species available for use as a structural material for structural designers. The aim is to carry out tests on timber specimens.

2. Solid Waste Management – Domestic and Industrial Solid Waste. The aim is to properly dispose of these wastes. This involves determining the composition of these wastes, physical and chemical. Management includes collection, transportation, and disposing of these in properly designed, constructed and managed landfills. Work has started in the identification of these properties but more needs to be done in order to be able to propose alternative systems.

A two-year fulltime MSc Programme is now being prepared for submission to Postgraduate Committee for approval by the Academic Board.

Dr Graham P Atkins, *Associate Professor*

Research Interests: Flood Predictions

His PhD was based on data up to 1973. He intends to from where it stopped. This is a possible as Maters and/or PhD research topics.

Dr Mirzi Betasolo, *Lecturer*

Research Interest and Priorities

1. Material Engineering & Technology
   a) Concrete Technology
      - **RVA (Rabaul Volcanic Ash) Cement and fine aggregate –on going (need fund to prototype project**

   b) Nanotechnology & Sensors
   c) Structural systems
   d) Timber technology –
      - structural strength of local timber (to start this year)

   f) Recycling

   g) Utilization of local resources –
      - **Utilization of Areca (Betelnut) Husk for FRC- on going (need fund)**

h) Energy resources –

- **Energy Efficiency Design on Public Buildings (Unitech) – on going**

2. Engineering Education
   - **Framework on Paradigm Shift Learning in Engineering Courses- ongoing**
   - **Virtual Research Environment- on going**
   - **LMS in Blended Learning for Engineering classes at Unitech- on going**
3. Water Engineering
   - **a. Groundwater resources- on Going**
   - b. Turbulent flow– *to start this year*

4. Structural Engineering
   - **Structural Design and Performance of Reinforced RVA Structure (on going, need funds)**

5. Urban & City Management
   a) Technology Management – *Capsulation*
   b) Resource Management- *availability of shale resources in PNG*
   c) Safe & Resilient City
   d) Technicity – **GHG Monitoring in Lae City (Proposal made, need funding)**
   e) Urban Transport
   f) Sustainable Urban Land Use Planning
   g) Energy Efficiency in buildings – **on going** (**Energy Efficiency Design on Public Buildings (Unitech)**
   h) Designing Water Utility Reform

PG Research for Civil Engineering for 2014

PG Candidate	Program	Topic of research	Supervisor
Maling Ambranga	MPhil	"A Comparative Evaluation of the Structural Performance of PNG River Gravel using the Repeated Load Triaxial (RLT) Test – A Performance based Test"	Chris A Kobal
Pia Peter	MPhil	"The Impact of Organisational Culture on Project Strategy of Construction Organisations in Papua New Guinea"	Prof Yaip Telue Chris A Kobal
Grace Wantepe	MPhil	"Condition Monitoring of A Bridge"	Prof Yaip Telue Chris A Kobal

FINAL YEAR PROJECT RESEARCH 2014

No.	Project Title	Proponents	Supervisor
1	Industrial Waste Management. Management System for Domestic Solid Waste	Thomas Wesley	Mr Chris A. Kobal
2	STW 1. Unitech Storm Water Drainage Management	Kingsley Maiauka, Samson Urara, & Jerry Lui	Mr Chris A. Kobal
3	STW 2. Unitech Storm Water Drainage Mangement	Samuel Karsailo & Greg Manehugu	Mr Chris A. Kobal
4	STW 3 Unitech Storm Water Drainage Management.	John Lawrence & Junias Sorea	Mr Chris A. Kobal
5	Design & Application of High Strength RVA Cement	Allan Dromenge	Dr Mirzi Betasolo
6	Utilization of Recycle Paper as Paper Pulp for Reinforced Fibre Concrete	Avdoh Meki & Mary Krystal Daniel	Dr Mirzi Betasolo
7	Utilization of Areca (Betelnut) Husk in Fibre Reinforced Concrete	Pip Waku-Nong	Dr Mirzi Betasolo
8	Structural Design and Structural Performance of Reinforced RVA Structure	Elijah Chiru	Dr Mirzi Betasolo
9	Energy Efficiency Design on Buildings in Unitech	Pomat Ronald & Jesse Mamun	Dr Mirzi Betasolo
10	Investigation & Improvement of Existing Road Pavement Failure in Lae City, Group 1	Peter Mawa, Patrick Namba, Darren Yaku,	J. Novulu
11	Investigation & Improvement of Existing Road Pavement Failure in Lae City, Group 2	Albert Loo, Doreen Koembo, Darren Yaku, & Noel Martin	J. Novulu
12	Investigation & Improvement of Existing Road Pavement Failure in Lae City, Group 3	Hitolo Daure & Rosemary Enoka	J. Novulu
13	Pothole Studies and Implementation of New Pavement Technology in PNG	Walter Kameren, Win Keyape & Kelly Sau	M. Konzang
14	Scope, Design and Estimate of Ward 2 Road Network in Lae LLG	Jacob Eluap & Thomas Max	M. Konzang
15	Design of 65 Storey Building	Daniel Lo, Noel Martin, Jonathan Kaupa, Brian Toluana	Prof. Y. Telue
16	Bridge Design, Group 1	Erick Peter & Teddy Auro	Prof Y. Telue
17	Bridge Design, Group 2	Enoch Leka, Pius Koko,	Prof Y. Telue

		Lele Lulue	
18	Investigation and Upgrading of Existing Sewerage Reticulation System for Unitech	Kenes Derol & Erwin Mari	M. Embe
19	Feasibility Study and Design of Waste Water Treatment System for UOG	Joe Jeff & Collen Dickson	M. Embe

List of Publications

2013

1. Betasolo, Mirzi, (2013). *Utilization of Shale Concrete for the Low Cost Housing Industry (an Axiomatic Design),* ICAD & DCEE 2013 Conference Journal. 29 June 2013, Massachusetts USA , can be accessed thru http://www.mkthompson.net/wp-content/uploads/2013/09/DCEE-2013-14-Betasolo.pdf

2. Betasolo, Mirzi, (2013). Managing Technology in Papua New Guinea: The Papua New Guinea University of Technology Adaptation Approaches to Emerging Crisis. A poster presentation MEPEC (Middle East Processing Exhibition and Conference), 30th September - 2 October 2013, Kingdom of Bahrain.

2014

1. Nil S., Rao S., **Betasolo M.** (2014) *Virtual team members MOOK as a form of effective cooperation in distance learning//Education as factor in the development of intellectual and moral potential of the individual and modern society: Proceedings of the International Scientific Conference*, 4-5 December 2014/SPb.: Leningrad State University. Pushkin, S.45-51

2. Betasolo, Mirzi, (2014) *Axiomatic Design to Assess Influences Affecting Pedagogic – Learning in the courses Engineering Materials & Fluid Mechanics* –for ICAD 2014, 24-26 September 2014Lisbon Portugal, pp

3. Betasolo, Mirzi,Jayson Hallu, & Mr. Justin Kubul. (2014) *An Axiomatic Based Design Approach of Alternative Routes to the Congested Mendana Highway, Solomon Island*. ICAD 2014, 24-26 September 2014, Lisbon Portugal, pp.

4. Betasolo, Mirzi,Samson Gore, & Mr. Anthony Bii(2014) *Design of Sustainable Use and Management of Groundwater in Morobe Province of Papua New Guinea.*Proceeding of the 3rd International Workshop on Design in Civil & Environmental Engineering (DCEE) 21-23 August 2014 Denmark, pp 27-36, pp

5. Lae City GHG Monitoring Systemhttp://mnd.mx/jirb#.U1kmQJaeSm0.gmail).

6. Betasolo, Mirzi, Joseph Lelepo and Nicholas. Kaurea (2014) *Concrete Innovation Using Rabaul Volcanic Ash as Cement and Fine Aggregate in Concrete*. Book of Abstract CIC2014. 11-13 June 2014,Norway, pp. 67

2014 Conference Attended

1. ICAD 2014- Lisbon Portugal on 24-26 September 2014
and presented papers as follows:

- Axiomatic Design to Assess Influence Affecting Pedagogic –Learning in the courses Engineering Materials & Fluid
- An axiomatic Based Design Approach of Alternative Routes to the Congested Mendana Highway, Solomon Island

2. Nil S., Rao S., **Betasolo M.** (2014) *Virtual team members MOOK as a form of effective cooperation in distance learning//Education as factor in the development of intellectual and moral potential of the individual and modern society: Proceedings of the International Scientific Conference*, 4-5 December 2014/SPb.: Leningrad State University. Pushkin, S.45-51 (virtual attendance)

Dr. Ty Jones, *Lecturer*

Research Interests:

- Open Distance Learning (ODL) Environment & sustainable e-learning and teaching environment
- Studying asphalt's properties for PNG & Lae's conditions
- Effects of EMF (Electromagnet field) applications to human health and environment in Lae –PNG
- Landfill's environment

Conference to Be Attended:

- World Conference in South Africa- October 2015

DEPARTMENT OF COMMUNICATION AND DEVELOPMENT STUDIES

Acting Head of Department: Dr Garry Sali

The Department offers a 4-year professional program and has two sections: A Communication for Development (C4D) Studies and a service-course sequence in English for Academic Purposes (EAP) for students across all disciplines of the University; and, a professional program Communication for Development, which offers both Diploma and Degree Programs to train liaison and community development and public relations officers for resource development companies, government departments and non-government organizations.

In 2009, the Department began offering a Master's in Communication Studies (MCS) program. This program has both a course work and a dissertation component, where the students write a research paper on an appropriate topic in the final semester of their second year. In addition, a Master's of Arts in Organizational Leadership is offered in Cooperation with Development Associates International (DAI), The Christian Leadership Training College of Papua New Guinea (CLTC) and the Pioneers of Australia.

The Department has the following academic staff, with their positions and research areas of interest being:

Name of the Faculty/Position/Research Interest

Dr Eric Gilder
Professor

Higher education policy, communication theory and practices across intercultural contexts, radio-TV history and legal aspects of broadcasting and the socio-psychological aspects of the communication process.

Dr Golam S. Khan
Associate Professor

Areas of international migration, urbanization, health sociology, political economy, research methodology (qualitative) and family dynamics.

Dr Garry Sali
Associate Professor and A/Head

Sociology of crime and deviance, prison systems, crime and development, and law and order problems in PNG.

Dr Rachael Aisoli-Orake
Senior Lecturer

English as a Second Language writing, Education/English curriculum and pedagogy, English for Academic Purposes, Cross- Cultural communication, development and responsibility and participatory research.

Justin Kehatsin
Senior Lecturer
Conflict resolution

Mary Kunenda Aisi
Lecturer

Development communication, gender and leadership, and mass media.

Imelda Ambelye
Lecturer

Topics education for sustainable development and communicating sustainable development.

Joshua Frank Kuri
Lecturer

Language development and practices via bilingual education; practices and effects of communication across developing societies.

Sheryl S. Makara
Lecturer

Emotional intelligence and leadership, critical thinking, communication in crime and sociology with relations to development, community development and participation.

Wilma Molus
Lecturer

Sociology of children, sociology of deviance and crime.

Michael Winuan
Lecturer

Means by which agricultural messages are communicated to farmers: A case study of OPIC and small-holder oil palm out-growers at Buvussi and Sarakolok sub-divisions in West New Britain Province.

Rhonda Lakele Eva-Gwale
Principal Technical Instructor

Information management, traditional knowledge, changing societies and gender issues.

Ngawae Mitio
Technical Instructor

Local community affairs/local governance

List of Publications/Conference Presentations- Participation and Seminars

Aisi, M. (2014). Communication strategies significant in achieving positive outcomes in politics for women in Papua New Guinea. *Journal of Communication and Development Studies* 1 (1): 82-103.

Florea, S. and Gilder, E. (2014). A risk to graduate preparation and lifelong learning in the knowledge-based borderless society: the scourge of "diploma mills". *Conference Proceedings 2 of The Knowledge--Based Organization: The 20th International Conference ("Economic, Social and Administrative Approaches to the Knowledge-Based Organization)*. "Nicolae Bălcescu" Land Forces Academy Publishing House, Sibiu, Romania (pp. 226-34).

Florea, S., Gilder, E. and Wells, P. J. (2014).Where have all the characters gone? Understanding the changing *ethos* of higher education and the reclaiming of "being" in higher education. Presentation, 10th World Congress, "The Human Being: Its Nature and Functions"
The International Society for Universal Dialogue, University of Craiova, Romania, 4-9 July (second author presented).

Gilder, E. (2014).*Knowledge production in European universities: states, markets, and academic entrepreneurialism* by Marek Kwiek (Book review). *European Journal of Higher Education* 4 (2): 201-04.

Gilder, E. (2014). *Nice work if you can get it: life and labor in precarious times* by Andrew Ross (Book review) *Management of Sustainable Development* (Journal of the "Lucian Blaga" University of Sibiu, Romania) (in press).

Gilder, E. (2014). Bologna process researchers conference: "future of higher education," The Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Bucharest, Romania, 24-26 November (Invited Participant).

Gilder, E. (2014). Seminar presentation in rhetoric and oral communication, "A rhetorical analysis of Malala Yousafzai's speech at the youth takeover of the United Nations, 12 July 2013." Faculty of Letters and Arts, Department of Anglo-German Studies, 18 November.

Gilder, E. and Hagger, M. (2014). The British *interregnum*: A yesterday that never happened. 11th International Conference, Cultural and Institutional Memory as [a] Means Of Progress, The Department of Letters and Foreign Languages of The Faculty of Social, Humanistic And Natural Sciences, Hyperion University, Bucharest, Romania, 5 March (Skype participation).

Gilder, E.and Khan, G. (2014). The intellectual and pragmatic dimensions of 'growing knowledge' in a transitioning pacific economy: two views of communication and development studies as a vehicle for sustainable progress in Papua New Guinea. *Conference Proceedings 2 of The Knowledge--Based Organization: The 20th International Conference ("Economic, Social and Administrative Approaches to the Knowledge-Based Organization)*. "Nicolae Bălcescu" Land Forces Academy Publishing House, Sibiu, Romania, 2014 (pp. 242-50).

Gilder, E. and Khan, G. (2014). Promoting research literacies of postgraduate social science students in PNG: Two "close reading" perspectives from afar. Presentation. 2014 Literacy Conference, Reading Association of Papua New Guinea (RASPNG). UPNG, Port Moresby, 13-14 November (second author presented).

Gilder, E., Khan, G. Sali, G., and Orake, R. (Eds.) (2014). *Journal of Development and Communication Studies* 1 (1).

Khan, G. (2014). Foundations of gender inequity issues in Bangladesh: patriarchy or religion? *Growth, Globalization and Governance: Promises and Challenges,* Prof. Swapan Kumar Majumdar, *et al*. (Eds.), Excel India Publishers, New Delhi. December.

Khan, G. (2014). Politics of partition-migration and the economic instability of the East Bengal Hindu migrants: Evidence from the fieldwork. *World Applied Science Journals* 30: 326-331, March 2014.

Khan, G. (2014). Pre-eminence of urban culture and apparent conflicts amongst the Bengali Hindus in Kolkata,*American Journal ofSociologicalResearch*4(3), May.

Khan, G. (2014). Effective teaching methodologies in the south-Asian universities in contemporary period, Workshop, University of Chittagong, Bangladesh, 9-12 December.

Mihăilescu, C. and Gilder, E. (2014). Kazuo Ishiguro's *The remains of the day* approached via Friedrich Schiller's theory of the naive and sentimental writers. Presentation. East-West Cultural Passage Conference: "Changing Places." The Faculty of Letters and Arts, "Lucan Blaga" University of Sibiu, The Academic Anglophone Society of Romania and The Centre for Anglo-American and German Research, Sibiu, Romania, 29-31 May (first author presented).

Molus, W. (2014). The role of intra-communication and inter-communication processes in motivating female children to engage in commercial sex practices in Lae, Morobe Province, Papua New Guinea. *Journal of Communication and Development Studies* 1 (1): 63-81.

Sali, G. (2014). Crime challenges the development path of Papua New Guinea. *Journal of Communication and Development Studies* 1 (1): 33-47.

Sali, G. (2014). Seminar presented on "Law and order problems in Lae with particular reference to rascal gangs in Lae", 22 April 2014. Department of Communication and Development Studies, Papua New Guinea University of Technology.

Sali, G. (2014). Seminar presented on the "MDGs and human development course at the CDS Department", Department of Communication and Development Studies, Papua New Guinea University of Technology, 27-30 August 2014.

Wells, P. J. and Gilder, E. (2014). *Beaujolais Ed-Nouveau*: Decanting the importance of life-long learning in the challenging, changing Europe of 2020. 4th International Symposium "Shaping Europe 2020: Socio – economic Challenges," Pro Global Science Association, Bucharest, Romania, 14-15 November (second author presented). This paper is also published in *Review of Applied Socio- Economic Research* (Volume 8, Issue 2/2014), pp. 219-29. (See: http://reaser.eu/RePec/rse/wpaper/REASER8_23Wells_P219-229.pdf)

DEPARTMENT OF ELECTRICAL AND COMMUNICATION ENGINEERING

Acting Head of Department: Mr Moses Kavi

Areas of Research

1. **Renewable Energy Sources for Morobe Province and future National Smart Grid for PNG.** In this work a study of renewable energy (RE) sources available in PNG with a focus on the Morobe Province is carried out, while mapping for Wind energy and Solar energy potential in the whole of Papua New Guinea is done. Following the identification and calculations of significant RE resources in certain areas, the work will design and optimize the connection of the RE sources not only to local town/village residences, but also to the main Ramupower grid, which is largely driven by hydroelectric power and increasingly by diesel generators. One paper was presentedat the Grand Renewable Energy conference (in Japan) to which the research candidate travelled supported by the University of Technology.

   Researcher Team: S Aiau (leader and PhD candidate, A/Prof Dr K Pirapaharan and Prof Paul Hoole. In 2015 the new member of staff Dr. Peter Kiss is expected to contribute to this program with the possibility of his taking over the supervision of Mr. Aiau, who is working towards his PhD at the University of Technology)

2. **Characterization and Measurement of and Protection against Sub microsecond travelling surges generated by high-voltage arcing across overhead line insulators**. The work is aimed at reducing the costly and significant amount of damage done by power transients generated at sub microsecond time scales, based on measurements done on the Low Voltage distribution systems, and mathematical, modelling and simulation of these transients to better understand and protect electronic, computer and telecommunication equipment and systems. One paper was presented at the Grand renewable Energy Conference, and an additional paper at the International Lightning Protection Conference. It is expected that the work will be carried on (in 2015) at the Queensland University of Technology by Mr. Moses Kavi, the research leader.
   Research Team: M. Kavi, Prof. Paul Hoole and A/Prof Dr K. Pirapaharan

3. **Array antennas and signal processing for Underground Mine telecommunication systems. I**t is recognized that wireless communications in the underground mines will have advantages over the wired (e.g. using leaky wave cables) telecommunication systems currently used in underground mines – including for the location and communication with miners trapped by tunnel collapse or explosions. However the underground mine presents a formidably harsh environment for space waves radiated by antennas. In this work a new design for array antennas is sought, with appropriate measurements of underground signal propagation measurements done to design against interference due to multiple reflections from the cave surfaces as well tunnel bends and junctions. Initial work has made progress in

the design of an array antenna that is simple in structure but will generate a single beam with significant reduction in additional beams which lead to waste of battery power as well as multipath signals emanating from the unwanted side lobes. This will also cut down on the need for reflectors which are commonly used in above ground wireless telecommunication systems. The main researcher, Mr. Herman Kunsei is expected to continue the research towards a PhD degree in Queensland. He is expected to leave in June 2015. Currently (2015) he is preparing a paper for an international conference based on the initial results.
Research Team: Mr. Herman Kunsei, A/Prof Dr. K Pirapaharan and Prof Paul Hoole.

4. **Design and Protection of Aircraft against Severe Electric Storms: with special reference to increasing use of Carbon Composite Material in aircraft body.** To make aircraft lighter and faster, both commercial aircraft (reduction in fuel) and military aircraft (allowing for faster maneuvers when combating enemy aircraft) increasingly use carbon composite material. These have less withstand power to lightning strikes, less shielding effectiveness for internal electronic system and demand a different geometrical structure to reduce the effects of severe electric storms. Moreover, with climate change and increase of earth surface and atmospheric temperatures, the thunder storms are expected to increase in severity calling for different strategy to handle future threats to land, sea and air borne systems and devices. The research work has successfully modelled and simulated realistic scenarios of aircraft-lightning electrodynamics to generate and analyze transient currents on aircraft surfaces which are almost impossible to measure when direct hits occur, as recent work on this at the Netherlands National Laboratory has shown (aircraft are deliberately flown into thunder storms). Three conference papers and two journal papers were published in 2014 in this area. The team leader Mr. Joe Fisher is working towards a PhD at the University of Technology.
Research Team: Mr. Joseph Fisher, Prof Paul Hoole and A/Prof Dr K Pirapaharan.

