THE PAPUA NEW GUINEA

UNIVERSITY OF TECHNOLOGY

RESEARCH REPORT

2018

Compiled and Edited
by

Professor Shamsul Akanda

Department of Agriculture

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FOREWORD

I am delighted to write this foreword to the 2018 Research Report of Papua New Guinea University of Technology. This is a compilation of the research activities of the fourteen academic departments and four research units of the university. I am very thankful to the Dean of Postgraduate School, Professor Shamsul Akanda, for compiling and editing the report.

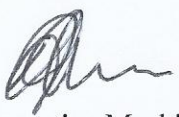
Research activities at Unitech are administered by a Research Committee of the Academic Board. It provides research grants to staff and postgraduate students. It also funds attendance at conferences and organizes a weekly research seminar. In 2018, a total of K93,657 was given for research projects and K24,209.40 for conference attendance. Thus, a total of K117,866.40 was given by the Research Committee to applicants for research grants.

Unitech has the largest postgraduate program in the country, with more than 200 postgraduate students in 2018. The majority of the students are from Papua New Guinea but there are also some from other Pacific Islands who are here through scholarships of the European Union. This year, we also have one postgraduate student from Africa, Nigeria, who is on an Association of Commonwealth Universities Scholarship. The presence of research students creates an atmosphere that is conducive to research. Supervision of postgraduate students and doing research go hand in hand.

The Papua New Guinean postgraduate students at Unitech are either sponsored by the university, by a company or they pay by themselves. Whereas the government has instituted scholarship programs for undergraduate study (HECAS – Higher Education Cost Assistance Scheme - and AES – Academic Excellence Scholarship) no similar schemes are in place for postgraduate study. We are aware that the government plans to introduce scholarships for postgraduate studies soon, and we look forward to a substantial expansion of our postgraduate programs when that happens.

There is a well-attended weekly research seminar at Unitech. For a few years in the past this was organised by the Dean of Postgraduate Studies, Professor Shamsul Akanda, and for the last two years it has been organised by Professor Subramaniyam Gopalakrishnan of the Applied Sciences Department. I am very grateful to both of them for their commitment to the seminars and to the postgraduate program as a whole.

I would like to take this opportunity to thank all heads of department, Team Leaders of research units and members of the Research Committee for their fruitful work during the year 2018. I also wish to thank the Acting Vice Chancellor, Dr Ora Renagi, and his management team 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, Professor Akanda, for compiling the 2018 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)
c. Chairman, ATCDI

Appointed Members

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

MEMBERSHIP

Ex-Officio Members

Associate Professor Ora Renagi
Associate Professor Augustine Moshi
Associate Professor Ora Renagi

Appointed Members

Associate Professor Augustine Moshi (Chairman)
Professor S. Akanda
Dr. S. Gopalakrishnan
Dr. G. Arpa
Dr Mex Peki

In Attendance

Mr Peter Likius, Deputy Bursar
Mr Gabriel Paul, Executive Officer

Executive Summary

The Annual Research Report is a comprehensive compilation of ongoing and completed research from all the 13 academic departments at PNGUoT each year. The university completed the 2018 Academic year on a high note despite some administrative and financial challenges. The *Annual Research Report 2018* contains the research priorities aligned with "Unitech 2030" and PNGUoT Strategic Plan; and national priority areas, ongoing and completed research, publications, national and overseas conference attendance by the academic staff from the 13 academic departments. During 2018, a total of 57 peer-reviewed research articles were published in reputed international and national journals along with a large number of conference publications and book chapters. These results show the strong commitment and resilience of our faculty members in research and publication activity, despite funding limitations, heavy teaching loads, and other challenges.

Research conducted by the final year undergraduate students also constitute a large proportion of research reported by the academic departments. Many of the research outputs are very important and of immense value for tackling the problems Papua New Guinea faces. Many of these initial studies can well be elaborated in future research.

Despite severe financial challenges, the University allocated a total of K93,657 to support the staff and postgraduate students' research, and an amount of K24,209 for conference attendance by the academic staff. Allocations of funds both for research and conference were higher than those made in 2017. This fact demonstrates the PNGUoT's strong commitment to Post Graduate studies and research to develop the academic culture required to fulfil the goal to become the technological knowledge hub for the country and the South Pacific. This funding needs to be substantially increased in the coming years as this is the spending needed to meet this goal. Postgraduate studies are the global conduits for universities to develop research programs to be creative and solve complex problems through innovations leading to sustainable national developments.

The report also contains 22 abstracts presented in the "Unitech Research Committee Seminar Series" – a hallmark of Unitech. This weekly seminar series that has been running for the last six years brings the academics, staff and students together in a common platform to share and disseminate research findings to the wider university community. This seminar series is thereby best forum not only to disseminate research outcomes to wider community but also to train young academics and postgraduate students in their presentation and communication skills.

Number of Peer Reviewed Journal Publications for Different Academic Departments (2013-2018)

Departments	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
Agriculture	14	06	08	08	12	13	61
Applied Physics	0	0	0	06	21	03	30
Applied Sciences	04	07	09	02	0	04	26
Architecture and Building	01	0	0	0	0	0	01
Business Studies	01	1	05	07	12	04	30
Civil Engineering	01	0	01	03	0	0	05
Communication and Development Studies	03	10	05	02	06	04	30
Electrical and Communication Engineering	0	03	01	06	05	0	15
Forestry	02	02	03	0	0	03	10
Mathematics and Computer Science	04	02	01	0	02	01	10
Mechanical Engineering	01	03	01	1	01	08	15
Mining Engineering	03	01	01	0	0	0	05
Surveying and Land Studies	03	11	12	20	09	18	73
Total	**37**	**46**	**47**	**55**	**68**	**58**	**311**

Departmental Research Reports

Agriculture

Applied Physics

Applied Sciences

Architecture and Building

Business Studies

Civil Engineering

Communication and Development Studies

Electrical and Communication Engineering

Forestry

Mathematics and Computer Science

Mechanical Engineering

Mining Engineering

Surveying and Land Studies

DEPARTMENT OF AGRICULTURE

Head of Department: Dr Rajashekhar Rao BK

The Department of Agriculture is one of the 13 Academic Departments in Papua New Guinea University of Technology (PNGUoT). It offers undergraduate and postgraduate degree programs in Agriculture, conducts agricultural research and disseminates relevant information to the community. There are two undergraduate programs consisting of a four year study program- the Bachelor of Science in Agriculture (BSc. Ag) offered in the residential model and the Bachelor of Agriculture and Rural Development (BARD) program in distance mode through the Department of Distance Learning (DODL). The postgraduate program has three robust degree programs, the Master of Science in Agriculture (MScAg), Master of Philosophy (MPhil), and Doctor of Philosophy (PhD). The MScAg program is a combination of course work and research, while PhD and MPhil studies are fully research-based degrees.

The Department has 16 qualified academic staff members (12 with PhDs and 1 on study leave pursuing PhD studies overseas). In 2018, five students graduated with postgraduate degrees (1 PhD, 1 MPhil and 3 MSc). The Department of Agriculture is committed in delivering quality teaching, research, outreach activities and post-graduate studies. It has well guided activities including research thrust areas stipulated in the Department's Five Year Strategic Development Plans (2005 – 2010 and 2011 – 2015). Strategic Plan for 2016-20 has already been prepared based on the University's Vision 2030 and Mission. The curriculum is enhanced through regular and periodic review in consultation with stakeholders and industries in the public and private sectors. The Department has established strong collaborative research links with international developmental partners and stakeholders, including Australian Centre for International Agricultural Research (ACIAR) and New Zealand AID. Regular publication of the scientific journal '*Niugini Agrisaiens*' and academic staff publishing scientific papers regularly confirm the department's strong commitment in research at Unitech. Strong collaborative research collaborations exist with PNG National Agricultural Research Institute (NARI), University of South Pacific (USP), Fiji, Charles Sturt University (CSU), Australia, National Research Institute

(NRI) of Greenwich University (U.K.), South Australian Research and Development Institute (SARDI), Australia, University of Canberra, Australia, Curtin University, Australia and other NGOs, industries and institutions further cements our strong leadership in agricultural research. Other publications, compilation of abstracts of research done by the post- graduate students, Annual Reports, Farm Report and Strategic Plan on annual basis also strengthens the department's research capacity. In 2016, Unitech Biotechnology Centre was amalgamated to the Department of Agriculture for the administrative oversight.

PNG University of Technology is an Associate Member of Asia- Pacific Association of Agricultural Research Institutions (APAARI) through the Department of Agriculture. The APAARI is located in Bangkok, Thailand aimed at strengthening research and innovations for sustainable agricultural development in Asia and Pacific.

The following research focus areas have been identified and much of the staff and student research are woven around these thematic areas:

AREAS OF RESEARCH

Research Focus Area – 1: Crop Sciences

- Evaluation of promising rice varieties for Papua New Guinea
- 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
- Study of 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
- Soil N and composting in sweet potato-based farming systems
- Symbionts as potential biocontrol agent for cocoa pod borer
- Development of a maize seed system for PNG
- Gene discovery in PNG wild rice: seed and grain characteristics
- Genetic transformations of taro and rice

- Quantification of greenhouse gases (GHG) emissions from soils under major cropping systems of Papua New Guinea
- Development of fungal inoculum for artificial agarwood production in PNG

Research Focus Area – 2: Livestock Sciences

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

Research Focus Area – 3: Agricultural Economics

- Analysis of marketing costs and margins spread of sweet potato sales produced from the highlands of Papua New Guinea
- Economic impact assessment of honey bee
- Coffee integrated farming in Eastern Highlands Province
- Economic impact of climate change on coffee and cocoa production in PNG: A Ricardian Approach
- Handbook on relevant production, trade and price statistics on agricultural, livestock and poultry products of PNG
- Agriculture sectorial growth in Papua New Guinea since political independence

Research Focus Area – 4: Agricultural Extension and Rural Development

- Evaluation of on-going extension approaches in PNG and their effectiveness in rural livelihood improvement
- Problems and prospects of retaining youth in agriculture in PNG
- Identifying 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
- Return from Investment in Higher Education, Extension and Innovations
- Entrepreneurship Development among Rural People
- Women in Agriculture for Food Security
- Diffusion of Agricultural Innovations among Rural Community

Research Focus Area – 5: Post-Harvest Technology

- Survey on current status of mechanization in PNG: impact study of mechanization on rural livelihood and environment
- Development of post-harvest technology and post-harvest management systems for horticultural crops in PNG

EXTERNALLY FUNDED RESEARCH PROJECTS/ COLLABORATIONS

Bue, V. (2018). Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in PNG. Australian Centre for International Agricultural Research (ACIAR) ASEM 2014/054. ACIAR COLLABORATIVE RESEARCH WITH CURTIN UNIVERSITY, Perth, WA. 2018-2020.

> The research project is looking at the enabling factors and constraints women entrepreneurs are confronted with in their income earning activities and how these factors have constrained or enabled them to advance in their entrepreneurial activities. Major contribution of the Department is imparting *advisory role and supervision of MSc student linked to the Project 2019-2020.*

Bue, V. (2018). Growth, inclusiveness and sustainability of the Vanilla Value Chain (VC) in Papua New Guinea funded by Natural Resources Institute (NRI), University of Greenwich, UK (2018-2019)

Dotoana, R. (2018). Sweetpotato integrated pest management project funded by ACIAR 2017-2021. ACIAR collaborative project HORT 083/2014.

> Departments' goal as one of the five collaborators is to search for soil-borne beneficial fungi that have the potency to kill or minimize sweetpotato weevils' infestations in the highlands

of PNG and possibly develop the ideal strains for small holder sweetpotato growers. We have screened 18 strains; 7/18 showed high pathogenicity/virulence. In the current phase, the 7 strains will be further tested and identity verified before mass production and field testing.

LIST OF PUBLICATIONS

Peer-reviewed Journal Articles/ Books

Aipa, J. and Michael, P. S. (2018). Poultry manure application and fallow improves peanut production in a sandy soil. ***International Journal of Environmental & Agriculture Research,*** 4(1), 68-75.

Ban, G., Maino, M. and Akanda, S. (2017). Identification and distribution of *Trichoderma* species in different cropping areas at the PNG University of Technology Farm, Papua New Guinea. ***Nuigini Agrisaiens,*** 9: 2-9. (Published in 2018)

Ban, G., Akanda, S. and Maino, M. (2018). The effect of *Trichoderma* on the growth and development of tomato and bean under greenhouse and field conditions. ***Annals of Tropical Research,*** 40(1): 35-45.

Iamba, K., Michael, P. S., Dono, D., Hidayat, Y. and Novotny, V. (2018). Community composition and species diversity of insects associated with fruits of *Gymnacarnthera paniculata*, *Marcaranga aleuritoides* and *Mastixiodendron pachyclado* in a Papua New Guinea forest. ***International Journal of Environmental & Agriculture Research,*** 4 (3): 28-35.

Koczberski, Gina., George N. Curry, Veronica Bue, Emmanuel Germis, Steven Nake & Geraldine M. Tilden (2018). Diffusing Risk and Building Resilience through Innovation: Reciprocal Exchange Relationships, Livelihood Vulnerability and Food Security amongst Smallholder Farmers in Papua New Guinea. ***Human Ecology,*** 46:801–814 (https://doi.org/10.1007/s10745-018-0032-9)

Maino, M. K. and Akanda, S. (2017). Screening of 64 lowland sweetpotato varieties from Papua New Guinea against root-knot nematode, Meloidogyne incognita, under greenhouse conditions. ***Niugini Agrisaiens,*** 9: 10-19 (published in 2018).

Michael, P. S. (2018). Effects of live plants and dead plant matter on the stability of pH, redox potential and sulfate content of sulfuric soil neutralized by addition of alkaline sandy loam. ***Malaysian Journal of Soil Science***, 22: 1-18.

Michael, P. S. (2018). The role of surface soil carbon and nitrogen in regulating surface soil pH and redox potential of sulfidic soil of acid sulfate soils. ***Journal of Tropical Agricultural Science***, 41: 1627-1642.

Michael, P. S. (2018). Comparative analysis of the ameliorative effects of soil carbon and nitrogen amendment on surface and subsurface soil pH, Eh and sulfate content of acid sulfate soils. ***Eurasian Soil Science***, 51: 1181-1190.

Michael, P. S. and Reid, J. R. (2018). The combined effects of complex organic matter and plants on the chemistry of acid sulfate soils under aerobic and anaerobic soil conditions. ***Journal of Soil Science and Plant Nutrition,*** 18: 542-555.

Michael, P. S. (2018). The time course of effects of simple carbon and organic matter on pH and redox potential of acid sulfate soils. ***Agricultural and Environmental Research,*** 3: 350-359.

Nugi, A. and Danbaro, G. (2018). Growth of beef cattle fed palm kernel meal on a feedlot in Papua New Guinea. *Livestock Research for Rural Development*, Vol. 30, Article #85, available at http://www.lrrd.org/lrrd30/5/garib30085.html (Retrieved August 15, 2018)

Timi, D., Gopalakrishnan, S. and Maino, M. (2018). Characterization and antimicrobial assessment of phytosynthesized silver nanoparticles using aqueous extracts of *Euphorbia geniculate*. ***Indian Journal of Science and Technology***, 11: 1-7.

RESEARCH REPORTS

Danbaro, G. (2018). Restoring livelihood of the people living in the special mining lease area of the Wafi-Golpu Joint Venture Project. Livelihood option 3-Poultry and livestock production. A project report submitted tonWafi-Golpu Joint Venture Ltd

Lescuyer, G., Helmes, R.**,** Syndicus, I. and Kerua, W. (2018). Cocoa value chain analysis in Papua New Guinea. Research Report, Montpellier: CIRAD-Wageningen University and Research, 134 p.

WORKSHOP/CONFERENCE/PROFESSIONAL MEETINGS ATTENDANCE

Akanda, S. (2018). Strategic Planning Workshop. 16-18 April 2018. Cross Road Hotel, 10 Miles, Lae.

Akanda, S. (2018). Research Leaders Dialogue Meeting. Organized by the Science and Technology Secretariat, Port Moresby, 9-10 October 2018

Bue. V. (2018). The Transformative Agriculture and Enterprises Development Program (TADEP)-ACIAR annual meeting at Kavieng, NIP. June 19-22, 2018

Bue, V. (2018). Preparation of manuscript for Book: 'Gender and Agriculture in the South Pacific'. University of Queensland. 20-22 August 2018.

Bue, V. (2018). Presentation on the 'Overview of the Vanilla Team Findings, PNG' by Claire Coote, Richard Lamboll, Helena Farrall and Veronica Bue, European Union Delegation, 16th August 2018. Port Moresby.

Bue, V. (2018). ACIAR Project-ASEM 2014/095: Improving opportunities for economic development for women smallholders in rural Papua New Guinea. Annual Review at NARI. 21-22 November 2018.

Danbaro, G. (2018). Curriculum Design and Assessment Workshop. The PNG University of Technology, Lae, 25-28 June, Facilitated by Prof Frank Bullen

Danbaro, G. (2018). Constructing Graduate Statements, Course Learning Outcomes and Course Skeleton. The PNG University of Technology, Lae, 21-24 May, Facilitated by Prof Frank Bullen

Danbaro, G. (2018). National Online Selection and Application System – Selectors Workshop, Port Moresby, October 12, 2018. Facilitator: Department of Higher Education, Research, Science and Technology

Dotaona, R. (2018). Crop Protection Research in PNGUoT: A step into sustainable management of agricultural insect pests in Papua New Guinea. la Yutera Campus Palencia, Universidad de Valladolid, Spain. 12th July, 2018 [Under the 2018 +Erasmus Visiting Fellowship, 9-16 July 2018]

Kewa, N. (2018). Asia- Pacific Association of Agricultural Research Institutions (APAARI). 15th General Assembly Meeting, 21st December, 2018, Taipei, Taiwan.

Maino, M. (2018). The Agriculture Sector Planning Retreat, Kimbe, West New Britain Province, 9-13 April 2018, Funded by UNDP under the Forest Carbon Partnership Facility (FCPF).

Michael, P. S. (2018). The importance of organic matter addition and turnover of organic matter of plant macrophytes in acid sulfate soils under falling soil moisture regimes as a result of climate change. Proceedings of the Climate Change Conference, 11th– 13th September 2018, University of Goroka, Goroka, PNG. 8 pp.

Rajashekhar Rao, B.K. (2018). Strategic Planning Workshop. 16-18 April 2018. Cross Road Hotel, 10 Miles, Lae.

POSTGRADUATE STUDENTS' RESEARCH

The following is the list of postgraduate students registered for studies in the academic year 2018, supervisors and their research topics.

Student	Research topic	Funding source	Supervisor
PhD Program			
David TIMI	Characterization and biological assessment of phytosynthesized silver nanoparticles	Self	Dr Maino
M.Sc.Ag Program			
Amelia JELSIWI	Physiological response of rice varieties to salinity	Self/Trukai Industries Ltd	Dr Maino

Raymond MANUS	Investigating the prevalence of mobile genetic elements in taro genome under water deficit and tissue culture induced stress	GAP	Prof Okpul
Loretha SELMATIN	Identification and development of DNA markers associated with cross-compatibility in sweetpotato	GAP	Prof Okpul
Camari DIVUNIWAQA	Effects of biochar on nickel polluted soil	BULA	Dr Rao
Dolores KAMANG	Allocative efficiency of smallholder rice farming in Madang Province	Self	Dr Manus
Peilyn WILLIE	Estimation of apparent metabolizable energy content and growth of broiler chickens fed sorghum based diets	SARDI	Professor Danbaro
Gerega MAIGA	Isolation, identification and screening of RHIZOSPHERE entomopathogenic fungi from cooler and warmer regions of Papua New Guinea	Self	Dr Dotaona
Daniel WENDO	Biological Control using *Lecanicillium lecanii* Zim. against Coffee Leaf Rust *Hemileia vastatrix* Berk. & Br. in Eastern Highlands Province	GAP	Dr Ban
Timothy BAFIEC	Efficacy of biochar material on alleviation of phosphorus fixation problem	GAP	Dr Rao
Tabitha PARAU	Smallholder coffee farmers' response to Coffee Berry Borer (CBB) incursion in Wantrifu Village, Eastern Highlands Province	GAP	Dr Bue
Joel SMITH	Effects of feeding *Leucaena leucocephala* and *Stylosanthes humilis* (Kunth) mixed with *Brachiariae decumbens* and *Bothriocloa bladhii* on nutrient digestibility, feed intake, and growth of local goats in Papua New Guinea	Trukai Industries	Professor Danbaro
MPhil Program			
Dickson AUGUIOM	Use of *Tephrosia* plant residues for taro beetle management	PDAL	Dr Dotaona
Evah TOKILALA	Site factors that contribute to the prevalence of basal stem rot (BSR) in Oil palm (*Elaeis guineensis*) blocks in PNG	PNGOPRA	Dr Pilotti/Dr Ban
Sharon AGOVAUA	Investigating the biology and control options of Coconut Flat Moth (CFM), *Agonoxena* sp. (Lepidoptera: Agonoxenidae)	PNGOPRA	Dr Ero/ Dr Dotaona

Simon NERO	Evaluating stomatal density and size in selected oil palm breeding populations at Dami Oil Palm Research Station, Papua New Guinea	NBPOL	Professor Okpul/ Dr Light

FINAL YEAR UNDERGRADUATE STUDENTS' RESEARCH PROJECTS

The following is the list of undergraduate students, their research projects and respective supervisors:

#	**Name**	**Supervisor**	**Title of the research project**
1	Agua EMMANUEL	Prof. T. Okpul	Ploidy manipulations on taro using colchicine.
2	Ale JACK	Dr. W. Kerua	Understanding mobile phone usage by fresh produces farmers of the High lands in improving vegetable marketing in PNG
3	A'o ROSE	Dr. M. Maino	Identification of genes expressed during mycoparasitism using native isolates of *Trichoderma* against *Fusarium* and *Rhizoctonia*
4	Bade LYNETTE	Dr. R. Rao	Allelopathic effects of selected invasive weeds on seed germination
5	Efi MARGARET	Prof. T. Okpul	The protocols for *Ipomoea batata* plant regeneration.
6	Gam LUCINDA	Dr. M. Maino	Phytoremidiation potential of weed species for heavy metals from polluted soils.
7	Gavuri JANE	Dr. G. Ban	Soil bioremediation of heavy metals using *Trichoderma*
8	Gena RAYLIN	Prof. G. Danbaro	Performance of broiler chicken on feed formulated from copra meal and sweet potato.
9	Haua BOSCO	Dr. P. Michael	The roles of plant macrophytes on soil-water chemistry in a residential sewage pond under tropical rain-fed wet lowland humid climatic conditions.
10	John ALISHEN	Dr. W. kerua	Evaluation of SPISARD livelihood improvement trainings on Munix farmers of Morobe Province.
11	Keuri JOEL	Dr. P. Michael	Farm workers involvement in farm problems, identification and priortization in UNITECH farm
12	Kewas NAOMI	Prof. S. Akanda	Study the effect of sheath rot and grain spot fungi on the germination of rice seeds
13	Korowa JACOB	Dr. P. Manus	Marketing Chain Analysis of Broiler Chicken Production in Nawai, Morobe Province.

14	Kuma'o SAM	Dr. P. Manus	An economic study of smallholder broiler production in my locality in Kainantu district EHP.
15	Lafana MEGINO JR	Dr. M. Maino	Bioremediation potential of native microorganisms for heavy metals from polluted soils.
16	Mason DOROTHY	Prof. S. Akanda.	Screening rice varities for resistance against sheeth blight fungi.
17	Mathew CHRIS	Prof. T. Okpul	Evaluation of F3 progenies of NR1 and Black rice.
18	Nanoh AINO	Dr. R. Rao	The need for capturing contribution of rocks and stones in soil carbon stock estimations.
19	Paskalis LISA	Prof. T. Okpul.	Developing a protocol for coconut plant regeneration.
20	Sabogi MISHAC	Dr. P. Michael	Effect of legume trees on N dynamics and soil properties of a sandy soil under tropical rain fed wet low land humid climatic conditions
21	Thomas OSO	Dr. G. Ban	Screening of *Trichoderma* strains for tolerance to locally available fungicides.
22	Tonefa LYNROSE	Prof. S. Akanda	Screening the rice varieties against sheath rot disease.
23	Wandibe HARALU	Dr. M. Maino.	Re-colonization of agriculture fields by weeds under humid lowland conditions.
24	Was PRISCILLA	Dr. R. Rao	Effect of selective invasive weed biomass on mineral nitrogen content of Soil.
25	Wek NATASHA	Prof. G. Danbaro	Performance of broiler chicken on feed formulated from cassava and fish meal
26	Wesley JUSTINA	Dr. G. Ban	The decomposition of organic matter by T*richoderma* in saline soils
27	Wokolon JOAN	Dr. P. Manus.	Marketing chain analysis of Irish Potato in Lae city.
28	Rourela MARTIN	Dr. R. Dotona	Identification of banana leaf roller parasitoid in selected areas of Morobe Province.
29	Georgina KAPI	Dr. M. Maino.	Isolation and identification of plant pathogenic fungi, *Fusarium* and *Rhizoctonia* spp.
30	John JACOB	Dr. W. Kerua	Constraint of agriculture extension work in Huon Gulf district.

AWARDS FOR RESEARCH AND SCHOLARSHIP

Dr. R. Rao has been awarded with the following recognitions:

1. ***Outstanding reviewer*** awarded by Elsevier publishers for the review work performed to journals:

- ‘Ecotoxicology and Environmental Safety’ in February, 2018
- ‘Scientia Horticulturae’ in October, 2018

2. Received ***Publons peer review awards 2018***; **Top 1% of the reviewers in assorted category** on Publons’ global database, determined by the number of peer-review reports performed during 2017-2018 award year.

DEPARTMENT OF APPLIED PHYSICS

Head of Department: Dr. Gabriel Anduwan

The Department of Applied Physics is relatively small in terms of building but the department served a lot of students just like other service departments. We used to have two courses running; the Bachelor of Science in Applied Physics with Electronics (BSAP) and Instrumentation and Bachelor of Science in Radiation Therapy (BSRT). However, we have shelved BSRT program for now until the Health department need some more graduates, then we will start running the BSRT program again. While running BSAP program, we provide service courses to 10 other departments out of 13 departments in this University.

The Applied Physics course with electronics and Instrumentation with more emphasis on the principles of application to Physics are imparted to students. The students are grounded with analytical skills and all the application to Physics principles. The graduates of Applied Physics students are working all over the country and few overseas. They are employed in any work related to Physics. Some are working in the Airline industry; education, mining industry, PNG Power and even some are doing private consultancy work.

We have two Post Graduate programs are running in the department. Our Master of Science in Applied Physics and Master of Philosophy in Applied Physics have been in existence for over 10 years now. This year we have started another Post Graduate program, Master of Technology in Exploration Geophysics. We have 13 PG students doing both programs leading towards Masters degree while 2 staff members are doing doctoral studies. We hope to increase the number of PG students in the near future.

Research Publications

1. Mukhopadhyay, Manoj, Eslam Elawadi, Basab Mukhopadhyay, & Saad Mogren (2018). Induced and ambient crustal seismicity under the Ghawar Oil-Gas Fields, Saudi Arabia. ***Journal Geological Society of India (Springer)***, Vol. 91, pp. 8.

2. Mukhopadhyay, B., Mukhopadhyay, Manoj,Om, Prakash Mishra, Diptansu, Sengugupta, Sujit Dasgupta, Eslam Elawadi, Prabir Kumar Mondal and Ghanshyam Dharamchand Gonade (2018). Constraining the seismic potentiality analysis for Andaman Arc System, NE Indian Ocean. ***Journal Geological Society of India (Springer),*** vol. 91, p. 523-534.

3. Senthilkumar, V. & Yong Soo Kim (2018). Impurity-Free, Direct Transferable Large-Area MoS2 Monolayer and Studies on Its Li-Storage Properties. **(COVER PAGE).** ***New Physics: Sae Mulli,*** Vol. 68 (2), pp. 166-172. http://dx.doi.org/10.3938/NPSM.68.166

Conference Papers

1. Jojo, P. J., Philip, V. Epemu, Pereira, F. B. & Gabriel Anduwan (2018). Radon in dwellings of Papua New Guinea: Observations of a preliminary study. 5th International Conference on Environmental Systems Research (ICESR 2018), Brisbane, Australia.

2. Jojo, P. J., F B Pereira & G. Kupale (2018). Prospects of Nuclear Energy in Papua New Guinea. SERI Conference, 27 – 28th June 2018, PNGUOT, Lae, MP, Papua New Guinea.

3. Pereira, F. B. & O. Renagi (2018). Long term variation of Atmospheric Temperature in Papua New Guinea. SERI Conference, 27 – 28th June 2018, PNGUOT, Lae, MP, Papua New Guinea.

4. Pereira, F. B., Nagombi, E., Panakal, J. J., Renagi, O., Betasolo, M., Navuru, G. & Magiri, S. (2018). A Study of Climate Change in Papua New Guinea related to Global Warming. SERI Conference, 27 – 28th June 2018, PNGUOT, Lae, MP, Papua New Guinea.

5. Thakur, Ravindra (2018). Theoretical Analysis of Power from Sun", SERI Conference 27 – 28th June 2018, PNGUOT, Lae, MP, Papua New Guinea.

Video Conferencing

Roberto, Soto., Mirzi, Betasolo., & Nick, Lambrache (2018). Smart Building Design for Daylight & Energy Conservation. Global Virtual Conference, Civil Engineering, PNG Unitech, Lae, Papua New Guinea.

Student Projects

	Name	Project Title	Supervisor
1	Danlee Ken	Temp. Ctl. System (PID) with PLC's	Mr. Roberto Soto
2	Jimmy Pera/Philip Lipa	T-junction Intersection Traffic Light ctl. For Lae City	Mr. Roberto Soto

3	Samuel Ogizo	Stepper Motor Ctl. Using a Universal Shift Register	Mr. Roberto Soto
4	Karen Iparun	Generating Bio-gas from Lae Market Waste	Mr. Roberto Soto
5	Kayleen Pia	Biogas Generation: using chicken manure	Mr. Roberto Soto
6	Desmond Hamambi	PLC & Pressure sensor based Automatic cooking oil filling system for Laga Industries.	Mr. Roberto Soto
7	Gideon Litau	Temperature Ctl. (Proportional Control), using PLC's	Mr. Roberto Soto
8	Tony Kah	On/Off Temperature Control System using PLC's	Mr. Roberto Soto
9	Eugene Mera	Light Listener/Lighting Sensor	Mr. Roberto Soto
10	Lucas Wai/Mark Kola	Designing a Solar Power Generator for the Applied Physics Department	Mr. Roberto Soto
11	Jayson Japal	Wireless Health Monitoring System in Hospitals for Patients	Mr. Roberto Soto
12	Rickman Sanga	Sun Tracker: Neural Networks Circuit	Mr. Roberto Soto
13	Gedu sorekine	Synthesis of semiconducting oxide thin film by spin coating technique for TCO electrode applications	Dr V. Senthilkumar

DEPARTMENT OF APPLIED SCIENCES

A/Head of Department: Reilly Nigo

Introduction

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 (except Australia and New Zealand).

Vision: "To become a quality department that produces intellectual manpower for Papua New Guinea's development and sustenance.

Mission: "To focus on high-class teaching and quality research, continuously strive to produce future leaders rich in intelligence and innovations in the field of Applied Chemistry and Food Technology and simultaneously concentrate in strengthening and enlightening the community".

The average employment rate of its graduates is more than 60% within three (3) months after graduating with Bachelor of Science in Food Technology or Bachelor of Science in Applied Chemistry.

The Department, based on the current market scenario and other developments, keeps track on the curriculum, and suitable changes and revisions to the curriculum were done in the past. The Department also embarked into balancing the total credits, as much as possible, so that the students undergo a smooth teaching-learning process.

The Department has strong emphasis on research. Our target is to publish one paper in an international journal annually. To encourage research activities and eventual publication, the Department has taken on a new initiative to reward those who publish internationally a cash reward of K200 per publication and national journal publication with cash reward of K100 per publication.

The Department has actively engaged industries through Industrial Advisory Committee (IAC) for their input on curriculum review on the two courses it offers and also few industry-based research work through its final year and MPhil projects.

The research activities are broadly classified into:

(a) **Chemistry:** Environment, material science, water and organic chemistry related research.
(b) **Food Technology:** Food processing, clean energy, quality control and nutrition related research.

The research activities of the two sections are provided below.

Research interests: Applied Chemistry Section

No.	Name	Research interests
1	Prof. Subramaniyam Gopalakrishnan	Organic chemistry, medicinal chemistry, nanotechnology, Spectroscopy
2.	Associate Professor William Modey	High Resolution chromatograhic separations; Air pollution research; Ambient particulate sampler design and evaluation; Determination of trace contaminants in aquatic media (particularly heavy metals, and the global emerging issues on pharmaceutical contaminants) ; Determination of toxic organic pollutants in air and aquatic media; Supercritical fluid technology for extractions and chromatograhic separations; Environmental and social impact assessment (ESIA) for regulatory assessment.
3	Dr. Srikanth Bathula	Chemical Speciation and bioavailability, engineering materials and water chemistry.
4	Dr. Sivakumar Balakrishnan	Material chemistry: Metal- Organic Frameworks (MOFs), development of materials for water purification and sensorbased materials on MOFs, porous silicon functionalisation and sol-gel ceramic materials. Research expertise in the area of phosphors (luminescent materials) and carbon materials.
5	Mr. David Timi	Organic chemistry, phytochemistry
6	Mr. Justin Narimbi	Analytical chemistry, environmental chemistry, instrumental methods for analysis, Water quality assessment and monitoring, Laboratory quality management.

Research interests: Food Technology Section

No.	Name	Research interests
1	Mr. Reilly Nigo	Renewable and Clean Energy, Animal Feed Development, Thermal Processing, Food Drying Studies Using Solar and Clean Energy Systems
2	Dr. Lydia Yalambing	Nutrition intervention studies, compliance studies in terms of food fortification and food nutrition labels; Complementary/supplementary food development and Food Composition studies.
3	Ms. Elizabeth Nasing	Antimicrobial Studies in Foods – Food Safety & Therapeutic Uses, Food microbiology – Water Safety, food safety, Antioxidants – Public Health/Food Safety, Product Development
4	Mrs. Sogoing Denano	Food safety and food security; compliance studies.
5	Mr. Zeipi Toksy	The general interest areas are enzymology, Fats, oil and protein chemistry.
6	Mr. Nigel Kiaka	Industrial solid and liquid waste management
7	Mrs. Rag Gubag-Sipou	Food microbiology, microbial quality of food and water, medicinal studies of indigenous plants.

Research Output: Peer Reviewed Journals

Alsultan, Mohammed, Sivakumar Balakrishnan, Jaecheol Choi, Rouhollah Jalili, Prerna Tiwari, Pawel Wagner and Gerhard F. Swiegers. (2018). Synergistic Amplification of Water Oxidation Catalysis on Pt by a Thin-Film Conducting Polymer Composite. ***ACS Applied Energy Materials***, 1(8): 4235–4246.

Hundang, K., Janarthanan Gopalakrishnan, Aisak Pue. (2018). Determination of Baseline Data on Cadmium Levels for Selected Food Products from Volcanic Areas in East New Britain Province of Papua New Guinea. ***International Journal of Sciences: Basic and Applied Research***, 42 (1): 10-21

Narimbi, J., Mazumder, D., & Sammut, J. (2018). Stable isotope analysis to quantify contributions of supplementary feed in Nile Tilapia *Oreochromis niloticus* (GIFT strain) aquaculture. ***Aquaculture Research,*** 42(1): 1866-1874

Timi, David, Subramaniayam Gopalakrishnan and Macquin Maino**.** (2018). Characterization and Antimicrobial Assessment of phytosynthesized Silver Nanoparticles using Aques Extract of Euphorbia geniculate". ***Indian Journal of Science and Technology,*** 11(47): 1-7

Conference Presentations

None

Unitech Research Seminar Series/SERI

Lydia Yalambing. Effect of Nutrition Improved Wheat Based Food on the Health of Children aged 6-12 years in Morobe Province – A Collaboration Research Project with University of New South Wales, Australia (10 July, 2018).

Sivakumar Balakrishnan, Metal-Organic Frameworks: A new class of porous crystalline materials (8th May, 2018)

Zeipy Toksy. Coconut oil extraction and assessment using enzymes from Giant African in Different processing Methods (13 February, 2018).

Collaboration Projects

1. **Designing a Suitable Drying System for Higher Altitude Conditions: Using Gembolg District, Simbu Province as a Model.**

   Jointly by FPDA, Applied Sciences and LNSDC. This is an applied research study to assist Fresh Produce Development Agency (FPDA) and the project serves as MPhil studies undertaken by Mr Nigel Kiaka and is co-supervised by Reilly Nigo from Unitech and Noel Kuman of FPDA. The work is in progress and is expected to be completed November 2019.

2. **NFA–Unitech – Laboratory Accreditation** – Project leader: Mr. R. Nigo. Around K3.5 million has been allocated to this project. Through the NFA funded the Department of Applied Sciences Building has been fully renovated. Several equipment worth more than K2 million has been purchased. Preliminary accreditation work is in good progress and few

industry-based tests have been done using HPLC and now two new equipment; namely Gas Chromatography and ICPMS both of the latest models have been commissions and trials runs are in progress. Launching of National Food Testing and monitoring Centre (NFTMC) was done April, 2018. Mr Narimbi and Mrs Denano are expected to be on 3 weeks hands on training in February 2019 as part of the accreditation process.

3. **Food Safety Courses / Training for Industries** – Coordinator: Mr. R. Nigo. This is a program running in three stages annually. Conducted by the senior Food Technology staff of the department (Mr. R. Nigo, Mrs. R.G. Sipou, Mrs. S. Denano, Ms. E. Nasing, Mr. Z. Toksy and Dr. L.Yalambing). The team has written modules and delivered training to various food Industries. The training is becoming popular in food and allied industries and government / semi-government organizations like NAQIA and Department of Health.

4. **Efficacy of multi-micronutrient fortified wheat-based food on the nutrition status of primary school children aged 6-12 years in Lae, Papua New Guinea.** The study is in collaboration with Applied Science, Unitech, UNSW, National Health Department and funded by Goodman Fielder. Dr. L.Yalambing is a co-investigator in this collaborative nutrition project. The project has been completed.

5. **Towards National Drinking Water Standards in Vanuatu**: Applied Research and Capacity Building– a collaborative research with reputed Universities of Australia and New Zealand funding by The Pacific Islands Universities Research Network (**PIURN**), Funded by PIURN – Under Taken by Dr Srikanth Bathula. The research is an ongoing study.

Post Graduate projects (2018)

No.	Student	Degree	Topic	Principal Supervisor
1	Kundo HUNDANG	PhD	Studies on Health and Medical Conditions Related to Environmental Effects of Volcano Affected Areas of East New Britain Province of Papua New Guinea	Dr L.Yalambing

2	David TIMI	PhD	Biological assessment of phytosynthesized silver nanoparticles	Prof.S.Gopalakrishnan
3	Zeipy TOKSY	MPhil	Extracting and assessment of coconut oil using mannan degrading enzymes from the crop of *Achantina fulcia*	Prof.S.Gopalakrishnan
4	Nigel. K. KIAKA	MPhil	Designing a Suitable Drying System for Higher Altitude Conditions: Using Gembolg District, Simbu Province as a Model	Mr Reilly Nigo
5	Carlton GUWANDA	MPhil	Development of supplementary food for malnourished children.	Dr. Lydia Yalambing

Completed Undergraduate projects (2018)

Applied Chemistry Section – research projects with final year students

No.	Student Name	Topic	Supervisor
1	Lynas AGINA	Phytochemical screening,Biosynthesis of Silvernano particles from *FICUS WASSA ROXB. Studies on Antibacterial and Antifungal activities of Nanoparticles against Human Pathogens.*	Prof. S. Gopalakrishnan
2	Stephanie ANIS	Phytochemical screening,Biosynthesis of Silvernano particles from *SPHAEROSTEPHANOS J.Sm. Comparison of Antimicrobial activities between Extract and Nanoparticles against Human Pathogens.*	Prof. S. Gopalakrishnan
3	Reuben GISAWA	Chemical and microbiological examination of *Diospyros hallierii*	Mr. David Timi
4	Ari JAMES	Kinetic studies of the bio-adsorption mechanism of heavy metals to banana peels in a cost effective water purification technique.	Mr. Kaupa Philip
5	Gilbert KEMA	Using formulated nutrient solution for vegetable production.	Mr. Justin Narimbi
6	Fannyanne KISIMI	Synthesis and characterisation of rare earth doped inorganic materials	Dr. Sivakumar
7	Garrison KOVA	Preparation of a solar cell	Dr. Sivakumar
8	Lahui LEONITEL	Quality assessment of synthetic paint samples	Dr. Srikanth Bathula

9	Nancy MAIMA	Chemical and microbiological examination of a selected PNG medicinal plant	Mr. David Timi
10	Aldu MALIB	Isothermal studies on the bio-adsorption of heavy metals unto banana peels as a cost-effective water purification technique.	Mr. Kaupa Philip
11	Eileen MARARANG	Determination of Heavy metal concentrations in seafood with microwave assisted sample dissolution.	Mr. Justin Narimbi
12	Gerald MARONG	Equilibrium studies of coconut husks bio-adsorption of heavy metals as a effective heavy metal removal technique.	Mr. Kaupa Philip
13	Margaret ORIRI	Micro nutritional studies of *Gnetum gnemon*	Mr. David Timi
14	Vance SOLMIEN	Wood and carbon-based materials for water purification application	Dr. Balakrishnan
15	Barthsilla SONNY	Quality assessment of different river water samples	Dr. Srikanth Bathula
16	Abigail TOSA	Determination of Heavy metal concentrations in rice with microwave assisted sample dissolution.	Mr. Justin Narimbi
17	Thomas TUMAU	Synthesis and characterization of monazite ceramic material	Dr. Srikanth Bathula
18	Rudolf UMO	Trace Metal Distribution in Sediment Profile from the Markham River	Mr. Narimbi
19	Lenga WAUTI	Sol-gel synthesis of polymer-alumina composite material	Dr. Sivakumar
20	Nostrodamus WEWERANG	Phytochemical Screening and Biosynthesis of Silver nanoparticles. Comparison of Antibacterial and Antifungal activities between the extract and Silver Nanoparticles of the *Hamoalnthus novoguineensis (Warb.) K. Shum* plant.	Prof. S. Gopalakrishnan
21	Ixzara BAKUNG	Bio-adsorption kinetic studies on coconut husks to verify its capacity as a cost-effective technique for the removal of heavy metals from water.	Mr. Kaupa Philip

Food Technology Section – research projects with final year students

No.	Student	Project Tile	Supervisor
1	Isadora PALEU	Microbiological Quality Studies of Water and Fish Cultured in Aquaculture Systems.	Mrs Rag Gubag Sipou
2	Melenie IMAROTO	Concluding Studies on Second Generation Biofuel Development from cocoa pod wastes and simple ending load tests.	Mr Reilly Nigo
3	Rosewitha MEAKORO	Quality and Product Development Studies of Cocoa	Mr Reilly Nigo
4	Dilkay BAU	Physio-chemical characteristics of local rice variety	Dr Lydia Yalambing

5	Evelyn MOKOM	Nutrition Intervention study: Ongoing Collaboration work between Unitech-UNSW	Dr Lydia Yalambing
6	Flora LAWRENCE	Growing of Lactic Acid Bacteria from Fermented Food Products.	Ms Elizabeth Nasing
7	Wilma OLI	Further Studies on Product Development from Molasses- a by-product from the Ramu Agri Industries.	Mr Reilly Nigo & Mrs Sogoing Denano
8	Samantha SIKARI	Feed Development Using Factory Wastes	Mr Reilly Nigo & Mrs Sogoing Denano
9	Nadia TIAGA	Drying Studies of Named Agricultural Food Commodities Different Solar Drying Designs.	Mr Reilly Nigo
10	Agnes POEMA	Physio-chemical Assessment of the quality of Virgin Cocoanut Oil.	Mr Zeipy Toksy

DEPARTMENT OF ARCHITECTURE AND BUILDING

Head of Department: Professor Cletus Gonduan

Research and Publications

There are a number of research projects pursued by a number of academic staff. Some are funded by external bodies whilst others are pursued on longer period to enable cost manageability.

Constant low staffing levels with high teaching loads continuously constrain active research and publication pursuit. This is common throughout the university, however, the imminent need to carry out research and publication cannot be underestimated when it has become a compulsive obligation. Because of this need staff are encourage to balance out the research, teaching and publication agenda throughout their tenure.

Research Listings

Research carried out in the 2017/2018 Academic years and into 2019

Professor Dr. Cletus Gonduan	**Research works are currently being untaken 2007 – 2018:** 1. User Behavior in Institution Housing: a periodic observation and assessment of indigenous user behavior in PNGUOT housing. 2007 – 2019 2. Environmental Stress: An assessment of the built environment wear and tear in response to user overload. 2016 - 2019 3. Shifting Cultural Influence in Domestic Architecture Design in Indigenous Environments and Societies 2009 – 2018 4. Local Fibers with Fiber-Reinforced-Polymer (FRP) as Potential Building Material 2018 - 2020
Dr. Andrew Sariman	**Research works are currently being untaken 2010 – 2018:** 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 from Sand Obtained from Sea Shore around Papua New Guinea

Daniel Wasi	1. Building Construction Waste in Papua New Guinea 2. Motivation and Performance of Indigenous Contractors.
Ken Polin	1. Hybrid Design System for developing state-owned buildings in PNG 2. Stakeholder management model for building projects in PNG.
Jerry Walliah	Research works are currently being under taken. 1. The utilization of Building Quantity Surveying and Estimating 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 5. Systems Dynamics is Retirement Home Delivery in Australia – QUT - PhD Research.
Austin Polin	**Research works are currently being under taken 2009 – 2018** *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. Culture as a Social Indicator in Melanesian Spatial Architecture – A Case Study on Alhoga Village, Misima Island
Mathew Pomoso	**Research works are currently being under taken 2017 – 2018** 1. Building Project Management – PNG Experience – Master Thesis UNRE
Magdalyne Kuluwah	**Research works are currently being under taken 2017 – 2018** 1. **Concrete application** 'ON SITE' in accordance with design and documentation specification by tradesmen in construction sites.

Final Year Projects

Final year research projects vary between Architecture and Building Students. In the 2017 and 2018 academic years the architecture and building students conducted research work under

AR 591 Research Project on a wide range of topics. Many of these projects address development issues that require extended investigation over a period of time and that of which is related to the PNG Building Industry needs.

A total of 23 Final Year Architecture students took up their 'Design Thesis' as a major final year capstone research project documentation. This came about as a result of Architectural Researches conducted in AR 491, AR 492 and in AR 591. All thesis projects addressed architecture in both an urban and rural context in a number of selected design themes. Innovative architecture and sustainable green design ideas were proposed and that would make successful development projects in real outcomes.

Projects pursued are as outlined below.