5. **Additional Researchand Innovation work** done at the Electrical and Communication Engineering department (with international collaboration) which have led to publications are:
   - 5.1 **Multi-element array signal processing** for mobile station safety and communication systems,
   - 5.2 **Signal pattern recognition** for signal localization as well as signal processing for source information extraction.
   - 5.3 **Computer Based Electromagnetic Device Analysis and Education** for reverse design.
   - 5.4 **Eddy Current based Non-destructive Testing using Graphics Processing Unit GPU**-based Laptops

6. **For Action** (University Research Administration): Given below is also our **Research and Innovation Plan Report**, though submitted about one year ago (2013) has not resulted in any further discussion with the Administration regarding support and infrastructure to take research at ECE Department on to higher levels and long term sustainability. As a team of researchers the department seeks to hold three essential Principles: Trust, Integrity (including transparency) and Collaboration.

7. A matter of concern: although we have tried to include senior undergraduate students in **research related undergraduate projects**, thus far there has been little, if any, success. The ECE department also intends to commence a taught Master's degree program once we have a minimum of four PhD holders on the ECE Staff. But the several **Research Seminars** that we conducted at the department in 2014 had a full house attendance including many undergraduate students participating.

ECE Research Plan Phase 1: 2014-2016

(Final Phase 2: 2017-2019)

CONTENTS

1. Preamble

Electrical and Communications/Computer Engineering, arguably, is the most interdisciplinary of all technical subjects at a University. It is found in almost every single discipline whether it is word processing and **data mining**, computer technology based **surgery**, **detection** of hostile face in a crowd through image processing, monitoring the soil property and fauna of a **farmland/forest** through multisensory network or in **satellite monitoring** of ocean, land use and abuse. Electrical and communication technology is used in the advanced systems of deep space technology. It may be used in a remote village to assist the villagers, nurses and doctors **to identify disease** from symptoms reported or logged in (using English or Pidgin) and the medicines to be prescribed from an intelligent off-line computer that rapidly mines and plays the role of the medical doctor in diagnosis and prescription. Connect a blood pressure measuring electronic device and a temperature measuring sensor to the computer, it becomes an "on line" computer in a village which can sometimes even do better than a **medical doctor and a nurse** for certain diseases if at the basic research level the partnership between the medical doctor and engineer has produced a **very intelligent diagnosing system**. Energy Systems Analysis where an electrical engineer works together with those in natural, applied and social sciences can enable **the government** not only to effectively deploy energy resources, including renewable energy, but also to effectively plan and make policies regarding energy generation and distribution and energy saving.

Since University of Technology is the premier University of Papua new Guinea in Technology, especially in the engineering disciplines, it is indeed pertinent that the research plan should aim at projecting and developing it as a leading institute in the Oceania, producing undergraduates that are competent to be top class engineers and leaders, able to position themselves as **advisors and wealth generators** for the community. Moreover, it is pertinent that that the University should generate **new knowledge and new technology that is relevant to the local and national needs**, including that which will take away dependence on hiring expertise from abroad but make Papua New Guinean engineers and researchers as able to provide the needed technical and research expertise to attract foreign industries to invest in Papua New Guinea and **produce a local job market and economic benefit** to the nation.

To be **second class** or lower in undergraduate and postgraduate education and research is to be perpetually dependent on expatriate expertise in engineering and research, with the local graduates and researchers being dependents and a burden until the national wealth is exhausted. Hence as a leading department in engineering our vision is set on producing undergraduates and postgraduates trained **in state of the art technology and research techniques and findings** that will make us as a department able to compete with the best of Universities in the Oceania, and, we hope one day, globally.

Teaching, Learning and Research and Innovation of a fast advancing engineering science and technology are the tasks that face the Electrical and Communication engineering department. Moreover, with the rapid decrease in the price of computer technology and electronic, electromagnetic sensors there are now more problems open to solutions by electrical and communication engineers within reasonable costs, an ability to manage large amount of data (large computer memory available in small chips) and at rapid speeds (faster microprocessor and communication speeds through light speed wireless and optical fiber systems).

For a basic description of what is research and innovation, please see Appendix1.

2. Vision

Cutting edge teaching and research programs that are based on experimental based courses and high impact research

Amongst the top 20 electrical communication/computer engineering-discipline departments in the electrical and communication engineering discipline in the Oceania at the end of next three years.

Internationally recognized research and technical leader for Papua New Guinea, at the end of the three years, in two of the three major research clusters

3. Specializations in Electrical and Communication Engineering

Considering the trends and needs in the local, national and international scenario, we envisage that at the end of the entire phases one and two of the research plan, the department would require electrical and communication engineering graduates with specializations in the following ten areas:

1. Power/Energy Systems 2 members of staff.
2. Telecommunications engineering. 2
3. Computer engineering 2
4. Sensors, Systems and Signals Engineering, 2
5. Renewable Energy Systems, 2.
6. Control and Systems, 2
7. Climate and Severe Weather Engineering, 2
8. Agriculture and Environmental Engineering, 2
9. Biomedical Engineering, 2
10. Music and Sound Signal Processing, 2

In the current situation of academic members of staff (see Appendix 2), only two (both expatriates) have earned doctorates and the others are with Master's degrees. Immense amount of will, vision, good cooperation between the **Administration and Academia**, persevering work and moral commitment are needed to accomplish the position where we should be.

4. Academic Priorities and Basic Commitments

The major **academic priorities** for **phase one (2014-2016)** of the research plan will be the following:

1. Integrate Research with Teaching and Learning
2. Local and national: connecting with the community
3. Recruitment of the best talents nationally and internationally – and retaining them.

An **additional three priorities** could be added when the **Phase 2 (2017-2019)** of the research plan is ready at the end of the first three years. One of the priorities for Phase 2 will be **Sustainability** where we project that about 70% of the full academic carder will be filled with national members of staff, of which a minimum of 80 % will have PhDs) and the rest with competitive expatriate

members of staff expert in one of the ten specializations and able to work together giving significant research leadership in the global scenario.

Our **basic commitments**, in keeping with these priorities are:

1. A department that is fully **integrated with Papua New Guinea industry and community**, changing society and creating wealth.
2. Depth of **quality and multidisciplinary in learning and applications** through class room, laboratory and research programs which have measurable outcomes.
3. Research and Innovation work that is **beneficial to the local community** and contributes to **knowledge and experience to international challenges** in science and technology and their functions in society.

5.Research priority (2014 – 2016)

In Phase 1 (2014-2016) we have only one research priority, which is to: Match the strengths of the department with opportunities for high impact research in Papua New Guinea (see Appendix 2 for one of the three Phase 1 Clusters). Additional two research priorities will be defined and aimed at once this basic research priority is accomplished. Under this single agenda we will seek to:

(a) Recognize and reward significant contributions and seek to get undergraduate students fully involved in industrial and research projects.
(b) Develop the department to meet the local, provincial, and national demands on our engineering profession.
(c) Redesign the department is able to compete with the leading Universities in neighboring countries, especially Australia.
(d) To set the initial stages, to be fully pursued in Phase 2, to match the strengths of the department with opportunities for high impact research in Papua New Guinea

6. Research Clusters (2014-2016)

Over the next three years we shall seek to develop the following three research clusters:

1. Smart and Renewable Energy Systems: Technology, Planning and Policies
2. Communication, Information and Sensor Systems
3. Climate and Environmental Engineering

For a more complete set of clusters, we envisage another four to be added. However, some of the others are already active in some of the research projects proposed within the above three clusters. **Space-Earth Technology** (a needful cluster) is used in the form of Geographic Information System (GIS) in developing the Renewable Energy research on solar and wind energy, as well as tidal energy potential in Papua New Guinea; moreover in developing the Geospatial Information System (GSIS) for Power Systems distribution maintenance and future expansion, the Space map of Papua New Guinea cities will be used to track present and future street and building locations.

7. Aims

1. Fully integrate undergraduate teaching and learning program with research
2. Establish active, full time PhD degree research in each cluster
3. Establish active, full time and part time MPhil degree research in each cluster
4. Commence a full time and part time taught Master's course to be held in the capital or at Lae campus.
5. To produce three PhDs and a minimum of 15 MPhil/Master's students at the end of Phase 1.

8. Strategies (2014-2016)

2014

1. From 2014 onwards, a minimum of three **PhD degree research** to be conducted at the department.
2. From 2014 onwards, a minimum of 10 full time or part time **MPhil research** programmers conducted by the department.
3. In each semester hold a minimum of five research or research related **seminars**.
4. By the end of 2014, recognizing the fact that many conferences and journals are substandard, the department will set out a **list of approved ECE conferences and journals** to be submitted to the University.
5. From semester 2, 2014 onwards all **expatriate members of staff** be divided into Teaching and Research streams. Those in the **Teaching stream (TS)** will do up to 18 hours of student contact work. They will be encouraged to do enough research to publish one first-author conference paper each year. Those in the **Research stream (RS)** will do a maximum of 6 hours undergraduate student contact work, supervise a minimum of 2 graduate students and produce a minimum of 1 conference paper and 1 journal paper in each semester.
6. From the middle of 2014 onwards all **national members of staff** shall be divided into similar streams (TS and RS) as the expatriate members of staff. Those doing research (including PhD and Master's candidates) will do a maximum of 6 student-contact hours, and publish a minimum of 1 national/international conference and journal paper each year.
7. By the end of 2014, a list **of laboratory technicians** willing and in a position to assist in research work will be identified and allocated to work with the national members of staff doing research, both in the research work and in translating the research to undergraduate projects. Their work and contribution will be recognized and rewarded according to a set of policies drawn to accommodate this new category of technical officers.

2015

8. A completely revised and **upgraded undergraduate syllabus** to be produced by the end of 2014, to be implemented in 2015 semester 1 or semester 2. The revision will be led by those in the Research Stream (RS), in cooperation with those in the Teaching Stream. The TS will be responsible to those in RS to teach up to standards set in the new syllabi.
9. In each semester hold a minimum of five research or research related **seminars**.
10. A new, **taught course Master's degree programme**, drawing on the expertise in the department, including courses and syllabi, be produced and implemented by the middle of 2015.
11. From the beginning of 2015 onwards, the department actively seek**support fromprivate and government departments** to support purchase of new equipment and support of research related work ad publicizing of results.

12. Each member of staff to recognize his/her strength and productively contribute to one of the major research clusters. From the second year (2015) onwards those in the RS **producing a minimum of one conference and one journal paper each semester**, co-authored with either fellow members of staff or students.

2016

13. By the beginning of 2016 the **three research clusters** should be formed.
14. From semester 1 of 2016 onwards, a minimum of 50% of the undergraduate final year projects (FYP) should be research-based projects, with the rest being industrial projects.
15. In the first semester of 2016 form an **Industrial Advisory Panel** (IAP) that shall meet either once a semester or once a year under the Chairmanship of the Vice Chancellor or one of the Pro-Vice Chancellors. At this the head of ECE shall give a progress report on the department. And at the first meeting the new syllabi, research and other activities of the department shall be submitted for scrutiny and advice from the IAP.

Support (2014-2016)

16. From the beginning of 2015 onwards the department will actively seek support from **private and government industries** for purchase of new equipment – including the hands-on training of technicians in all new equipment - and for research and research related publicizing of findings and results.
17. Seek Support for **handling charges** for one to two journal paper(s) per year for each member of staff, where the numbers will naturally be more for those that work and produce together with other members of staff.
18. Seek Support for national members of staff to spend some months, if the opportunity is available and they make adequate progress, to spend **a period of time with their external, international supervisor and his University**, continuing his work there. Where a **transfer degree** is possible, and approved by the Universities, support the transfer of registration and a longer period of time in the University abroad to complete the PhD abroad.
19. Seek Support for the **external supervisor** to visit us here, and teach one modular course (possibly involving final year undergraduate students and engineers from the industry) and speak to others interested in co-researching with him/her in the specific field of expertise.
20. Seek Support for a **one day symposium** with papers and lectures from students and experts from members of staff to which the local industry participation will be encouraged.
21. From the second year (2015) onwards, seek support for a **one national conference** each year
22. Seek Support for members of staff to attend and present papers in the **best international conferences** identified by an internal committee.
23. Seek Support for the annual or biannual meetings of the **IAP**.
24. After 3 years (end of 2016) seek support for **a review of the department** by a committee consisting of a minimum of one industrialist and one academic expert from abroad.

Appendix 1: What is Research and Innovation?

Universities are now evaluated on the basis of the original research output and the good publications that come out of the various departments of the University. The importance of research for not only postgraduate students but also for undergraduate students is illustrated, for instance, by the fact that the National Science Foundation (NSF) of United States of America (USA) awards research money for members of staff that successfully establish undergraduate

research projects. The statement "We are a teaching University and nor a Research University" is not accepted since it has been observed that where there is quality research, the quality and relevance of undergraduate teaching and learning also significantly increases. Indeed there are now those that argue that good class room teaching must come out of the teacher's own research work. All this means that we need to upgrade and regularly review and revise the undergraduate (and where it applies, and postgraduate) courses and course contents.

But what is research? Related to research is Development or Innovation that springs from it. Research may be defined as addressing ONE of the following three issues (a one sentence statement of two research examples are given for each of the three possible areas):

1. **A Question to be Answered.**
   e.g. (i) Is there a relationship between Climate Change and the increasing Severity of Storms (e.g. severe hurricanes, severe electric storms, etc.)? (ii) What factors lead Some Nations to Fail and Other Nations to Succeed?

2. **Observations to be Explained**
   e.g. (i) Observation to be explained - Bats manage to fly close together as a bunch and yet avoid collision with each other, whereas we get so many road accidents of vehicles driven by intelligent men and women. (ii) Observation to be explained – The number of Children that are born medically Autistic or Dyslexic appears to be increasing in many developed countries.

3. **A Problem to be Solved**
   e.g. (i) In underground mining, when a tunnel collapses communication with trapped miners fails because communication lines get destroyed - can this problem be solved and the trapped miners are successfully and quickly located? (ii) In struggling Universities how can be improve Teaching and Learning quality as well as Research and Innovation in an honest and measurable manner?

It is important that any postgraduate research student or staff should be able to express their research work by a onesentence statement as we have done above; it helps to clarify and focus the work. A good start is to make sure that each year at least one international conference or an international journal paper is produced by each member of staff. An alternative, a compromise practiced by some Universities, is to divide the members of staff into Teaching and Research Streams –those in the Teaching Stream elect not to do research but to take up more teaching hours.

Appendix 3: MPhil Research Projects in Smart Energy Systems: Technology, Planning and Policies

Part time students may work from their office and field of work. Full time students, if they so wish to, may apply for financial assistance from the ECE department. Power, Communications, Robotics, Mining and Artificial Engineering graduates are invited.

Confidential

I. Power Quality: Protection and Reliability

1. High Impedance faults cause about 10% of power outages in developed countries. This work will seek to understand the nature, frequency and consequences of high impedance faults in the Port Moresby and Ramu Power network distribution systems. High Impedance faults continue to be the most difficult faults to detect because of the low fault currents that cannot be detected by conventional over current relays and protection devices. The research work will seek to carry out a thorough investigation of high impedance faults in one of the most active distribution systems, model the fault and develop techniques for early detection, localization and isolation of high impedance faults.

2. Estimating Voltage/Current Surge caused Damage to Consumer Systems and Equipment and Mitigation Systems that may be used in Low Voltage Destruction network. In the electric power network in the USA the estimated cost of damage due to lightning surges is about 5 billion dollars, and 8% of all insurance paid (about 20 million dollars) is related to lightning. The figures for Papua New Guinea will be mined into and estimated. Subsequently, this work will focus on both domestic and commercial electrical system related damage and the minimization of damage by a new approach to low voltage distribution system protection in the Port Moresby and Lae cities.

3. Improving the reliability of HV Distribution and Transmission Surge protection at Minimum Cost – Port Moresby (or Lae) Power Network. The research will seek to consider the surge arresters, grounding wires and grounding systems used to mitigate high voltage surges and identify the damage to substation equipment and consumer equipment by surges. Based on the investigation a modified or new method will be proposed to improve protection at minimum cost. The work will also include modelling surge formation and propagation in the network.

4. A study of the Power Quality issues in the transmission and distribution systems of the three independent power systems in Papua New Guinea and to prose economically viable and technically manageable solutions to improve the power quality of the main power grids.

II. Intelligent Energy Systems

5. Space-Earth Technology. Use of geospatial Systems to design the extension of the present high voltage transmission and/or distribution networks to supply power to remote

communities and towns. The design and innovative work will include the study of alternative routes, the economics and reliability of the routes to decide on the best grid extension programme to meet rural electrocution needs. Moreover, Geographical Information System will be used to study the relationship between rural electrification and the geographical layout, as well as the Renewable Energy sources available in each district, in order to make an intelligent decision regarding grid extension and the use of local renewable Energy resources.

6. Renewable Energy Design and Operation using Computer Intelligent Planning and Scheduling Systems. In an area where two or more of Renewable Energy sources are available (e.g. solar, wind, mini-hydro and tidal), design and development and day to day, month to month operation of an Intelligent Renewable Energy electric systems. The systems will also keep track of running costs and a variable tariff, as well as payments and maintenance of the system.
7. Intelligent Systems for the HV and LV Power Grid. Several research ideas may be pursued depending on the interest and needs. Intelligent Systems for Pre-fault detection of line and cable breakdown. This vast area of research newly opened up with new, inexpensive sensors (electromagnetic sensors and other) will be applied for Power System diagnosis, regular online assessment of the equipment, and for early warning detection of failing systems or components. Another area is the innovation of an Intelligent system for data mining to obtain rapid data on past and present performance of the power system for critical decision making.

8. Innovative new electric and magnetic field measurement techniques to identify rogue electricity (for safety and early warning) and the present electrical status of power equipment and substation using both smart, intelligent antennas and novel measuring sensors with antennas. A device, for instant, that records and stores electric field or magnetic field measurements at a substation, and at the next inspection alerts if any electricity component fields have changed and diagnoses the cause.

9. Design and innovation of a land mobile robot that can measure electric and magnetic fields, as well as take visual, digital images to assess the status of electrical equipment and encroaching houses or vegetation to perform an annual or six monthly inspection of the electricity system, including both transmission and distribution networks.

III. Renewable Energy and Future Challenges

10. Distributed Electric Energy resources in Papua New Guinea. This work will consider the availability of renewable energy sources in the entire Papua New Guinea, which will enable the present electricity network to transfer into next generation smart grid. It will seek to estimate the amount of generation power available (e.g. wind, solar, etc.) and the issues regarding integration of these distributed sources into the existing grid. It will also take into account the ecological impact of renewable energy and impact on such critical issues as vegetation management and species such as birds and land use.
11. The stability and scheduling of a Renewable Energy Systems connected to the main power grid. The small generators or the DC system of the Renewable Energy system may be used to meet power demands at other locations through the main grid. However, the stability and

protection coordination of the two systems with vastly different inertia needs careful research and innovative solutions.

12. Climate change and Future Severe Thunderstorm Electricity. In this work an internationally networked research shall be carried to understand the impact of climate change and the expected increase in the severity of future lightning and other electric storms. The implications of this to future power systems security, protection systems protection and insulation and expected impact on the present system will be investigated, particularly in relation to high thunderstorm regions including Papua New Guinea.

IV. Energy Efficiency and Consumer Concerns

13. Commercial ad Domestic Consumer behavior Study. Future increase in power generation can be curtailed (which is desirable) and energy demand can be controlled if the present use and value placed by consumers of electricity is known. Using a research study and the analysis of consumer behavior and value in Papua New Guinea in high electricity consuming areas, protocols and guidelines will be developed for the government and power company to develop an efficient energy providing strategy for the future. In parallel, research will be done to understand and assess the technologies available in this region for customers to better cope and handle power outages for long periods of time.

14. Researching current network to develop a Geospatial Information Systems (GIS) for the electricity demands matched to streets in (a) Port Morseby and (b) Lae. The GIS system will be used to study the present positioning of substations, lines, cables and distribution network layout, and to intelligently propose future systems that are cost wise and quality wise matched to GIS data (which will be designed to take into account annually changing Geospatial demands for energy).

15. EMF and RF Emissions from Power Systems and Health Concerns. The research work will address the issue of childhood leukemia in Papua New Guinea cities where power lines run close to residential areas. The study shall seek to both provide careful measurement of EMF from power lines as well as an understanding of future smart systems which will use wireless high frequency RF communication systems for monitoring and control of commercial and domestic power supplies and meters.

16. Communication, Safety and Security. The development of Wireless Communication systems and Optical Fiber systems along with Grid Extension. The telecommunication issues and design of effective communications systems for safety and security of new power installations as well as communication lines for the consumers.

V. Power Quality: Harmonics

17. Harmonics observed in many distribution systems are caused by consumer equipment and electric faults rather than the power supplier company's substation transformers. Harmonics is a major concern in the local network. In this research investigation careful study will be made of harmonics in the distribution power network in the vicinity of Milford power station as well as in the Port Moresby systems. The harmonic contents that are fed into the grid by power electronic equipment and compact fluorescents will be tracked and solutions shall be proposed. The knowledge of the total losses in the system will be used to determine

the optimal line and cable use and connection, and where available the best voltage settings of on-load tap changing transformers.

Appendix 3. Current (January 2015) Academic Members of Staff

Moses Kavi

Sammy Aiau

Herman Kunsei

Gibson Kupale

Peter Kiss

K Pirapaharan

Paul Hoole

Appendix 4. Areas for Administrative-Academic Harmony and Cooperation

1. **Recruitment** of the most talented expatriates for Research linked Teaching and nationals to be trained in postgraduate degrees and developed as leading EC-engineering researchers.
2. **Support** for the following strategies: 15 to 23.
3. **Retention** of the most talented national and expatriate members of staff: remuneration, facilities, care and performance based rewards.