AR 502 Design Thesis Capstone Project 100% Continuous Assessment 2018

STUDENT	**Design Thesis Design & Documentation**
BALIP Emmanuel	Finschhafen District Academic Library
ALFRED Ilai	Public City Library in the CBD of Lae - MP
AMOS Philip	Cultural Complex - Pacific Arts in Port Villa - Vanuata
APIO Wilkinson	LFA Double Soccer Stadium - Lae MP
BELESI Albert	PNGUOT Academic Library - Lae MP
BENSON Elanine	Transit HUB Complex -Kokopo ENB
ELI Shadrack	Mix-Use Commercial Shopping Development - Alotau
FITZERALD Kennedy	Mix-Use Commercial Shopping Mall - Eriku Lae MP
GUNINIEI Vincent	Tourist Information Centre - Alotau MP
IGAG Vanellie	National Sport Academy Goroka EHP
JIM Emmanuel	Kauga-Erave District Administration Building SHP
KAGENA Vanesa	Bulolo Airport Terminal - Bulolo MP
KARL Junior	Regional Bus Transit Terminal - Lae MP
KURUA Richard	Mix-Use Commercial Port Moresby NCD
MESA Raylance	Floating Resort - Finchaffen -MP
Mogua Shelsilla	Mix-Use Building Complex CBD Lae

POMOSO Theckla	Seafarers Transit Centre -Koki - Port Moresby NCD
SAMENE John	Commercial Mix-Use Building - Honiara -Solomon Islands
SEROK Joel	Mix-Use Building Complex Lae MP
SEVUA Bluey	PNGUOT Conventional Centre Lae - MP
SONGAKE Apisai	Morobe Provincial HQ, Lae MP
TANIS Camilus	Arawa Office Complex - Arawa - North Solomons
TERUPO Dayral	Cultural and Tourist information Centre Lae MP
WARTOVO Apelis	New Ireland Provincial Government HQ - Kavieng NIP

The final year Building Students also conducted their final second semester project work in the following:

Student	Topic
Ronnie Solomon	Study of an attempt to minimize air conditioning maintenance in high cost buildings at the Papua New Guinea University of Technology
Robinson Ngaungau	Implementation of Remote Construction using Steel Frame and QUI Panel – Case Study on Pata Primary School, Bialla, West New Britain
Malcolm Sakiromo	Problems faced by contractors in PNG – Case study of Kemkai Investment Ltd.
Mangum Wiri	Factors causing delay in construction of a project at Gordons 5 Port Moresby – Project by Digara Construction
Kefri Repo	Implementation of PNG Unitech Project Office as a business entity.
Franky Silo	Difference in motivation of workers in profit and non-profit organizations in Lae, PNG.
Daveny Samana	Case Study on Lamana Development Ltd way of delivering projects in PNG
Dennis Pundia	The effects of concurrent delay on the Kapal House causing time overrun-causes and prevention
Victor Vaulai	Quality control of building construction in East New Britain Province

DEPARTMENT OF BUSINESS STUDIES

Head of Department: Professor Zhaohao Sun

1 Introduction to Department of Business Studies

Department of Business Studies (DBS) is the largest Department of the 13 academic departments at the UNITECH with about 600 undergraduate and postgraduate enrolments every year. It is a multidisciplinary Department with proven track records for producing national and Pacific regional leaders and beyond. Our alumni have led PNG's industrial and governmental sectors for decades.

The programs within the DBS make our students easier to build bridges between knowledge, skill and practice. The DBS offers undergraduate programs in Accounting, Applied Economics, Information Technology, and Management. It also offers postgraduate programs including PhD programs in Information Technology, Economics, Finance and Banking; Master of Philosophy in Information Technology, Economics, Finance and Banking; Master's in business administration (MBA) and an Executive master's in business administration (EMBA) program. The DBS is developing the comprehensive postgraduate programs including postgraduate diploma, masters and PhD programs in Accounting and Management. The programs of the DBS currently aim to drive various aspects of national strategic visions and development efforts, as well as regional and global competitiveness, innovation and entrepreneurship in an increasingly complex business environment.

The faculty is staffed by a dedicated, nationally and internationally recognized team of academics whose teaching is innovation and entrepreneurship driven and supported by their active involvement in relevant industries, professional associations. Academic staff have an established research record with a commitment to conducting competitive research with national and international reputation.

The DBS has a Research Centre of Big Data Analytics and Intelligent Systems (BAIS) and a Centre

of Innovation and Entrepreneurship (CIE). As a research platform for collaborating with our colleagues here and international peers to conduct research in the areas of big data, big data analytics, AI, business intelligence and intelligent systems, BAIS disseminated ITCS-BAIS Vol 6, Issues 1-4 to its team to share the state of art big data analytics, data science, AI and intelligent systems in 2018. BAIS has its presence at https://www.researchgate.net/lab/Zhaohao-Sun-Lab. In 2018, BAIS published 14+ Preprints (Working papers) on big data, AI, big data analytics, business intelligence and intelligent systems at https://www.researchgate.net, 9 of them have been indexed by Google Scholar. BAIS has drawn increasing attention in the international academia.

The DBS is building a PNG –China Centre of Business Studies and a PNG-Australia Centre of Governance and Policy Development.

The DBS is committed to providing our students with excellent education opportunity using state-of-the-art ICT technology and equipment. The faculty pursues excellence in teaching/learning, research, consultancy and community service supported with innovative and interactive blended technologies. Our faculty also engages in research and development that helps understanding of nature and improvement of the ever-changing world.

The DBS has a close cooperation relationship with many universities of other countries including Federation University, Australia; Handong University, Korea; Hebei University of Science and Technology, and Chongqing Normal University, China.

Research across the four main disciplines represented in the Department of Business Studies is encouraged; Economies, Management, Information Technology, and Accounting. The following research activities were undertaken by academic staff members in the Department of Business Studies during 2018 Academic year: The report demonstrates that 1. Comparing with 2017, the number of publications has decreased from 7 to 5, although at least 3 of them have been indexed by SCOPUS or ERA or ISI (SCI). 2. many academic staff at DBS have no record of publications, nor attending national and international academic conferences, nor deliver any research seminar presentations in the past three years (2016-2018). Therefore, how to activate and encourage the research passion of academic staff and increase outcome of quality research taking into account SCOPUS, ERA or SCI is still a big and lasting challenge for DBS. The research performance of

academic staff is an important index for any international or national accreditation of undergraduate and postgraduate programs, not only for teaching at universities.

2 Research Outcome

2.1 List of Publications in 2018

In 2018, DBS published 4 peer-reviewed (refereed) international journal articles, 1 peer-reviewed international conference proceedings paper.

2.2 Published Journal Articles

[1]. Konafo, K. (2018). Remarketing to Effectively Segment Audience, ***Journal of Marketing***, DOI: 10.15640/jmm.

[2]. Paul, M. Thomas (2018). The Issues and Implications About the Volatility of the Stock and the Bond Prices and Their Returns and the Volatility of Interest Rates and Inflation - Which Are Being Researched in Finance and Macro-Monetary Economics Literature: A Survey. ***Applied Economics and Finance***: 5(2): 125- 142.

[3]. Sun, Z., Strang, K.D., & Pambel, F. (2018). Privacy and security in the big data paradigm, ***Journal of Computer Information Systems,*** DOI: 10.1080/08874417.2017.1418631, published online in Feb 2018.

[4]. Sun, Z., Sun, L., & Strang, K. (2018). Big Data Analytics Services for Enhancing Business Intelligence, ***Journal of Computer Information Systems*** (JCIS), 58(2):162-169. DOI:10.1080/08874417.2016.1220239, published online in Oct 2016.

[5]. Sun, Z., Strang, K., & Li, R. (2018). Big Data with Ten Big Characteristics. ***Proceedings of the 2nd Intl Conf. on Big Data Research*** (ICBDR 2018), Weihai, China, Oct. 27-29, 2018, ACM, pp. 56-61. ISBN: 978-1-4503-6476-8.

2.3 Research Thesis Completed

Mr. Tiki, Samson received his Master of Philosophy from Queensland University of Technology in 2018. His Master of Philosophy Thesis is: Perceptions of bribery versus gifts within the government departments of Papua New Guinea, Queensland University of Technology. See https://eprints.qut.edu.au/121496/.

2.4 Research Seminar Presentations

2.4.1 International Research Seminar Presentation

- 23 Dec 2018, Prof Zhaohao Sun delivered a presentation, titled “Smart City Development in China: A Big Data Intelligence Perspective”, at Hebei University of Science and Technology.

2.4.2 UNITECH Research Committee Seminar Presentation

- 6 March 2018, Prof. Zhaohao Sun delivered a presentation, titled “Intelligent Big Data Analytics: Foundations and Applications” as a UNITECH Research Committee Seminar, one of the University Research Seminar Series of PNG UoT, coordinated by Prof.S. Gopalakrishnan.

2.4.3 DBS Research Seminar Presentations

- 28 Feb 2018, Prof. Dr. Zhaohao Sun, Imaginational Intelligence: Foundations and Applications
- 14 March 2018, Ms Frieda Siaguru, Service Quality Measurement in Higher Education Institutions.
- 18 April 2018, Mr Gomi Gipe, (1) "Basics of Testing Hypothesis, using one Sample Test"; (2) "A Research Proposal about Income, Expenditure, and Health in a sphere of Influence in Lae city".
- 25-Jul-2018, Mr Rodney Naro, Unified Electronic Payment Acumen System- Real-time gross settlement, currency exchange, remittance.

3 National/International Conferences Attendance

Prof Sun was invited to deliver a keynote speech on “Innovation and Entrepreneurship for Accounting in PNG” at CPA Annual Conference, Lae, on 24 August 18.

As an invited speaker, Prof Sun delivered keynote speech at Hebei Conference on Industry and Applied Mathematics on 22 December 2018. The presentation topic is Mathematical Principles of Big Data Intelligence.

DEPARTMENT OF CIVIL ENGINEERING

A/Head of Department: Mr. Chris Kobal

The Department of Engineering is one of the 13 Academic Departments in Papua New Guinea of Technology. It offers Undergraduate and Postgraduate Degrees in Civil Engineering, conduct civil engineering research and disseminate the relevant information to the community. The undergraduate program consists of a four-year study program- Bachelor in Engineering in Civil Engineering (BECV). There are four postgraduate programs that the Department is offering, which include Master of Engineering in Civil Engineering (MEng.CE), Master of Science in Solid Waste & Resource Management (MSc. SWRM), Master of Philosophy (MPhil), and Doctor of Philosophy (PhD). The MEng. CE and MSc. The SWRM programs have a combination of course work and research-based degree program and is offered in blended learning with live webinar sessions, while MPhil and PhD studies are fully research-based degrees.

The Department have nine (9) qualified academic staff (4 with PhDs, 2 with Master's Degree and 3 on further studies). In 2018, one student graduated with MPhil de3gree. There were 6 students in MSc.SWRM (1 second year and 5 first year), while MEng.CE has 1 student in the second-year level. The Department of Civil Engineering is committed in delivering quality teaching with innovation such as in place overhead projector in each classroom and fully utilizing the University Learning Management System (LMS). The commitment in research is reflected in the 17 final year projects. We have a commitment for outreach activities where the Village of Busama and its needs in water supply and shore protection had been attended through meeting and consultation. Our commitment to foster the training of our graduates is reflected in increase of postgraduate students.

LIST OF PUBLICATIONS

Conferences

Betasolo, M.**,** Kobal, C., Pikire, W., & Hemetsberger, L. (2018). "Greening Civil": An Applied Climate Change Mitigations Program at PNGUoT. **SERI Conference 2018.** Papua New Guinea University of Technology, Lae City Papua New Guinea.

Betasolo, M., Magiri, S., & Kobal, C. (2018). Lae City Second Seventh Landfill Rehabilitation Proposed Framework. *Paper submitted to SERI publication (under review)*

Gupta, S., Soto, R., Betasolo, M., Niego, R., & Olatona, D. (2018). Harnessing and Maximizing the Potential of Micro Renewable Energies in Papua New Guinea and the Pacific Island Countries. **SERI Conference 2018.** Papua New Guinea University of Technology, Lae City Papua New Guinea.

Kanawa, J., Kala, J., Tobby, S., Zuke, M., Kumbiye, A., Yaa, L., & Betasolo, M**.** (2018). Inked Waste Paper Suitability in Concrete Fiber Reinforcement. **Global Virtual Conference in Civil Engineering (GVCCE) 2018**. Papua New Guinea University of Technology, Lae City Papua New Guinea.

Lageo, A., Michael, J., & Betasolo, M. (2018). Groundwater Health and Development al Impact of Boreholes Supplying Water to Lae City, PNG. **Global Virtual Conference in Civil Engineering (GVCCE) 2018**. Papua New Guinea University of Technology, Lae City Papua New Guinea.

Obu, I., Betasolo, M**.,** & Vines, M. (2018). Investigation of Building Failure Mechanism Caused by M7.5 Earthquake, Southern Highlands and Hela Province of PNG. **Global Virtual Conference in Civil Engineering (GVCCE) 2018**. Papua New Guinea University of Technology, Lae City Papua New Guinea.

Oskine, F., Alois, C., Kasadimi, J. (2018). Suburban Development of Manum Village. **Global Virtual Conference in Civil Engineering (GVCCE) 2018**. Papua New Guinea University of Technology, Lae City Papua New Guinea.

Pereira, F.B., Nagombi, E., Panakal, J.J., Renagi, O., Betasolo, M., Navuru, G., & Magiri, S. (2018). A Study of Climate Change in Papua New Guinea Related to Global Warming. **SERI Conference 2018.** Papua New Guinea University of Technology, Lae City Papua New Guinea.

Soto, R., Betasolo, M.**,** Lambrache, N. (2018). Smart Building Design for Daylight and Energy Conservation. **Global Virtual Conference in Civil Engineering (GVCCE) 2018**. Papua New Guinea University of Technology, Lae City Papua New Guinea.

Taviri, M., Bosuk, F., Kula, W., Lae B., Dujambi E., Ganifiri, S., & Betasolo, M. (2018). Waste Egg Carton as a Fiber Reinforcement for Structural Lightweight Concrete. **Global Virtual Conference in Civil Engineering (GVCCE) 2018**. Papua New Guinea University of Technology, Lae City Papua New Guinea.

Postgraduate Research Completed

Table 1. Research work undertaken by MPhil students as a partial fulfillment of the Master of Philosophy (Civil Engineering) degree program in 2018

No	Name	Supervisor	Title of the Research Project
1	Mr. Murray Konzang	Dr. Mirzi Betasolo	Impact on the Accessibility and Mobility of Traffic Caused by Development of Four Lane Highway and New Lae Port Development Project

Final Year Undergraduate Research Projects

Table 2. Research work undertaken by fourth-year BECV students as a partial fulfillment of the Bachelor's degree program in 2018

No	Name	Supervisor	Title of the Research Project
1	Helen WHITE	Dr. Subramanyam	Determination of Water Quality Index (WQI) and suitability of Bumbu River for municipal water supply in Lae City, Papua New Guinea
2	Joro KOMANE	Dr. Subramanyam	Planning and Designing a Water Treatment Plant
3	Joshua BOMOTENG Anthony YALEHEN Shane MOIN Mostyn Piko PHILEMON	Dr. Subramanyam	Solid Waste Management in Lae City
4	Issach Faiko OBU	Dr. Betasolo	Investigation of Failure Mechanism in Buildings caused by Earthquake (February 26th 2018) in Southern Highlands, PNG
5	Kiature NERO Shaneanne RANGGAS	Mr. Nosare Maika	The Feasibility study of a new micro-hydro power scheme for Keremu Village, Dalo District
6	Jackson WINPE	Mr. Lazaro Hemetsberger	Scope and assessment of a possible overpass structure across Kumalu River in Bulolo District, Morobe Province
7	Brendon YINANGUIE	Mr. Jedge Kasadimi	Civil Infrastructure and Land Development at the Uni Block, Lae City
8	Feltex OSKINE Clayton ALOIS	Mr. Jedge Kasadimi	Civil Infrastructure and Land Development at the Manum Village
9	Tsir TENGELYAN Ethel AKEMA Jonathan KONGON Ray ELIAS	Mr. Murray Konzang	TR4: Determination of the Capacitiies of the Road Intersections in Lae City
10	Stanley KAMANO Ezra IPOYA Pedro PUMUYE Christina GEORGE	Mr. Murray Konzang	Scope and assessment of possible overpass structure across Kumalu River in Bulolo District, Morobe Province
11	Jerry JOSEPH	Mr. Murray Konzang	Aedrome Pavement Design Case Study of Nadzab Airport
12	Max EMMANUEL Presley NICK Kenny KOMBA	Mr. Murray Konzang	Scope, investigate and design of Kiburu junction to Prita Junction, Southern Highland Province, Road Upgrade Project
13	Hillary DICK Nelson ANDREW	Mr. Murray Konzang	Gubadik Junction to Nawaeb Highway high school road upgrade and sealing

14	Ken MARLEY Solomon YAMBU Tony JUSTIN Japeth ANDREW	Mr. Murray Konzang	Cost effective design of Flexible and Rigid pavement on a sandy-gravel base sub-grade
15	Den ENN Sharon LUKE Ricky PAUL	Mr. Murray Konzang	Investigation of the early failure of concrete pavement in Lae City
16	Carl PINDU Haifa WAK	Mr. Murray Konzang	Effective road pavement drainage system of Top Town CBD Area - 8th Street and 9th St.

Workshop

Dr. Revanuru Subramanyam organized two days "**Workshop on Water and Wastewater Analysis"** during 09-10th July, 2018. A total of nine participants from various industries and educational organizations viz., National Fisheries College – Kavieng, WafiGolpu Joint Venture, K92 Mining Limited, Harmony Gold, Department of Applied Physics and Department of Civil Engineering from Papua New Guinea University of Technology (UNITECH) participated in the workshop.

DEPARTMENT OF COMMUNICATION AND DEVELOPMENT STUDIES

Head of Department: Associate Professor Garry Sali

As concerns *teaching activities*, 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 degree program to train liaison and community development and public relations officers for resource development companies, government departments and non-government organizations. It also presently administers the Postgraduate Certificate Course in Student-Centered Teaching for the further specialized training of academic staff at PNGUoT.

In 2009, the Department began offering a Masters 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 Masters 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. Furthermore, a growing PhD program is underway, with one graduate to date and two others currently enrolled.

As concerns *research activities*, the Department of Communication and Development Studies at the Papua New Guinea University of Technology is a department that blends three broad academic strands (Language and Communication Studies, Sociology, and Communication for Development). Through its individual members of staff, research is conducted in under general umbrellas (Linguistics and Culture, English for Academic Purposes/EAP, English for Special Purposes/ESP, Sociology, and Communication for Development). General and sub-topics include:

In Linguistics and Culture, focus is given to PNG national languages, comparative linguistics, and the interface between society and language across time. In EAP or ESP, research topics include:

classroom research, EAP/ESP methodology, course design, material design, genre analysis, rights analysis, critical EAP/ESP, reading and writing, testing and evaluation, computer-mediated language learning, EAP/ESP research, and socio-linguistic influences on the teaching and learning of EAP/ESP.

In the general area of Sociology, research foci include fieldwork, health, corrections, communication theory and practice, media studies, critical-cultural studies, and comparative higher education studies. Another thread is concerned with the problems of youth in society, especially on topics such as integration, sex education, and social behavior.

In the Communication for Development (C4D) area, the sub-topics of research interest include: communication in education, communication and gender, communication in resource management, conflict resolution, negotiation skills, partnership building, communicating development in such sectoral contexts as economic industries, healthcare, agriculture, and so forth, democracy and human rights, and HIV/AIDS.

Both empirical (quantitative) or qualitative approaches to relevant topics are employed by our academics, with trans-disciplinary innovations (such as action research) encouraged. The Department publishes a peer-reviewed organ, the *JCDS: Journal of Communication and Development Studies* in cooperation with the UNESCO Chair of Quality Management of Higher Education and Lifelong Learning of "Lucian Blaga" University of Sibiu, Romania, and its Director, Prof *habil*. Dr Silvia Florea.

Name of the Faculty Member/Position/Research Interests

Name of the Faculty Member	Position	Research Interest
Dr Eric Gilder	Professor	Higher education policy, scientific communication, technology and society, 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	Professor	International migration, urbanization, health sociology, political economy, research methodology (qualitative) and family dynamics.
Dr Garry Sali	Associate Professor and Head of Department	Sociology of crime and deviance, prison systems, crime and development, and law and order problems in PNG.
Dr Rachel 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.
Dr Kaveri D. Mishra	Senior Lecturer	Mass media and journalism, Information Technologies Utilization, Comparative media studies, Gender studies.
Dr Apoi Yarapea	Senior Lecturer	Linguistics and Applied Linguistics: Language documentation, discourse analysis, language education, production

		of learning materials for language at all levels (Elementary, Primary, Secondary and tertiary institutions), cross-cultural communication strategies, curriculum research, design, implementation and evaluation, English language development in PNG schools.
George Wrondimi	Lecturer	Social work; social policy and planning; social mapping; community development;
Mary Kunenda Aisi	Lecturer	Development communication, gender and leadership, and mass media.
Imelda Ambelye	Lecturer	Education and community empowerment (women and youth), natural resources (mining and other extractive industries) in PNG.
Dr Francis Essacu	Lecturer	Natural resource management and environmental governance, Conflict Resolutions, Peace building and Human Rights, Sustainable Development Projects Management, Sociology of Development, Development Policy, Development Leadership & Politics and Community Development - Gender inequality and Social Inclusion, Disaster Risks Managements.
Joshua Frank Kuri	Lecturer	Language development and practices via bilingual education; practices and effects

		of communication across developing societies.
Sheryl S. Makara (on study leave)	Lecturer	Emotional intelligence and leadership, critical thinking, communication in crime and sociology with relations to development, community development and participation.
Wilma Molus (on study leave)	Lecturer	Sociology of children, sociology of deviance and crime.
Michael Winuan	Lecturer	Enrolled in PhD Program (Year 3). Research Topic: "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" (Eric Gilder &Apoi Yarapea, Supervisors).
Rhonda Lakele Eva-Gwale .	Principal Technical Instructor	Information management, traditional knowledge, changing societies and gender issues. Graduate of Masters in Organizational Leadership (MAOL) Program.
Lucy Maino	Lecturer	Participatory development communication (PDC) whereby communication processes, techniques and media are used to engage stakeholders (individuals, groups, and institutions) in socio-economic change processes, cross-cultural communication, communication for

		agricultural innovation, participatory social mapping, community development, English for academic purposes.
Ngawae Mitio	Technical Instructor	Local community affairs/local governance.

Ongoing International Partnership Research Projects:

Yarapea, A. (Coor.). Papua New Guinea languages documentation project – Partners: PNG University of Technology and USA Living Tongues Institute of Endangered Languages.

Peer-Reviewed Publications:

Essacu, F. (2018). The impacts of resource development projects on community livelihoods in Papua New Guinea: a case study from mining and agriculture projects, *European Journal of Sustainable Development* 7(3): 507-517.
Retrieved: http://ecsdev.org/ojs/index.php/ejsd/issue/view/31

Khan, G.S. (2018). Women's property rights and social empowerment issues in Bangladesh: A qualitative observation. *Romanian Review of Political Sciences & International Relations* 15(1): 45-54.

Khan, G.S. (2018). Melanesian culture and customs in transition: An epilogue. *New Zealand Online Journal of Multi- and Interdisciplinary Studies* (NZOJIS) 1(3):72-91.

Sali, G. (2018). Concerns and challenges of crime in Papua New Guinea. *South Pacific Studies* 38(2): 39-72. Retrieved: http://cpi.kagoshima-u.ac.jp/publications/southpacificstudies/sps/sps38-2/ South Pacific Studies 38-2-pp39-72.pdf

Other Publications:

Aisi, M., Rooney, M.N., Forsyth, M., & Kuir-Ayius, D. (2018, 10 December). FSV, children's school attendance and strategies used by schools to help, *DevPolicyBlog*. Retrieved: http://www.devpolicy.org/fsv-childrens-school-attendance-and-strategies-used-by-schools-to-help-20181210/

Essacu, F. (2018). Conference Proceedings/ Book of Abstracts, 6th International Conference on Sustainable Development, 12-13 September, 2018, European Centre of Sustainable Development, Rome Italy. Retrieved: http://ecsdev.org/books-proceedings/proceedings-2018

Kuir-Ayius, D., Forsyth, M. & Rooney, M.N., & Aisi, M. (2018, 6 December). Family and sexual violence and its impact on families in Lae, *DevPolicyBlog*. Retrieved: http://www.devpolicy.org/family-and-sexual-violence-and-its-impact-on-families-in-lae-20181206/

Mishra, K. D. (2018, 27 February). Polio in PNG: a menace resurfaces (Papua New Guinea), *The Interpreter* (Lowry Institute). Retrieved: https://www.lowyinstitute.org/the-interpreter/polio-png-menace-resurfaces.

Rooney, M.N., Forsyth, M., Aisi, M., & Kuir-Ayius, D). (2018, 12 December). Accessing justice: police responses to domestic violence, *DevPolicyBlog*. Retrieved: http://www.devpolicy.org/accessing-justice-police-responses-to-domestic-violence-20181212/

Rooney, M.N., Forsyth, M., Aisi, M., & Kuir-Ayius, D. (2018, 22 May). In search of services to address family and sexual violence in Lae communities, *DevPolicyBlog*. Retrieved: http://www.devpolicy.org/services-to-address-family-and-sexual-violence-in-lae-20180522/

Scholarly Presentations:

Aisoli-Orake, R. (2018). Resource development & human rights: FPIC and the duty to consult indigenous peoples (a case study on Nautilus seabed mining in PNG), CDS Weekly Seminar, The Papua New Guinea University of Technology, Lae, 26 April.

Aisoli-Orake, R. (2018).The English for Academic Purposes (EAP) program at PNGUoT: Its role, challenges and the way forward, PNGUoT Academic Research Seminar, Lae, 17 April.

Essacu, F. (2018). The hybridisation of Big-shot and Grand-Chief leadership models in PNG: Compromising traditional loyalties to favour self-interests, CDS Weekly Seminar, The Papua New Guinea University of Technology, Lae, 12 April.

Gilder, E., & Hagger M. (2018). A semiotics of signals, secret signs and salvation: Herbert W. Armstrong's odd overseas radio broadcasting Empire, Semiosis in Communication – "Differences and Similarities," National University of Political Studies and Public Administration, Bucharest, Romania, 14 – 16 June (first author presented).

Gilder, E. (2018). Conference held on the Launch of the Volume: *Lucian Blaga: Selected Philosophical Abstracts* (A. Botez, R.T. Allen & H. A. Serban, eds.). Vernon Press, USA. Academy of the Romanian Scientists: Philosophy, Theology, Psychology and Journalism Section, Bucharest, Romania, 12 December.

Gilder E., & Sali, G. (2018). Intriguing challenges of crime in Lae: Developing an integrated and collaborative approach to create a more just, safe, and secure urban space, 11th LUMEN International Scientific Conference Communicative Action & Transdisciplinarity in the Ethical Society (CATES 2018), Targoviste, Romania, 23-24 November (first author presented).

Gilder, E. (2018). Appreciating or deteriorating systems amidst paradigm shifts: Achieving an integrated natural and Social-Economic Capital System for sustainable development, Asia Pacific

International Conference on Energy, Climate and Renewable Green Energy Technology Transfer. SERI/PNGUoT, Lae, 27-28 June.

Henry, R., & Ambelye, I. (2018). Dying out of place: bodies, borders and bereavement among Papua New Guinea Highlanders, "Life in the Age of Death" AAS 2018 Conference, James Cook University (Cairns Institute), Australia, 4-7 December.

Lovo, R. […] Gilder, E. Olatona D., *et al*. (2018). Looking on the 'bright side' of earth's stratospheric ozone depletion and climate change. Climate Change Conference, The School of Science and Technology, The University of Goroka, PNG, 11-13 September (Gilder & Olatona presented).

Sali, G., & Gilder, E. (2018). Ethics of building a quality teaching, research and service culture at the PNG University of Technology, 2nd LUMEN EDU International Scientific Conference, "Education, Quality & Sustainable Development," Targoviste, Romania, 21-22 November (second author presented).

Wrondimi, G. (2018). The service centre development model for Papua New Guinea: A concept paper, CDS Weekly Seminar, The Papua New Guinea University of Technology, Lae, 13 September.

Postgraduate Research Supervision/Examining

External

Year	PhD Candidate	Research Title	Co-Supervisor/Examiner	Institution
2018	Simon VANDESTADT	Inequality, identity and conflicts in Papua New Guinea	Dr Francis Essacu	University of Melbourne (Australia)

2018	Anca Simina-MARTIN	Shakespeare's Bawdy Puns: Their (Un)Translatability	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2018	Ruxandra Mădălina POP (Dan-Pop)	A Discursive-Semantic Model of Attitudinal Appraisal of Sexuality in Romanian Online Personal Advertisements	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2018	Elena (Meştereagă) GORDEA	Bilingual Education and Social Change	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2018	Isabela DRAGOMIR	Representations of Power Dynamics In NATO Military Discourse	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2018	Scott EASTMAN	Standardized Methodology for Implementing Applied Critical Geopolitical Discourse Analysis to Improve Forecast Accuracy	Prof Eric Gilder	"Lucian Blaga" University of Sibiu (Romania)
2018	Wendy Bai MAGEA-VAVARI	Making a living in urban Papua New Guinea: Community, Creativity and the provision of	Dr Rachel Aisoli-Orake	University of Goroka (PNG)

		mobile phone goods and services in Goroka		

Internal

Candidate	Program	Supervisor(s)	Research Topic
Shauna AISIME	MCS1	Dr Mishra/ Dr Aisoli-Orake	Dutch disease and the role of communication in addressing socioeconomic issues: A case study in Wapfi Mining Area
Alex KAMBAO	MCS1	Prof. Gilder/ Dr Yarapea	Participatory communication in the registration of unelinated land for community development: A case study of primary, community and elementary schools in Enga
John MILBA	MCS1	Dr Essacu/ Prof. Khan	Effective communication approaches in improving Timber Authority (TA) and Forest Management Area (FMA) application process: A case study in Madang/Morobe Province
Christie PASKALIS	MCS1	Dr Aisoli-Orake/ Dr Mishra	Comparing and contrasting communication barriers and challenges in Kavieng LLG, New Ireland Province: A case study to identify and develop a sustainable approach to addressing issues at all levels of structure
Jack YARO	MCS1	A/Prof. Sali/ Dr Essacu	Effective communication strategies in addressing occupational health and safety risk management in resource development industries in PNG: A case study of Barrick (Porgera) Gold Mining Ltd. Enga Province
Jacob NAWA	MCS1	Dr Yarapea/ A/Prof. Sali	Application of participatory communication as a model for delivering community water supply and sanitation in PNG

Puso SEZUKA	MCS2	Prof. Gilder/ Assoc. Prof. Sali	The socio-economic impact of the internet in the market promotion of safari tourism in Northwest Botswana
Kerryanne MESKEREA	MCS2	Dr Aisoli-Orake/ Assoc. Prof. Sali	Evaluating and Determining the Extent and Effects of Restoring Clan Relationships Subsequent to Land Ownership Conflicts as a strategy for Rural Community Development: A Case Study of Central-Inland Pomio Rural LLG, Pomio, ENB Province.
Stanley EPENI	MCS2	Dr Yarapea/ Prof. Gilder	A communication perspective on resource management: A case study of Enga Teachers College Students' resources management
Mary AISI	PhD1	Prof. Gilder/ Dr Aisoli-Orake	Strategic Management Planning Systems: Catalyst for Organizational Efficiency and Accountability in Public Sector Organizations tasked to facilitate the planning and implementation of Behaviour Management Policy in Schools in Papua New Guinea
Elymas BAKUNG	PhD2	Prof. Khan/ Assoc. Prof. Sali	The Propagation of Socio-economic Restructure by Cult Doctrines and its Threats to the Future of the Existing Formal Socio-economic Structures in Morobe Province.
Michael WINUAN	PhD3	Prof Gilder & Dr Yarapea	Means by which Farmers Receive Agricultural Messages: A Case Study of Small-holder Oil

			Palm Out-growers at Bavussi and Sarakolok Sub-divisions in West New Britain Province.

Notes:

1. For MCS research students the principal supervisor is mostly responsible for the research outcome; the co-supervisor is available for student consultation.
2. For PhD scholars both principal supervision and co-supervisor are responsible but the former directs the research project.

Undergraduate Final Year Research Supervision (CD 472)

STUDENTS, SUPERVISORS, RESEARCH TOPICS - 2018

	Surname	First Name	Sex	Supervisors	Research Topic
1	BAIWONG	Trevor	M	Prof Gilder	Street vending in Lae city: A case study of street vending as a form of sustaining livelihoods of the urban poor.
2	BUGEN	Derrol	M	Assoc. Prof Sali	Short fall of Tuition Fee Free (TFF) in PNG: A case study of primary schools in Lae, Morobe Province.
3	EFAMI	Lisa	F	Mr Sefo	The causes of single mothers in three state circles of Tent City area, Lae in 2016 – 2018.
4	GUMAIM	Fiona	F	Dr Mishra	Sorcery (Sanguma) hindering development aspects. A case study in Tangu village of Bogia District in Madang Province.

5	INAPE	Kevin	M	Prof Gilder	Mining impacts on customary land owners: Need for relocation at Pogera Gold Mine.
6	IPATA	Sophia	F	Dr Essacu	Communication strategies used in identifying causes and effects of rural urban migration. A case study of migrant street vendors in Lae Top Town area.
7	JOHN	Malachi	M	Ms Gwale	The use of effective communication skills and strategies to reduce domestic violence in Lae District: The case study of Banana Block, East Taraka, 2017.
8	KAMBA	Beatrice	F	Mrs Aisi	Communicating the importance of Standard Based education as opposed to Outcome Based Education.
9	KAREPA	Melvine	F	Mr Wrondimi	A Community-based Restorative Justice Program: A case study of restoring and reducing the consumption and abuse of drug and alcohol by

					the out-of-school youths of Taraka, Lae, Morobe Province in 2018.
10	KIAPRANIS	Michelle	F	Mr Winuan	Effective communication strategies to address violence among boy-girl relationship: A case study of violence against final year female students at the Papua New Guinea University of Technology, Lae.
11	KILIP	Noah	M	Mr Kuri	Roles of communication in agricultural extension services in Lae District.
12	KURI	Jane	F	Mrs Maino	An investigation on the role of communication in voluntary resettlement project by Pogera Joint Venture (PJV) on mine affected communities of Pakien and Panandaka from 2017 – 2018.
13	NARI	Naomi	F	Assoc. Prof Sali	The use of effective communication strategies to address factors that influence

					alcoholism among adolescence at Peter Block in Kamkumung, Lae, Morobe Province.
14	NARRY	Jason	M	Dr Yarapea	Communication issues with pregnant women: A case study of health care resources accessibility for pregnant women in Lae City, Morobe Province
15	NIAKA	Stacy	F	Dr Aisoli-Orake	Impact of alcohol consumption on upper-secondary students dropping out: A case study of Grade 11.6 and 11.7 students of Lae secondary school.
16	PULINGE	Murphy	M	Mr Sefo	Communication strategy used to address challenges faced by women in informal sector. A case study of Lae city, East Taraka.
17	PULUPE	Luke	M	Dr Essacu	Examining the involvement of landowners through broken promises in a resource development project: The case of

					LNG Project in Angore (PDL 8), Hela Province.
18	RANYETA	Stanley	M	Ms Gwale	Applying participatory communication skills in managing illegal mining awareness: A case study of Pogera Gold Mine, Enga Province.
19	SOGAPIA	Ismael	M	Dr Yarapea	The social impact of marijuana consumption: A case of consumers in East Taraka, Lae, Morobe Province.
20	SUENU	Dulcie	F	Mr Sefo	The importance of doing social impact assessment in infrastructural project affected areas in Papua New Guinea.
21	TALIYA	Danny	M	Mrs Aisi	Communicating the effects of unstructured housing areas in Lae: A case study of Sialum Compound (Boundary Road), Lae.
22	TEPI	Letrisha	F	Mr Kuri	Impacts of TB affecting quality of life in Lae city: A case study of Papua New Guinea University of

					Technology, 2017 – 2018.
23	TIMIEL	McQuina	F	Mrs Maino	Poverty among children is the result of poor family planning in Lae: A case study of Kamkumung Kona Settlement.
24	WABILA	Max	M	Mr Mitio	Communication as a tool in identifying causes of crime and violence in Lae City Settlements: A case study on Boundary Road Settlement.
25	YAVETAVE	Toxen	F	Prof Khan	Children Beggars in Lae city. An enquiry into poverty and deprivation.

DEPARTMENT OF ELECTRICAL AND COMMUNICATION ENGINEERING

Head of Department: Dr Raj Kumar

Introduction

Electrical Engineering is a science-oriented field that is concerned with many disciplines such as power systems engineering, electronics and communications engineering, electromagnetics, control systems engineering, and computer engineering. Further, it encompasses many other sub-disciplines such as electric machines, power electronics, antenna and propagations, instrumentation and process control, mechatronics and robotics, industrial electronics and automations, biomedical engineering, consumer electronics, sensors and measurements, and computer networking. In fact, almost all technologies in modern life from nano and micro scale devices to small-scale devices, and the large scale systems rely on electrical engineering. In the nano/micro scale, technologies such as pacemakers, implantable cardioverter-defibrillators, and many other implantable devices can scavenge energy from everyday actions (motion), ambient radiations (thermal), or even from the vivo-fuel cells that oxidize blood glucose to provide a small trickle of energy. The small scale systems such as mobile phones rely on battery storage for power supplies, whereas the large scale systems such as aircraft, ships, and power systems are driven by large electric machines.

Here at PNG University of Technology, the Electrical Engineering Department offers undergraduate programs leading to the degree of Bachelor in Electrical Engineering (B.E.E), and postgraduate degree programs leading to Master of Philosophy (MPhil) and the newly approved master's by course work leading to the Master of Science (M.Sc.) in Communications Engineering. The Department also offers PhD program in either Communications or Power Engineering.

The courses taught in Communications Engineering are aimed to deepen the knowledge and skills of students on the basic concepts and theories that will equip them in their professional work involving analysis, systems implementation, operation, production, and maintenance of the various technologies such as computer network, the cellular services that includes the Global System for Mobile (GSM) communications, Code Division Multiple Access (CDMA)

protocols used in 2G and 3G wireless communication, and the Long Term Evolution (LTE). The LTE is a high speed wireless communications technology that many modern cell phones and cellular devices use as in 4G and 5G. Further, the students also broaden their knowledge in other technologies such as the radar and sonar which are detection systems that use radio waves to determine the range, angle, or velocity of objects in air or water respectively. Radar systems can be used to detect aircraft, ships, spacecraft, guided missiles, motor vehicles, weather formations, and terrain. The students also study computer networking and intelligent electronics devices that drive the Internet of Things (IoT). IoT is simply a network of devices such as vehicles, and home appliances that contain electronics, software, sensors, actuators, and connectivity which allows these things to connect, interact, and exchange data.

Similarly, power systems engineering is a discipline of Electrical Engineering that deals with the interconnections of generation, transmission, distribution and utilization of electric power and the electrical equipment. It is an electrical grid that delivers electricity from producers to consumers. The electrical grid is currently going through a drastic transformation into what is known as a Smart Grid. The shift in traditional power systems grids to integrate renewable distributed generations has significant potential to reduce carbon dioxide emissions and provide secure and resilient power supply. The development of smart grid systems which allows for two-way communications between the electric utility and its customers, and the sensing along the transmission lines makes the grid more efficient, more robust, and more resilient to disruptions.

Further, power engineers perform any of the following tasks: operate automated or computerized control systems, stationary engines and auxiliary equipment such as reactors, boilers, turbines, generators, pumps, compressors, pollution control devices and other equipment to generate electrical power and to provide light, heat, ventilation and refrigeration for buildings, industrial plants and other work sites. Power engineers are in charge of very large systems whose availability and reliability are critical to the society's ability to function and develop. The increase in demand in power, environmental and economic constraints, and the scarcity of some sources of energy (such as fossil fuels) pose significant challenges to modern power engineers. Thus, the issue of energy and environmental sustainability is a mammoth task that transcends the use of clean and reliable energy. It involves many engineering challenges

in light of the climate change and its effects on the environment. Power engineers continue to face these mounting challenges to provide sustainable and smart energy solutions.

Since PNG University of Technology is the only university in Oceania apart from the universities in Australia, New Zealand, and Hawaii (a State of USA) that specializes in Engineering and Technology, its research plan is focused in producing undergraduate and postgraduate students that are competent to be top class engineers and leaders. The graduate engineers should be able to position themselves as advisors and wealth generators for the country and the region. Moreover, recognizing the importance of both research and research-intensive universities to the development of knowledge economies, it is pertinent that that the University should generate new knowledge and new technology that are relevant to the national needs. This will alleviate dependence on hiring expertise from abroad thus, enabling national engineers and researchers the needed technical and research expertise to attract foreign industries to invest in Papua New Guinea and produce a local job market that is of economic benefit to the nation.

The undergraduate program covers mathematics and physics in addition to the core curriculum in either power engineering or communications engineering and other required electives. The program enables students to specialize in any one of the following two areas: Communications and Power Engineering. In the final year of the studies, students undertake research projects on various topics in Electrical Engineering. The students show their ingenuity and innovation in researching on various topics and building prototypes or undertaking simulation models and presenting their work at the end of the academic year. The research projects are designed to trigger engineering curiosity of students and finding new methodologies to foster innovative design that employ the synergistic effect between design and innovation as the key in promoting engineering ingenuity. Table 1 provides a listing of a number of the research topics undertaken within the Department in 2018.

The postgraduate research activities in the last four years (2015-2019) are subdivided into two phases. Phase 1 of the research work extended from 2015-2018 has been successful in graduating two PhD scholars and an MPhil scholar. One of the PhD degrees and the MPhil degree were undertaken locally at PNG University of Technology while the other PhD degree was undertaken abroad at the Queensland University of Technology (Australia).

Table 1 Undergraduate Students' Research Projects

	Project Supervisor	Undergraduate Research Project Title
1.	Assoc. Professor Raj Kumar	Design of an Automatic 12 Volts Battery Charger Controller for Telecommunication Applications
2.	Dr Moses Kavi Dr Joseph Fisher	Challenges in Overcurrent (OC) Protection System Design in Radial distribution Feeders with Photovoltaic Penetration (Modelling and simulation MATLAB/Simulink.
3.	Mr Herman Kunsei	Structural Monitoring with Remote Sensing
4.	Mr Herman Kunsei	Signal Processing for Smart Antennas in Confined Environment
5.	Ms Rani Maeoaka	Laboratory Testing and Load Analysis of a Separately Excited DC Generator
6.	Mr Gibson Kupale	Design of Portable Solar Powered Container Unit for East-West Transport Limited
7.	Mr Sammy Aiau	Design of an Automated Hybrid Solar Power System for Goroka Provincial Hospital as a Backup
8	Mr Gibson Kupale	Solar PV System for ECE department as Backup Power
9	Dr Joseph Fisher	Wave Damper for Prevention of Islands and Coastal Villages Shoreline Erosions and Power Generation Utilizing Direct Drive Wave Energy Converters Driven from the Wave Dampers.

The Phase 2 (2017-2019) of the research plan that is currently underway has four candidates enrolled in the PhD programs and 5 students undertaking master's degree. One of the priorities for Phase 2 will be Sustainability where the Electrical Engineering Department projects that about 70% of the full academic carder will be filled with national members of staff, of which a minimum of 80 % will have PhD degree 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.

The Department's 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.

Table 2 Current Postgraduate Research within the Department

	Researcher's Name	Research Title
1	Mr. Wilson Kepa	GSM based Industrial Automation and Protection Systems
2	Ms. Rani	Smart Energy Management System and Power Quality
3	Mr. David Chen	A Tok Pisin based programming language for programming FPGA
4	Mr. Lolong Karipinne Bonner	Shorter Duration Digital Impulses Generator To Enhance Digital Data Processing and Transport Rates On VSAT MODEM/CODEC/Routers
5	Mr. Samy Aiau	Renewable Energy Sources for Morobe Province and Future National Smart Grid for PNG
6	Mr Gibson Kupale	Centralized and Distributed Micro Grid and Grid Extension in PNG
7	Mr. H. Kunsei	Array antennas and signal processing for Underground Mine Telecommunication Systems
1.	Mr Sylvester Tyrones	Smart Battery Management System
2.	Mr Mathew Pua	Rural District Electrifications with PV/Diesel Integrated System
3.	Mr David Finaka	Assessment of Distributed Generation Based on Renewable Energy Sources for East Sepik Province Using Wind and Solar Power

Vision

To be at the cutting edge in teaching and research in the generation and application of electrical engineering knowledge in graduating globally competent professional electrical engineers of high ethics and human values.

Academic Priorities and Basic Commitments

The major **academic priorities** for **phase one (2017-2019)** of the research plan was the following:

1. Integrate Research with Teaching and Learning

2. Connecting the academics with the community for its service
3. Make the teaching and learning process compatible with industry
4. Recruitment of the best talents nationally and internationally and retaining them.

Description of the work:

Note that the descriptions cover the research topics in progress. Other topics are still in the proposal development stage.

1. **Smart Battery Management System**

This research is an embedded system designed for battery management and is specified as smart battery management system (BMS). It is interdisciplinary research which includes Battery, soft computing (Neural Networks and Fuzzy Logic) and embedded system. The BMS for battery monitoring uses artificial intelligence where artificial neural network and fuzzy logic is used to map battery behaviour. This system indicates battery status that results in timely detection and alarming of its non-working status which is very essential for reliability and safety of all instruments.

2. **GSM based Industrial Automation and Protection Systems**

Global System of Mobile Communication (GSM) is playing a mutual role in the communication industry in providing data, voice and Short Message Service (SMS) where real time distant communication is reality. In the PNG context as is being revealed at the Internet Filtering and Policy workshop, Port Moresby, “With the increase in technology, Papua New Guinea now has over 900, 000 internet users and 3.3 million people out of the total population of 8 million use a mobile phone.” (Charles Punaha CEO NICTA, 2016). This project is a multipurpose state of the heart machine to human remote communication system using GSM as a choice of infrastructure.

GSM based industrial automation, protection and monitoring systems is very challenging yet beneficial. Today in the 21st century with emerging technology in industrialization, equipment and workers safety is considered to be the highest priority. Tracking, automation and surveillance systems using sensors for systems like electrical motor automation, pressure measurements, acceleration, flow rate, inclination, temperature, humidity, and hazardous gas leakage concentration using wireless sensor networks (WSN) is found to be the promising solution regardless of the geography and settings of the industry.

3. Space Technology Based Smart Grid System Evaluation for PNG: Focusing on Markham District New Township Solar- wind Renewable Energy Supply

A portable weather station with an inbuilt data logger and a modem was installed on an 8 meter constructed tower at the Umi solar and wind site at the end of August 2016. Please note that the portable weather station has the capability of remote monitoring and transfer of data from the site to a computer in an office however the set will require a web base IP address which requires a use of internet domain name set up. Hence currently travelling every two weeks, to and from the research station site at Umi, Markham District and manually downloading the data on a flash drive.