Appendix 5. Resources Needed

1. **Literature: leading journals and books**
2. **Transport to visit sites where research work is connected to.**
3. **Good opportunities and good financial support for the academically the best young researchers/graduates to join the department.**
4. **Allow the successful research personnel of department more research and development time to lead and to contact more industries, do joint research with them and seek support.**

DEPARTMENT OF FORESTRY

Head of Department: Dr Larry Orsak

UNITECH's Forestry Department is the only academic institution in the South Pacific island region to confer undergraduate and postgraduate degrees in Forestry.

Education is the university's principal mission and the Forestry Department aims to provide high quality academic and administrative support services not only for undergraduates, but with increasing focus on the training of postgraduate students. Our postgraduate program continues and further develops research skills they began learning through Year 3 courses (especially 'Experimental Design'), and culminating in Year 4 (final year research project).

Our overall educational challenge in forestry is to produce professionals, both men and women, with the necessary technical skills. Foremost amongst these is the ability to solve problems. It is to develop this problem-solving capacity that our department's research activities fundamentally fit into our education mission. To achieve this goal requires that the faculty themselves are not only well versed in research but apply that knowledge through active research projects and programs. This five year plan is our first departmental articulation of the strategies and mechanisms by which we hope to enhance our department's research activity component. The document also points out current, significant constraints in attaining our objectives that must be overcome at the university level.

Forest/Forestry Research Themes

The Forestry Department has long recognized the multi-faceted value of Papua New Guinea's forests, and over the years has woven this into its academic and research program. Sustainable forestry in PNG requires a cross-disciplinary approach, which today means blending aspects of the economy, social features, environment services and climate change.

The Department structures its Research Development Plan and Post Graduate Study Program around a number of specific research themes:

Ecosystem and Environmental Services

Forest Biology, Ecology& Biodiversity

Forest (health) Protection

Wildlife Management, Community-Driven Forest Conservation.

Role of Forests in Climate Change

Silviculture, Including Reforestation and Plantation Management

Agro-forestry/ Social and Community Forestry and Multiple land-use

Wood Science and Technology; Timber Production/Utilisation

Forest Engineering

Forest Economics and Forest Product Marketing

Appropriate Technology

Remote Sensing and GIS

Biomass Energy

On-Going Research Programs in the Department (2014)

The Forestry Department has a number of on-going research activities, which are segregated according to general theme and briefly described below, noting the principal investigators involved:

- **Ecosystem and Environmental Services**
  Deferred
- **Forest Biology, Ecology & Biodiversity**

Effects of altitude on soil seed bank community along an altitudinal gradient in Morobe Province, Papua New Guinea (O. Gebia-MPhil Student, M Peki)

A review of genius *Ixora* in Papuasia region with an exploration of sources of species richness including flower-dependent niche partitioning (H Maraia-M.S. student, L Orsak)

Refinement of using moths as a biodiversity indicator (L. Orsak)

Comparison of under storey composition and regeneration in Lae Botanic Garden versus natural forest(S Tomaki-final year student, L. Orsak)

- **Forest (health) Protection**

Soil, plant stress and pest/disease vulnerability in plantation in *Araucaria* species (L. Orsak)

Termite Control Using *Tithonia* sp (Asteraceae) leaves on *Araucaria cunninghamii* at Omsis forest plantation (S. Wagia-final year student, L. Orsak)

Soil profile differences between poor growth and healthy *Araucaria within a small area of Bulolo Plantation* (S. Kombra-final year student, L. Orsak)

Relationship of stress and termite damage in plantation *Araucaria* (G. Navaru-final year student, L. Orsak)

- **Wildlife Management, Community-Driven Forest Conservation**

- **Role of Forests In Climate Change and Carbon Trade**

Comparing options for earnings in merchantable standing volume and biomass in Busama forest: Log export and managing forests for carbon trade (S.Namba-final year student, M. Peki)

Comparing the various diameter class distribution in natural forest of PNG (R.Akila-final year student, M.Peki)

- **Silviculture, including Reforestation and Plantation Management**

Clonal Propagation for Eaglewood (J. Beko-M.Phil student, K. Mulung)

Investigating seed propagation and agar wood formation of Papua New Guinea Eagle wood (*Gyrinops ledermannii*): Seed germination and fungi efficacy (J. Beko-M.Phil student, K. Mulung)

Variation in soil moisture, pH and texture in cultivated eaglewood (*Gyrinop*s sp) sites (S.Inu-final year student, R. Pokon)

The potential effect of different hormone concentrations on the root initiation and development from stem cuttings of *Santalum macgregorii (H.Morte-final year student, K. Mulung)*

The Use of *Acacia mangium* in the rehabilitation of mined out site at Hidden Valley in Papua New Guinea (L. Lewis-PhD student, M. Hossain)

- **Agro-forestry/ Social and Community Forestry and Multiple land-use**

Motives for grassland burning and the consequent threat status in Markham Valley (H. Bisa-final year student, K. Mulung)

- **Wood Science and Technology; Timber Production/Utilisation**

Physical Wood Strength of *Anisoptera thurifera* for Constructional use in Papua New Guinea (C. Rawali-final year student, M. Hossain)

Wood strength testing to use in the design of house and bridge structures (S. Keki-MPhil student, M. Hossain)

Strength Dynamics of *Araucaria cunninghamii* (Hoop) from Bulolo Forest Plantation (S. Keki-MPhil student, M. Hossain)

Conducting natural durability test using soil bed trials by lesser known timber species: *Macaranga alenritoides* and *Trema orientalis* (P.Ono-final year student, P. Edwin)

- **Forest Engineering**

The productivity Study of Skidding Operation at Bulolo Pine Forest Plantation (J. Palmer-final year student, M. Hossain)

Study on Soil Compaction on Skid Trail and Landings due to Harvesting Activities in Bulolo Forest Plantation (C Feriwok-final year student, M. Hossain)

- **Forest Economics and Forest Product Marketing**

Role of Policy in Export Trade of Round logs in PNG, Guyana and Gabon (Reddy Vue-final year student, H. Jeremiah)

- **Appropriate Technology**

Mini-Pro Solar Kiln Timber Dryer – Drying of hardwood timbers using solar energy (low power consumption) technology (P. Edwin)

- **Remote Sensing and GIS**

Land use and land cover detection using medium and high resolution data by remote sensing techniques in the Markham valley of Morobe Province, PNG (R.Tarutia-MPhil student, D.Lopez)

Comparison of biodiversity hotspot areas and logging concessions in PNG using GIS (C. Kausik-final year student, D. Lopez)

Creating a map with Information on PNG soil type, vegetation & rainfall erosity using GIS (C. Single-final year project, D. Lopez)

Postgraduate Research Programs

- **Biomass Energy**

Undergraduate Research Projects (2014)

The potential effect of different hormone concentrations on the root initiation and development from stem cuttings of *Santalum macgregorii.*

Variation in soil moisture, pH and texture in cultivated eaglewood (*Gyrinops* sp) sites

Soil compaction assessment in commercial thinning and clear fell logging operations in Bulolo Forest Plantation

Soil profile differences between poor growth and healthy *Araucaria* within a small area of *Bulolo Plantation*

Relationship of stress and termite damage in plantation *Araucaria*

Termite Control Using *Tithonia* sp (Asteraceae) leaves on *Araucaria cunninghamii* at Omsis forest plantation

Comparing the various diameter class distribution in natural forest of PNG

Comparison of under storey composition and regeneration in Lae Botanic Garden versus natural forest

Comparison of moth biodiversity indices when specimen sorting is carried out by professional entomologists versus parataxonomists.

Creating a map with Information on PNG soil type, vegetation & rainfall erosity using GIS
Postgraduate Research Programs

Comparison of biodiversity hotspot areas and logging concessions in PNG using GIS

Role of Policy in Export Trade of Round logs in PNG, Guyana and Gabon

Comparing options for earnings in merchantable standing volume and biomass in Busama forest: Log export and managing forests for carbon trade

Felling and skidding productivity study in Bulolo pine forest plantation logging operations

Conducting natural durability test using soil bed trials by lesser known timber species: *Macaranga alenritoides* and *Trema orientalis*

Wood density assessment (physical wood strength) of *Anisoptera thurifera* or construction use in PNG

Motives for grassland burning and the consequent threat status in Markaham Valley

Postgraduate Research Programs (2014)

Effects of altitude on soil seed bank community along an altitudinal gradient in Morobe Province, Papua New Guinea

Strength Dynamics of *Araucaria cunninghamii* (Hoop) from Bulolo Forest Plantation

Investigating seed propagation and agarwood formation of Papua New Guinea Eagle wood (*Gyrinops ledermannii*): Seed germination and fungi efficacy.

Land use and land cover detection using medium and high resolution data by remote sensing techniques in the Markham valley of Morobe Province, PNG

A review of genius *Ixora* in Papuasia region with an exploration of sources of species richness including flower-dependent niche partitioning

The Use of *Acacia mangium* in the rehabilitation of mined out site at Hidden Valley in Papua New Guinea (L. Lewis-PhD student, M. Hossain)

Ongoing Research Collaboration with External Partners

Apart from internally funded research programs, Forestry Department has been blessed with number of opportunities to conduct collaborative research with external partners over the last five years. The formal projects that contain research components include:

Improving the Papua New Guinea balsa value chain to enhance smallholder livelihoods (FST 2009/16). Funded by Australian Centre for International Agricultural Research Centre (ACIAR), 2012. Currently the project is active

Technical support to the Papua New Guinea Forest Authority to implement a multi-purpose National Forest Inventory (GCP/PNG/006/EC). Funded by European Union in 2012. Currently the project is active.

Enhancing Value Added Wood Processing in Papua New Guinea (FST/2012/092). Funded by Australian Centre for International Agricultural Research Centre (ACIAR), 2014. The project has commenced operation this year February 2015.

List of Publications

David Lopez Cornelio (2013). Open source GIS software options for forestry education in Papua New Guinea, accepted by Open Journal of Ecology, Volume 4, Number 4, March 2014.

Moripi, L. and Peki, M. (2015). Analyzing the distribution patterns of Nutmeg (*Myristica* spp) in the Busama forest area using quadrat size technique. Universal Journal of Plant Science, 3(2):13-20

Kotlarewski, N. J, Ozaraska, B. and Gusamo, B. (2014). Thermal conductivity of PNG Balsa measured using the needle probe procedure. Boi Resources, 9(4):5784-5793

Papers accepted and waiting to be published

Peter Edwin and Barbara Ozarska (2014) Bending properties of hardwood timbers from secondary forest in Papua New Guinea. (Paper accepted last year November 2014 by Journal of Tropical Forest Science (JTFS) awaiting to be published this year 2015)

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Acting Head of Department: Mr Benson Mirou

The department has embarked on a long term goal of developing a postgraduate program to embrace the changes taking place in the university with regard to scientific research and ensure that from this program qualified national academics are produced.

Our short-term goal (2015 – 2019), however, is to ensure that qualified international academics with years of experience in teaching, industry and research in either Mathematics & Computer Science or both are recruited and are actively involved in supporting the program.

To that end, the department has embarked on accomplishing the following in 2015;

1. Identify potential postgraduate students from among national members of staff who are serving as academics and technical instructors. So far eight have been identified for this training. Training to be sourced locally (Unitech and/or training partners) or overseas.

2. Identify potential postgraduate students from our recent and current graduates to enrol in the postgraduate program as future academics. So far three have been identified. One has enrolled as a GAP student, the first for the department and two others recently engaged as technical instructors.

3. A new inclusion in the department, Dr. Smolin, a Computer Science engineer will enable the department to implement some of its goals (points 1 and 2 above) in terms of postgraduate training and give us some more depth in research. We are hopeful that two more inclusions in the middle of year will boost our stocks of qualified international counterparts who will lead in research and provide skilled manpower in developing our postgraduate programs in both Mathematics & CS.

Research Based Departmental Seminars

To ensure that a healthy culture of research is established in the department, a series of seminars on a weekly or fortnightly basis has been scheduled where opportunity is given to a member of staff to address his academic colleagues on an area of research or area of interest. Staff, who are also identified as postgraduate students involved in Mathematics and CS are encouraged to participate. So far early in the semester the results have been encouraging.

Department Research Project

The department has proposed and agreed to isolate and focus on an area of research that is common to both Mathematics and CS as a starting point. The aim of the project is to teach

skills that are necessary for research and writing papers, something that the department clearly lacks in its national academics. The area of research chosen is Cryptography.

Apart from this suggested area of research, staff are encouraged to continue working in their areas of expertise and to seek direction from senior members of staff with experience in research and writing papers.

This year we continue on the work done last year and hope the level of research increases each year. Below is the proposal that was put forward last year and we will continue to support the program add to it meaning fully this year.

Common Research Area Proposed for Mathematics and CS (2014 – 2015)

We proposed to organize a seminar with the title "Algebraic structures, coding theory and statistics" in 2014. We will continue with the program and study algebraic structures which have applications in computer science: lattices, semi-lattices, semigroups, ordered sets. We also will discuss at this seminar papers on statistics and applications in areas of CS.

A tentative program of the seminar "Algebraic structures, coding theory and statistics":

1. To study the book by **Ricahrd E. Blahut, "Algebraic Codes for Data Transmission", Cambridge University Press, 2003**, 482 pages"(the book is readable and contains chapters about applications).
2. To try to find directions of research in statistics and CS.
3. To report new results obtained by the members of the Department.

Academic Staff - List of Most Recent Publications Only

1. **Kulbhushan Singh,** Ambrish Kumar Pandey, "Using a Quartic Spline Function for Certain Birkhoff Interpolation Problem", International Journal of Computer Applications Vol. 99– No.3**, August 2014** www.ijcaonline.org/archives/volume99/number3/17357-7866.

2. Ambrish Kumar Pandey, Q S Ahmad, **Kulbhushan Singh,** "Lacunary Interpolation (0,2;3) Problem and Some Comparison from Quartic Splines", American Journal of Applied Mathematics and Statistics, 2013, Vol. 1, No. 6, 117-120 www.pubs.sciepub.com/ajams/1/6/2

3. **Senthilkumar, K. S. (2013)**. A Study of Behavior-based and Role-based Autonomous Multi-Robot Exploration and Coverage Systems. International Journal of Latest Research In Engineering and Computing (IJLREC), Volume 1, Issue 1 : Page No.12-20, September-October 2013, www.ijlrec.com

4. **Ursul, Mihail (2013)**. The weights of closed subrings of a locally compact ring**.** (English)

Topology Appl. 160, No. 8, 960-964. MSC2000: *16W80, *Reviewer:* Mart Abel (Tartu)

5. **Ursul, Mihail;** Juŕaš, Martin (2013). Notes on topological rings. *Carpathian J. Math.* **29** (2013), no. 2, 267--273. MR3137559

   Associate Professor Ursul continues with his research in topological rings. His latest paper, on "*1-bound finite rings*", is still in progress in 2015.

Student Research Projects

The research activity is also extended to the undergraduate program, where the final year students in CS are required to participate in a year-long (two-semester) research project supervised by a member of staff. The topics chosen are normally an indication of the department's area of strengths in terms of research and teaching.

The CS student research projects completed in 2014 are shown below.

Student Name	**Project Supervisor**	**Project Title**
AISI, Vincent	B. Mirou	Finger Print Identification Software
AKALIPA, Peter	S. Benny	Creation of a Forum/discussion page for PNG Unitech student server
BONJUI, Bradley		Explore the technology of allJoyn its applications and the deployment of it through Android applications and other devices
BULLEN, Arthur	N. Puy	Travel Guide Application
BUNIMA, Nemiah (	N. Puy	Unitech Bookshop online shopping system
DOPEKE, Azariah	B. Mirou	A Research – Android application for monitoring Blood Pressure using Bluetooth Medical Devices
GIGIMAT, Lindsay	B. Mirou	Developing an Android-based system for Unitech Room Allocation Process
GUBA, Barbara	N. Puy	Android app to enable smart phone users to connect a server through mobile intranet
HURIAVI, Clement Jr	N. Puy	Unitech Bookshop online shopping system
INGIRIN, Martin	S. Benny	Electronic Voting System in Lae Urban LLG
KAMAN, Newman (1	B. Mirou	Grade 12 Selection Software Development
LUIOPEN, Jackson	B. Mirou	Developing an Android-based system for Unitech Room Allocation Process
MANA, Sakias	B. Mirou	Developing an Android-based system for Unitech Room Allocation Process
MELEPIA, Terry	B. Mirou	Finger Print Identification Software
NANADAI, Manau	C. Wilkins	Content Management System

ONILLI, Bill	B. Mirou	Grade 12 Selection Software Development
SAPUL, Gibson	S. Benny	Electronic Voting System in Lae Urban LLG
SEETO, Jamal	N. Puy	Travel Guide Application
SOLIEN, Gilchrist	B. Mirou	Finger Print Identification Software
SUPRIS, Chris	S. Benny	Electronic Voting System in Lae Urban LLG
THOMAS, Higgins	N. Puy	Travel Guide Application

List of PG diploma students Research

Name of the Students	Research Project Title
Joel Meguza Tahie	Dedekind Complete Riesz Spaces and Boolean
Issac Angra	One Topological Semigroup of Continuous Functions
Samuel David Dunstan	To Create Dipstick Calibration Charts for Horizontal and Inclined Fuel Tanks Through Mathematical Analysis Alone
Gibeon Kewa	Industrial Application of Max Flow – Min Cut Theorem to Open Pit Mining

DEPARTMENT OF MECHANICAL ENGINEERING

Head of Department: Professor John Pumwa

1.0 Introduction:

The Department of Mechanical Engineering considers engineering research to be very important as it leads to an expansion of knowledge and discoveries of new products services. It is through research that leads to breakthroughs in engineering and technology. Research and experimental development comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

Engineering research is the systematic investigation and study of materials and sources to establish facts and reach new conclusions, so it shapes people's understanding of the world around them. Research involves testing hypotheses and predictions using testable data and a full battery of scientific and engineering tools and methods.

2.0 Focused Research Areas

The department has decided to concentrate and focus on the following areas of research in mechanical engineering:

i. Design and Manufacturing
ii. Energy and Environment
iii. Materials Characterization
iv. Engineering Education and Management

The department encourages faculty to conduct their research concentrating and focusing in the above areas.

3.0 Research Seminars

The department plans to organize monthly research seminars where faculty and postgraduate students can present their research finding.

4.0 Faculty Research Topics:

The following table provides research topics that current faculty members are being involved in:

Staff Member	Topics of Research	No. of Papers published in 2014	Comments
Professor John Pumwa, Ph.D.	Tribology (Friction, Wear and Lubrication), Failure Analysis, Energy, Biodiesel, Engineering Education.	7	
Professor M. A. Satter, Ph.D.	Machine Design, Systems and Control, Vibrations, Engineering Education and Management, Curriculum Design		
Professor Nicholas Lambrache, Ph.D.	a) 3-D modeling of weak parts and subsystems. b) Finite Element simulation on stresses – including dynamic stresses and fatigue c) Fatigue experiments on computer controlled devices. d) Statistical interpretation based on accumulated data from the mine site. e) Material Science interactive research on minerals affecting strength of metal alloys in mining equipment	1	Joined in 2014
Dr S Wahid	Energy and Environment : 1. Heat Transfer, 2. Renewables, 3. Conservation of energy		Joined February 2015
Dr Asherd	New Staff		Joined February 2015
Dr Albert Ude	New Staff		Joined February 2015
Mr M.R. Satter	a) Creative problem solving in engineering design b) Integrating the use of technology to enhance creativity engineering education c) Engineering curriculum optimization using Quality Function Deployment (QFD) house of Quality. d) Renewable energy technologies – power generation systems		

Mr Hari S. Srivastava	a) Operations/Production management and Supply Chain Management H.S Srivastava and Praveen Pandey, *Curriculum Development in the Technical Education Supply chain of Papua New Guinea*, Paper No. HS7-2013-0097 (ISBN 978-9980-87-541-9), 7th Huon Seminar, The PNG University of Technology, **Lae**, Nov 13-14, 2013	1	Paper presented at Huon Seminar 2013
Mr E. Sirisena	a) Automotive Engineering		
Mr Samuel Dunstan	a) Effect of corrosion (rust) on structures b) *A Mathematical Approach to Dipstick Calibration*		
Mr Steve Ales Korokan	Returning Staff from studies		Joined February 2015
Mr Brian N'Drelan	a) Renewable energy – use of solar to provide power b) Statistical analysis of Failure of mining equipment – study of the properties of the mineral being mined and the effects on life expectancy of equipment components.		Student project Prepare for PhD Program

5.0 Undergraduate Research Projects.

The following projects were done by final year Mechanical Engineering Students in 2014 as part of departmental research efforts:

Item	Project	Status
1	Design a solar-powered standby source for the computer room within the department of mechanical engineering	
2	Energy efficient smokeless firewood cooking stove	
3	Design and construction of a hand operated mechanical gripper	
4	Mechatronics systems on National Instruments/Mindstorms Platform	
5	Design of a gravity powered lamp and construction of working model(s)	
6	Design and development of solar powered grinding machine	
7	Design and fabrication of a hydraulic jack	
8	Design and fabrication of solar refrigerator	
9	Use of dimensional analysis on an airfoil to predict behaviour on a usable hydrofoil and prove these predictions by observations on a hydrofoil	
10	Determine the aerodynamic forces on the basic shapes using FEA software and design an aerodynamic shape with low drag	
11	Analyse failure modes and recommend practices to improve the availability of material handling systems (mine-mill conveyor system at OTML)	
12	Use existing preventative maintenance schedules in place to carry out PM checks for the department of mechanical engineering - report on effectiveness and suggest improvements	
13	Design a solar-powered water pumping system within the department of mechanical engineering	
14	Rainwater tank performance calculations, improvement in the current system and expansion	
15	Robotic arm development	
16	Development of SI Engine Test Bed	
17	Design and fabrication of library chair	
18	Advanced 3D CAD Modeling of Mechanical Systems	
19	To build and test an atmospheric corrosion, prevention method facility to do either galvanization, anodisation or electroplating	

6.0 Postgraduate Students Research

The following projects are being conducted by M. Tech Students:

Item	Research Projects	Status
1	Transient and Steady State Response on Autocratic Process Controller	Almost Complete
2.	Corrosion Rates in Atmospheric and Seawater Environment of Lae Port on Selected Metallic Alloys	Continuing

7.0 List of Publications

1. **Satter, Muhammed A., "***Quality Assurance in Engineering Education with Special Reference to Engineering Programs at the PNG University of Technology*", The Proceedings of the 10thHuon Seminar (Keynote Address), PNG University of Technology, Lae, Papua New Guinea, November 13 – 14, 2013.