During the 2017 study program the portable weather station set up at Umi, Markham District in the Morobe Province was logging in the ground-based measurements of solar irradiances and wind speeds and wind directions. The portable weather station has been logging in the solar irradiance, wind speeds and directions starting September 2016 and throughout the 2017 study program these data have been downloaded onto a flash twice every month to the end of 2017 and will continue into year 2018. These data will be analysed and compared with the GIS data (completed in 2016 with the assistance of Dr Sailesh Samanta, Head of GIS section, Department of Surveying and Lands Studies, PNG University of Technology) and simulate the solar and wind power generation at the Umi site for the new Umi Township for the Markham District.

For the 2017 study program the following were carried out

- Ground-based measurements (data logger) of solar irradiances and wind speeds at the Umi weather station research site (continuing into 2018).
- Analysis of the ground-based measurements of solar irradiances and wind speeds for the Umi site.
- Developed solar and wind models and started simulations using the Matlab/Simulink and ETAP (Electrical Transient Analysis Program) simulation software packages.

The simulations will be basically on the power flow or load flow analysis on the various models of distributed power systems. In the simulations I am limited to 25 bus power systems, while the Ramu grid has over 80 buses.

4. **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 Ramu power grid, which is largely driven by hydroelectric power and increasingly by diesel generators.

5. **Array Antennas and Signal processing for Underground Mine Telecommunication Systems**

It 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.

6. **Smart Protection System for Future Power System Distribution Networks with Increased Distributed Energy Resources**

Existing distribution feeders and their integrated protection systems are not designed for high penetration of renewable energy (RE) based distributed energy resources (DERs). The overcurrent protection systems are designed considering the passive, unidirectional current flow. However, integration of the RE based DERs such as PV systems through power electronic inverter interfaces fundamentally changes the distribution network from passive to

active network with bidirectional current flow. The increased use of inverter interfaced RE based DERs and loads will result in increased harmonic injection affecting power quality. Moreover, increased penetration of RE based DERs will reduce the level of fault current magnitude from the feeder substation source. This will adversely affect the feeder protection system to provide effective protection as the fault current could fall below the overcurrent threshold.

Faults in power systems (both in AC and DC system) are inevitable and will occur at one time or another. Certain fault types, such as high impedance faults (HIF) in AC systems generate low fault current magnitude as opposed to high fault current magnitude from common short circuit faults which renders the feeder overcurrent (OC) protection mechanism ineffective in HIF detection. This type of faults must be detected and isolated as they can cause fire hazards and increase the risk of electrocution. The inherent difficulty in HIF detection using OC protection scheme in medium- (MV) to low voltage (LV) where HIFs are a common occurrence can be aggravated by penetration of RE based DERs. HIF detection and classification based on feature extraction rather than simply using current magnitude as a metric for HIF detection will fail. This is due to low fault current magnitude from HIFs and moreover, increased penetration of RE based DERs that reduces the fault current magnitude.

Short circuit faults on the other hand result in large fault current having potential to cause severe damage to power system apparatus and switchgear as well as causing instability to the unaffected portion of the power system, thus must be speedily detected and isolated. Short-circuit fault conditions generate transients in fault current with an exponentially decaying DC-offset. The DC-offset distorts the fault signal waveform and may compromise the integrity of the relay algorithms such as those based on fast Fourier transform (FFT) and wavelet transform (WT) thereby resulting in computational delays in the detection of the fault condition. As the accuracy and speed of convergence of conventional FFT and WT relies on the periodicity of the fault current and voltage, their effectiveness under DC-offset and HIFs are limited. Moreover, most DC-offset suppression techniques utilise parameter estimation, and can add additional computational delay.

Fault protection systems in DC distribution are at their infancy as compared to the fault protection systems in AC distribution. Faults in DC systems including DC side of PV system

exhibit characteristics quite different from AC system generally because of different voltage (V) and current (I) characteristics in DC systems. DC systems generally suffer from short circuit as well as open circuit faults resulting from mechanical separation of conductors, and in most cases resulting in sustained arcing. An overcurrent protection strategy using current magnitude as a threshold metric is applied for all types of faults in the DC power systems including PV systems. However, not all fault conditions on the DC system can be adequately protected using such a strategy. One such fault condition is the DC arc-fault occurring on the DC systems including the PV system. DC arc-fault can either be a parallel fault (a short-circuit fault) or a series fault (an open-circuit fault). In PV systems, the detection mechanism relies on backfed current to detect theses faults. The nature of the faults, especially the series fault contravenes the logic in its detection using current as the threshold metric. The difficulty in DC arc-fault detection is compounded in PV systems, particularly at low irradiance which also includes night to day transition and partial shading. The fast action of the maximum power point tracking (MPPT) algorithm to put the system at different MPP operation also imposes additional difficulties in the task of developing accurate reliable DC arc-fault detection techniques.

7. Severe Electric Storms and their Electrostatic and Dynamic Interactions with Low Flying Aircraft

The thesis presents a low computer memory and reliable computational model to represent and study the electrostatic field environment created by a thundercloud and the electrostatic field, electrostatic potential, electric charges that such a field produces on the surface of the aircraft. A knowledge of these parameters are crucial to design the geometry of the aircraft in order to minimize surface electric stress and production of electric breakdown, to contain the induced potential in electronic circuits and systems placed under the outer body of the aircraft, and zones the aircraft for the probable surface areas on which a .lightning strike may occur. Moreover, from the induced electric charge and the static potential, the capacitance distribution of the aircraft is determined. The capacitance and the aircraft circuit parameters (including the aircraft resistance and inductance) are used to simulate the electrodynamics aircraft-lightning interaction for either an aircraft or a thundercloud initiated lightning flash.

The three-dimensional (3D) electric dipole charge simulation method presented here allows for all these parameters to be determined for aircraft design and testing stages in the vicinity of a

thundercloud. Using this 3D electric dipole charge simulation method, electrostatic studies on both the airbus A380 and F16 military aircraft are reported in the thesis. Subsequently, the modelling of the aircraft by electric circuit elements, and the use of this model with circuit model (transmission line model, TLM) of the lightning flash channel are used to study the electrodynamics performance of the aircraft, which occurs when the electric breakdown process results in electric connection to the thundercloud and ground. This leads to the most severe electric phenomena, called the return stroke currents and voltages on the aircraft frame. Both cloud to ground (CG) and ground to cloud (GC) electric flashes to the aircraft are considered, yielding electric parameters that are not accessible to measurements for a variety of situations (e.g. the aircraft at different altitudes when struck by lightning). The electric parameters obtained include transient return stroke current, continuous current, transient voltage pulses, electric charges carried by the return stroke, peak current, rate of rise of current, frequency spectrum of the return stroke and rise times. The simulation is further extended to include lightning-aircraft electrodynamics for the severe cloud-to-cloud (CC) lightning flashes to the aircraft.

Thus, the results obtained were validated using the currently existing, although limited, experimental data on pre-lightning strike electrostatic field enhanced zones. Further, in the case of lightning-aircraft electrodynamics, the results obtained were validated with statistically measured and modelled data available on lightning-interactions with ground based structures since there is limited data available on lightning-aircraft interactions.

Publications in 2018

Conference Papers

1. Aiau, S., R. Kumar, J. Fisher, G. Kupale, & Hoole, P. (2018). Renewable Energy Resources Mapping in Papua New Guinea: Solar and Wind Power, Case Study in Markham Valley, Morobe Province, Papua New Guinea. Sustainable Energy Research Institute (SERI) 2018 International Conference on Energy and Energy Technologies, PNG University of Technology, Lae, Papua New Guinea,

2. Aiau, S., Kadasamy Pirapaharan1, Sailesh Samanta, Hoole, P. R. (2017). Renewable Energy Resources Mapping in Papua New Guinea: Solar and Wind Power, Case Study

in Markham Valley, Morobe Province, Papua New Guinea. 2017 IEPNG Engineering Conference in Port Moresby from 18 - 19 April, 2017.

3. Fisher, J., K. Komuna, G. Kupale, S. Aiau, F. Sakato, & Augustine, S. (2018). Planning a Reliable, Resilient, and Robust Trans-regional Electricity Grid. Sustainable Energy Research Institute (SERI) 2018 International Conference on Energy and Energy Technologies, PNG University of Technology, Lae, Papua New Guinea, 27th – 28th June 2018

4. Sakato, F., J. Fisher, S. Aiau, & Kupale, G. (2018). Improving Electricity Accessibility Through Off-grid Solar Solution in Papua New Guinea. Sustainable Energy Research Institute (SERI) 2018 International Conference on Energy and Energy Technologies, PNG University of Technology, Lae, Papua New Guinea, 27th – 28th June 2018

List of Research Students

Researcher's Name	Supervisors	Program	Research Title	Remarks
Mr. Wilson Kepa	Dr. Raj Kumar	MPhil	GSM based Industrial Automation and Protection Systems	Work in progress *On Mobility program in Spain*
Ms. Rani	Dr. Raj Kumar	MPhil	Smart Energy Management System	Work in progress
Mr. Lolong Karipinne Bonner	Dr. Raj Kumar Dr. K. Pirapaharan	MPhil	Shorter Duration Digital Impulses Generator To Enhance Digital Data Processing and Transport Rates On VSAT MODEM/CODEC/Routers	Started in Year 2016, work in progress
Mr. David Chen	Dr. Raj Kumar	Ph.D.	A Tok Pisin based programming language for programming FPGA	Work in progress
Mr. Gibson Kupale	Prof. P.R.P. Hoole Dr. Raj Kumar	Ph.D.	Centralized and Distributed Micro Grid and Grid Extension in PNG	Work in progress

Mr. Samy Aiau	Dr. Raj Kumar Prof. P.R.P. Hoole Dr. K. Pirapaharan	PhD	Renewable Energy Sources for Morobe Province and future National Smart Grid for PNG	Work in progress
Mr Moses Kavi	M., Y. Mishra	PhD	Smart Protection System for Future Power System Distribution Networks with Increased Distributed Energy Resources	Graduated
Mr. Joseph Fisher	Prof. P.R.P. Hoole Dr. K. Pirapaharan	PhD	Severe Electric Storms and their Electrostatic and Dynamic Interactions with Low Flying Aircraft	Graduated.

DEPARTMENT OF FORESTRY

Head of Department: Dr. Mex Peki

INTRODUCTION

The Department of Forestry at Unitech is the only institution in the South Pacific region that offers training in tropical forestry at professional level. The Department has integrated Degree and Diploma curricula offered at Unitech and Bulolo campuses respectively. The *three- year* course leading to Diploma in Forestry is completed at Bulolo while the *four-year* course leading to Bachelor of Science Degree in Forestry is completed at Taraka campus.

The Mission Statement of the Department is: *Recognizing the capacity of forests to generate large number of jobs for a given level of investment, the Forestry Department at Unitech was established to produce professionals, both men and women, with technical production skills and expertise needed to manage PNG forest resources sustainably. A well-managed forest is an asset to local and national economies and the well-being of current and future generations.*

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 from 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. Its aim 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/Utilization
- ✓ Forest Engineering
- ✓ Forest Policy, Economics and Forest Product Marketing
- ✓ Appropriate Technology
- ✓ Remote Sensing and GIS
- ✓ Biomass Energy

SUMMARY OF FACULTY MEMBERS 2018

In the academic year 2018, Forestry Department had a total of 21 Academic Staff (Table 1).

Table 1: Academic Staff at Forestry Department (Taraka & BUC) – 2018

Name	Position	Research Interest
Dr. Mex Peki	HOD & Senior Lecturer	Forest inventory including measurements and estimation of timber volume, biomass and carbon in plants (above ground).Sustainable Forest Management and Planning
Dr. Osia Gideon	Professor	- Plant systematics (specialist in the families: Rubiaceae, Portulaceae, Costaceae, Zingiberaceae & Arecaceae) - Plant diversity and Conservation - New Guinea Biogeography - History of New Guinea Botany (exploration and biographies of botanists) - Sustainable use of biodiversity (traditional and contemporary uses) - Forest Policy for Sustainable Development
Dr. Mohammed Jashimuddin	Professor	Wood Science and Technology; Climate Change; Land use Change and Classification; Forestry and Livelihoods; Co-management of Forest; Forest and Environmental Economics; and Ecosystem Services.
Dr. Cossey Yosi	Senior Lecturer	Forest management planning; Forest Policy; Natural Forest Silviculture; Forest sampling; Environmental Services; Climate Change and REDD+; Forest certification; Environmental impact studies
Mr. Peter Edwin	Lecturer 2	Wood science and technology; Forest management (Currently on PhD study leave at University of Melbourne)
Mr. Rapo Pokon	Lecturer 2	Plant biology, pest and disease
Mr. Haron Jeremiah	DHOD & Lecturer 1	Forest Economics and marketing

Mr. Diaiti Zure	Lecturer 1	Natural forest Silviculture; Forest Genetics; Soil-plant-microbial interactions and nutrient dynamics under changing environmental conditions; Ecological and molecular responses of plants and trees (crops) to climate change; and Evolution, phylogenetic and diversity of secondary medicinal plant metabolites (Currently on PhD study leave in Taiwan)
Mr. Leonard Wana	Lecturer 1	Forest Inventory and Geographic Information Systems
Mr. Billy Bau	Principal Technical Officer	Plant Botany; Herbarium Curation; Plant Taxonomy; Botanical Collection; Ecological and Biodiversity studies.
Mr. Eko Maiguo[1]	Principal Bulolo University College & Lecturer 2	Silviculture and Forest Management
Mr. Louis Veisami[1]	Technical Instructor 2	Forest Mensuration and Inventory
Mr. Benson Gusamo[1]	Lecturer 2	Wood Science & Technology, Forest Products, Non-timber Forest Products, Bio-energy
Mr. Bazakie Baput[1]	Lecturer 1	Community Forestry, Agro forestry and Forest Ecology
Mr. Olo Gebia[1]	Lecturer 1	Forest ecology and plant biology; Forest biodiversity
Mr. Tombo Warra[1]	Technical Instructor 1	Plant Eco-physiology and Conservation Ecology
Mr. John Beko[1]	Technical Instructor 1	Silviculture and Plant Propagation
Miss Pricilla Menin[1]	Technical Instructor 1	Community Forestry, Communities response on forest plantation and projects
Mr. Leonard Hansutan[1]	Technical Instructor 1	Phytoremediation - plant/soil and toxic chemical relationship
Mr. Samson Aguadi[1]	Technical Officer 1	Forest Enumeration through Imagery, Forest App Development and Forest Harvesting Operation Planning.
Mr. Koniel Alis[1]	Technical Officer 1	Bio-energy and Sawmilling

Note: [1] Faculty members based at Bulolo University College (BUC)

ON-GOING RESEARCH PROGRAMS IN THE DEPARTMENT - 2018

The Forestry Department has a number of on-going research activities, which are segregated according to general theme and briefly described in Table 2, noting the principal investigators involved.

The details of the on-going research programs in the Department includes the general theme of the research study; research project or topic; name of the principal investigator and the research status in 2018 (Table 2).

The 2018 status is basically to indicate whether the particular research activity was active as at 2018 or an on-going research study. On-going research studies are particularly those that are being undertaken on a long-term basis, most of which are collaborative research projects and are being funded by external agencies.

Table 2: On-Going Research Programs in the Department - 2018

GENERAL THEME	RESEARCH PROJECT / TOPICS	PRINCIPAL INVESTIGATOR	2018 STATUS
1. Ecosystem and Environmental Services	1. Payment for Forest Ecosystem Services (PFES) in a community forest in PNG: A case study in Sogeram, Madang Province.	**C. Yosi**	**On-going**
	2. Estimating CO_2 sequestration from permanent sample plots: an investigation to inform the potential of payment for environmental services (PES) for Papua New Guinea communities.	**C. Yosi**	**Manuscript being prepared**
2. Forest Biology, Ecology & Biodiversity	1. Effects of altitude on soil seed bank community along an altitudinal gradient in Morobe Province, Papua New Guinea.	**O. Gebia**	**Completed in 2018**
	2. A review of genus *Ixora* (Rubiaceae) in Papuasia region with an exploration of sources of species richness including flower-dependent niche partitioning.	**H. Maraia & O. Gideon**	**Active**
	3. Using distribution of Geometridae moths to understand the changes in forest along the altitudinal gradient in PNG.	**J. Paliau & R. Pokon**	**Active**
	4. Exploring root causes of *Piper aduncum* competitive ability with an investigation of possible mitigation control measures in the Bulolo *Araucaria* plantations, Morobe Province, PNG.	**C. Single & L. Orsak**	**Active**
	5. Patterns of Fern Species Richness and Beta Diversity in Highland Ecosystems of PNG.	**G. Sosanika & O. Gideon**	**Active**

	6. New Guinea species of *Ficus* in section *Malvanthera* (Moraceae) 7. Floristic inventory of the Forestry Department Arboretum at the PNG University of Technology	**B. Bau** **B. Bau**	**MPhil, submitted** **Started**
3. Forest (health) Protection	1. Fruit fly community observation and assessment in PNG forests for forest health analysis. 2. The Importance of latex as a defense against folivorous insects in a tropical rainforest.	**R. Opasa & R. Pokon** **G. Luke & O. Gideon**	**Active** **Active**
4. Wildlife Management, Community-Driven Forest Conservation	The Role of Indigenous Knowledge in Forest Management: Implication for the Multi-purpose National Forest Inventory in PNG.	**C. Bigol & M. Peki**	**Submitted to examiners in 2018**
5. Role of Forests In Climate Change and Carbon Trade	1. Modeling of Forest Soil Carbon on Primary Forest Types in Morobe Province using Terrain Attributes. 2. Estimating above ground biomass and carbon in selected forest types in PNG.	**L. Moripi & M. Peki** **B. Kuroh & M. Peki**	**Submitted to examiners** **Final stages**
6. Silviculture, including Reforestation and Plantation Management	1. Clonal Propagation for Eaglewood. 2. Investigating seed propagation and agar wood formation of Papua New Guinea Eaglewood (*Gyrinops ledermannii*): Seed germination and fungi efficacy. 3. Variation in soil moisture, pH and texture in cultivated eaglewood (*Gyrinops* sp.) sites. 4. The potential effect of different hormone concentrations on the root initiation and development from stem cuttings of *Santalum macgregorii* F.v. Muell. 5. The reliability of determining accurate volume from green weights of merchantable Klinkii logs.	**J. Beko** **J. Beko** **J. Beko** **J. Beko** **L. Veisami, E. Maiguo & M. Peki**	**Active** **Active** **Active** **Active** **MPhil research in progress**

7. Agro-forestry/ Social and Community Forestry and Multiple land-use	1. Motives for grassland burning and the consequent threat status in Markham Valley.	**H. Jeremiah**	**Active**
8. Wood Science and Technology; Timber Production/Utilization	1. Physical Wood Strength of *Anisoptera thurifera* for Constructional use in Papua New Guinea. 2. Wood strength testing to use in the design of house and bridge structures. 3. Strength Dynamics of *Araucaria cunninghamii* (Hoop) from Bulolo Forest Plantation 4. Physical, Mechanical and Wood Working Properties of *Trema orientalis* (L) Blume in PNG.	**P. Edwin** **P. Edwin** **P. Edwin** **S. Komut & M. Peki**	**On-going** **On-going** **On-going** **Active**
9. Forest Engineering	1. The productivity Study of Skidding Operation at Bulolo Pine Forest Plantation 2. Study on Soil Compaction on Skid Trail and Landings due to Harvesting Activities in Bulolo Forest Plantation	**Ass. Prof. Late L. Orsak** **Ass. Prof. Late L. Orsak**	**Completed** **Completed**
10. Forest Policy, Economics and Forest Product Marketing	1. Role of Policy in Export Trade of Round logs In PNG, Guyana and Gabon. 2. PNG Forest policy now and for the future.	**H. Jeremiah** **D. Kaip & M. Peki**	**Active** **Completed**
11. Appropriate Technology	1. Mini-Pro Solar Kiln Timber Dryer – Drying of hardwood timbers using solar energy (low power consumption) technology.	**P. Edwin & O. Pendis**	**On-going**

12. Remote Sensing and GIS	1. Land use and land cover detection using medium and high resolution data by remote sensing techniques in the Markham valley of Morobe Province, PNG. 2. Measuring Forest Land Use Change in PNG between 2000 -2015.	**R. Tarutia** **G. Gamoga & M. Peki**	**Active** **Completed in 2018**
13. Biomass Energy	Trial Production of Wood Pellets from Sawdust with Cassava Starch from Five Native Timbers for Bio-energy Purpose	**Koniel .T & B. Gusamo**	**Completed in 2018**

POSTGRADUATE RESEARCH PROJECTS IN 2018

In 2018, the Department has hosted over twenty (20) postgraduate research studies and attracted students from outside organizations including the PNG Forest Authority; PNG Forest Research Institute; and the New Guinea Binatang Research Center. These researches have been undertaken MSc, MPhil, and PhD studies. In 2018, fifteen (15) postgraduate students undertook MPhil studies; five (5) postgraduate students studied for an MSc; and One (1) student undertook a PhD study by research.

As at 2018, the status of postgraduate studies at the Forestry Department showed that three (3) MPhil students have successfully completed and submitted their theses while other research studies are on-going and will continue in 2019 (Table 3).