2. **Satter, M. A., "***A Perspective on the Historical Development of Mathematics*", The International Conference on Pure and Applied Mathematics (ICPAM), PNG University of Technology, Lae, Papua New Guinea, November 27 – 28, 2013, ICPAM – LAE Digest, pp 5- 15.

3. **Pumwa John, "***Engineering Education in Papua New Guinea*", The Proceedings of the 7th Huon Seminar (HS72013-HS-095), PNG University of Technology, Lae, Papua NewGuinea, November 13 – 14, 2013.

4. **Satter, Muhammed A., Albert Schram, Pumwa, J. and Thomas, V., "***Developing KIPs for Papua New Guinea University of Technology*", The Proceedings of the 10th Huon Seminar (HS72013-HS-035), PNG University of Technology, Lae, Papua NewGuinea, November 13 – 14, 2013.

5. **Pumwa John, "***Mathematics as a Tool for National Development*", The International Conference on Pure and Applied Mathemattics (ICPAM), PNG University of Technology, Lae, Papua New Guinea, November 27 – 28, 2013, ICPAM – LAE Digest, pp 5- 15.

6. **Vu Trieu Minh and Pumwa John,** *Feasible Path Planning for Autonomous Vehicles"*, A Research Article, Hindawi Publishing Corporation, Mathematical Problems in Engineering, Volume 14, Article ID 317494, 12 pages, 2014 (http://dx.doi.org/10.1155/2014/317494

7. **Vu Trieu Minh and Pumwa John,** *Computational Predictive Control Schemes for Autonomous Vehicles"*, A Research Article, Hindawi Publishing Corporation,

Mathematical Problems in Engineering, Volume 14, Article ID 317527, 19 pages, 2014 (http://dx.doi.org/10.1155/2014/317527

8. Sammy Aiau, Moses Kavi, **John Pumwa**, Kandasamy Pirapaharan, Paul R. Hoole, Sanath Alahakoon and Samuel R. H. Hoole, "*Renewable Energy Resource Mapping in Morobe Province, Papua New Guinea: Solar and Wind Power*", The Proceedings of the Grand Renewable Energy International Conference (GRE2014), Tokyo, Japan, July 27 – August 1, 2014.

9. Moses Kavi, Sammy Aiau, **John Pumwa**, Kandasamy Pirapaharan, Paul R. Hoole, Sanath Alahakoon and Samuel R. H. Hoole, "*Papua New Guinea National Energy Roll Out Plan (NEROP) and the Power Quality of the Distribution System*", The Proceedings of the Grand Renewable Energy International Conference (GRE2014), Tokyo, Japan, July 27 – August 1, 2014.

10. **Satter, M. A.,** "Quality Assurance in Engineering Education with Special Reference to Engineering Programs at the PNG University of Technology", The Proceedings of the 7th Huon Seminar (HS72013-HS-095), PNG University of Technology, Lae, Papua NewGuinea, November 13 – 14, 2013.

11. Prof. N. Lambrache, "*The Method of Design and Manufacturing of the Gear Hobbing Cutter with Bulges"*, Applied Mechanics and Materials Vol. 657 (2014) pp 13-17; (2014) Trans Tech Publications, Switzerland.

12. H.S Srivastava andPraveen Pandey, *Curriculum Development in the Technical Education Supply chain of Papua New Guinea*, Paper No. HS7-2013-0097 (ISBN 978-9980-87-541-9), 7thHuon Seminar, The PNG University of Technology, **Lae**, Nov 13-14, 2013

13. **SAMUEL DUNSTAN,** *"A MATHEMATICAL APPROACH TO DIPSTICK CALIBRATION";* Proceedings Of The 2nd Conference On Pure And Applied Mathematics (ICPAM 2 2014); University Of Goroka; Goroka, Papua New Guinea, December 08-12, 2014**.**

DEPARTMENT OF MINING ENGINEERING

Acting Head of Department: Dr. Gabriel Arpa

The Mining Engineering departments offer two degrees- bachelor of Engineering in Mining Engineering and Mineral Processing Engineering. It is currently functioning without a full pledge head of department for the last 7 years. There are 15 academic staff, 5 Technical staff, 3 Administrative staff and two auxiliary staff. One of the 15 academic staff are currently on study leave pursuing PhD studies in Australia and 3 academic staff are currenly pursuing Masters in Philosophy studies in the Department . The current staffs of the department are pursuing research activities in their areas of expertise as outlined below.

DR. GABRIEL ARPA, SENIOR LECTURER

Research Priority Areas

- Feasibility study of Kassam Pass Underground Tunnel Construction., Lae Papua New Guinea.
- Site Blasting specification for Hidden Valley open pit mine using blast vibration monitoring. Morobe Mining. Lae Papua New Guinea.
- A comparative study on ventilation efficiency in dead space in both laboratory model and underground mine condition. Lae, Papua New Guinea.
- Modelling of the Deep Sea Tailing Placement System and Practice in Papua New Guinea.
- Sedimentation Studies of the Watut and Markahm River system and their effect on the environment and Lae Wharf system. Lae Papua New Guinea.
- Mineral Economic studies of mines in PNG after Extension of Mine Life

Papers submitted and currently under peer review

1.) International Journal of Mining and Rock Mechanics Science. ***(Elsevier Science)***2015

Assessment of Rock Mass Characteristics of Centre Pit to improve Drill and Blast Parameters at Ok Tedi Copper Mine

Gabriel ARPA[1], Anthony Igo[1]

[1]Mining Engineering Department, Papua New Guinea University of Technology.

Abstract

This paper presents an Assessment of Rock Mass characteristics of the Centre Pit to improve Drill and Blast parameters at Ok Tedi Mine. Drill and Blast optimization is an important study, normally done to minimize additional mining costs and, at the same time to obtain the required particle size for mill throughput. But most importantly, the main objective of fragmentation by

blasting is to achieve the optimum powder factor. Presently, the powder factor is established through trial and error blasts. However, powder factor may also be estimated using rock design and explosive parameters. These parameters were identified and managed to obtain the favorable results. Rock mass characterization helped in the selection and optimization of drill and blast parameters, where various methods were used to present a comprehensive analysis, in characterizing the rock mass.
Hence, this paper has found a correlation in the rock mass characteristics, which are sufficiently reliable to improve drill and blast parameter, through the determination of an optimum powder factor, for the different rock types at Ok Tedi, while at the same time maintaining the required blasting results in terms of fragmentation and particle size distribution for subsequent mill throughput.

2.) International Journal of Mining, Reclamation and Environment ***(Taylor and Francis)*****.** 2015

A Comparative Study on Ventilation Exchanges In Dead Spaces Along Main Airways Based On Mine Measurement And Laboratory Models

Gabriel ARPA[1], Kyuro SASAKI[2], Arif Widiatmojo[2] and Yuichi SUGAI[2]

[1]Mining Engineering Department, Papua New Guinea University of Technology.
[2] Department of Earth Resources Engineering, Faculty of Engineering, Kyushu University, Fukuoka 819-0395, Japan

Abstract

Studies on airflow through a mine ventilation network, using tracer gas has revealed that quality of air is greatly affected by the presence of dead spaces along the mine airways. In order to further study the effect of dead spaces on quality of air and the ventilation exchange rate in the dead space of the mine, studies were conducted in both laboratory model and measurements in an open stope at the Porgera underground mine in Papua New Guinea. Laboratory models of dead entry space by varying aspect ratio, L/W, with constant width, W, and increasing length, L, were constructed. Tracer gas was released inside the end of dead space and the gas concentration against elapsed time was measured at the entrance of the dead space for various L/W ratio. Air exchange rate N, decreases as the length of the dead space increase under a constant cross sectional area, and ventilation flow was measured as almost constant against the L/W ratio over one.

MS. MARY KAMA, SENIOR TECHNICAL INSTRUCTOR

Research priority Areas

- Calcination and Quality tests on Elimbari lime stone from Chuave in Simbu Province.

- Isothermal carbothermic reduction of iron oxide and production of sponge iron from 4 different material from Ok Tedi magnetite Skarn Ore (MPhil Research Project).
- Further research activities to extract iron from tails from other existing Mines in PNG.
- Further research to increase grade of sponge iron produced from pyrite concentrates- mini steel industries.
- Calcination & quality testing for Manus & Finshafen lime stone deposits

Abstracts of Publications

7th HUON SEMINAR
ACHIEVING VISION 20050 THROUGH HIGHER EDUCATION, RESERCH, SCIENCE & TECHNOLOGY
NOVEMBER 13TH TO 14TH 2013, PAPUA NEW GUINEA UNIVERSISTY OF TECHNOLGOY, LAE, PAPUA NEW GUINEA.
HS 72013 – HS – 200.

Production of Sponge Iron by Oxidation Roast and Carbothermic Reduction of Ok Tedi Pyrite concentrates.

M. Kama [1] (Ms), A. K. Chakrabarti [2] and P.S.A Leki[3]

1. Mining Engineering Department, PNG Unitech.
2. Corresponding author: akc 1940 @ gmail.com

Abstract

The OK Tedi mine in the Western Province has constructed a pyrite flotation plant at Mt. Fubilan to concentrate the pyrite from the copper plant tails. The pyrite concentrates are transported in a slurry form to Bige, where it is buried below the water table to prevent oxidation and generation of acid mine drainage. This study was done to assess the possibility of converting the pyrite concentrate into sponge iron for use in steel plant.

Approximately 10 grams of pyrite concentrate from OK Tedi mine with bulk chemical composition (%) of C= 11.8, O=23.5, Mg=0.07, Al=1.2, Si=4.1, S=28.1, K=0.6, Ca=0.7 and Fe=29.6 (SEM EDAX analysis) were roasted in a muffle furnace at 700^{o}C, 750^{o}C and 800^{o}Crespectively, for periods ranging from 5 mins to 40 mins. The weight change after roasting of pyrite was recorded and it was noticed that the roasting kinetics are marginally faster at 800^{o}C.

For the carbothermic reduction experiments, the pyrite concentrate of 10grams was roasted at 800^{o}C for 1 hour. The sinter was mixed thoroughly with 30% graphite and was further reduced at 1100^{o}C for periods ranging from 30 mins to 120 mins. Sponge iron of low degree of metallization was produced after 120 minutes. Composition in (%) of the reduced sinter by SEM EDAX show C=4.7, O=33.6, Mg=0.7, Al= 0.7, Si= 4.4, S =4.5, Ca= 0.7, Fe= 5.7. Oxygen was not completely removed, but the iron content increased appreciably due to removal of sulphur.

The results suggest that the pre-roasting of the pyrite concentrate needs to be carried out at a higher temperature than 800^{o}C to remove sulphur completely. It also suggests that the final reduction temperature needs to be below 1000^{o}C because CO_2 is unstable above this temperature. Therefore, it is necessary to adjust the temperature and time of reduction roasting to prevent re-oxidation of the sponge iron produced. Reduction of iron oxide will occur more efficiently if the initial sulphur in the charge is low. Hence magnetic separation of the iron oxides may be tried to increase grade.

Published in the Proceedings of the XVI International Mineral Processing Congress (Mexico, 2014)

Isothermal Carbothermic reduction of iron oxides in Magnetite Skarn Ores from Ok Tedi Mine, Western Province, Papua New Guinea

Kama M. and Gena K.,

(Mining Engineering Department, PNG University of Technology, Papua New Guinea)

Abstract

The Magnetite skarn ore is one of the copper bearing ore type mined from OkTedi Copper Mine. The copper minerals are floated to concentrate the copper while the iron oxides and pyrite are discarded as tails. This research was undertaken to investigate the possibility of producing sponge iron by extracting high iron content in the magnetite skarn by isothermic carbothermic processes. The sponge iron produced can be used as a starting material for mini steel plant in Papua New Guinea.

The SEM-EDAX analysis indicates that the magnetite skarn ore contains C =10.1%, Fe = 30%, Mg = 0.6%, Si = 1.1%, S = 21.1%, Ca = 0.8% and Fe = 36.2% by weight. Fluxed and unfluxed pellets with 5% by weight of lime of different sizes weighing 30 grams were produced and roasted in a muffle furnace at different temperatures and roasting time. Carbothermic reduction test of the roasted magnetite skarn were also carried out in a muffle furnace using coconut shell carbon as a reducing agents at various temperatures and roasting times.

The results indicated that the reaction kinetics increases with increasing temperature and time. However, there is no significant difference between fluxed and unfluxed materials. There is a slight increase in kinetics with reduced particle size. The result also suggest that at low reducing temperature, time and particle size there is high metallization as well as prevention of re-oxidation of the sponge iron produced. Magnetic separation and oxidation roasting of the feed material indicated a reduction of sulfur content, thus increasing the grade of the iron oxides and quality of sponge iron produced.

Keywords: Isothermal, carbothermic, magnetite, skarn, ore, carbon, flux, pyrite, reduction, sponge iron, roasting and reaction kinetics.

DR JIM LEM. SENIOR LECTURER, MINERAL PROCESS ENGINEERING

Research Priority areas

- Process mineralogy
- Increasing flotation recovery in the -10 µm slime region by investigating approaches that can improve particle-bubble collision efficiency
- Use of DETA to reduce the effect of base metals particularly Cu on gold cyanidation
- Investigating an environmentally benign depression in the selective flotation of molybdenite and chalcopyrite.
- Increase recovery of gold in porphyry copper ores.
- Effect of density on cycloning of high density minerals.
- Investigation of stable metal complexing agents in mill tailings.

MR. STANLEY RUNGWA, TECHNICAL INSTRUCTOR

Research Priority Areas

- Assessment and Evaluation of Tailing Disposals and Contaminants (Heavy Metals) into Bulolo and Markham River Stream, Morobe Province, Papua New Guinea.
- Hyper-accumulator Plant Species Identification along Bulolo and Markham River, Morobe Province, Papua New Guinea.
- Biotechnology/Genetic Study of Hyper accumulators to increase their Heavy Metals Absorption Activities, Morobe Province, Papua New Guinea.
- Assessment of Leucaena plant as Phytoremediation plant species for PNG Mining Environment.
- Assessment of Arsenophyrite Stability using Phytoremediation Technique on Lihir Mining Environment.

MR. FRANCIS KISAI BURE, SENIOR TECHNICAL INSTRUCTOR

Research priority Areas

- The Qualitative Assessment of Aggregates (Industrial Minerals) used for Horizontal and Vertical Construction
- Charaterisation of River Gravel Aggregates (Industrial Minerals) used in the construction Industry.
- Charaterisation of Quarry Aggregates (Industrial Minerals) used in the construction Industry.

The Qualitative Assessment of Aggregates (Industrial Minerals) used for Horizontal and Vertical Construction

Industrial minerals (River sediments or Gravel & Quarried Limestone or Sandstone) have been used for the construction of roads and buildings in Papua New Guinea (PNG), for decades. River gravel has been the major source of construction material except for a few places where river sediments are inaccessible, then quarry materials are used for road construction.

PNG is a mountainous country and has high drainage systems. Hence, river gravel or sediments are transported long distances from its source and deposited along river banks where the river currents gradually plateaus out. The sediments deposited or gravel consists of various minerals of varying quality and hardness. Some are soft minerals and others are hard minerals with varying reactivity, from very reactive to the more stable rocks like granite.

River gravels are common sources of aggregates used in roads and building constructions in most parts of PNG at present. These materials are composed of minerals of varying physical and chemical properties. It is known that some minerals have properties that are reactive and when exposed to the atmosphere over prolonged periods, tend to disintegrate thus contributing to collapse of aggregate-based products. In this process the reactive, minerals slowly disintegrate and cause the aggregates to loose their structure and strength, thus result in propagations of cracks and collapse of the mineral particles of the aggregates. The fast deterioration of sealed roads and collapse of footpaths and concrete-based structures are partly testaments to failure due in part to the disintegration of the reactive mineral species.

The aim of this investigation is to firstly characterize all the mineral compositions of the materials used to produce aggregates for roads and general constructions. After the characterization of the minerals the reactive components will then be selectively separated and removed to improve the homogeneity of the aggregates. A comparative study will be undertaken where the homogeneous aggregates and the river gravel as it is will be subjected to hardness test to determine the hardness of each type of minerals deposits (river sediments). The investigation will also look at alternative rock breakage methods with the intention to select the best crusher or processing method to produce compatible aggregates.

The success of this work will translate to huge savings to the PNG Government's annual road maintenance expenditures and the building and construction industries by enhancing the longevity of aggregate-based products. This project provides for us an opportunity to produce original data and invaluable knowledge and information which will form part of PNG standards in the production of aggregates for the construction industry. The work will help to improve the quality of knowledge and information in the production procedures and selection, flow sheet design and production of competent aggregates to ultimately enhance the longevity of finished aggregate products including sealed roads and concrete based products in PNG.

LIST OF PUBLICATIONS

Stanley Rungwa, Gabriel Arpa, H. Sakulas, A. Harakuwe and D. Timi (2012).“Phytoremediation – An Eco-Friendly and Sustainable Method of Heavy Metal Removal from Closed Mine Environments in Papua New Guinea”.*Procedia Earth and Planetary Science,* ELSEVIER Science Direct. Vol. 6, pp. 269 - 277 http://www.sciencedirect.com/science/article/pii/S1878522013000374

Rungwa.S, G. Arpa, H. Sakulas, A. Harakuwe and D. Timi (2012).*Phytoremediation − An Eco-Friendly and Sustainable Method of Heavy Metal Removal from Closed Mine Environments in Papua New Guinea*, The 10th International Earth Science and Technology Symposium Proceedings (Bundang Institute of Technology – Indonesia), 19th – 20th of September, 2012. Science Direct: http://www.sciencedirect.com/science/article/pii/S1878522013000374

Rungwa.S, G. Arpa, H. Sakulas, A. Harakuwe and D. Timi (2012).*Phytoremediation − An Eco-Friendly and Sustainable Method of Heavy Metal Removal from Closed Mine Environments in Papua New Guinea*, The Papua New Guinea Research, Science and Technology 5th Conference Proceedings (PAU), 25th – 29th of July, 2012.

Rungwa. S, G. Arpa, H. Sakulas, A. Harakuwe and D. Timi (2012), *Review on Phytoremediation Technique in PNG Mining Environment,* Environment PNG Journal, Volume 2, Issue 3, pp 1- 9.

Rungwa.S, G. Arpa, H. Sakulas, A. Harakuwe and D. Timi (2013).*Assessment of Phragmitekarka (pitpit) as Possible Phytoremediation Plant Species for Heavy Metal Removal from Mining Environment in PNG.A Case Study on Closed Namie Mine Wau, Morobe Province.* The 7th Huon Seminar Proceedings, November 13th – 14th, 2013, PNG University of Technology

Rungwa. S, Arpa G. (2014), *Statistical Comparison and Analysis of Selecting Optimal Native Phytoremediation Plant Species for Heavy Metal Removal on Mining Environment of Papua New Guinea. A Case Study at Closed Namie Mine of Wau, Morobe Province,* The 2nd International Conference on Pure and Applied Mathematics – Proceedings, December 13th – 18th, 2014.

Bradley Vali, Gabriel Arpa (2014) “Finding the Relationship between RQD and the Fracture Frequency in the Different Ok Tedi Lithologies”. *Procedia Earth and Planetary Science,* ELSEVIER Science Direct. Vol. 6, pp. 403 – 410. http://www.sciencedirect.com/science/article/pii/S1878522013000544b

Kobal, W., Tongamp, W., Arpa, G., Shibayama, A., (2013) Extraction of nickel and cobalt from Ramu laterite ore – Papua New Guinea. XXVI International Mineral Processing Congress (IMPC) 2012 Proceedings, 2468 - 2477

Kobal, W., Tongamp, W., Arpa, G., Shibayama, A., (2013) Extraction of nickel and cobalt from Ramu laterite ore – Papua New Guinea. XXVI International Mineral Processing Congress (IMPC) 2012 Proceedings

Kama, M., Chakrabarti, A. K. and Leki,P.S.A.,(2014).,Production of Sponge Iron by Oxidation Roast and Carbothermic Reduction of Ok Tedi Pyrite concentrates**.** XXVII International Mineral Processing Congress (IMPC) 2014

Proceedings.https://www.google.com/search?hl=en&q=Isothermal+Carbothermic+reduction+of+iron+oxides+in+Magnetite+Skarn+Ores+from+Ok+Tedi+Mine+Western+Province+Papua+New+Guinea&gws_rd=ssl

DEPARTMENT OF SURVEYING AND LAND STUDIES

Head of Department: Professor Dilip Kumar Pal

A. Priority Research Areas of the Department

The department's research activities revolve around the pivot 'Land and allied resources' optimum utilization, management and valuation. The department is primarily involved in the process of developing human resources adept in the holistic management of land resources and to eke out best value out of them in a sustainable manner through coordinated research activities. The human resources developed in the department have a wide exposure to the state of the art technology e.g. recent developments in the field of Remote Sensing, Geographic Information Systems, Global Positioning System / GNSS, use of latest Total Stations and allied implements of the digital era.

The department is also involved in a number of research programs including densification of Benchmark points for PNG using latest GPS / GNSS technology, GIS, remote sensing, and cartographic communication through development of thematic maps for PNG, property valuation and land management research programs as well as student projects.

Some specific areas are given below:

1) Climate change studies
2) Land suitability for Rice cultivation in PNG using Remote Sensing and GIS
3) Forest Biomass monitoring using Remote Sensing and GIS
4) Forests and Societal management
5) Inventorying Environmental Resources
6) Disaster Risk Reduction / Disaster Risk Management (DRR & DRM)
7) Urban sprawl detection
8) Groundwater mapping
9) Land use planning and management
10) Land Administration studies
11) Migration studies
12) Asset valuation studies

13) Cadastral Data Modeling
14) Management of incorporated land groups (ILG)
15) GNSS Survey and Vertical Adjustment of Madang Network
16) GIS In Customary Land Tenure Investigation
17) RS & GIS in Urban and Regional Planning
18) Mining and Its Impacts on Property Market
19) Residential Property Management
20) Public Educational Facility Management
21) Property Development Process in Papua New Guinea
22) Low Income Housing in PNG: Challenges and Opportunities
23) AHI land mobilization policy
24) Impacts on customary land owners under Plantation Redistribution Scheme
25) Impacts & effects of special agriculture and business lease (SABL) on customary land owners
26) Causes and effects of urban land values
27) Road Alignment (Horizontal/Vertical)
28) Drainage Design
29) Subdivision Design
30) Control Surveys using GPS/GNSS
31) Local Geoid study using GPS heighting on heighted MSL Benchmarks
32) GPS/GNSS to Cadastral Surveying in PNG
33) Infrastructure Development Surveys
34) Geodetic Control Surveying using GPS/GNSS
35) ILG (Integrated Land Groups) Customary Land Registration

etc.

B. List of Scientific (National/International) Paper Publication in Peer Reviewed Journals

1. Yali, G., and Samanta, S., 2014, Biomass and carbon stock estimation using high spatial resolution satellite data, Journal of Environmental Research And Development (JERAD), 8 (3A), 777-785.

2. Samanta, S., Pal, D. K, 2014, Scenario of Large Scale Rice Production in Papua New Guinea, International Journal of Innovative Research in Science & Engineering, 2 (6), 463-475.

3. Rabindra Kumar Das, Dilip Kumar Pal, & Michael Manisa. (2014) - Inventorying Environmental Resources - Paradigm Shift in Large Scale Topographic surveys and Mapping using High Resolution Satellite Images; Accepted for publication in journal ENVIRONMENT- Papua New Guinea

4. Samanta, S. and Koloa, C., 2014, Modelling Coastal Flood Hazard Using ArcGIS Spatial Analysis tools and Satellite Image, International Journal of Science and Research (IJSR), 3 (8), 961-967.

5. Samanta, S., 2014, Market Accessibility for Marginal Rice Grower in Papua New Guinea, Innovative Space of Scientific Research Journals, 10 (2), 342-352.

6. Samanta, S., 2014, Shoreline Change Analysis Along Hansa and Broken Water Bay Coastal Tract of Papua New Guinea Through Remote Sensing and GIS, International Journal of Management and Social Sciences Research (IJMSSR) , 3 (11), 25-31.

7. Jana, S.K., Sekac, T. and Pal D. K., (2014): Study of changing river courses and estimation of reduction of available land reserved for development in Lae city of Papua New guinea using GIS and Remote Sensing Technology, *International Journal of Advancement in Research & Technology*, Vol. 2, Issue 12, Page 45-57, ISSN 2278-7763

8. Tumare, J., Jana, S.K. and Pal D. K., (2014): Application of Space Technology for Groundwater Zone Investigation in Bulolo-Wau surrounding Gold Mine, Morobe Province, Papua New Guinea, *International Journal of Geoinformatics*, Vol. 10, No 4, Page 45-57, ISSN 1686-6576.

9. Wesley, T., Jana, S.K. and Sekac, T., (2014). Change detection study of Lae urban, the second largest city of Papua New Guinea using multi-temporal high resolution remote sensing data, *International Journal of Management and Social Sciences Research* (IJMSSR) ISSN: 2319-4421 Volume 3, No. 10, October 2014, pp 63-69 http://www.irjcjournals.org/ijmssr/Oct2014/10.pdf

10. Sekac, T., Jana, S.K. (2014): Change detection of Busu river course in Papua New Guinea-Impact on local settlements using Remote Sensing and Technology, *International Journal of Scientific & Engineering Research,* (IJSER) Volume 5, Issue 8, August-2014 896 ISSN 2229-5518, http://www.ijser.org/research-paper-publishing-august-2014_page5.aspx

11. Babarinde, J.A. (2014), "Forced Migration and Displacement: A Conceptual Framework for Explaining the Impact on Women and the Role of Land Management", *Journal of Internal Displacement*, Vol. 4, No. 1, pp. 91-111.

12. Babarinde, J. A. (2014-5), "Contribution on Papua New Guinea", In: International Society of City and Regional Planners (ed.), International Manual of Planning Practice (IMPP), ISOCARP, The Hague, The Netherlands (Soon to be released).

13. Babarinde, J. A. and Mhango, B. J. (Forthcoming), "Bridging urban-rural disparities in Namibia for Vision 2030: A Human Development Index (HDI) Approach", Submitted to *Progress Journal*, Namibia University of Science and Technology.

14. Babarinde, J. A. (Forthcoming), "Asset Valuation and the Role of News in Sub-Sahara Africa: Valuers' Rationality and the Hype Dilemma", Submitted to *Pacific Rim Journal of Property Research.*

15. Babarinde, J. A., Holis, S., Pai, A. (Forthcoming), "Embedding Real Options in Commercial Property Valuations", Submitted to *Journal of Property Investment and Finance.*

C. List of Conference Proceedings Publication

1. Dilip Kumar Pal & Sarbari Pal, 2014. Transforming Global Temperature through Influences other than Greenhouse Effect – A Treatise on Issues. Presented (oral) in the International Congress of Environmental Research ICER-14 at Bangalore, India, Proceedings reference: ICER/625/SS-I/14.

2. Tumare, J., Jana, S.K. and Pal D. K., (2014): Application of Remote Sensing and GIS for Ground Water Potential Zone investigation in Bulolo-Wau Gold mine surrounding, Morobe Province, Papua New Guinea, International Conference in Geospatial Media & Communication 2014, 5-9th May2014, Geneva, Switzerland.

3. Samanta, S., (2014): Identification of Large Scale Rice Suitability Areas in Papua New Guinea Using Remote Sensing and GIS Technology, Pacific GIS/RS User Conference 2014, 24-28th November Suva, Fiji.

4. Samanta, S., (2014): Coastal Hazard and Vulnerability Assessment using Remote Sensing and Geographical Information System, 1ST Management and Innovation Technology International Conference (MITiCON2014), December 17-19, 2014, Garden Cliff Resort & Spa, Pattaya, Thailand.

5. Babarinde, J.A. (2014-5), "Project Viability and Fear of Terror Attack: Investors' Rationality and the Risk Dilemma". Paper's abstract has already been approved for full paper development and presentation at the forthcoming Conference on: ***Changing Cities: Spatial, Design, Landscape & Socio-economic Dimension*s, Porto Heli, Peloponnese, Greece, 22-26 June 2015, organised by the University of Thessaly, & Ministry of Energy and Environment, Greece.**

D. List of Book Publications

1. Samanta, S., 2014, Remote Sensing and GIS in Climatological Modelling, CreateSpace Independent Publishing Platform, ISBN-13: 978-1500258504, Paperback, 160 Pages.

2. Jana S. K., (2014-07-22): Integrating Space technology in Forest and Societal Management, *Scholar's Press*, OmniScriptum GmbH & Co. KG , Germany, ISBN: 978-3-639-66216-0

3. Tumare, J., Jana, S. K., (2014-06-20): Groundwater Investigation Using Space Technology, *LAP Lambert Academic Publishing*, OmniScriptum GmbH & Co. KG , Germany, ISBN: 978-3-659-56048-4

E. List of Unitech Seminar Presentations

1. Babarinde, J.A. (2014). Project Viability and Fear of Terror Attack: Investors' Rationality and the Risk Dilemma. UNITECH Research Committee Seminar – 11/2014. Presentation made at the weekly Unitech Staff/Students Academic Seminar, Rose Kekedo Foyer, Unitech Campus, Lae, Tuesday, May 27.

2. Dilip Kumar Pal (2014). Space Technology in Sustainable Development – A case study in generating Action Plan for Optimum Resources Management and Monitoring. UNITECH Research Committee Seminar – 12/2014. Presentation made at the weekly Unitech Staff/Students Academic Seminar, Rose Kekedo Foyer, Unitech Campus, Lae, Tuesday, June, 03.

3. Junior Tumare (2014). Ground water investigation using Space Technology. UNITECH Research Committee Seminar – 22/2014. Presentation made at the weekly Unitech Staff/Students Academic Seminar, Rose Kekedo Foyer, Unitech Campus, Lae, Tuesday, September, 30.

F. International Collaborative Research Projects

1. **[Completed - 2014]** Worked as Consultants (Dr. S Samanta and Professor D K Pal) in the capacity of Local Hydro-Meteorologist- UNDP, PNG Project "Developing a comprehensive hazard profile for East Sepik, Madang, Morobe, New Ireland and Northern Province in Papua New Guinea", Collaboration between, Department of Surveying & Land Studies, The PNG University of Technology, Private Mail Bag, Lae, Papua New Guinea (Consultants) and RMSI Private Limited ("RMSI").

2. **[To be Completed in 2015]** Worked as Consultants (Dr. S Samanta and Professor D K Pal) in the capacity of GIS/database specialist- UNDP, PNG project, "Climate Risk, Vulnerability and Needs Assessment for Morobe, Madang, East Sepik, Northern and New Ireland Provinces of PNG", Collaboration between, Department of Surveying & Land Studies, The PNG University of Technology, Private Mail Bag, Lae, Papua New Guinea (Consultants) and RMSI Private Limited ("RMSI").

G. Ph.D Research

SL No	Name of Research Scholar	Program Year	Topic	Discipline	Supervised by	Remark
1	Mr Wycliffe Antonio	Ph.D; Registered in 2014	A Conceptual Framework for Cadastral Data Modelling for Papua New Guinea	Geomatics	Prof. D. K. Pal	Ongoing
2	Ms Cathy Koloa	Ph.D ; Registered in 2015	Hydro-Morphometric Analysis and Hazard Assessment of Major River Basins in Papua New Guinea using Remote Sensing and GIS Technology	Geomatics	Dr. S. Samanta Prof. D. K.Pal	Ongoing

H. M.Phil Research

List of the M. Phil students in Surveying & Land Studies department: 2014

SL No	Name of Research Scholar	Program Year	Topic	Discipline	Supervised by	Remark
1	Junior Tumare	M.Phil/2	Application of RSGIS for Ground Water Potential Zone Identification in Bulolo-Wau Surrounding, MP, PNG	M.Phil in Geomatics	Dr. S. K. Jana Prof. D. K.Pal	Comple ted
2	Richard Baia	M.Phil/2	Application of GIS In Customary Land Tenure Investigation for Mining Project- A Case study of Yandera Copper – Molybdenum –Gold Mining Project, Madang Province, PNG	M.Phil in Geomatics	Dr. S. Samanta Prof. D. K.Pal	Comple ted
3	Cathy Koloa	M.Phil/2	Hydro-morphic Analysis of Markham River Basin and Hazard Assessment of Lae Coast Using Remote Sensing and GIS Techniques	M.Phil in Geomatics	Dr. S. Samanta Prof. D. K.Pal	Comple ted get degree this year
4	Alice Risiapa	M.Phil/1	Using Remote Sensing & GIS application to identify factors contributing to low life expectancy in Morobe province, PNG	M.Phil in Geomatics	Dr. S. Samanta Prof. D. K.Pal	On going
5	Mr Glen Yali	M.Phil/1	Assessment of Above Ground Carbon Utilizing Remote Sensing and GIS techniques: integrating forest inventory data and satellite mapping approaches	M.Phil in Geomatics	Dr. S. Samanta Prof. D. K.Pal	On going
6	Robert Rosa	*M.Phil/1	GNSS Survey and Vertical Adjustment of Madang Network by GNSS	M.Phil in Geomatics	Dr. S. K. Jana Mr. Samudra Gupta	On going
7	Jerry Mille	*M.Phil/1	The efficiency and effectiveness of land title registration process in Papua New Guinea-A case study focus on Momase & Highland region	M.Phil in Land Studies	Dr. Jacob Babarinde Mr. Andrew Pai Dr. S. K.Jana	On going
8	Lepani Kariwaga	*M.Phil/1	Issues affecting management of incorporated land groups (ILG) and their sustainability in Papua New Guinea	M.Phil in Land Studies	Dr. Jacob Babarinde Mr. Andrew Pai Mr. Suman Holis	On going

I. Bachelor's Degree Final Year Research

List of the GISci Section: 2014

COURSE: **BGIS/4**

S/ No	Student	Topic	Supervisor
1	ATUHUBEN Beatrice	Using PGIS/RS to mitigate crime in the Eriku Suburb - Lae City	Mr Kari
2	AUGWI Carina	Availability of Broad Land-Use for Residential Development Purposes using GIS/RS: Lae	Mr Suat
3.	BANDE Daliah	Using GIS to assess Peoples Accessibilities to Health Facilities and in Lae Urban Area.	Mr Suat
4	IMAN Arty Samuel	Using GIS/RS Technology for Environmental Conservation in the Lae Urban Area	Mr Kari
5	KARUA Marelle	Ramu Agri Industries Ltd. Housing Database System.	Mr Gupta
6	KODO Amos	Using GIS/RS to Identify Potential Sites for Medium Scale Hydro Dam	Mr Kari
7	KORAI Katrina	Application of GIS to Detect the Amount of Excessive Pollutants in the OK Tedi River System	Dr Jana
8	KULL Jacinta	The Development of Electronic Yellow Page Site for Lae City using GIS/RS	Mr Gupta
9	LADI Anthony	Updating DCDB of Ward 2: Lae City	Mr Suat
10	MAPOSIA Micah	Mineral Resource Planning & Management using GIS Technology	Dr Samanta
11	MEA Paul Stanely	Using GIS to Analyse Market Accessibility of Coffee in Obura Wonenara - EHP	Mr Antonio
12	MOCHON Charles	Lae Urban Sprawl Mapping and Land Use Change Analysis using RS/GIS	Mr Gupta
13	MUKAP Veronica	Erosion Risk Assessment Using R/S & GIS Technology In the Gogol Catchment Area.	Dr Samanta
14	ORU Jack	Updated Map of Lae City – Application of GIS/RS	Mr Antonio
15	PETER Junior	Application of GIS as a Potential Port Information Management System by Using Lae Port as a Model Study Area	Mr Suat
16	PISO Angelyn	Using RS/ & GIS techniques in Spatial Information Monitoring of Gold and Mineral Refuse Disposal Piles	Dr Samanta
17	ROREA Nelson	Risk Management for Informal Settlers and Natural Disaster – Honiara City	Dr Jana
18	SEKAC Tingneyuc	Change Detection of Busu River course and its impact on local settlement using RS data	Dr Jana
19	SIGAYONG Raiwaso	Integration of GIS/RS in Web mapping Site for Unitech	Mr Kari
20	TAPULU Wesley	Application of RS & GIS in Urban and Regional Planning in Lae City	Dr Jana
21	TETE Benson	The Use of Application of GIS in Real Estate Management	Mr Antonio
22	TUAKI Deborah	Application of ArcGIS network model into Water Distribution of Eda Ranu.	Mr Antonio
23	WAHUNE Milcah	Creating Network Analysis Database for PNG Water Board.	Dr Samanta

List of the Property Studies Section: 2014

COURSE: **BPVP-BPLP/3**

S/ No	Name	Research Topic	Supervisor (s)
1	Percy AIGERE	An Investigation into the Feasibility of a Rent Control Policy for PNG: A Case Study of Lae	Mr S. Holis
2	Wilfred ATZIER	Mining and Its Impacts on Property Market: A Case Study of Lihir Gold Mine in PNG	Mr A Pai
3.	Jerry BEROM	Fire Safety Management in Shopping Centres: A Case Study of Brian Bell Shopping Centre in Lae	Dr J. A. Babarinde
4	Sedester ELECOR	Impacts of High Rentals on Residential Property Market in Lae	Mr L. Karigawa
5	Lalapu JESSY	Regulation of Valuer Registration in Papua New Guinea: Its Challenges and the Way Forward	Mr J. Mille
6	Yatu JOSEPH	Relationships between the PNG LNG Project and Increase in Prices of Residential Properties in Lae	Mr S. Holis
7	Allen MALISO	Decentralisation of Land Title Registration System from the National to Provincial Level in PNG	Mr A Pai
8	Albert MARU	Challenges Associated with Residential Property Management in Port Moresby: The Way Forward	Dr J. Babarinde
9	Solomon MASO	Land-owners' Benefit-sharing in PNG: A Critical Appraisal	Mr L. Karigawa
10	Danny MIAMBA	An Appraisal of Public Educational Facility Management in PNG: A Case Study of Unitech Main Campus	Mr J. Mille
11	Stanis-laus MU-HU	Urbanisation and Its Impacts on Residential Real Estate in Lae	Mr S. Holis
12	Steven PAUL	An Assessment of the 99-Year State Lease and Its Impacts on Commercial Property Investment in PNG	Mr A Pai
13	Michael PETER	Impediments to Supply of Affordable Housing Accommodation in Lae	Dr J. Babarinde
14	Nosa PURINDA	Analysis of Informal Customary Land Sales and the Outcomes in Lae	Mr L. Karigawa
15	Vanessa SAKIUSA	Tenant Satisfaction in Leisure Properties: A Case Study of Grand Papuan Hotel	Mr J. Mille
16	Enos GAWI	An Assessment of the Property Development Process in Papua New Guinea: A Case Study in Port Moresby	Mr S. Holis
17	Socrates GUNINIEI	Mixed-use Developments as a Strategy for City Sustainability in PNG: An Exploratory Study	Mr A Pai
18	Nisi KANDAO	Loopholes and Defects in Rural Property Valuation Practices and Its Impact on Sustainable Development in the Highlands	Dr J. Babarinde
19	John KOLTES	An Exploratory Study of Student Housing in PNG Using Shipping Containers	Mr L. Karigawa
20	Richard MADI	A Study on Vacant Land for Highest and Best Use in Lae, Morobe Province	Mr J. Mille
21	Francis MANGO	The Impacts of Urbanisation Affecting the Value of Real Properties in Port Moresby, Papua New Guinea	Mr S. Holis
22	Robert MAINADI	Property Development: Feasibility and Impact Parameters in Lae City	Dr J.Babarinde
23	Sillon	A Sustainable Resettlement Policy Framework for the Displaced	Mr A Pai

	MANIWAVIE	Manam Islanders Sequel to the Volcanic Eruption	
24.	Mora NICKSON	Residential Property Market Segmentation to Meet Customer Needs in Port Moresby	Mr L. Karigawa
25.	Sebastian PAUL KODANG	An Analysis and Assessment of Development-induced Displacement and Resettlement: A Case Study of Madang Marine Park Development	Mr J. Mille
26.	Cathy TAVIP	Compulsory Purchase and Resettlement Policies in Papua New Guinea: An Assessment	Mr S. Holis
27.	Joel WAPELE	Residential Property Investment: Issues and Challenges Affecting First Time Investors in Papua New Guinea	Mr A Pai
28.	Atha WAUGA	Private Sector Provision of Low Income Housing in PNG: Challenges and Opportunities	Dr J. Babarinde