Table 3: Postgraduate Research Projects - 2018

#	STUDENT NAME	Program	THESIS / RESEARCH TOPIC	PRINCIPAL SUPERVISOR	EXTERNAL SUPERVISOR	2018 STATUS
1	Dambis Kaip*	MPhil/2	PNG Forest policy now and for the future	**Dr. Mex Peki**	**Dr. Ruth Turia**	**Completed**
2	Gewa Gamoga*	MPhil/2	Measuring Forest Land Use Change in PNG between 2000 -2015	**Dr. Mex Peki**	**Dr. Abe Hitofumi**	**Completed**
3	Constin Bigol*	MPhil/2	The Role of Indigenous Knowledge in Forest Management: Implication for the Multi-purpose National Forest Inventory in PNG	**Dr. Mex Peki**	**Dr. Ruth Turia**	**Active**
4	Steven Komut	MPhil/2	Physical, Mechanical and Wood Working Properties of *Trema orientalis* (L) Blume in PNG	**Dr. Mex Peki**	**Professor M Hossain**	**active**
5	Bruno Kuroh*	MPhil/2	Estimating above ground biomass and carbon in selected forest types in PNG	**Dr. Mex Peki**	**Dr.Cossey Yosi**	**active**
6	Leroy Moripi*	MPhil/1	Modeling of Forest Soil Carbon on Primary Forest Types in Morobe Province using Terrain Attributes	**Dr. Mex Peki**	**Dr. Peter McIntosh and Mr. Nalish Sam**	**Submitted to examiners**
7	Clifford Single	MSc/2	Exploring root causes of *Piper aduncum* competitive ability with an investigation of possible mitigation control measures in the Bulolo *Araucaria* plantations (Morobe Province, PNG).	**Dr. Larry Orsak/Dr. Mex Peki**		**Active**
9	Koniel Towalis	MSc/2	Investigating combustion characteristics of three native timbers: *Pometia pinnata; Intsia bijuga;* and *Araucaria cunninghamii* as the source of bioenergy.	**Mr. Benson Gusamo**		**Completed in 2018**

11	Haydrian Morte	MPhil/2	Effect of Labour Cost to Informal Sawn Timber Production Using Portable Mills along Bukawa and Bulolo roads, Morobe Province, PNG	**Mr. Haron Jeremiah**		**Active**
12	Reedley S. Opasa*	MPhil/2	Fruit fly community observation and assessment in PNG forests for forest health analysis	**Mr. Rapo Pokon**	**Prof. Novotny**	**Active**
13	Jason Paliau*	MPhil/1	Using distribution of Geometridae moths to understand the changes in forest along the altitudinal gradient in PNG	**Mr. Rapo Pokon**	**Prof. Novotny**	**Active**
14	Grace Luke*	MPhil/1	The Importance of latex as a defense against folivorous insects in a tropical rainforest	**Prof. O. G Gideon**	**Prof. Novotny**	**Active**
15	Gibson Sosanika*	MPhil/2	Patterns of Fern Species Richness and Beta Diversity in Highlands Ecosystems of PNG	**Prof. O. G Gideon**	**Prof. Novotny**	**Submitted**
16	Miller Kawanamo*	MPhil/2	Tree species diversity and forest structure in different vegetation types and disturbance levels	**Prof. O. G Gideon**	**Prof. Novotny**	**Submitted**
17	Enock Kaledimimo*	PhD	Modern and traditional resource ecology of culturally and socially important tree species in PNG (to be further refined)	**Prof. O. G Gideon**	**Prof. Novotny**	**Active**
18	Bulisa Iova*	MPhil/2	The effect of habitat types on bird communities in different elevations throughout PNG. Exploration of Beta-diversity, Alpha-diversity and abundance	**Prof. O. G Gideon**	**Prof. Novotny**	**Active**
19	Jacob Yombai*	MPhil/1	Diversity and community composition of ants (Hymenoptera: Formicidae) in the forest of PNG	**Prof. O. G Gideon**	**Prof. Novotny**	**Active**
20	Heveakore Maraia	MSc/2	Review of the Genus *Ixora* (Rubiaceae) in the Papuasia region, with an exploration of sources	**Prof. O. G Gideon**		**Submitted**

			of species including flower-dependent niche portioning			
21	Samson Aguadi	MSc/2	Plant identification via digitized leaf pattern recognition	**Prof. O. G Gideon**		**Active**
22	Anthony Troy Turagavuli	MSc/2	Technique for Improving Seed Germination of Papua New Guinea Sandalwood (*Santalum macgregorii* F.v. Muell.)	**Prof.O.G Gideon**	**Mr. John Beko**	**Active**
23	Louis Veisami	MPhil/1	The reliability of determining true volume from green weight relationship for Klinkii pine logs	**Mr. Eko Maiguo**	**Dr. Mex Peki**	**Active**

UNDERGRADUATE RESEARCH PROJECTS IN 2018

Table 4: Final Year Student Research Projects

No.	Student Name	Title	Principal Supervisor(s)	External Supervisor
1	**TANGA Zawenuca**	Investigating Contour planting in degraded grasslands and slope sites: Case studies in Sambio and Nawibanda in Bulolo	Dr. Yosi	Mr. Karma
2	**POKANA, Christine**	Monitoring harvesting rate (volume) for Bulolo Plantation since year 2014	Mr. Wana	
3	**SOLIEN, William**	Identification of suitable site for *Ochroma lagopus* (Balsa) using ArcGIS Modelling	Mr. Wana	
4	**ADVENT, Francis**	Assessment of Soil Seed Bank in Primary and Secondary forest in lowland areas of Morobe Province	Mr. Gebia & Prof Gideon	
5	**HORO, Glenphil**	Determining the variability of seeds in soil seed bank of different disturbance intensities caused by small scale logging in lowland rainforests.	Mr. Gebia	
6	**POKEL, Kelvin**	Determining Variation in Soil Seed Banks across Different Slope Levels in a Logged Over Forest	Mr. Gebia	

7	**AURE Joseph**	Evaluation of different Indo-Butyric Acid (IBA) concentrations for rooting stem portions of *Cryptocarya massoy* (Massoia)	Mr. Beko & Mr. Jeremiah	Mr. Paul Marai
8	**TAMIT, Solomon**	Case Study on Logging Impact Assessment and Monetary Valuation of Potential Future Timber Stands at Oomsis Natural Forest.	Dr. Yosi	
9	**MATHEW, Merolyn**	Perception on wood physical properties, major inlay patterns and their relationships to socio-economic attributes of Lae Residents.	H. Jeremiah	
10	**PILA, Joshua**	Comparison of the Effectiveness of *Barringtonia asiatica* (L) Kurtz. and *Calophyllum inophyllum* L. against Leaf Defoliating Caterpillars in Lae, Morobe Province	Mr. Pokon	
11	**TENE, William**	Investigating the Potential Biochemical Agents of Sea Cucumber *(Bohadschia vitiensis*) for Subterranean Termite Resistance in Papua New Guinea	Mr. Pokon	
12	**SIMON, Elizah**	Identifying the current invasive distribution of *Mastotermes darwiniensis* Froggatt in Lae, Morobe Province	Mr. Pokon	
13	**DINGI, Jeffrey**	Determining the Physical and Mechanical Properties on Plantation-grown *Eucalyptus deglupta*, Open Bay, PNG	Mr. Gusamo	
14	**LOMUTOPA, Ian**	Determining Mechanical Properties of Plantation-grown *Pinus patula* from Lapegu, Papua New Guinea	Dr. Peki & Mr. Gusamo	
15	**WAGI, Rossie**	Chemical Analysis of Crude Oils from the Fruits of *Cynometra ramiflora* Linn and *Pandanus conoideus* Lamk: Potential Feedstock for Pharmaceutical Industries.	Mr. Gusamo	

ON-GOING RESEARCH COLLABORATION WITH EXTERNAL PARTNERS

Apart from internally funded research programs, Forestry Department has been blessed with a number of opportunities to conduct collaborative research with external partners over the last five years.

In 2018, Forestry Department had a total of four on-going research collaborations with external partners. These research projects have been supported by international organizations including the Australian Center for International Agricultural Research (ACIAR); European Union-Food and Agricultural Organization of the United Nations (EU-FAO); and the Asia Pacific Network for Global Change Research (APN).

The details of Forestry Department's internationally supported research projects and members of the staff who are currently participating in these projects are given (Table 5).

Table 5: Research Collaboration with External Partners

RESEARCH PROJECT TITLE	SPECIFIC RESEARCH TOPIC / PRINCIPAL INVESTIGATOR	COLLABORATION PARTNERS	FUNDER / SPONSOR	2018 STATUS
1. Improving the Papua New Guinea balsa value chain to enhance smallholder livelihoods (FST 2009/16) (include the duration of the project)[ACIAR PROJECT]	Trial Utilization of Balsa End Grain-Panel as Core Material for Door Making, Furniture Component, Packaging and Bee Hive Boxes: An Implication for Creating Balsa Market Opportunity in Papua New Guinea ***(Benson Gusamo)***	ACIAR; University of Melbourne; UNITECH Forestry Department; PNG FRI; TFTC	Australian Center for International Agricultural Research (ACIAR)	**Active**
2. Technical support to the Papua New Guinea Forest Authority to implement a multi-purpose National Forest Inventory (GCP/PNG/006/EC) (March 2013 to March 2019) extended [EU FAO PROJECT]	Most of the research activities here are done by FAO –PNGFA sponsored Post Graduate Students **(see table 1).**	FAO; Sapienza University; University of Queensland; Forest Practices Authority-Tasmania; UNITECH Forestry Department; UPNG; New Guinea Binatang Research Centre; PNGFA; PNG FRI	EU-FAO; Mountain Partnership; The Crawford Fund	**Active in 2018. Project will be completed in March 2019.**
3. Enhancing Value Added Wood Processing in Papua New Guinea (FST/2012/092) (July 2014 to 2018. [ACIAR PROJECT]	1. Preservative Treatment Characteristics of Timbers from Oomsis Secondary Forest, Morobe Province, PNG **(Benson Gusamo &Undergraduate student)** 2. Investigating Natural Durability of Timbers from Oomsis Secondary Forest,	ACIAR; University of Melbourne; UNITECH Forestry Department; PNGFRI; TFTC	Australian Center for International Agricultural Research (ACIAR)	**Completed in 2018** **Completed in 2018**

	Morobe Province, PNG **(Benson Gusamo &Undergraduate student)** 3. Investigating Wood Density Trends at Different Inter-tidal Zones as an Parameter to Above-ground Biomass/Carbon Stock in Mangrove Forest, Lae, Morobe Province, PNG**(Benson Gusamo & Undergraduate student)** 4. Comparing Physical and Mechanical Properties in the Sapwood and Heartwood of *Terminalia brassii* in Unitech Plantation **(Dr. Mex Peki &Undergraduate student)**. 5. A Role of Industrial Wood Preservation Practice on Mitigating Climate Change **(Benson Gusamo).** Current staff from DOF Unitech who are involved in this Project: **Dr. Mex Peki** – Team Leader Unitech Partner Institute **Mr. Benson Gusamo** – Researcher & Research Project Objective 2 leader **Mr. Haron Jeremiah** – Researcher			**Completed in 2018** **On-going, Project will be completed in March 2019**

	Mr. Peter Edwin – Researcher (on PhD studies Melbourne) **Mr. Ono Pendis** – Research Officer (ACIAR).			
4. APN Research Project: Effective Models for Payment Mechanisms for Forest Ecosystem Services in PNG, Philippines and Thailand.	Payment for Forest Ecosystem Services (PFES) in a community-managed forest in PNG: A case study in Sogeram, Madang Province. **Henry Scheyvens – IGES, Japan** **Dr. Cossey Yosi – Unitech, PNG** **Mark Winai – FPCD, PNG** **Stewart Serawe – FPCD, PNG**	Asia-Pacific Network for Global Change Research (APN); Institute for Global Environmental Strategies (IGES); UNITECH Forestry Department; Foundation for People and Community Development (FPCD)	Asia-Pacific Network for Global Change Research (APN)	**On-going**

LIST OF PUBLICATIONS IN JOURNALS - 2018

Our Academic staff in the Department have involved in publication of scientific articles in 2018. The details of these publications are contained in Table 6.

Table 6: Forestry Department List of Publication in 2018

STAFF NAME	PUBLICATION DETAILS
Professor Mohammed Jashimuddin	1. Bhuiyan, M. M., Islam, K., Islam, K. N., & Jashimuddin, M. (2018). Monitoring dynamic land use change in rural-urban transition: a case study from Hathazari upazila, Bangladesh. *Geology, Ecology, and Landscapes*. DOI: https://doi.org/10.1080/24749508.2018.1556034 [Taylor & Francis Online, Informa UK Limited] 2. Islam, K., Rahman, M. F. & Jashimuddin, M**.** (2018). Modeling land use change using Cellular Automata and Artificial Neural Network: The case of Chunati Wildlife Sanctuary, Bangladesh. *Ecological Indicators*, **88**: 439-453, May 2018. DOI: https://doi.org/10.1016/j.ecolind.2018.01.047 [ELSEVIER] 3. Islam, K., Jashimuddin, M., Nath, B. & Nath, T. K. 2018. Land use classification and change detection by using multi-temporal remotely sensed imagery: The case of Chunati wildlife sanctuary, Bangladesh. *The Egyptian Journal of Remote Sensing and Space Sciences*, **21** (1): 37-47. DOI: https://doi.org/10.1016/j.ejrs.2016.12.005 [ELSEVIER]

SEMINAR /WORKSHOP AND CONFERENCE

FORESTRY DEPARTMENT SEMINARS HELD IN 2018

The Forestry Department Seminars for 2018 has been successful and attracted five (5) scientists or researchers outside of the University representing different organisations. Two (2) of these presenters have delivered their seminars as scheduled while three (3) have deferred their presentations to 2019 (Table 7).

As part of the Department Seminar, five (5) postgraduate students studying for their MPhil were able to present their researches at Department level which was an opportunity for them to prepare themselves for the 2018 University Annual Postgraduate Conference.

Table 7 below gives details of the seminars held at the Department in 2018.

Table 7: Forestry Department Seminar Conducted in 2018

DATE	PRESENTERS NAME	ORGANISATION	PRESENTATION TITLE	2018 STATUS
Wed 18/07/2018	Agnes Sumareke	PNG Forest Research Institute, Lae	Aboveground biomass and forest carbon mapping using ALOS2-PALSAR2 data	**Seminar delivered**
Wed 01/08/2018	Billy Bau	New Guinea Binatang Research Centre	New Guinea species of *Ficus* section *Malvanthera* (Moraceae)	**Seminar delivered**
Wed 19/10/2018	**NAME OF STUDENT**	**PROGRAM**	**PRESENTATION TITLE**	**TIME**
	Leroy Moripi	MPhil/2	Soil Carbon Modelling across Forested Landscapes in Morobe Province.	2:00 – 2:30 PM
	Koniel Towalis	MSc/2	Investigating Combustion Characteristics of Wood Pallets of Three Native Timbers: *Pometia pinnata, Intsia bijuga and Araucaria cunninghamii* as the Source of Bioenergy	2:30 – 3:00 PM
	Samson Aguadi	MSc/2	Plant identification via digitized leaf pattern recognition	3:00 – 3:30 PM
	Anthony Turagavuli	MPhil/2	Techniques for Improving Germination of Papua New Guinea Sandalwood (*Santalum macgregorii (*F.v.Muell)	3:30 – 4:00 PM
	Louis Veisami	MPhil/1	The reliability of determining true volume from green weight relationship for Klinkii pine logs	4:00 – 4:30 PM

STAFF SEMINAR PRESENTATIONS OUTSIDE THE FORESTRY DEPARTMENT

Apart from our Department Seminar, Department staff have also attended, participated or presented their researches in various seminars and workshops outside the Department in 2018. The details of the these meetings and presentations are given below;

Presentation of Research Papers:

1. Jeremiah, H (2018). Assessing pricing variables of wooden carvings in an urban settlement and the associated marketing challenges: *A case study in Labes Kitiva settlement, Alotau town, Milne Bay Province.*Paper presented at the PNG University of Technology Research Committee Weekly Seminar, held on the 13th March, 2018.

2. Maiguo, E. (2018). Tree species composition and forest structure in primary and secondary forests along elevation gradient in the Upper Mape Area, Morobe Province. Paper presented at the Research Conference on PNG Multipurpose National Forest Inventory held at the PNG Forest Research Institute, Lae, 14 -15th February, 2018.

Workshop Attendance:

1. Dr. Mex Peki attended the following workshops in 2018;

a) Workshop on Developing PNG University of Technology Strategy Plan held at Cross roads Hotel 9 mile. Lae from 28th February to 2nd March 2018 (Tier 1, high level)

b) Workshop on the PNG University of Technology Course and Curriculum Refreshed Project Workshop – Constructing Course Skeletons. Held at The PNG University of Technology, Lae, and 21st to 24th May 2018.

2. Workshop attended by Professor Mohammed Jashimuddin in 2018;

a) Workshop on filling-in the strategic planning template held at the Vice Chancellor's conference room on the 15th of November, 2018.

CONSTRAINTS

World-competitive research today occurs only when certain, mandatory infrastructure is present. Because forestry relies so much on fieldwork, reliable personal transport (4-wheel drive vehicle) is our foremost constraint. While lab space and overall research funding are general issues at UNITECH, high quality research is often possible in forestry at surprisingly low cost and our lab space is good compared to other departments.

Less mentioned but probably most fundamental to achieving world-competitive research, however, is access to relevant primary literature. This is woefully inadequate at UNITECH: we

rely on antiquated interlibrary loan hardcopies which themselves are limited, plus a few free access journal networks provided by non-profit institutions that do not access many forestry journals. In contrast, researchers overseas enjoy electronic access via an appropriate level of subscription to the Web of Science that would include a spectrum of high calibre Forestry and related journals.

Expatriate faculty, and certain senior national faculty suffer less from this deficiency if they have library connections (via overseas schools they attended, overseas advisors they studied under, etc.), or can pull in literature during overseas annual leaves (i.e. Expatriates). Faculty lacking such connections are at a disadvantage within the Forestry Department and more generally in the university. Currently, it is the national faculty who have not recently gone on overseas study leave who suffer disproportionately; it is essential that this inequality be recognized and addressed through much-improved university-wide access to primary literature.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Acting Head of Department: Mr Sipa Benny

Introduction

The Department of Mathematics and Computer Science offers a four year degree in Computer Science and also teaches Mathematics and Computing courses to 12 academic departments. The department comprises of 14 full-time academic staff that specialize in different fields of mathematics and/or computer science.

In order to adapt the new technology and changes in the IT industry the Department continues to improve the computer science curriculum. The current first and second year are on a new curriculum while the third and fourth year on the old curriculum. The department is also embarking on involving more industrial input into the design and delivery of the content of the new curriculum.

1. List of published papers

Ursul, Mihail, Bovdi, Victor, & Salim, Mohamed (2018). Completely simple endomorphism rings of modules. *(English)* Zbl 06969951 Appl. Gen. Topol. 19, No. 2, 223-237.

2 List of seminar presentations

All staff members working on master thesis have presented talks at the annual seminar of Post Graduate students.

3. Current list of research

Raymond Kuna has submitted his Master thesis "The Hartman-Mycielski Functor in the Class of Topological Rings" under supervision of Prof. Mihail Ursul

DEPARMENT OF MECHANICAL ENGINEERING

Head of Department: Professor John Pumwa, Ph.D.

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 and services. It is through research that leads to breakthroughs in engineering and technology. Research and experimental development comprise 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.

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.

Research Seminars

Departmental staff and postgraduate students are encouraged to present seminars regularly and as often as possible. The research coordinator is encouraged to schedule regular research seminars basing on the above areas of research interest.

Faculty Research Interests

The following Table provides research areas of interest for the current faculty members:

Academic Staff Members	Research Areas
Professor John Pumwa, Ph.D.	Tribology (Friction, Wear and Lubrication), Failure Analysis, Energy, Biodiesel, Vehicle Emission Effect on the Environment, Engineering Education.
Professor Nicholas Lambrache, Ph.D.	3-D modeling of weak parts and subsystems, Finite Element, Simulation on stresses – including dynamic stresses and fatigue, Fatigue experiments on computer-controlled devices, Statistical interpretation based on accumulated data from the mine site, Material Science interactive research on minerals affecting strength of metal alloys in mining equipment.
Kamala K. Muduli, Ph.D.	Supply Chain Management, Sustainable Development, Operations Management, Health Care, Waste Management.
S. Wahid, Ph.D.	Research in the Broader Area of Energy, Renewable/Sustainable Energy, Environment and Pollution, Heat Exchanger's, Behavior/Control of Heat Flow at the Interface of Materials, Tribology, MEMS in Energy Exchange Applications.
G M. Arshed, Ph.D.	Numerical Analysis, Fluid Dynamics
A. MOHMAED, Ph.D.	Corrosion
Mr. Jack Khallahle	On Study leave
Mr. Samuel Dunstan	On Study leave

Mr. Steve Ales Korokan	On Study leave
Mr. Brian N'Drelan	Renewable energy – use of solar to provide power, efficiency management of renewable energy, 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, Safety Analysis of Causes of Accidents leading to analysis of design and even management of existing practices – looking at ethical implications.

Undergraduate Research Projects

The following are final year Mechanical Engineering Students projects offered in 2018 as part of their partial fulfillment of their degree:

Title No.	Suggested Description	Suggested by (Lecturer)	Number of Students
1	**Biodiesel Production Using Coconut Oil**	Prof John Pumwa	Timana Garake, Branden Sipendi
2	**Determination of the Cost of Biodiesel Production Using Coconut Oil**	Prof John Pumwa	Raymond Molo
3	**Design and Fabrication of Friction and Wear Test Rig (Pin-Disc)**	Prof John Pumwa	TWO STUDENTS
4	**Nitrogen Recovery System (BOC):**	Dr Ghulam Arshed	Israel Serave, Stanley Anton
5	**Autonomous Robot.**	Prof Nicholas Lambrache	Eileen Rawali, Sharolyn Hungrabos, Leilani Laina, Lisa Wiambi
6	**Vibrating Table for Mineral processing**	Prof Nicholas Lambrache	Anthony Mark, Rocky Pombeken, Diana Watato
7	**Characterization of Intergranular Corrosion of Inconel Alloy**	Dr A Mohamed	Stanford Miukin, Nelson Thomas
8	**Effect of Corrosive Environment in Oil and Gas Pipeline Industry**	Dr A Mohamed	Gita-Kristie Korimbo, Oscar Tomati

9	**Characterisation of Re-use Fly ash obtained produced from Power Plants**	Dr A Mohamed	Kelly Hibuya
10	**Effect of Corrosive Environment in Mining Plant**	Dr A Mohamed	Frank Savannah
11	**Corrosion under insulation in Oil and Gas on Offshore Rigs**	Dr A Mohamed	Joshua Gett
12	**Fabrication of nanofiber for Nano-Medicine Tissue Engineering**	Dr A Mohamed	Kenneth Oswyn, Harold Silonamo
13	**Maintenance Inventory management (PNG Power Hydro Power Plants)**.	Brian N'Drelan	Benny Goi, Jonah Tokiong, Jesse Garu
14	**PLANT LAYOUT DESIGN USING CRAFT ALGORITHM**	Assoc. Prof K. Muduli	James Bayang, David Kawage, Anthony Papo
15	**Life cycle assessment on healthcare waste management and its problems in LAE City**	Assoc. Prof K. Muduli	David Wambi, Amos Moses
16	**Biogas generation from chicken manure: An assessment of potential and feasibility in Papua New Guinea.**	Mr Karo Komuna	Leroy Pandi, Kingsley Sarip
17	**Students' Mess Waste**	Mr Karo Komuna	TWO STUDENTS
18	**Design of a Solar Oven**	Dr G.M. Arshed	Paniu Panga
19	**Design of a Solar geyser**	Dr G.M. Arshed	Joe Kupe, Jeremeel Gubby
20	**Wind-Hydro Hybrid Power Plant for Wapenamanda District**	Dr Syed Wahid	Tyson Gideon, Willie Khaberan
21	**Waste Management system design for Unitech**:	B. N'Drelan	TWO STUDENTS
22	**Mini Hydro for Komkui Community**	Dr Syed Wahid	Naptallian Napi, Malcolm Nama
23	**Vibration Analysis of Gas Turbine Blade**	?????	Jonathan Weldon, Aaron Opium

Postgraduate Students Research

The following projects are being conducted by our Postgraduate Students:

Item	Research Projects	Status	PG student
1	Mechanical Component Failure in Inventory Management	Continuing	Brian N'Drelan (PhD)
2	Feasibility Study of Mini Hydro Power Plant for Six Villages in Eastern Highlands Province	Completed (2018)	Joram Seth (MTech)
3	Studying the possibility of interfacing the Ultrasonic Digital Flaw Detector to a PC/Laptop to carry out UT testing, interpretation of test results.	Continuing	Thomas Peter (MTech)
4	PDI Optimization in Automatic Control of Vessel Fluid Level	Continuing	Roboam Pabuar (MTech)

List of Journal Publications

1. Aich, S., K. Muduli, M.M.H. Onik, & Kim, H. C. (2018). A novel approach to identify the best practices of quality management in SMES based on critical success factors using interpretive structural modeling (ISM). ***International Journal of Engineering & Technology,*** 7(3.29), 130-133.

2. Biswal, J. N., Kamalakanta Muduli, Suchismita Satapathy, Devendra K. Yadav, & Pumwa, J. (2018). Interpretive Structural Modeling-based Framework for Analysis of Sustainable Supply Chain Management Enablers: Indian Thermal Power Plant Perspective. ***Journal of Operations and Strategic Planning*** 1(1) 1–23. SAGE Publications India Private Limited SAGE Publications sagepub.in/home.nav DOI: 10.1177/2516600X18774169 http://journals.sagepub.com/home/osp

3. Biswal, J. N., K. Muduli, S. Satapathy (2018). A Framework for Assessment of SSCM Strategies with respect to sustainability performance: An Indian Thermal Power Sector Perspective. ***International Journal of Procurement Management,*** Vol. 11 (4), pp 455-471**.**

4. Biswal, J. N., K. Muduli, & Satapathy, S. (2018). Soft Factors of Influencing SSCM Implementation in Indian Thermal Power Plants. ***International Journal of Advance Research in Science and Engineering,*** Vol, 7, No 2, pp. 342-350.

5. Biswal, J. N., K. Muduli, S., Satapathy, D. K., Yadav, (2018). A TISM based study of SSCM enablers: an Indian coal- fired thermal power plant perspective. ***International Journal of System Assurance Engineering and Management***, https://doi.org/10.1007/s13198-018-0752-7

6. Mishra, S. S., K. Muduli, M. Dash, & D.K. Yadav, (2018). PROMETHEE-Based Analysis of HCWM Challenges in Healthcare Sector of Odisha. ***Smart Innovation, Systems and Technologies,*** 77, pp. 163-170.

7. Mishra, S. S., K. Muduli, M. R. Dash, U. C. Paridaa, & Pumwa, J. (2018). When Sustainable Development Matters in Health Care Supply Chain: An analysis of Influential Factors of Waste Management. ***Indian Journal of Public Health Research & Development,*** Vol. 9 No. 12, pp. 229-236.

8. Mishra, S. S., M. R. Dash, K. Muduli, J. Pumwa, S. Kar (2018) A SWOT-AHP based Approach to Investigate Waste Management Issues in Health Care Supply Chain in Odisha. ***International Journal of Mechanical Engineering & Technology,*** 9 (10), pp. 1074-1084.

Conference Publications

1. Aich, S., K. Muduli, & Kim, H. C. (2018). A Multi Criteria Decision Modelling Approach for Gait Analysis of Parkinson's Disease using Wearable Sensors to Compare the Classification Performance Based on the Different Feature Selection Methods. 7th International Conference on Frontier Computing, July 3-6, 2018, Kuala Lumpur, Malaysia

2. Lambrache, Nicholas., John Pumwa, Syed Wahid, Gulam Arshed, Lidia Olaru, Brian N'Drelan, Nosare Maika, Christopher Russell, Roboam Pebbuar, & Ryan Rombuk (2018). Flow Control in Hydroelectric Plants. ***The Proceedings of SERI International Conference on Sustainable Energy***, Lae, Morobe Province, Papua New Guinea, June 27 – 28, 2018.

3. Lambrache, Nicholas., Pumwa John, Dapsy Olatona, Mihail Ursul, & Brain N'Drelan (2018). Failure of Francis Water Turbines Due to Flow Variations in Papua New Guinea. ***The Proceedings of the International Conference on Industrial Engineering and Operations Management,*** Paris, France, July 26 27, 2018.

4. Lambrache, Nicholas., John Pumwa, Dapsy Olatona, Mihail Ursul & Brian N'Drelan (2018). Stress Behaviour of Composite Materials withNatural Fibers from the South Pacific. ***Second European International Conference on Industrial Engineering and Operations Management***, Paris, France, July 26 – 27, 2018.

5. Lambrache, Nicholas., John Pumwa, Dapsy Olatona, Mihail Ursul & Brian N'Drelan (2018). Failure of Francis Water Turbines Due to Flow Variations in Papua New Guinea. ***Second European International Conference on Industrial Engineering and Operations Management,*** Paris, France, July 26 – 27, 2018.

6. Mishra, S. S., J. Pumwa, M. Dash, & Muduli, K. (2018). Challenges and Prospects in Waste Management in Indian Health Care Supply Chains. ***Proceedings of 95th The IRES International Conference***, Kuala Lumpur, Malaysia, 1st-2nd January, 2018

7. Muduli, K., John Pumwa, D. Yadav, S. Tripathy, & R. Kumart (2018). A Grey Relation Approach for Selection of Industrial Robot. ***The Proceedings of the 17th International***

Conference on Information Technology, CET, Bhubaneswar, India, December 20 – 22, 2018.

8. Muduli, K., John Pumwa., R. Mark, K. Gaitu, & H. Apana (2018). When Socio-Environmental Concerns Matter in Health Care Supply Chain: Prioritization of Strengths and Opportunities for Adoption Waste Management Practices. ***World Conference on Multidisciplinary Research and Innovation***, Dubai, December 29 – 30, 2018.

9. Pemberton, Cilla., John Pumwa, Rajeshkannan Ananthanarayanan, & Oneil Josephs (2018). Engineering Programs and Economic Development in the SIDS of the Caribbean and the South Pacific. ***The Proceedings of the Caribbean Academy of Sciences*** – 21 General Meeting and Conference (CAS-2018), November 27 – 30, 2018.

10. Pumwa, John (2018). Waste Cooking Oil as Fuel Source. ***The Proceedings of the 8th International Conference on Industrial Engineering and Operations Management (IEOM Society),*** Bundung, Indonesia, March 6 – 8, 2018.

DEPARTMENT OF MINING ENGINEERING

Head of Department: Dr Gabriel Arpa

The Mining Engineering Department offers two degrees- Bachelor of Engineering in Mining Engineering and Mineral Processing Engineering. There are 13 academic staff, 4 Technical staff, 2 Administrative staff and two auxiliary staff. Two of our academic staff are currently on study leave. Mr. Wilson Kobal is undertaking PhD studies in Queensland University of Technology and Mr. Gideon Yowa is enrolled for Masters of Science in Mining Engineering under the Australian Awards Scholarship at the James Cook University, Australia.

Currently we have 8 students enrolled in Masters of Philosophy in the Department embarking on research in Mining and Mineral Processing field.

Research Theme and Focus Areas

The Departments research focus and interest is centred on resource exploitation and extraction techniques, environmental solutions to mining related waste and safety. The main focus areas are;

- Environmental engineering
- Mining production optimization
- Geological modelling and evaluation of uncertainties
- Engineering geology
- Geomechanics and rock mass deformation and behaviour
- Alluvial mining techniques and resources evaluation
- Optimization of gold recovery system
- Innovative solution to Acid Rock Drainage (ARD) problems from mine waste

DR. GABRIEL ARPA, SENIOR LECTURER

Research Priority Areas

- Modelling Diffusion, Dispersion and Advection mechanism of deep see mine tailing disposal.
- Optimization of underground mine ventilation system.
- Rock Mass classification and its application to higly weathered rock mass
- Feasibility study of Kassam Pass Underground Tunnel Construction., Lae PNG.
- 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
- Geomechanics Studies of Wafi-Golpu Underground Mining (Block Caving)
- Mechanics of Phytoremediation – Environmental Engineering

Conceptual Design of the Under-Ground Access Tunnel for Lae City

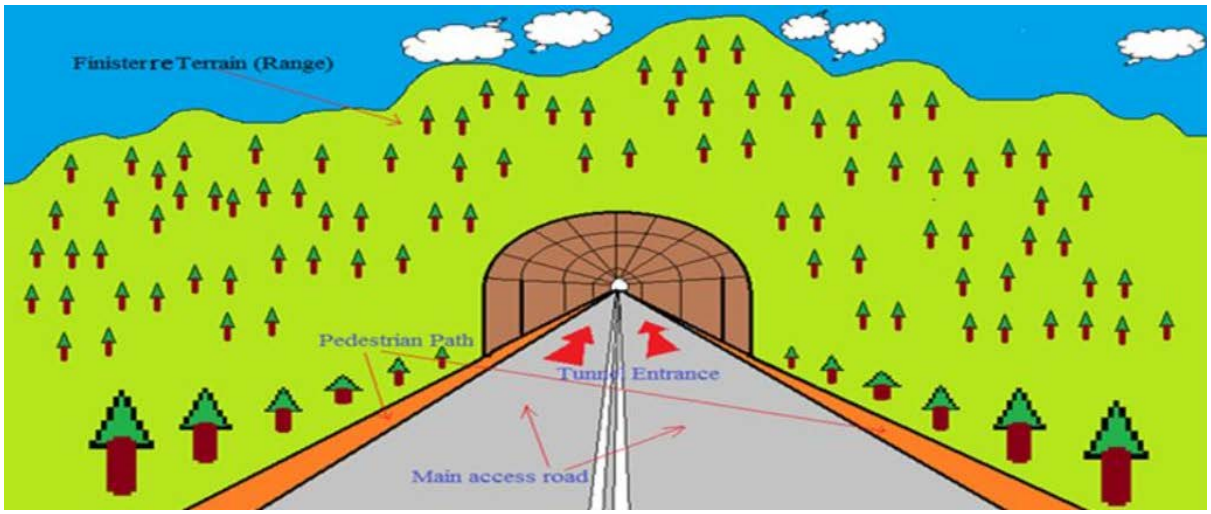
M. Kumbun, S. Emmanuel, J. Pani, G. Arpa

Abstract

Lae city is the second largest city in Papua New Guinea. The city is also the main industrial hub for the country and connects to the highlands regions and the Momase and it will be expending very rapidly with the development of the Wafi-golpu project, Ramu sugar and cattle projects and other mines and agricultural industries. Development of other highlands regions requires materials to be transport in bulk from Lae by road. With the increasing number of industries and demand for road transportation, there will certainly be an increase in the number of vehicles on the road in and out of Lae. Therefore, in anticipation of the increasing number of vehicles, the best option is to expend the road, construct additional roads or construct access roads. Therefore, this project aims to design an access underground tunnel from six mile to west Taraka to solve traffic problems. The engineering part of the project involved designing the construction of both surface road and underground tunnel that cuts through the mountain range between West Taraka and 6 mile as shown in figure 1.

Fig. 1

The stability of the tunnel access is mainly due to the geological composition of the rock, discontinuities like joints, faults,structures and the amount of fragmentation or overcuts caused by blasting towards the roof. Stress induced by the overlying rock mass is also a factor that affects the stability of the back-wall or the roof of the tunnel access. The are many other factors that affect the stability like ground water, etc. that needs to be drained. Below is the conceptual design outline of where the surface road meets the entrance of the tunnel.



Dr. Ken Ail, Lecturer II

Research Priority Areas

- A critical analysis of the PNG Mineral Taxation Regime
- Bougainville's new mining taxation regime
- A review of the hydrocarbon taxation regime in PNG

- Sustaining the economic and social developments in the Post-Porgera mine era
- Risk-based evaluation techniques for discounted cash flow modelling of long life mining projects
- Suitable sluicing techniques for improving the efficiency of recovering alluvial gold with different size distributions

Progressive Mineral Taxation Regime

Ken. K. Ail

Abstract

A model was developed for analyzing the progressive mineral taxation regime of PNG in dealing with pertinent and current issues facing PNG as a developing mineral-rich country. Governments can collect a high magnitude of revenues through devising a more progressive tax system that includes indirect tax instruments and non-tax benefits. It is also argued that the fiscal disparity gap created by the weakly progressive tax instruments can be reversed by adding the indirect tax instruments and non-benefits to the direct tax instruments, including royalties and the levies etc, However, the non-tax benefits cannot be a substitute for paying lower levels of direct tax revenues than the tax-base requires as the government needs revenues from the direct and indirect tax instruments for a fair redistribution of goods and services at the national level and to diversify the resource revenues into other sectors such as agriculture to maintain economic stability.

This study finds that PNG's mineral taxation regime, which was reformed in 2000, is the best one and does not need major reforms. PNG, however need to protect the tax base more than changing tax rates. The study finds that accelerated depreciation, a thin capitalization rule of 2:1 debt-to-equity ratio, limited loss carries forward provision to the payback period and completely banning tax holiday can make tax instruments more progressive and therefore could raise more revenues for social development.

Francis Bure Kisai – Senior Technical Instructor

Research Theme and Focus Areas

STUDIES ON AGGREGATES FROM PAPUA NEW GUINEA: THE TESTING OF MATERIALS FROM BUSU, BUMBU AND YALU RIVERS, MOROBE PROVINCE

Francis B. Kisai

Abstract

Various local quarries (mining sites of sand and gravel) have been operating for decades in the Busu and Bumbu rivers and, until relatively recently, the Yalu river. River aggregates are consumed in large quantities in Lae alone for horizontal and vertical construction purposes. However, little is known by consumers about the quality of gravel. To ensure construction aggregates are fit for purpose and meet the requirements of the end-users it is important to have an understanding of the Geology of the resources, production processes and standards and test methods used to evaluate their suitability. This study will be conducted to evaluate quality of river gravel to know their suitability as aggregate (raw material for concrete and road construction). The samples of river gravel will be analyzed for petrographic, physical, mechanical and chemical properties. Preliminary work on samples obtained from Yalu and Bumbu showed material were sedimentary (predominant) and volcanic in nature. The clasts seem to be well graded. The majority of the samples were rounded, with significant irregular shapes. The surface textures of the clasts were rough to smooth. In terms of the shape, workability of the gravel appears satisfactory. Work is still in progress to complete physical tests to determine density, water absorption value, porosity, dry density of samples. Mechanical tests of Aggregate Impact Value and Los Angeles Abrasion tests will be employed to determine hardness of the samples. Magnesium Sulphate Value test will be employed to determine resistance against chemical weathering and frosting. All these values will be compared against PNG Standards and Australian standards of testing of materials to ascertain if studied materials are suitable aggregates for concrete and road construction purposes. It is hoped that the research results will complement the work and testing being done by the civil and construction industry.

Ms Mary Kama - Lecturer II

Production of Ferrochromium from Hessen Bay chromite ore in Papua New Guinea

M. Kama

Abstract

Chromite is an iron chromium oxide mineral which has the formula of $FeCr_2O_4$ or (FeO, Cr_2O_3), belonging to the spinel group. It is a complex mineral containing magnesium, iron, aluminum, and chromium in varying proportions, depending on the deposit, that can be represented as $FeCr_2O_4$ or $(Fe^{2+}, Mg)[Cr, Al, Fe]_2O_4$. In its purest form, chromite ore contains 68 % Cr_2O_3, and a Cr/Fe ratio of 1.8:1. Chromite is submetallic in lustre and has the color of iron-black and brownish-black. Its hardness (H) is 5.5 and specific gravity is 4.6. It occurs in basic and ultrabasic igneous rocks and in metamorphic and sedimentary rocks that are produced

by alteration of heat and weathering. Large variations of chromium and iron in the lattice occur depending on the different geological and geographical distribution of chromite deposits and those that are large enough to mine are classified into stratiform, podiform and the beach sands. The Hessen Bay chromite ore is of the beach sand type deposit where the chromite contained in the beach sands that are derived from the weathering of chromite-bearing rocks and laterite soils that developed over peridotite. Hence the beach sand chromite deposit in Hessen Bay is rich and large enough to mine for chromite.

The spectrographic data of high purity samples showed Cr, Fe, Al and Mg as the major elements with Mn, Ni, V, Ti and Si as the minor elements. Cobalt is found to be trace. Based on the values of the major elements the chemical formula for the Hessen Bay chromite is $(Fe_{4.10}\ Mg_{3.62}\ Mn_{0.22})\ (Cr_{10.96}\ Al_{3.97}\ Fe^{3+}_{0.97})\ O_{32}$. Also, the composition variations show Cr/Fe ratio of 2.0 and Cr/Al ratio of 5.33. Generally, with these compositions the Hessen Bay chromite deposit is of a chemical grade. Aluminum substitution of chromium is predominantly between 2 and 5 cations whilst it has slightly lower Fe^{3+} substitution for Cr. Thus, the level of Al and Fe^{3+} substitution for Cr places this chromite in the alumina chromite classification. About 10-15 % of the Hessen Bay chromite is highly magnetic as revealed by microprobe and microscopic examination of various degrees of chromite replacement by magnetite. Therefore, a careful development of a flowsheet will enable us to completely recover chromite with high grade Cr without loss of significant amount prior to grinding.

An upgrade of Cr/Fe of 2.0 to 4.0 from Hessen Bay chromite ore is required to produce a feed stock of high carbon ferrochromium for the ferrochromium and nichrome steels. Having in mind the economics of the project, this study takes into consideration the locality of the deposit and its natural environmental conservation together with both the positive and negative social impacts on the communities close to the deposit.

Mr. Manau Saki	Metallurgical Characterization of Crater Mountain Gold ore
Mr. Yawas Dekba	Genetic Modeling of the Bauxite Deposit, Manus Province, PNG
Mrs. Blacky	The effect of copper minerals in gold cyanidation. A case study on Ore from Kainantu

Mr. Rayen Tagai	Modeling the Dispersion, fall out and settling of Deep Sea Tailings Placement
Mr. Hans Matarab	Innovation Mine Design and Production Scheduling of Industrial Minerals – Case study on the Bauxite Deposit in the Manus Province, PNG

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; Climate studies, Disaster Risk Reduction and Disaster Risk Management. 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. It is also actively involved in finding solution to Disasters Risks and Disaster Management, Disaster linked to climate change, tectonic 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, Photogrammetry, 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 Paper Publications in Peer Reviewed Journals

1. Akinbola, K., Babarinde, J. & Oloyede, O. (2018). Inquiry into the Stamina of Nigeria's Land Administration System towards Delivery of Urban Lands. *Melanesian Journal of Geomatics and Property Studies*, pp 74-92.

2. Babarinde, J. A. (2018). Urban Planning Inputs in Sustainable Condominium Housing Projects in Ontario, Canada, *International Journal of Development and Sustainability*, 7(2): 822-835.

3. Babarinde, J. A. (2017). Using Urban Planners to Increase City Sustainability through the Development Process, Sustainability Preprints 2018, 2018010117 (doi: 10.20944/preprints201801.0117.v1) (not included in 2017 Report)

4. Harley, P., & Samanta, S. (2018). Modeling of inland flood vulnerability zones through remote sensing and GIS techniques in the highland region of Papua New Guinea. *Applied Geomatics*, 10(2): 159-171. https://doi.org/10.1007/s12518-018-0220-8 (SCOPUS INDEXED).

5. Hoping, M., & Kari, L. (2018). Mapping and Assessing Wi-Fi Network within PNG Unitech using GIS and 3D Visualisation of Signal Transmission Interference. *Melanesian Journal of Geomatics and Property Studies*, ISSN (Online): 2414-2557 Vol. 3, Issue 1.

6. Jana, S.K., Sekac, T., & Pal, D.K. (2018). Geo-spatial approach with frequency ratio method in landslide susceptibility mapping in the Busu river catchment in Papua New Guinea. *Spatial Information Research*, Springer publication-Singapore, ISSN: 2366-3286 (print version) ISSN: 2366-3294 (electronic version) https://doi.org/10.1007/s41324-018-0215-x. (Google Scholar INDEXED).

7. Karigawa, L., Babarinde, J. A., and Holis, S. S. (2017). A Comparative Analysis of Land Associations and Sustainability Issues in Papua New Guinea. *Land Tenure Journal*, Issue 2016/1, pp. 88-119, FAO, UN (Available at:http://www.fao.org/3/a-i7689t.pdf).

8. Karigawa, L. (2018). Eroding Fabrics of Communal Land Ownership in Papua New Guinea. *International Jounal of Environment Agriculture and Biotechnology*, vol, 3 issue 4 ISSN: 2456-1878

9. Korada N., Sekac, T., Jana, S.K., and Pal D. K. (2018). Delineating Drought Risk Areas Using Remote Sensing and Geographical Information Systems-A case study of Western Highland Province, PNG, *EJERS, European Journal of Engineering Research and Science*, 3(10), *October 2018*, DOI: http://dx.doi.org/10.24018/ejers.2018.3.10.937 103

10. Kotra, K. K., Samanta, S., and Prasad, S. (2017). Rainwater Harvesting for Drinking: A Physiochemical Assessment in Port Vila, Vanuatu, *The South Pacific Journal of Natural and Applied Sciences*-SPJNAS, 35(2), 33-44, http://www.publish.csiro.au/sp/SP17004 (Published: 26 March 2018) (SCOPUS INDEXED).

11. Muriki, G., Kari, L., & Yanabis K.C. (2018). Determination of Optimal Road Alignment Using GIS Least Cost Path Analysis: A Case Study of Situm - Gagidu Station, Morobe Province-PNG. *Melanesian Journal of Geomatics and Property Studies*, ISSN (Online): 2414-2557, 3(1).

12. Pal, I., Tularug, P., Jana, S. K., and Pal, D. K. (2018). Risk Assessment and Reduction Measures in Landslide and Flash Flood-Prone Areas: A Case of Southern Thailand (Nakhon Si Thammarat Province); Book Chapter-17; *Integrating Disaster Science and Management;* Global Case Studies in Mitigation and Recovery; Elsevier Publication; Pages 295–308; https://doi.org/10.1016/B978-0-12-812056-9.00017-8 (SCOPUS INDEXED).

13. Poi, N., Sekac, T., Kari, L., and Jana, S.K. (2018). Rural Development Planning – A Case Study in Developing Geospatial Data Infrastructure with the help of GIS, Remote Sensing and GPS. *American Journal of Rural Development,* (6): 59-70*;* Available online at DOI: 10.12691/ajrd-6-3-1.

14. Poi, N., Sekac, T., Jana, S.K., & Pal, D.K. (2018). Geophysical-Geotechnical Evaluation of site Suitability Assessment of Road in Mountainous and Rugged Terrain using a GIS MCE Approach A case study of Simbu Province, PNG, *Melanesian Journal of Geomatics and Property Studies*, ISSN (Online): 2414-2557, 3(1).

15. Rupa, I.C., Sekac, T., & Pal, D.K. (2018). GIS and Remote Sensing in Identification and Change Detection of Wetland Reclamation Areas in Port Moresby, PNG, *Melanesian Journal of Geomatics and Property Studies*, ISSN (Online): 2414-2557, 3(1).

16. Samanta, S., Palsamanta, B., and Pal, D.K. (2018). Flood Susceptibility Analysis Through Remote Sensing, GIS and Frequency Ratio. *Applied Water Science*. 8:66. https://doi.org/10.1007/s13201-018-0710-1 (Google Scholar INDEXED).

17. Sekac, T., Jana, S.K., & Pal, D.K. (2018). Evaluation of Earthquake-Induced Liquefaction Susceptibility in the Earthquake Prone Areas of Morobe Province, Papua New Guinea, *Melanesian Journal of Geomatics and Property Studies*, ISSN (Online): 2414-2557 Vol. 3, Issue 1.

18. Thontteh, E. O., and Babarinde, J. A. (2018). Analysis of Land Speculation in the Urban Fringe of Lagos, Nigeria, /*Pacific Rim Property Research Journal,* pp. 1-

24, https://doi.org/10.1080/14445921.2018.1461770, Routledge (Taylor & Francis Group). (SCOPUS INDEXED).

C. List of Conference Proceedings/Workshop/Seminar

1. Babarinde, J. A. (2018). Urban Planning Inputs in Sustainable Land Development in Papua New Guinea, A Paper presented at the Weekly Research Seminar Series, Papua New Guinea University of Technology, Lae, 27 March, 2018.

2. Babarinde, J. A. (27 April – 5 May, 2018). Senior Team Member, ISOCARP-Durban UPAT – Durban Inner City Regeneration Project, Durban, South Africa.

3. Gupta. S., Betasolo. M., Soto. R., Olatona. D., & Renagi. O. (2018). Micro Renewable Energies - Energy Too Little to Harness, Too Large to Loose. Paper Presented at the International Sustainable Energy Research Institute (SERI), Conference, PNG University of Technology, 27th – 28th June, 2018, Unitech, Lae, PNG.