COURSE: BPLP/4 – LAND ADMINISTRATION & PROPERTY MANAGEMENT

S/ No	Name	Research Topic	Supervisor (s)
1	Jana AKUANI	Pollution from Morobe Mining (MMJV) affecting land use of customary landowners along the Watut River Community	Mr. Suman Holis
2	Fabiola ATBO	Factors affecting residential property development: A comparative study of NCD and Lae.	Dr. Jacob Babarinde
3	Martin BAGIOM	The effects of land under customary ownership in developing Madang Town	Mr. Jerry Mille
4	Mavis GWANGWEN	The impact of AHI land mobilization policy on the AHI customary land	Mr. Andrew Pai
5	Peter IMBO	Improving the facilitation and registration process of Incorporated Land Group in PNG.	Mr. Lepani Karigawa
6	Murray INAPI	Full use and effectiveness of Incorporated Land Groups and participation of customary land owners in the social and economic development	Mr. Jerry Mille
7	Nobert KEMBO	Issues hindering development and expansion of Lae City on customary land	Mr. Andrew Pai
8	Didymas KISSO	Development and creation of new student dormitories at Unitech	Mr. Suman Holis
10	Aron LYANDAO	Incentives as land compensation than money to promote economic development	Mr. Jerry Mille
11	David MARA	The effects of land compensation for the acquisition of alienated land for public purpose development in Lae.	Mr. Andrew Pai

12	Michaella OTTO	Management of girls dormitories at Unitech	Mr. Suman Holis
14	Trino PUPUNESO	Impacts on customary land owners under Plantation Redistribution Scheme in Hofaga, Bena, Eastern Highlands Province.	Mr. Jerry Mille
15	Arthur ROBINSON	The impact of costs involved in registering ILGs and customary land: A case study of Butibam village in AHI LLG, Lae, Morobe Province.	Mr. Suman Holis
16	Daniel TOMAI	Causes and effects of residential accommodation shortage in selected urban secondary schools in Lae City, Papua New Guinea	Dr. Jacob Babarinde
17	Correny URE	The compulsory acquisition mode and its common complications in central province, PNG	Mr. Lepani Karigawa

COURSE: BPVP/4 - VALUATION & PROPERTY MANAGEMENT

S/ No	Name	Research Topic	Supervisor (s)
1	Bethel BAMA	The market opportunity for student's private rented housing in Lae City, Morobe Province, Papua New Guinea	Dr. Jacob Babarinde
2	Carlos JIMBO	Impacts & effects of special agriculture and business lease on customary land owners: A case study of Turubu, East Sepik Province	Mr. Andrew Pai
3	Gibson KAMA	Formalizing of informal urban settlements in Lae City, Morobe Province	Mr. Suman Holis
4	Steven KAPI	Improve the management and upgrading of Port Moresby General Hospital	Mr. Lepani Karigawa
5	Fatai MALOLO	An analysis of socio-economic impact on staff housing at Unitech	Dr. Jacob Babarinde
6	Prudence MANDRAKAMU	Land acquired for the processing centre in Manus Province and its possible impacts on the landowners	Mr. Andrew Pai
8	Albert MOROMO	Development and expansion of Madang Town	Mr. Jerry Mille
9	Paulus MOTORO	The impact of taxation on property prices in Lae City, Papua New Guinea	Dr. Jacob Babarinde
10	Ginton NALIGA	The need for a permanent graduation hall at PNG University of Technology	Mr. Suman

			Holis
11	Junior NATHAN	Introducing a housing policy for all Police Barracks in PNG	Mr. Lepani Karigawa
12	Joshua PAEKE	Minimizing negative impacts on current developments on the natural and social environment and PNG University of Technology	Mr. Jerry Mille
13	Maninga PAPO	Negative impacts of lease-lease backon customary land owners in Morobe Province	Mr. Lepani Karigawa
14	Lucas RAMITA	Causes and effects of informal rental housing on real estate practice	Mr. Suman Holis
15	Shirley SOAN	Liquefied Natural Gas project's impact on real estate market in Port Moresby, Papua New Guinea	Dr. Jacob Babarinde
16	Wanpis TINDIPU	Socio-economic impacts of PNG LNG Project on residential properties in Lae	Mr. Andrew Pai
17	Kivison WASA	Causes and effects of urban land values in Port Moresby City, Papua New Guinea	Dr. Jacob Babarinde
18	Nigel WENES	An exploratory study on management of maintenance practices of staff residential accommodation for Government educational institution in Lae, Morobe Province "Case study: PNG University of Technology"	Mr. Suman Holis

List of the Surveying Section: 2014

COURSE: BTSR/4

S/ No	STUDENT NAME	RESEARCH TOPIC	NATURE	SUPERVISOR/ CO-SUPERVISORS
1	SUL, Dickson	Road Alignment (Horizontal/Vertical) and Drainage Design, back road to Bumayong.	Engineering Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
2	MAS, Mclyn	Subdivision Design – Residential Area 2, Unitech Campus	Cadastral Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
3	ANDEPA, Luke	Road Alignment (Horizontal/Vertical) Design, … Back road from the Road Junction at the end of New Staff Houses/Quarters to Road Junction at Habitat and Road to 2nd Gate.	Engineering Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
4	KAGL, Benjamin	Drainage Design – Redesign the existing Drainage System from International Students Residence to Mass area, Unitech.	Engineering Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
5	JONNES, Issac	Subdivision Design for Residential Purpose, Residential Area 1, Unitech Campus	Cadastral Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
6	KUNA, Polopea	Subdivision Design, Residential Area 4, Unitech Campus	Cadastral Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
7	KUNIAKA, Nathan	Proposed Design of New Water Supply for Unitech Male Dormitories	Engineering Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
8	KELLY, Chris	Control Surveys using GPS/GNSS – Unitech Campus	Geodesy GPS/GNSS	T.L. Malolo (R. Rosa)
9	TOM, Simon	Drainage Design, from International Students Residence to the Road Junction at Area 1 and Security Office.	Engineering Surveying	T.L. Malolo (M. Tagicakibau N.V. Kapi)
10	KENNY, Joel	Road Alignment Design – Sogeri Market back gate to PTC College	Engineering Surveying	T.L.Malolo (N.V.Kapi)
11	BORE, Bejone	Road Alignment Design, Back Road from Residential Area 1 towards Area 5.	Engineering Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
12	WENDE, Owen	Investigation of Transformation Processes & Techniques and their various applications to Geodetic Surveying	Geodesy	T.L.Malolo (R.Rosa)
13	WATATO, Timothy	Land Subdivision Design – Portion of Land in East Taraka	Cadastral Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
14	JAMES,	Road Alignment (Horizontal & Vertical)	Engineering	T.L.Malolo

	Turia	and Drainage Design – Back Road from Area 1 towards Area 5	Surveying	(M.Tangicakibau N.V.Kapi)
15	DAVID, Frank	Redesign of Road Alignment (Horizontal & Vertical) for Road Upgrading – Along Rigel Road from Chemica to Mapai Transport Yard	Engineering Surveying	T.L.Malolo (M.TangicakibauN.V. Kapi
16	RINKI, Nelson	Road Alignment Design (Horizontal & Vertical) – Back Road from Road Junction Residential Area 1 to new Staff Houses/Quarters	Engineering Surveying	T.L.Malolo (M.TangicakibauN.V. Kapi)
17	NAEPE, Martin	Control Surveys using GPS/GNSS – Unitech Campus	GPS/Geodesy	T.L.Malolo (R.Rosa)
18	KENOWA, Moses	Drainage Design (for road upgrading) – Along Rigel Road from Chemica to Mapai Transport Yard.	Engineering Surveying	T.L.Malolo (M.Tangicakibau N.V.Kapi)
19	UMBU, Joel	Drainage Design – Back Road from Resident. Area 1 towards Area 5	Engineering Surveying	T.L.Malolo (M.TangicakibauN.V. Kapi)
20	SOGOTEE, Eric	Road Alignment Design (Horizontal & Vertical) – From International Village to Road Junction to Pakanamare	Engineering Surveying	T.L.Malolo (N.V.Kapi M.Tangicakibau)
21	ARIRO, Zairah	Standardization of UNITECH EDM Calibration Baseline	Physics/ Surveying	T.L.Malolo (N.V.Kapi)
22	DICKSON, Haua	Determination of local Geoid at Unitech Campus, using GPS heighting on heighted MSL Benchmarks	Geodesy GPS/GNSS	T.L.Malolo (R.Rosa)
23	KAPUTIN, Ronald	Applications of GPS/GNSS to Cadastral Surveying in PNG – A Case Study	Geodesy GPS/GNSS	T.L. Malolo (R. Rosa)
24	KARROL, Kenneth	Road Alignment Design (Horizontal & Vertical), from the Main Gate Unitech to Junction at Security Office/Union Shop	Engineering Surveying	T.L. Malolo (N.V. Kapi M. Tagicakibau)
25	KUNAI, Alexander	An Assessment of Storm Water Management at Unitech – looking from an Engineering Design perspective.	Engineering Surveying	T.L. Malolo (M. Tangicakibau N.V. Kapi)
26	WANI, Russel	Infrastructure Development Surveys at Unitech Campus to Identifying suitable lands/locations for construction of new Building Facilities?	Topographical Surveying	T.L. Malolo (M. Tagicakibau N.V. Kapi)
27	YALLOW, Rex	Land Subdivision Design in a Slope Environment – Lae City	Cadastral Surveying	T.L. Malolo (M. Popeu)
28	HOBART, Desmond	Geodetic Control Surveying using GPS/GNSS at Unitech Campus	Geodesy Geodetic Surv.	T.L. Malolo (R. Rosa)
29	IRUGA, Richard	Processes involve in the ILG (Integrated Land Groups) Customary Land Registration	Cadastral Surv. L/Registration	T.L. Malolo (M. Tagicakibau)

Research Conducted by the PG Students during 2014

The following 40 students completed their research/studies in 2014 and will graduate on April 10, 2015 compared to a total of 32 students in last year

Name of the student	Thesis Title	Program	Department
Macquin K. Maino	Effects of Root-knot Nematode (*Meloidogyne incognita*) on Lowland Sweet Potato Varieties in Papua New Guinea	PhD	Agriculture
Jeffrey Waki	Investigating Gene Flow between Wild and Cultivated Taro (C*olocasia esculenta* (l.)Schott) Population in Morobe Province, Papua New Guinea	Mphil	Agriculture
Chris Fidelis	Development of Cocoa Pod Husk-based Compost and its Effects on the Growth of Hybrid Cocoa Seedlings	Mphil	Agriculture
Enara Enara	Screening of Thirty Six (36) Upland and Lowland Imported Rice Varieties for Drought Tolerance Under Glass House Condition.	Mphil	Agriculture
Samuel Kapia	Baseline Study on the Occurrence of Some Heavy Metals in Fish Tissue in Yonki Reservoir, Eastern Highlands Province	Mphil	Agriculture
Tabitha Manjobie	Investigation into the Biology of *Segestidea defoliaria defoliaria* (uvarov) and it's Egg Parasitism by *Doirania leefmansi* Waterston	Mphil	Agriculture
Kundo Hundang	Exposure of Food Crops and Fishery Products to Cadmium in the Volcanic Areas of East New Britain Province and Their Potential Health Risks	Mphil	Applied Sciences
Barton Gabi Maino	Effective communication methods enhance rehabilitation programs in Prisons: A case study of Buimo prison in Morobe Province	MCS	Communication and Development Studies
Mispher Mark Nanu	Marketing Technical Vocational Education and	MCS	Communication and Development

	Training via Mass Media for Youth Socio Economic Development: A Case Study of Youths in Lae Urban Settlements		Studies
Paul Paraka	Effective Communication Prevents Cult Practice in the Secondary School Students: A Case Study of Lae, Bugandi and Bumayong Secondary Schools of Lae	MCS	Communication and Development Studies
Lucy Maino	Participatory Communication for Innovation in Rice farming Systems – A Case Study in the Morobe Province	MCS	Communication and Development Studies
Andie Aitikus Bill	Communication Strategies for Developing a Procedural Framework to Formalize Land Issues of Ahi People of Morobe Province: A Case Study of Butibam, Kamkumung and Yalu Villagesof Communicating Resettlement	MCS	Communication and Development Studies
Ale Gaun	Effective Ways of Communicating Resettlement Issues: A Case Study of Lae Port Development Project	MCS	Communication and Development Studies
Peter Pia	The Impact of Organisational Culture on Project Strategy of Construction Organisations in Papua New Guinea- A Case Study of Lae City Roads Rehabilitation and Upgrading	Mphil	Civil Engineering
Maling Ambranga	A Comparative Evaluation of the Structural Performance of Papua New Guinea River Gravel using Repeated Load Triaxial (TLT) Test- A Performance Based Test	Mphil	Civil Engineering
Olo Gebia	Variation in Tropical Rainforest Soil Seed Bank Community Along an Altitudinal Gradient in Morobe Province, Papua New Guinea	Mphil	Forestry
Cathy Koloa	Hydro-Morphometric Analysis and Hazard Assessment of Markham River Basin and Lae Coast Using Remote Sensing and GIS Technology	Mphil	Surveying and Lands Studies

Anne Warra	Efficacy of Entomopathogenic Nematode-associated Bacteria as Biopesticide	MSc	Agriculture
Philemon Nahuet	Perceptions of Village Oil Palm (VOP) Farmers in the Markham Valley on the Impact of Their Involvement in Oil Palm Production on Their Livelihood	MSc	Agriculture
Joel Meguza Tahie	Dedekind Complete Riesz Spaces and Boolean	PGD	Mathematics and Computer Science
Issac Angra	One Topological Semigroup of Continuous Functions	PGD	Mathematics and Computer Science
Samuel David Dunstan	To Create Dipstick Calibration Charts for Horizontal and Inclined Fuel Tanks Through Mathematical Analysis Alone	PGD	Mathematics and Computer Science
Gibeon Kewa	Industrial Application of Max Flow – Min Cut Theorem to Open Pit Mining	PGD	Mathematics and Computer Science
Charlie Suruban	Filed Evaluation of the Incidence of Brown Plant Hopper and Stem Borer on 36 Introduced Rice Varieties Under Upland Rain-fed Condition	PGD	Agriculture
Mathias William	Investigating the Impact of Late-acting Self-Incompatibility on Cocoa (*Theobroma cacao*) Yield	PGD	Agriculture
Viti Oso	Evaluating Soil Carbon Stock at Five Selected Land Use Systems in a Tropical Landscape	PGD	Agriculture
Joseph Kimagl	Effects of incorporation of rice polish in broiler performance and carcass composition at Unitech Farm	PGD	Agriculture
Emily Maingu Aidan		EMBA	Business Studies
Brian Selarn Alois		EMBA	Business Studies
Robin Guebiang Bazzynu		EMBA	Business Studies
Polapoi Chalau		EMBA	Business Studies
Emete Enare Franky		EMBA	Business Studies
Patric Pakala Ibitali		EMBA	Business Studies
Albert Ishmael		EMBA	Business Studies
Ivan Noese		EMBA	Business Studies
Vincent Vagi Onnevagi		EMBA	Business Studies

Taffo Newton Rockaya		EMBA	Business Studies
Ms Gwen Sissiou		EMBA	Business Studies
Nelson P. Terema		EMBA	Business Studies
Kemasang Kemas Tomala		EMBA	Business Studies

Summary:

Degree	**Number**	**Department**	**Number**
PhD	01	Agriculture	12
Mphil	10	Applied Sciences	01
MSc	02	Business Studies	13
MCS	06	Civil Engineering	02
MBA (E)	13	Communication and Development Studies	06
PGD	08	Forestry	01
		Mathematics and Computer Science	04
		Surveying and Land Studies	01

PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

ALLOCATION OF RESEARCH FUNDS FOR 2014

Item	Applicant	Program	Supervisor	Department	Research Title	Amount (K)
1	Samuel Kapia	MPhil	Dr R. Rao	Applied Science	Baseline study on the occurrence of some heavy metals in fish tissues in Yonki Reservoir, Eastern Highlands Province.	15,000
2	Kundo Hundang	MPhil	Dr J. Gopalakrishnan	Applied Science	Exposure to cadmium from food crops and fishery products of volcanic areas in East New Britain Province and their potential health risks.	8000
3	Rahmie Par	MPhil	Dr J. Gopalakrishnan	Applied Science	Synthesis and characterization of metal complexes derived from bulky amine based bidentate ligands.	12,900
4	Api M Kaiwa	MPhil	Dr Kaul Gena	Mining	Extraction of Copper from Concentrates and Tailing by Choloridizing Roasting, Leaching and Cementation and/or Solvent Extraction.	10,000
5	David Y Timi	PhD	Dr S. Gopalakrisnan	Applied Sciences	Phytochemical, Microbiological and Antimalarial Investigations on PNG Medicinal Plants of *Diospyros* (Ebenacease).	15,000
6	Philemon Nahuet	MPhil	Dr Veronica Bue	Agriculture	Perceptions of Village Oil Palm (VOP) farmers on the impact of their involvement in oil palm production in Markham valley, Papua New Guinea	3,700
7	Ero Wambu	MCS	Dr Gari Sali	Communication for Development Studies (CDS)	Law and Order Issues at Porgera as a result of Conflict of interest between Landowners and Barrack Company.	3,670
8	John K. Riwasino	MCS	Dr Golam Khan	Communication for Development Studies (CDS)	Communication Strategies for Agriculture and Forestry in Papua New Guinea: A Case-study about implications for commercial tree farming in Markham Valley, Morobe Province.	2,600
9	Starza Paul	MCS	Dr Golam Khan	Communication for Development	The Intriguing challenges of tribal warfare in Enga: Communicating an integrated clan-based	4,000

				Studies (CDS)	approach to restore peace and order.	
10	Ruth Cliff Moka	MCS	Dr R. Orake	Communication for Development Studies (CDS)	Effective Communication Strategies helps improve dropping academic standards in PNG's secondary schools	2, 400
11	Glen Yali	MPhil	Dr Sailesh Samanta	Surveying & Lands Studies	Assessment of above – ground biomass & carbon stocks utilization Remote sensing & GIS Techniques in Yalu Community wet tropical lowland forest Morobe, PNG	4,365.62
12	Ivan Kepe	MPhil	Prof Samson Akoitai	Applied Sciences	CHROMATED-COPPER-ARSENATE IN (CCA) TREATED TIMBER: "*Determination of CCA in treated wood and its content in exposed soil of Bulolo, the high-land of Morobe Province, PNG*	3, 092.35
13	Anne Warra	MPhil	Mr Macquin Maino	Agriculture	Efficacy of entomopathogenic nematode-associated bacteria as biopesticide	10,000
14	Justin Kehatsin	PhD	Dr Gar Sali	Communication and Development Studies (CDS)	Unlocking Conflicts in Public Universities in PNG	5,713.80
15	Peter Buyoyu	MPhil	Mr Macquin Maino	Agriculture	Investigating the Fungus causing anthracnose disease on cut nut, Barringtonia edulis	9,000
16	Jerry Mille	MPhil	Dr J. Babarinde	Surveying & Land Studies	Identification & Analysis of Land Dispute Factors: A Study of Boundary. Ownership. Types of Disputes and Assessment (BODA) Factors in Simbu Province.	5, 020
Total						**114,461.77**

PNG UNIVERSITY OF TECHNOLOGY
CONFERENCE FUNDING APPROVED FOR 2014

Item	Applicant	Department	Venue	Amount Approved (K)
1	Ms Dora Kialo	Teaching and Learning Method Unit	University of Goroka, PNG	480
2	Dr R. Orake	Communication and Development Studies	University of Goroka, PNG	1,099
3	Dr S. Gopalakrishnan	Applied Science	Auckland, New Zealand	9, 304.54
4	Mr Sammy Aiau	Electrical & Communication Engineering	Tokyo, Japan	7,000
5	Dr M. Betasolo	Civil Engineering	Nova De Lisoa, Portugal	10, 466.19
6	Mr Macquin Maino	Agriculture	University of PNG	1,820
7	Dr Maia Wamala	Agriculture	University of PNG	1,820
8	Mr Londari Yamarak	Business Studies	University of PNG	1,820
9	Mr Samson Menggenang	Mathematics and Computer Studies	University of Goroka	2,534
10	Mr Samuel Dunstan	Mechanical Engineering	University of Goroka	2,534
11	Ms Kundo Hundang	Applied Sciences	Adelaide, Australia	2, 821
Total				**41698.73**

UNITECH RESEARCH COMMITTEE SEMINAR SERIES 2014

We successfully achieved another milestone by concluding the Research Committee Seminar series for the 2014 Academic year. Altogether, 23 seminars were presented on diverse subject matters. There were lots of enthusiasm in the Unitech community as expressed though the participation of academics, staff and students alike. As a University, we have to carry this forward to strengthen and build the research culture at Unitech. This is turn will enhance our standing as a university and help our bid for program accreditation. This seminar series is the best forum not only to disseminate the research outcomes to wider community but also to train the young academics and postgraduate students for their presentation skills

To make the Unitech Research Committee Seminar series sustainable and more attractive, everyone one of us has a role to play.

- Recently, Unitech recruited a large number of academic staff with wealth of experiences. It is probably the best forum for sharing the unique experiences.
- Masters and PhD students are also encouraged to make presentation on their research findings
- Many of the Academic Departments have the new HODs and Professors. It would be interesting for the new and also the existing HODs and/or A/HODs to make presentation on their strategic thinking and priorities for the Departments in the coming days.
- The SEM members also can play a vital role in this process through their participation which would be moral boosting for the staff members. On the top of that, they can also contribute through strategic discussions on different university matters.

I take this opportunity to thank Dr Kaul Gena, Pro Vice Chancellor (Administration) for his presence during the closing seminar for 2014 on behalf of the Senior Executive Management to show the support and commitment towards the seminar series. He made some excellent comments regarding the necessity of this seminar series to go ahead uninterrupted and the importance of publications in journals. The publications in peer reviewed journals not only will raise the profile of Unitech but also are necessary for promotions and contract renewals.

A compilation of all the research abstracts is posted on the Unitech website (www.unitech.ac.pg) as the resource materials for anyone to access. If anybody needs further information on any of the presentations, please contact the individual staff member at the appropriate email address.

Unitech Research Committee also takes this opportunity to thank all the presenters and participants involved with the seminar series. It is hoped that the seminar series will enhance the research culture and reputation of Unitech. With posting of the seminar abstracts on the

website, the Unitech Research Committee renews its commitment to make the seminar series sustainable and more attractive in the future.

Look forward to see you in 2015. I am quite confident that together, we can make this Research Committee Seminar a success story.

Professor Shamsul Akanda
Coordinator, Unitech Research Committee Seminar

Assessing Policy Impact on the Smallholder Rice Based Cash Crop Production Systems in Papua New Guinea - Food Security Implications

Nick Kewa
Lecturer
Department of Agriculture
nkewa@ag.unitech.ac.pg

Abstract

The policy impact of smallholder rice based cash crop production systems in Papua New Guinea (PNG) was assessed using farm data collected in a field survey between November 2008 and January 2009. The study was conducted in three agro-ecological zones, namely, Anglimp (highlands agro-ecological zone), Umi-Mutzing, (dry lowlands agro-ecological zone) and Erap-Bubia, (wet lowlands agro-ecological zone). The input-output data were collected through field surveys using structured questionnaires. Secondary data, mainly on transportation costs, processing costs, government levies, storage and handling, documentation, exchange rate information and insurance were collected from respective service providers and government agencies. All the data were then calculated to get a national scenario. Crop budgets were developed initially in financial terms and later on economic prices were utilized to evaluate the comparative advantage of rice production over other cash crops identified during the study period.

The analytical frame work used to determine the policy impact of smallholder rice based cash crop production systems was the Policy Analysis Matrix (PAM). Nominal protection coefficient of output (NPCO), nominal protection coefficient for inputs (NPCI) and effective protection coefficient (EPC) are important indicators of the PAM used in this study.

NPCO for coffee and cocoa indicated that farmers are receiving less than the world prices. NPCO for other import substitution crops indicated no distorting policies. NPCI for crops identified in the study were zero except coffee which is less than unity, suggesting that coffees tradable inputs are implicitly subsidized by policy while no tradable inputs applied for other crops. EPC for coffee, cocoa and rice indicated net tax applied. EPC for peanut, taro and sweet potato indicated no government policy causing incentives /disincentives in both input and output markets.

Keywords: Effective protection coefficient, nominal protection coefficient, agro ecological zones.

Postgraduate Scholarship Opportunities under BULA (Building University Links for Action) Project

Professor Shamsul Akanda
Dean, Postgraduate School
sakanda@ag.unitech.ac.pg

Abstract

The purpose of this seminar was to familiarize the staff and students to available the opportunity of postgraduate and staff mobility Scholarship scheme under BULA (Building University Links for Action). This scholarship scheme is aimed at facilitating the movement of Masters students, PhD students and Staff between selected national Universities in the Pacific regions as a means of building capacity and encouraging sustainable socioeconomic development the region. The general objective of the Project is to promote sustainable development and poverty alleviation by allowing educational opportunities for students in the Pacific region to encourage brain circulation within the Pacific region and to prevent brain drain

The BULA Project is coordinated by The University of South Pacific (USP), Fiji; and Unitech and Timor Leste (UNTL) are the partner institutions. The cooperation and mobility programme in the area of Higher Education is funded and implemented by the Education, Audiovisual and Culture Executive Agency (EACEA) of the European Union (EU). The scholarships cover the payment of tuition fees, travel costs to and from the host country and a health, travel and accident insurance. Eligibility and selection criteria for the scholarships were also discussed. Staff and students were advised to visit www.bula-pacific.org for further information.

Source of information: http://www.bula-pacific.org/

The Effect of Pruning on the Growth of Acacia Plantations and the Utilization of Biomass to Produce Biochar

Lawrence Hillary Lewis
PhD Student
Department of Agriculture
l_lewis16@yahoo.com

Abstract

The primary objective of this project was to determine the effects of pruning on the growth *Acacia mangium* plantation that were established at St. Elizabeth, Mahdia as part of the Forest Landscape Restoration (FLR) project in Guyana and to utilize the biomass obtained from the pruning treatment to produce Biochar and determine the ratio of biomass to Bio char. The trees in this research were sown in 2009 where exotic *A. mangium* plants were planted on a mined out site to demonstrate to miners that these lands can be reclaimed after mining. The project site was located at St Elizabeth, Mahdia, Potaro-Siparuni Region #8, Guyana.

The research utilized no specific type of pruning method, however,pruningwas done at four stages throughout the duration of the study at four standard heights and data (height and diameter measurements) was recorded every two months. This data was utilized to assess the effects of pruning on the growth of the trees. The Pearson's Product Moment was used to measure the strength of linear association between the two variables height and diameter and the Wilcoxon Rank Sum test Correlation was used to determine the strength of association which indicated a **p-value** = 0.000which meant that there was a significant difference between height and diameter of the trees, meaning that pruning had an effect on the growth of the tress when compared to the trees of the two plots pruned and unpruned.

The biomass obtained from the pruning treatment was utilized in eight Biochar production trials to obtain an average ratio of **3.3kg: 1kg** at a recovery percentage of **30.1%** which is similar to studies conducted by Allyson, 2011 for biomass material such as corn, manure and rice.

Climatological Modelling of Temperature and Rainfall through Remote Sensing and GIS Techniques

Dr Sailesh Samanta
Senior Lecturer
Department of Surveying and Land Studies
ssamanta@survey.unitech.ac.pg

Abstract

Geographic information systems (GIS) and modelling are becoming powerful tools in agricultural research and natural resource management. This thesis is focused on designing an empirical methodology for modelling and mapping of the monthly and annual air temperature and rainfall using remote sensing and geographic information system (GIS) techniques. It also examines statistical approaches for interpolating climatic data over large regions, providing different interpolation techniques for climate variables for use in agricultural research. Three interpolation approaches, like inverse distance weighted averaging, thin plate smoothing splines and co-kriging are evaluated for 4° x 4° area covering the eastern part of India, which is located between 21° N, 85° E and 25° N, 89° E. The study area is Gangetic West Bengal and its neighborhood in the eastern India, where a number of weather systems occur throughout the year. Gangetic West Bengal is a region of strong heterogeneous surface with several weather disturbances. Different climate variables like average maximum, mean, minimum temperature and rainfall are used for the interpolation process as the dependent parameters and other variables like relative humidity and cloudiness factor are used as the independent parameters for temperature and rainfall modelling. Standard false color composition bands (green, blue and near-infrared bands) of LANDSAT-7, ETM+ are used to produce land use/land cover dataset. Digital elevation model is built using the contours which are pulled together from Topographical maps of the region and SRTM data sets. With the help of soil type map of West Bengal and soil region map of India the soil texture dataset is built. Land use/land cover, soil texture and digital elevation model are used as the independent variables for temperature modelling. Rainfall modelling is performed using relative humidity, cloudiness factor, latitude, land use/land cover and digital elevation model. Multiple regression analysis with standard method is used to add dependent variables (temperature and rainfall) into regression equation. Finally standard errors are evaluated after comparing the predicted and observed temperature and rainfall of the area. Interpolated dependent climate variables, dependent parameters, the model output and the standard error raster matrixes are used to build final maps applying basic GIS techniques. For further improvement, distance from the coastline, seasonal wind pattern and weather disturbances are stressed to be included as independent variables and which may be considered for future research work.

Keywords: Remote Sensing, Geographic information systems, Land use/land cover, Topography, Soil, Climate, Spatial Interpolation and Modelling, Mapping.

Impacts of Migration on the Livelihoods of Urban Settlers: A Case in Point of Port Moresby

Londari Yamarak
Lecturer
Department of Business Studies
lyamarak@dbs.unitech.ac.pg

Abstract

This paper examined the effects of rural-urban migration on the suburban communities of Port Moresby (Gerehu) of Papua New Guinea. Data were obtained using quantitative method comprising questionnaire surveys.

Seven Stages of Gerehu were selected based on population size and spatial equity from a population of almost 40 to 50 thousand people. From each of the Stages, fifty six migrant (who has migrated from the rural villages) households were sampled for the study. Multinomial logit model and cluster analyses were used to estimate and categorize the effects of rural-urban migration. The conceptual framework employed was a modified version of the sustainable livelihoods framework. Measures of household capital were derived using principle component analysis, or directly from survey responses. Six mutually exclusive livelihood strategies were identified using cluster analysis.The regression analysis shows that rural-urban migration significantly impacted on the livelihoods of migrants. There were significant impacts of migration on the choice of livelihood (using multinomial logit model), other than the choice of "urban mixed" livelihood was 8.7 times more likely than "agriculture" livelihood for those migrating into the urban centers ($p = 0.001$).

Based on the findings, recommendations such as initiation and strengthening of the informal sector whereby people migrating can easily be engaged in and strengthening of the social safety net (Wantok system). Development projects based on the identified needs of each of the urban communities must be implemented to cater for the increase in the migrants.

Keywords: Migration, cluster analysis, multinomial logit regression, livelihoods

The Use of Mobile Phones for Development in Rural Communities

Dr Rachel Aisoli-Orake and Dr Lilly Sar
Department of Communication and Development Studies
rorake@cds.unitech.ac.pg

Abstract

This seminar reports on the trends of using mobile phones in community development. The first part of the seminar will report work done on M4D by PNG Economic and Public Sector Program. Mobile phone project was trialed using three projects; Health: Childbirth Emergency Phone, Law and Justice: Village Courts Data and Education: SMS Story. Some valuable lessons learnt from the projects will be discussed. This will be followed by the use of mobile phones by GSMA mWomen group which aims to increase women's access to and use of mobile phones. GSMA talk focused on strategies to apply mobile phone at work besides the voice calls and text messaging. The seminar concludes with suggestions on how the University of Technology multi-disciplinary expertise could be harnessed to contribute towards achieving the PNG 2050 vision using mobile phones and other ICT services in rural communities.

Keywords: Mobile phone Projects, community development, GSMA mWomen, ICT services, rural communities

Integrating Social Mapping with Geographic Information Systems: Network Analysis in Market Diversification and Sweetpotato Innovations

Lilly P. Sar [1]*, Anton Mais [2], Isidora Ramita [2], Amanda Wandau [2], James Laraki [2] Cathy Koloa[1], Barton M Gabi[1], Lucy Maino[1] and Andie Bill[1]

[1] University of Technology, [2] National Agricultural Research Institute
*All correspondence to this author. Email: lsarnorah@gmail.com

Abstract

This research drew from social learning and international development literature. The purpose of the community research was to trace the spread and impact of sweetpotato flour in two rural communities in Papua New Guinea. Participatory rural appraisal methods were used to engage smallholder farmers to share their experiences. The paper mapping process was documented using a video recorder and field notes. Geographic Information Systems technology was then used to incorporate local spatial knowledge on scale maps. The main finding was the identification of social networks through tracking of sweetpotato knowledge; identifying who used the knowledge and whether there were any modifications, the location of those who used the knowledge and whether the knowledge was shared and with whom. Most significant was the enabling factors that strengthened existing and potential future networks. Rural communities are diverse needing participatory multi-layered methodologies that are people oriented for agricultural technologies to be learnt and utilized for improved livelihood.

Keywords: Social mapping, Social learning, Agricultural innovation, Sweetpotato, Papua New Guinea.

An Exploratory Study of Project Learning in Project-based firms in UAE; lessons for other Resource-based Economies

Dr W. Mainga
Senior Lecturer
Department of Business Studies
wmainga@dbs.unitech.ac.pg

Abstract

Project success is partly dependant on the ability of project teams to be able to extract as much new knowledge and learning from a current project being undertaken by a firm and transferring that new knowledge gained to other (current and future) projects. However, despite this growing realization of the importance of knowledge and its accumulation within the context of project practice, a number of studies have found that relatively fewer firms have institutionalized mechanisms to systematically capture project-learning and use 'lessons learned' to feed and improve the execution of subsequent projects. There is increasingly a growing realization that the management of knowledge within a project environment is confounded by several challenges, not least of which is the fact that the temporal nature of projects tend to lead to a focus on 'short term' project deliverables. With this in mind, an exploratory study was undertaken to analyse the level and nature of inter-project learning processes taking place in a sample of project-based firms (PBFs) in the United Arab Emirates (UAE). A number of lessons learnt from the research findings are outlined, which could be applicable to project-based firms operating in similar resource-based economies like Papua New Guinea. A more 'nuanced' approach to inter-project learning is required.

Keywords*:* Project learning, Project-based firms, Knowledge transfer, Project competencies, Resource-based economies.

Project Viability and Fear of Terror Attack: Investors' Rationality and the Risk Dilemma

Dr Jacob A. Babarinde
Associate Professor
Department of Surveying and Land Studies
jbabarinde@survey.unitech.ac.pg

Abstract

Prior to practical implementation, a speculative real estate project should pass through a series of appraisals and decision points, each of which can lead to the rejection or acceptance of the project. This paper is an offshoot of an aborted 5-Star hotel project proposed to be located in Abuja, Nigeria, sequel to an initial viability study that took place in 2012. The purpose of this paper is to present an interesting case of investment abortion following the reality that the investment could suffer from terror attack that could render the client's proposal a colossal failure. In terms of methodology, the paper relies on a combination of market data and case study data generated well before the fear of possible terror attack in Abuja set in around 2012.

Cost data and revenue data were captured using online market survey of stakeholders in the hospitality industry in Abuja, Nigeria. The project's concept plans and other information supplied by the client were verified for accuracy using due diligence. Viability parameters derived quantitatively from project data analysis were subjected to a sensitivity/risk analysis under three market scenarios, using probabilities to test whether the project could still break-even if challenged by terror attack. To measure risk, the paper uses *standard deviation*, which measures the dispersion of the expected return around the mean value and provides information on the extent of possible deviations of actual investment returns from the expected returns of the hotel project. The paper answered three research questions bordering on three key issues: how much profit the hotel project might deliver if implemented; how likely it was that this profit would actually be delivered in the face of the high probability that the hotel could be attacked by terrorists; and, in the event that the project idea had to be shelved, what other options were available to the investor. Based on the findings, recommendations were made to reinforce the importance of viable and sustainable real estate projects, including hotels, as drivers of the national economy; as sources of huge property tax revenues to city governments; and as generators of employment opportunities in urban centres that are often the choice destinations of rural-urban migrants. However, the paper notes that many otherwise viable projects are increasingly becoming targets of terror attacks in many parts of the world and this evil has assumed alarming proportions since September 11, 2001.In view of the complexity of terrorism, business stakeholders must now be security conscious more than ever before and obtain sound investment advice before embarking on any project. Investors who already own projects should not relent either. If they have not done so already, they should put in place effective 'Emergency Management' strategies that fully guarantee terror mitigation, preparedness, response, and recovery. They should also cooperate with local, provincial/regional and national governments in promoting the ideals of good governance devoid of corruption and similar vices that detract from rationality and best business practices.

Keywords*:* Project viability, risk analysis, hotel, emergency management, terror attack.

Space Technology in Sustainable Development – A Case Study in Generating Action Plan for Optimum Resources Management and Monitoring

Professor Dilip K. Pal
Head
Department of Surveying and Land Studies
dkpal@survey.unitech.ac.pg

Abstract

The paper recounts how satellite remote sensing can be used for creation of locale specific Action Plans (APs) with a view to enriching socioeconomic fabric. Output AP maps are meant for fostering decision making by the planners and resources managers. AP maps are brought forth through overlay analysis of several information layers derived from the Satellite Remote Sensing data supplemented with conventional data. Nuances of data collection process are discussed. Major categories of satellite orbits, theirs details and utilities are presented. Concept of integrated development, the details of necessary inputs are narrated using Geographic Information System (GIS) platform leading to sustainable development. Emphasis is laid on space technology inputs for generation of APs for resources management in a sustainable fashion. Further, the means of monitoring the implementation of APs is discussed in special context of how the APs can be used for renewable resources management of Papua New Guinea (PNG). The need for meeting the changing needs of today and tomorrow with economic viability at enhanced productivity level is highlighted. Deliberation is done on successful management of resources, be it internal, external, renewable or nonrenewable. Maintenance, preferably enhancement of quality of environment is pronounced. Conservation of natural resources particularly soil and water, which form the pivot of Agriculture & Forestry with their allied industry as the vehicle for GDP growth banking on RENEWABLE RESOURCES is highlighted. Caveat is laid on the excessive dependence of the Government of PNG on the nonrenewable resources and the necessity to develop renewable resources and their sustainable utilization aspects.

Keywords: Satellite data, Action plan, Sustainable

*Raskols** and Crime in Lae, Papua New Guinea

Dr Garry Sali
Acting Head
Department of Communication and Development Studies
gsali@cds.unitech.ac.pg

Abstract

This study on raskols and crime in Lae was conducted between 2012 and 2013. The aim of the study is to examine the occurrences of crime in Lae committed by the raskols. There were total of 68 raskols identified, through a snowball sampling method, who participated in this research. The data collected was analyzed and it revealed that these raskols are not only young and lowly educated gangsters but includes adults who have completed secondary and tertiary education. They belong to raskol groups which are sparsely spread over the entire city of Lae and they have been responsible for committing all range of serious crimes including murder, rape, serious physical assault and armed robberies. Ironically, it is interesting to note that the raskols and their crime activities in Lae are being supported by a minority of law enforcers and a few individuals who supply firearms to equip and aid the thugs' criminal acts. It is concluded that the raskols are from the same community that rest of the law abiding citizens dwell but because of socio-economic hardship these criminals are marginalized and forced to commit crime. Therefore, it is important to properly deal with dysfunctional issues, like poverty, improper socialization, corruption, unemployment, and rural-urban migration in our efforts to minimize crime and lawlessness in Lae. Unless the Papua New Guinea Government makes a rigorous and committed efforts to seriously address these mixtures of factors one by one, raskols and crime problems in Lae will continue to be an issue challenging different state initiated interventions to curb crime and lawlessness in this city with over 148,000 people.

**The term raskol is a Pidgin English term derived from the English word 'rascal' and it is used in PNG to refer to a criminal or a member of a gang group. The word 'rascal' generally refers to images of disobedient, defiant and naughty person, or violent thugs and trouble makers.*

IP-video Streaming Platform for PNG University of Technology: Department of Open and Distance Learning

Glenda Kolam[1], Alex Roalakona, Jr[2].
and
Herman Kunsei[3]

Department of Electrical and Communications Engineering
[1]gkolam@hotmal.com.au
[2]ajroalakona@gmail.com
[3]hkunsei@ee.unitech.ac.pg

Abstract

Since gaining independence in 1975, Papua New Guinea (PNG) has experienced considerable growth in all sectors of society. One of which was the adoption of the free education policy by the O'Neil- Dion government, where large numbers of students are now enrolled in to primary schools around the country. This in turn has resulted in a larger number of students moving on into secondary level. However, a shortfall of this policy is the failure to cater for the needs of the next level of education i.e., tertiary education. Large numbers of these students have passed out of Grade 12, with satisfactory marks to gain a place at these institutions but miss out due to the lack of facilities available to accommodate for the demand. These students are then forced to turn to expensive, privately run colleges and skill training centers to develop careers to make a better life for themselves.

This paper addresses the need to fill rift that is currently been experienced in the national education system. The lack of proper learning facilities, bundled with the high influx of school-leavers at the major government-funded tertiary institutions has led to an overall drop in the quality of graduates. By creating distance learning centers around the country enables students to have access to the same content as that been offered at the university campuses themselves.

Two issues to address in this paper are the cost of accessing and producing the educational materials and distribution of materials to these distance learning centers. To reduce cost of accessing the content, we propose the implementation of national content delivery network. To address the need for content distribution, we propose the use of smart phones as a means to access live or recorded lectures or tutorial via the video distribution network.

We will analyze the current technical solutions, cost models and evaluate the possibility of adapting the most promising solution for PNG's unique setup through measurement on live events. Results of the measurements of network performance and throughput from live events will be presented.

Biography

Alex Roalakona (Jr)

Completing his secondary education at the Jubilee Catholic Secondary School in the year 2010 and is currently studying for his BE in Electrical Engineering at the Papua New Guinea University of Technology. After seeing the large student numbers and class sizes at the university he was inspired to work on a video streaming project to help alleviate the problem faced by the university. The result of which is this paper on an IP-based streaming solution for the University of Technology. This would be his first project proposal. Areas of research interest are multimedia and audio engineering systems, computer networks and Community communications equipment.

Glenda Kolam

Born on the 2nd of March 1992 at the Port Moresby General Hospital, Glenda Kolam is of mixed parentage, Morobe and New Ireland Province and resides in Port Moresby. She is currently studying for a Degree (4th year) in Communication Engineering at the Papua New Guinea University of Technology. She last attended Hohola Demonstration Primary and Gordon Secondary where she has successfully attained certificates in grades eight, ten and twelve. Apart from reading, sight-seeing and athletics, her utmost interest includes the study of information transfer around the globe through various methods with the aid of platforms such as the internet.

Mr. Herman Kunsei

Mr. Kunsei is a faculty at UNITECH since 2001 in electrical and communications department. His area of research is communications and computer networking discipline with emphasis on data networks. He is a UNSW and UNITECH alumnus with a Master of Engineering Science and Bachelor in Electrical Engineering respectively.

The Status of Household Food Security at Bialla and Hoskins Oil Palm Land Settlement Schemes, Papua New Guinea

Dr Veronica Bue
Lecturer
Agriculture Department
vbue@ag.unitech.ac.pg

Abstract

This paper examines household food security on two oil palm Land Settlement Schemes (LSSs) in West New Britain Province, Papua New Guinea.Concerns were raised about the declining access to garden lands and population increase on the LSSs and the potential impacts on household food security. The report recommended that further research be initiated to examine the status of smallholder household food security. Thus this research fills this void.

Dietary recall surveys were conducted for a period of 7 days to find out the dietary patterns of the households. Fortnight paydays and non-fortnight paydays were also taken into consideration to find out the impact of cash on the dietary patterns. Likewise, data were collected during periods of high and low oil palm prices in 2010 and 2013 respectively to also understand the impact of income on smallholders' diets.

Household Dietary Diversity (HDD) and Food Consumption (FC) scores revealed that smallholder households had nutritionally adequate diets indicating that the status of household food security was generally good on the LSS. Most households consumed two meals per day with most meal ingredients being from smallholders' own food gardens, though store foods provided an important supplement. Households switched between store and gardens foods depending on the price of oil palm. Relationships were identified between household fortnightly income and daily food expenditure. Store foods such as tinned fish/meat, fresh meat, fish and chicken increased the HDD and FC scores indicating that income is a primary determinant of diet quality for people living on the LSS.

Community Media and Communication Education for Social Development in Rural Areas of Papua New Guinea

How Can Rural People's Indigenous Knowledge Potential be Harnessed in Social Development?

Dora Jimela Kialo
Lecturer
Teaching and Learning Method Unit
dkialo@tlmu.unitech.ac.pg

Abstract

This paper presents the pilot research study of a privately funded innovative program case designed to use mobile communication technology as new media form to meet the entrepreneurial educational and other social developmental needs of disadvantaged young people especially women in different communities in Maprik District before funds are sought. This study highlights the importance of sustaining and harnessing community media, Indigenous Knowledge (IK) and Post Secondary social entrepreneurial education that use New Media forms to improve youth's literacy, poverty reduction and other social developmental activities. The methods and experiences of Nana Niangu (Our Youth), a group made up of young men and women that harnesses the potential of ICT and Indigenous Knowledge for entrepreneurial education for women, girls and youth which ripples down to community development. The pilot study illustrates the best practices of social entrepreneurial education with less financial and technological resources within the context of a Papua New Guinea (PNG) rural society. The major challenges facing the young organization are highlighted and its successes are also identified. The activities of the Nana organization reveal that, PNG and other countries in the South Pacific (SPC) need effective multilateral initiatives to meet their educational aspiration as well as the Millennium Development Goals (MDGs). If properly and innovatively applied by the public and civil society groups, community media through the use of ICTs have the potential to improve the quality and access to both pre-secondary and post-secondary education in Maprik District in particular and the Pacific region in general. Undoubtedly so, it will also create a great deal of employment and employment benefits including financial deepening in both macro and micro economic terms. The shift in development thinking and practice towards people-centred programmes and most significantly the participation of people and communities in decisions concerning their own lives is creating new opportunities for social change and the empowerment of both women and men in rural areas. Nevertheless, it is vital to stimulate their indigenous knowledge awareness, entrepreneurial skills development and utilization after completing secondary education and through their involvement to enhance their capabilities further. Indigenous knowledge and forms of communication is often dismissed as "'traditional and outdated' and hence irrelevant to modern ecological assessment". (Mwende. J.2011, p.35-47).

Therefore,

"Education is not preparation for life, education is life itself" John Dewy

> "What struck me so forcefully was how small the planet had become during my decades in prison.... [ICT] had shrunk the world, and had in the process become a great weapon for eradicating ignorance and promoting democracy."
>
> (Nelson Mandela, *Long Walk to Freedom, 1994*)

This pilot research case also critically examines the reasons for the virtual absence of research in this area in PNG is proposed, and contrasts between users of conventional media and alternative media audiences suggested. Finally, connections between social movements and a call for alternative media uses are discussed, the interplay between political consciousness and IK/ICT integrated post secondary educational model with alternative media use is examined, and social conditions in which the latter are responded to be explored.

There are academic arguments advanced to how community media as media for social change and commercial media can advance indigenous ecological knowledge to harness the potentials of rural people in development in Maprik District of East Sepik Province, Papua New Guinea. The central argument of this paper is that the government and the community media organizations and NGOs have a responsibility to create innovative programs designed to use ICT to meet the educational needs of disadvantaged young people and women in different communities can harness the potential of rural people in development. Community media and commercial media will be used interchangeably here and though the two systems are conceptually different, it would be fallacious to regard forms of commercial media as superior to the other merely because they are premised on different world view. Communicating developmental issues through community media therefore are more effective in rural settings and can harness the potential of rural folks and their traditional ecological knowledge in development through community media networks for social change. This should be done by recognizing the need to support sustainable communication media activities and relevant capacity building that promote traditional environmental knowledge awareness, conserve and protect the environment, respect wildlife, flora, biodiversity, ecosystems and cultural diversity, and improve the welfare and livelihoods of local communities by supporting their local economies and the human and natural environment as a whole.

The current governmental or commercial media set ups through its networks can also call for enhanced support for sustainable entrepreneurial activities and relevant capacity-building in PNG through community media in order to contribute to the achievement of sustainable rural development. Through the community media development integrated ICT education processes, the government and the people as a whole can therefore acknowledge the need to further mainstream sustainable development at all levels, integrating economic, social and environmental aspects and recognizing their inter-linkages, so as to achieve sustainable social and economic development in all its dimensions.

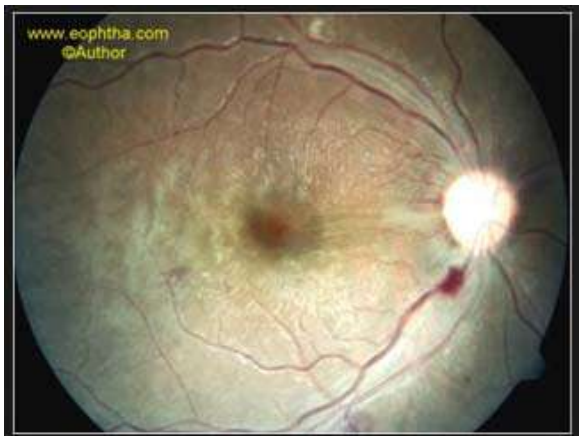
Keywords: Secondary Education; Information and communication technology (ICT or New Media form); Youth Indigenous knowledge (IK) community media, commercial media, alternative media. Note that New media and ICT will be used interchangeably.

Training: Community development; Social Entrepreneurship

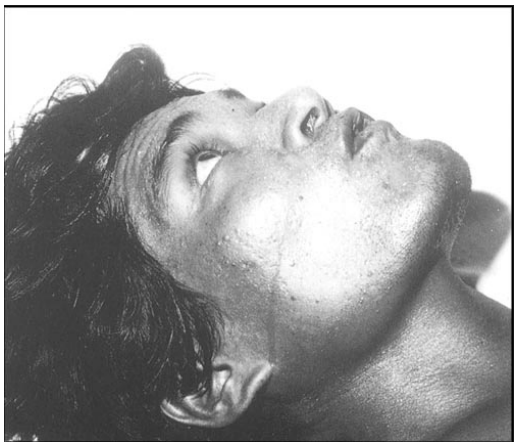
Facts About Malaria – Global Aspect and Present Status at Unitech

Dr. Pramod Kumar Lal Das
Chief Medical Officer
plaldas@clinic.unitech.ac.pg

Malaria remains a serious global health problem for 40% of the World's Population i.e. 2.8 billion people, most of them living in developing countries. About 300-500 million new infections occur annually. Globally 1.5 to 2.7 million people die each year, many of them children. Malaria is caused by a microscopic organism of the genus *Plasmodum*. Data of malaria at Unitech are based on the total outpatient attendance. Total malaria and patient per year at Unitech is about 10575 of which 3119 were students. The classic malarial sign and symptoms are acute is onset of fever, headache, shivering (rigors and chills), sharp rise in temperature and profound sweating, etc. The golden rule is to suspect malaria as the cause of any fever until proven otherwise.



Retinopathy



Pouting and deviation of the eyes with cerebral malaria complicated by hypoglycaemia

Acute pulmonary oedema

Decerebrate rigidity

This paper includes the information about what to do about malaria when you return to your country and long term expatriate residents returning permanently to their home country. So far, no drugs have been found which will effectively prevent malarial parasite from infection in the liver.

Profound anaemia with bleeding from the gum

It is most important to always remember that Plasmodium *falciparum* malaria is potentially fatal. For *Plasmodium falciparum* malaria the first 3 months after return is a real danger period for short term visitors. For long term expatriate, the danger period is longer up to 12 months after return. Vaccines are among the most cost effective of interventions for infectious disease like malaria. The most advanced vaccines known as RTS, S is currently in a large phase of 3 trials in Africa and initial reports suggest vaccine efficiency of 30-50% lasting over 2 years.

Chikungunya (Tiger Malaria) is a mosquito borne virus that causes acute fever and persistent Polyarthritis. Outbreaks of Chikungunya is caused by strains form the East/Central Southern African (ECSA) genotype and harbour mutation (EI: A226V) in the E1 glycoprotein genes that enables CHIKV to replicate and spread more efficiently in *Aedes albopictus* mosquitoes. This paper is a kind of literature review with compilation of the information from various sources.

Keyword: Chikungunya, Long-term expatriates, Malaria, Prophylaxis, Vaccines

Tin-Bearing Chalcopyrite and Platinum-Bearing Bismuthinite in the Active Tiger Chimney, Yonaguni Knoll IV Seafloor Hydrothermal System, Southern Okinawa Trough, Japan

Dr. Kaul Gena
Associate Professor
Department of Mining Engineering

Abstract

The active sulfide chimney ore sampled from the flank of the active Tiger chimney in the Yonaguni Knoll IV hydrothermal system, South Okinawa Trough, consists of anhydrite, pyrite, sphalerite, galena, chalcopyrite and bismuthinite. Electron microprobe analysis indicates that the chalcopyrite and bismuthinite contain up to 2.4 wt. % Sn and 1.7 wt. % Pt, respectively (Table 1). The high Sn-bearing chalcopyrite and Pt-bearing bismuthinite are the first occurrence of such minerals on the submarine hydrothermal systems so far reported. The results confirm that the Sn enters the chalcopyrite as a solid solution towards stannite by the coupled substitution of $Sn^{4+}Fe^{2+}$ for $Fe^{3+}Fe^{3+}$ while Pt enters the bismuthinite structure as a solid solution during rapid nucleation. The homogenization temperature of the fluid inclusions in anhydrite (220-310°C) and measured end-member temperature of the vent fluids (325°C) indicate that the minerals precipitated as metastable phases at a temperature around 300°C. The Sn-bearing chalcopyrite and Pt-bearing bismuthinite express the original composition of the minerals deposited from a hot hydrothermal fluid with temperatures of about 300°C.

Table 1. Mean chemical composition of chalcopyrite, pyrite and bismuthinite from Yonaguni Knoll IV, Okinawa Trough

Element	**cpy (n =16)**	**py (n = 11)**	**bis (n = 9)**
Cu	34.88	0.13	0.71
Fe	29.77	47.62	0.46
Sn	1.34	0.01	0.00
Bi	0.12	0.39	78.06
Pt	0.00	0.00	1.56
S	34.43	53.24	19.11
Total	100.54	101.39	99.90
Cu	2.03	0.00	0.06
Fe	1.97	1.02	0.04
Sn	0.04	0.00	0.00
Bi	0.00	0.00	1.87
Pt	0.00	0.00	0.04
S	3.96	1.98	2.99
	Stannite (wt.%)		
	4.84		

Betel nut - Should We Destroy it or Find Alternative Commercial Uses?

Macquin K. Maino
Department of Agriculture
mmaino@ag.unitech.ac.pg

Abstract

On 23 October 2012, a letter was written to the Editor of *The National* newspaper. The letter was titled: *"How do we get rid of betel nut?"* The writer lamented:

> *"So much has been said about betel nut and its negative effects. Countless suggestions have been made and yet nothing seems to work. Every time you walk around the town, markets, bus stops or even villages, you will not miss betel nut stains and husks. If the rules and policies are not working, or if chewers do not respect our laws, how can we go forward? Where are our scientists and elites? They must come up with some options so our people can be healthy, cities and towns are clean, and money can be better spent on improving health, education, infrastructure, etc."*

"How do we get rid of betel nut?" And *"Where are our scientists and elites?"* are challenges that genuinely beg holistic scientific inquiry and subsequent rational response. Investigations are ongoing to address some issues associated with the "green gold". This seminar will present areas of ongoing research and highlight some intended outcomes that could contribute towards human health, environment beautification and alternative commercial benefits.

Numerical Modeling of Diffusion Phenomena in Narrow Vein Mine Stope from Field Measurement and Scaled Laboratory Model

Dr. G Arpa
Acting HOD and Senior Lecturer
Department of Mining Engineering
garpa@mining.unitech.ac.pg

Abstract

The diffusion phenomena in mine airways and working face is important to better understand the transportation and dilution mechanism of contaminated and airborne pollutants introduced into the mine airways with dispersion by velocity profile and turbulent diffusion phenomena in airways. In this study, physical and numerical modeling of diffusion phenomena in narrow vein shrinkage stope has been investigated by both mine measurements and scaled laboratory experiments. The mine measurements were conducted by pulsed dozing of known volume of tracer gas (SF_6) from the upstream and its concentration was measured at the downstream against elapsed time. The down scaled laboratory shrinkage stope model and measurement system were constructed to represent the field conditions with two main lower and upper level drives. Air flows from lower level, through the raises, through the stope and exits to the upper level through the raises. The effective turbulent diffusion coefficient, E, was evaluated as E = 10 to 15 m^2/s based on the mine measurement, while the laboratory model ranges E = 0.06 to 0.3 m^2/s. It was noted in the model that airways with one or more mixing nodes gives a higher effective diffusion coefficient then those with no mixing node. Considering the scaling factor between mine and laboratory, a rough equation has been proposed to estimate the effective diffusion coefficient as E = (1.0 to 3.0)$U_m d$, where U_m is average velocity and d is equivalent diameter of the airway.

Keywords: *Virtual Diffusion, Effective turbulent diffusion coefficient, Dead Space, Shrinkage stope*

The University of Perpetual Help System DALTA (Philippines) Environmental Management Program

Dr Enrico C. Mina
Senior Lecturer
Department of Business Studies

The University of Perpetual Help System DALTA is a for-profit private university owned and managed by the founder, Dr. Antonio L. Tamayo, and his family. It has a total population of 18,000 students, of which 10,500 are in the main campus in Las Piñas, Metro Manila and 3,500 and 4,000 are in the branch campuses of Calamba, Laguna and Molino, Cavite in the Philippines.

In all the units of the UPHSD, an Environmental Management Program (EMP) has been established to minimize the environmental impact its operations. It has two major components:

- The implementation of the 5S System of Housekeeping developed in Japan, which consists of five components: Sort and Separate, Systematic Arrangement, Sweep and Scrub, Standardize, and Self-discipline. This system ensures that the workplace will be consistently clean and orderly contributing to safety, quality, and productivity.

- The Zero Waste Management (ZWM) program aimed at managing the solid waste (i.e., garbage) that a facility with a large number of people inevitably generates. At the core of this program is the segregation of solid waste into "biodegradable" and "recyclable". Solid waste is classified at the source and placed into separate color-coded bins:

    - Black—recyclable/non-biodegradable/dry waste
    - Green—compostable/biodegradable/wet waste
    - Yellow—hazardous/special waste

The biodegradable waste is turned into compost for fertilizing the campus vegetable garden. The recyclable dry waste is taken three times daily to the Materials Recovery Facility, a shed where the materials are cleaned, batched, and weighed and then sold to contracted buyers. Beside the MRF is the Livelihood Center which which turns out innovative products from some of the outputs of the MRF. The ZWM's principal focus is the implementation of the "3R's": Reduce, Reuse, and Recycle.

The EMP has active committees responsible for planning, implementing, monitoring, and evaluating the program activities, all staffed by volunteer middle level employees: Training and Education Committee; Evaluation, Standardization, and Implementation Committee; and Promotions, Recognition, and Awards Committee.

The ZWM program is self-sustaining because it is continuously generating income from the sales of the reusable and recyclable waste, thus contributing to the economic viability of the UPHSD. Its direct net income in 2008-2009 was ₱4,247,037.80 (approximately equal to K249,825.75 at the exchange rate of K1 = ₱17.00).

Keywords*:* Environmental management, zero waste management, good housekeeping

Ground Water Investigation Using Space Technology

Junior Tumare
Lecturer
Department of Surveying &Land Studies
jtsunsetsurveyors@gmail.com

Abstract

Groundwater is one of the most valuable natural resources, which supports human health, economic development and ecological diversity. In the present study, an attempt has been made to evaluate groundwater potential of Bulolo-Wau surrounding, Morobe Province, Papua New Guinea, The study area compresses an area of 2715.10sq.km. It has a population of 25000 persons (Census 2010 est.). Ground water is an important source of water supply throughout the world. Due to rapid growth in population, industrialization and increasing agricultural demand, the future requirement of water will be enormous.

A systematic planning of groundwater exploitation using modern techniques is essential for proper utilization and management of this precious but shrinking natural resource. With the advent of powerful and high-speed personal computers, efficient techniques for water management have evolved, of which Geoinformatics technology includes RS (Remote Sensing), GIS (Geographic Information System) and GPS (Global Positioning System) are of great significance. In the present study, an attempt has been made to delineate possible groundwater potential zones in the study area, using Geoinformatics technology. The thematic layers considered in this study are lithology, landform, drainage density, vegetation, hydro-geomorphic/hydrologic soils groups soil, land slope, altitude and Land use/Land cover, which were prepared using the Landsat ETM+, SRTM and conventional data.

Analysis of groundwater potential zones shows that the very high groundwater potential zones constitute 3.47% of the study area. The regions were mainly north –west to south east diagonal direction. The hydrologic parameters-based groundwater potential zone map indicates 22.67% of the study area constitutes high potential, 30.14% moderate potential and 29.92% low potential. This study also provides a methodological approach for an evaluation of the water resources in hard rock terrain and enables an opening of the scope for further development and management practices.

In addition the communities around the industrial mining area have been severely affected due to waste disposal in to the Watut river system. To date, the people of that area have been using contaminated water and packaged drinking water which is costly. The study therefore intends to provide areas of ground water availability for usages by the community at large and thus reducing the cost and further improving their hygiene.

Keywords*:* Remote Sensing, GIS, Land use/land cover, Soil, Groundwater, Geomorphology and Hydrology

Axiomatic Design Model to Assess Influences Affecting Pedagogic-Learning in Engineering Courses

Dr Mirzi D. Llego-Betasolo
Department of Civil Engineering
mbetasolo@civil.unitech.ac.pg

Abstract

This paper explores to set an axiomatic design model in the Assessment of Influences Affecting Pedagogic-Learning in order to succeed in finding core factors affecting student's performance in the Engineering courses with case studies for specific courses: Materials I (CE 221) and Fluid Mechanics I (CE 211-F). These subjects are the building blocks of engineering knowledge, thus requires that the student should grasp the knowledge before he/she moves to the next level of materials and fluid mechanics. The survey aims to understand what student influential factor best relate to teacher goals. The questions asked to get the perception of what influences students' about pedagogic-learning on engineering courses were taken from an inventory of teaching goals by Angelo and Cross (1993). On the case of CE 221, 92 second-year students from Mineral Processing, Mining and Civil Engineering participated in the study. On the other hand, there are 42 second-year students from Civil Engineering participants for the CE 211-F. The study uses the axiomatic design (AD) principles in finding success on the assessment of the influential factors that affects student pedagogic-learning. The study found that by using AD, the analysis of the assessment is simplified and the factors that influence the students in each case study are best identified. The result of the assessment helps the author identify the gaps for teaching and learning. This will also help to find ways in bridging that gap using a new framework to address the challenges of culturally preferred influences (self-concept & self- efficacy) than educational influences (educational behavior and attitude) of engineering students at the Papua New Guinea University of Technology, Lae, Morobe Province, Papua New Guinea.

Keywords: Pedagogic-learning, assessment, framework, influences, model.