4. Jana S. K., Sekac, T., and Pal D. K. (2018). Flood Propensity Mapping in the Maranbi River Catchment, Papua New Guinea: Geomatics with Frequency Ratio Method, Conference Proceeding of the World Conference on Multidisciplinary Research & Innovation-18 held on 29-30th December 2018 at Dubai, United Arab Emirates (Paper was accepted for oral Presentation)

5. Joeli. V., Sekac, T., & Jana, S.K. (2018). Earthquake Hazard Assessment in Viti Levu Island of Fiji, Conference Proceedings of the Pacific Island GIS and Remote Sensing User Conference-2018 was held in USP Japan Auditorium, Suva, Fiji, Organised by Pacific GIS and RS Council, during November, 26-30, 2018.

6. Muriki, G., & Kari, L. (2018). Determination of the Most Suitable Road Alignment using Remote Sensing and Geographic Information Science (GIS) Least Cost Path Analysis (LCPA). A case study of Situm to Gagidu Station in Morobe Province-Papua New Guinea. 52nd Annual Survey Congress on 4th of July 2018, Lae International Hotel, Lae Morobe Province.

7. Renagi, O., and Babarinde, J. A. (2018). An Appraisal of PNG National Energy Policy 2018-2028, Refereed Paper Presented at the International Sustainable Energy Research Institute (SERI), Conference, PNG University of Technology, 27th – 28th June, 2018, Unitech, Lae, PNG. Also Reported the Courier National Newspaper, PNG, 27th June, 2018.

8. Samanta, S. (2018). Flood Susceptibility Analysis and Mapping Through Frequency Ratio Model, The 3rd Int'l Conference on Remote Sensing Technologies and Applications (ICRSTA 2018), January 5-7, 2018, Bangkok, Thailand.

9. Samanta, S. (2018). Application of Remote Sensing and GIS on Inland Flood Susceptibility Mapping, 1st International Conference on New Frontiers in Engineering, Science and Technology, January 8-12, 2018, Delhi Technological University; Delhi, India.

10. Samanta, S. (2018). Natural disaster/hazard identification, modeling, mapping and risk assessment through remote sensing and GIS techniques in the pacific region, One Day International Seminar on Natural Disaster and its Management, 9th February, Sabang Sajanikanta Mahavidyalaya, West Bengal, India (Invited Speaker).

11. Samanta, S., Pal, D.K., and Palsamanta, B. (2018). Modeling of Micro Level Solar Radiation Using High Resolution Topographic Data through Remote Sensing and GIS, Asia Pacific International Conference on Sustainable Energy and Technology Transfer, SERI-2018, 27th – 28yh June, 2018, PNU University of Technology, Morobe, Lae.

12. Sekac, T., Jana, S.K., and Pal D. K. (2018). Earthquake Induce Liquefaction Susceptibility Evaluation In The Earthquake Prone Areas of Morobe Province, Papua New Guinea, Conference Proceedings of the 8th Huon Seminar held in The Papua New Guinea University of Technology, Taraka Campus, during November, 7-8, 2017.

13. Sekac, T., Jana, S.K., Pal. I., and Pal D. K. (2018). Earthquake Risk Assessment in Momase Region of Papua New Guinea using GIS, International Expert Forum on "Mainstreaming Resilience and Disaster Risk Reduction in Education" Integrating SDG, SFDRR and UNFCCC Paris Agreement, scheduled to be held on 1 - 2 December, 2017 at AIT, THAILAND.

14. Sekac, T., Jana, S.K., & Pal, D.K. (2018). Potential Sites Analysis Using High Resolution Topographic Data for Micro Hydro Power Plant in Busu Catchment, PNG, Paper Presented at the International Sustainable Energy Research Institute (SERI), Conference, PNG University of Technology, 27th – 28th June, 2018, Unitech, Lae, PNG.

D. Book Chapters in Professional Edited Books

1. Babarinde, J. A. (2017), A Case Study of the United Kingdom in Planning and Politics Interaction, in: Planning and Politics in Nigeria, Mandatory Continuing Professional Planning Education Programme (MCPPEP), Town Planners Registration Council of Nigeria, TOPREC, Abuja, Nigeria.

2. Babarinde, J. A., (Revised 2017), "Land Economics," in: Agbola, Tunde (Ed.), Readings in Urban & Regional Planning in Nigeria, MacMillan, Ibadan: Nigeria (Reviewed in December, 2017).

E. Winning Project

Ongoing collaboration research Project: PIURN

Project Title
Towards National Drinking Water Standards in Vanuatu: Applied Research and Capacity Building

Research Team Members and Affiliations
Ø Dr Krishna Kumar Kotra, Lecturer, School of Biological and Chemical Sciences, FSTE, The University of the South Pacific (USP) – Principal Investigator
Ø Dr Sailesh Samanta, Associate Professor, Dept. of Surveying and Lands, PNG University of Technology (PNGUNITECH) – Co-Investigator / Co-funder
Ø Dr Srikanth Bathula, Senior Lecturer, Dept. of Applied Sciences, PNG University of Technology (PNGUNITECH) – Co-Investigator
Ø Mr Erie Sammy, Hydrogeologist, Dept. of Water Resources, Govt. of Vanuatu – Co-Investigator / Co-funder
Ø Dr Lokesh Padhye, Senior Lecturer, Oceania Water Research Consortium (OWRC), Dept. of Civil and Environmental Engineering, University of Auckland, New Zealand – Co-Investigator / Co-funder
Ø Dr Martin S. Andersen, Senior Lecturer, School of Civil and Environmental Engineering, and director of Connected Waters Initiative (CWI), University of New South Wales, Sydney, Australia – Co-Investigator / Co-funder

Budget: 43,311 Fiji Dollars
Project Duration: 2 years (01-10-2017 to 30-09-2019)

F. Undergraduate Research Projects

Year 4 BTSR Research Project 2018

Surname	Name	Topic	Supervisor
Bonga	Maida	Geodesy – Geodetic Survey: Updating Unitech network and transformation to the plane surface from the ellipsoidal surface coordinates – at PNG university of technology Taraka campus in Lae, Morobe Province	Mr. Robert Rosa

Bongere	Dominic	Monitoring the deposition by Markham river using hydrographic survey techniques at specific point in Lae main whalf	Mr. Heva Honeaki
Enok	Paulus	Updating of Unitech control stations to PNG Nation Geodetic Datum (PNG94) using GNSS technique	Mr. Robert Rosa
James	Brendan	Residential Subdivision for Unitech Housing at Area 5	Mr. Mosese Tangicakibau
Edrin	Karagu	Proposed Subdivision design of section 359 and 351 for PNG Unitech for AHS	Mr. Mela Popeu
Kemnasi	Ferman	Drainage design and effect of poor drainage system on the road surface	Mr. Mosese Tangicakibau
Kirori	Landen	The future of surveying using UAV for large areas replacing traditional methods and cost and time efficiency	Mr. Job Suat
Likia	Christopher	Road Boundary Identification Survey along independence drive	Mr. Mosese Tangicakibau
Micah	Evah	Identification survey of section 350 and 351 with the neighboring land parcel of Lae City	Mr. Junior Tumare
Moses	John	Mine Baseline re-establishment using static GNSS survey control. A case study of Pogera Gold Mine	Mr. Robert Rosa
Nandie	Douglas	A feasibility study upon need to develop vacant parcels of land within the PNG university of Technology using Surveying approach	Mr. Mela Popeu
Navu	Max	Traversing on the ellipsoid	Mr. Robert Rosa
Ovia	Giam	Acquiring a subdivision from the original tract of Unitech land for the purpose of religion land use	Mr. Mela Popeu
Paul	Ronald	Proposing a breakwater and a pier (Jetty) to be used by NMSA as control base using hydrographic information	Mr. Heva Honeaki
Penai	Philemon	Modeling of Local Geoids Using geometric methods. A case study of Lae City	Mr. Robert Rosa
Robert	Gabriel	The identification survey of the road reserve along the independence drive.	Mr. Mela Popeu
Rupa	Nickson	Redefinition of road centerline alignment and road design along the independence drive	Mr. Mosese Tangicakibau
Tindipa	David	A comparison of different methods of data acquisition to calculate the bare figure colume of stockpiles using different surveying	Mr. Mosese Tangicakibau

		instruments in Pogera Open Pit Mine	
Wanwanji	Emmanuel	Bridge Site Survey: Re-identification of proposed bridge centerline and application of trigonometric heighting method to generate a digital terrain model (DTM) profile of the river bed-A case study of Situm River	Mr. Mela Popeu

Year 4 BGIS Students Research Project 2018

Surname	Name	Topic	Supervisor
DIRO	Arlette	Using RS/GIS to identify Ground water Potential zones in Rigo, Central Province	Assoc. Prof Dr. Sujoy Kumar Jana
KASE	Esther	Using GIS/RS to identify Optimal High Voltage Transmission Line Routing in Central Province: Case Study Port Moresby to Bereina Station	Mr. Levi Kari
KEROWA	Bradley	Using GIS/RS to map The Power Distribution Network & for the Asset Management for PNG Power in Lae City	Mr. Job Suat
LAKAI	Renee	Using GIS/RS to identify suitable area to grow Cacao: Case study of Morobe Province	Mr. Samudra Gupta
MAINO	Elizah	Using RS/GIS to investigate Surface Runoff within Lae City and its impact on local settlements	Mr. Tingneyuc Sekac
MARTIN	Ellington	Impact Assessment of Busu River through Change Detection study	Mr. Tingneyuc Sekac
PAUL	Cynthia	Using GIS/RS to identify suitable agricultural land for effective production of Potato in Laiagam, Enga Province.	Mr. Samudra Gupta
PAIPO	Abigail	Using GIS/RS Techniques to monitor and measure Change Detection in Lae City in the last decade	Mr. Job Suat
SAKA	Akus		
SAKATO	Robert	Using GIS/RS to map shortest/safest Routines for Primary School Student to easily access schools in Lae City	Mr. Job Suat
TONGIA	Russell	Using GIS/RS to identify potential and suitable mini power hydro dams in Chuave, Chimbu Province	Mr. Tingneyuc Sekac

TURIA	Joshua	Using RS/GIS Technologies to create and map a Housing Database of PNG Unitech	Mr. Levi Kari
YATU	Glenda	Evaluation of Terrestrial Carbon Storage based on LULC change	Assoc. Prof Dr Sailesh Samanta
YERE	Brian	Specific Site Evaluation to establish mini hydroelectric plant setups using high resolution and field survey data-A case study of Busu River, Morobe Province	Assoc. Prof Dr. Sujoy Kumar Jana

Year 4 Property Studies Research Project 2018

Surname	**Name**	**Research topic**	**Supervisor**
BALIAWE	Fred	An Investigation into Causes and Effects of Poor Management of State Land in PNG: A Case Study of Lae	Mr. Lepani Karigawa
HURIAMBOHO	Juritus	Challenges Facing Customary Land Development in Lae City	Mr. Lepani Karigawa
KANAWI	Theresa	SABLs and Land Grabbing in Papua New Guinea: A Situation Analysis	Mr. Lepani Karigawa
KANJIP	Stephanie	Protecting Customary Landowner Rights in Public Land Acquisition in PNG: The Fairness Question	Mr. Jerry Mille
MADANI	Kimberly	Acquisition of Land for Telecommunication Masts: A Case Study of Telikom, PNG	Mr. Jerry Mille
MAMBERE	Dzaroba	Mixed Commercial-Residential Land Use Developments in Lae City	Prof. Jacob Babarinde
PAPE	Ben	Impact of Road Transportation Networks on Residential Property Values in Lae City	Mrs Rosemary Adu-Mcvie
SINNE	James	An Exploratory Investigation of the Feasibility of Public Private Partnership (PPP) Projects in PNG: A Case Study in Lae City	Mr Suman Holis
SMITH	Marrianna	An Assessment of Incorporated Land Groups (ILGs) and their Significance in Manus Province	Mr. Lepani Karigawa
TANDOLA	Daduma	An Investigation of Causes and Effects of Shortage of State Land in Lae	Mr. Jerry Mille
TAROA	Jonathan	Physical Planning and Land Administration Inputs in Legalizing Illegal Settlements in PNG	Mr. Jerry Mille
TUMARE	Joel	Residential Property Marketing for Sale and Letting in Lae: Current Practices and Challenges	Mr. James Seniela

WOMBU	John	Pressure on Urban Land Due to Rural-Urban Migration: A Mitigation Analysis for Port Moresby	Prof. Jacob Babarinde
AIPINGI	Meishen	Mining and Its Impact on Customary Landowners: The Need for Relocation at Porgera Gold Mine	Prof. Jacob Babarinde
ATENI	Tabitha	Squatter Settlements and their Impact on Property Values in Lae City	Mr. James Seniela
BABONA	Rachael	A Critique of the Valuers Registration Board of Papua New Guinea	Mr.Suman Holis
BINAYAU	Glen	An Evaluation of Compulsory Purchase Valuation Practices in Papua New Guinea	Mr.Suman Holis
BILLY	Ezekiel	Trends in Informal Housing and Impact on Low to Medium Income Earners in the Urban Fringe of Lae City: The Case of East Taraka	Mr. James Seniela
BUSANE	Robin	Urban Planning Considerations in Speculative Retail Development: A Case Study of Food Mart Shopping Mall, Lae City	Prof. Jacob Babarinde
FELIX	Aaron	Impact of Rezoning on Land Values in PNG: A Case Study of Port Moresby	Prof. Jacob Babarinde
GALES	Carl	Viability Study of a Proposed Four Star Hotel in Buka Town, Bougainville	Prof. Jacob Babarinde
HACCA	Gerald	Sellers' Listing Behaviours and Residential Property Market in Port Moresby	Mr. Lepani Karigawa
HOMBA	Kisapai	Is Customary Land a Constraint to Property Development in Lae City?	Mr. Jerry Mille
KULU	Jane	Residential Mobility Patterns in Port Moresby and Impact on Residential Property Market	Prof. Jacob Babarinde
PAKI	Solomon	Trends in Multi-tenanted Residential Property Development in Port Moresby	Mrs. Rosemary Adu-Mcvie
PIPI	Mana	Investigating Effective Ways to Value Customary Land in PNG: A Case Study ofNorth Fly District, Western Province	Mr.Suman Holis
SAKIS	Charlie	Implementing Residential Condominium Projects in PNG: Benefits and Challenges	Prof. Jacob Babarinde
SUI	Donald	An Exploratory Study of Unitization of Property Investments in Papua New Guinea	Prof. Jacob Babarinde
SINE	Mark	Trends in Commercial Property Prices and Rentals in Port Moresby	Mr. James Seniela
UTLAGE	Peter	Trends in Rental Values of Residential Properties: A Case Study of Lae City	Mr. Suman Holis

VELA	Axel	An Investigation Into How Urban Planning Creates Property Values: A Comparative Analysis of Selected Neighbourhoods in Alotau, PNG	Mrs. Rosemary Adu-Mcvie

G. Postgraduate Students Research Project, 2018

M. Sc in Remote Sensing & GIS 2018

Name of STUDENTS	TOPIC	Supervisor
Ian Kavua	Landslide Hazards Investigation for Mororbe - Gulf missing link road in Papua New Guinea- A Remote Sensing & GIS approach	Assoc. Prof. Dr. Sujoy Kumar Jana
Lennie Kiap	Land Information System with the application of Remote Sensing & GIS: A case study NCD-Bomana-Kennedy Estate	Mr. Lewi Kari
Wesley Jacob	Mapping Hydrothermal Alteration Minerals using Satellite Remote Sensing Techniques for Potential CU, AUI, MO Exploration in Big Tabar Island, Kavieng, New Ireland Province, PNG	Mr. Tingneyuc Sekac

Ph. D & M. Phil in Geomatics 2018

Name of the Students	Project Title	Course	Supervisor/(S)
Cathy Koloa	Hydro-Morphometric Analysis and Hazard Assessment of Major River Basins of PNG using Remote Sensing and GIS Technology	PhD	Assoc. Prof. Dr. Sailesh Samanta and Prof. Dilip. Kumar Pal
Herro Jack Losea	Watershed characterization as an alternative approach to re-define the existing Bioregion using GIS & Remote Sensing application Case Study: Moro Bioregion (Lake Kutubu) & IgifuAgogo Limestone Uplands Bioregion	MPhil	Assoc. Prof Dr. Sailesh Samanta

ALLOCATION OF RESEARCH FUND FOR 2018

Applicant	Department	Title	Amount (K)	Meeting #
Unaro Yauo (MSc/1-Self), Dr. Mirzi. L Betasolo	Civil Engineering	Biogas Micro-Production from Human Organic Waste: The case of Busama village Lae City MP, PNG	K5,000.00	RC#120
Amelia Jelsiwi (MSc/1-Self), Dr Macquin Maino	Agriculture	Physiological responses of rice varieties to saline regions	K1,614.00	RC#120
Camila Yanabis (MPhil/1) Mr Lewi Kari	Surveying & Land Studies	An Interactive Crime Mapping System of Unitech Campus	K8, 400.00	RC#121
David Kolkoma (PhD/1) Prof. Panakal Jojo	Applied Physics	Radiation Dose Profiling of mineral dose regions of Papua New Guinea.	K20,000.00	RC#121
Dr. Kamalakanta Muduli,	Civil Engineering	Investigation of health Care aste Management Issues in Health Care Supply Chanins of Papua New Guinea	K33,500	RC#122
Jack Yaro, (MCS, 1/GAP), Dr. Garry Sali,	Communication & Development Studies	The Developent Communication for Moblization of Mining Impacted Communiteids in Small & Medium Enterprises (SMEs): A Case Study of Special mining Lease (SML) & Lease for Mining Purposes in Porgera Mining, Enga Province	K4,330.00	RC#123
Hayden Wagia, MPhil/1 Dr Mex Peki	Forestry	The Effect of 20 – year El Nino Extreme on the dynamics of lowland Tropical rainforest in PNG: Case Study of Wanag Conservation Area of Madang Province.	K7,615.00	RC#124
George Noho, MSc/1	Applied Physics	Seismic Hazard of Papua New Guinea.	K5,000.00	RC#124

Prof M. Mukhopadhyay,				
Christine Paskalis MCS/1, Dr. Rachael A. Orake,	Communications & Development Studies	Comparing and Contrasting Communication barriers and Challenges that exist within Service delivery system of the Kavieng Urban Local Level Government in the New Ireland Province and Lae Urban Local Level Government in the Morobe Province	K5,166.00	RC#124
Alex Kambao, MCS/1, Prof. Eric Gilder	Communications & Development Studies	"Applying Effective Participatory Communication Skills in Disaster Reisk Management: A case study of Tari Hela Province & Pogera District in Enga Province in the Highlands of PNG".	K3,032.00	RC#124
			K93, 657.00	

ALLOCATION OF CONFERENCE FUND FOR 2018

CONFERENCE FUNDING					
No	Applicant	Department	Title	Amount (K)	Meeting #
1	Prof. Manoj Mukhopadhyay	Applied Physics	5th International Conference on Geological and Environmental Sustainability GEOLOGY CONGRESS 2018, August 13-14, Bali Indonesia	K10,851.40.	RC#122
2	Mr David Kolkoma	Applied Physics	International Atomic Energy Agency (IAEA) on Projects Design 2-6th July, 2018, Lamana Hotel & NDoH, Port Moresby	K2, 120.00	RC#123
3	Dr. Partick Michael	Agriculture	Climate Change, UOG, Goroka, 10-14th September, 2018	K1,940.00	RC#123
4	Dr Kamalakanta Muduli	Mechanical Engineering	Multidisciplinary Research and Innovation, 29-30th Dec 2018, Dubai, UAE	K4,828.00	RC#124
5	Prof. Jojo J. Panakal	Applied Physics	5th International Conference on Environmental System Research, 6-7th University of Queensland, Brisbane. Australia.	K4,470.00	RC#124
Total Conference Fund approved				K24, 209.40	

ABSTRACTS

UNITECH SEMINAR SERIES

2018

Update on Indian Scholarships and Internationalization of the PNGUoT with Funding Organizations and Universities in India

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Highly educated and talented manpower is required for the development of Papua New Guinea, and this forms its greatest long term asset. In order to move PNG forward and to build a knowledge-based society, fully qualified academics with a doctorate are necessary. Internationally, only academics with a doctorate are recognized as independent researchers by funding agencies.

Without postgraduate studies and research at Universities, there will be no innovation in Papua New Guinea, and without innovation there will be no sustainable economic development and a diversified economy. Universities are establishing collaboration internationally in order to share the knowledge, scholarships and publications through which to develop the human resource capacity for development of economy and to solve complex global challenges collaboratively.

Because the state of PNG is facing severe cash shortages, and because since 2012 Australia has kept the PNGUoT mostly out of its aid programs for universities, we had no choice but to engage with the great powers which support academic collaboration: the European Union, India, China and the United States.

Since 2015, Trukai Industries Ltd. saw an opportunity and sponsored our engagement with India with the purpose of enhancing rice research. As a consequence, we were able to do 2 missions in 2016 and 2018 which allowed the Vice Chancellor to sign a total of 10 agreements so far with Indian funding agencies and universities.

We gratefully acknowledge Trukai Industries' financial support for these missions. Most developing countries send scores of students to India, but PNG was not doing this.

We were able to make our strategy a success for the benefit of the PNGUoT and the country, thanks to the excellent guidance His Excellency M. CHANDRA (until 2016) and ShriNagedra Kumar SAXENA, High Commissioner, High Commissioner of India in Port Moresby. In 2014, the Honorable Vice Chancellor Dr. Albert SCHRAM appointed me as the coordinator for the India strategy.

Here are the results

This year, we have secured eight (5+3) scholarships with the Indian Council for Cultural Relations (ICCR) and one visiting Professor in Management, plus ten visiting fellowships for Indian scientists collaborating with the PNGUoT to train our faculty with financial support from the Indian Council for Agricultural Research (ICAR). There are four more scholarships for PNGUoT graduates and staff from the Indian Institute of Technology – Gandinagar (IIT-G) as well as Maharana Pratap University of Agriculture and Technology (MPU - with 50% expenses. The collaboration with the IIT-G is noteworthy since this is one of the top 30 universities in the world ranking, and among the best in India.

PNG University of Technology started its journey of internationalization with India through the globalization policy of India in 2012 and graduated its first MSc in 2016 in Food Technology. Currently, two PNGUoT graduates are doing their PG and PhD at the Indian Institute of Technology - Gandhinagar (IIT-G) and Haryana University of Agriculture (HUA) respectively, as part a first step in implementing this internationalization strategy. The ICCR and ICAR are the largest funding organizations provide scholarships, visiting professors and scientists to develop education and technology internationally. The bi-lateral relationship between PNG and India is strong enough to assist our PNGUoT students and staff to get pursue masters and PhD degrees at Indian universities.

The number of scholarships from India is increasing every year. Uutilizing the opportunities offered by the globalization policy of India, helps the PNGUoT to become the premier university in the South Pacific The ball is in the court of its academic departments to utilize these opportunities for their own benefit.

Film Commissions as a Driver for Tourism, Culture and Economic Development: Framework for PNG

Dr. Kaveri Devi Mishra
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Abstract

Film Industry has played a vital role in show casing culture and accelerating tourism thereby largely contributing in economic development in many countries across the world. A standing example is Bollywood (Indian Cinema) that has successfully show cased its diversity and culture over decades across the world from USA, UK, Canada, and Africa to Russia and European countries giving a boost to tourism.

The aim of this presentation is to analyze the main models of Film Commissions that have been successful and encouraging film industry globally. Thereby, analyzing the contrasting framework of the situation in PNG where film industry been neglected for various reasons.

Intelligent Big Data Analytics: Foundations and Applications

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Abstract

We are living in an age of trinity: big data, analytics and artificial intelligence (AI). This presentation first introduces the characteristics of this age of trinity, and demonstrates Intelligent Big Data Analytics as the core of the age of trinity with applications. Then it proposes a strategic framework of intelligent big data analytics. The framework examines intelligent big data analyticsas a science, technology, system, service and management. Then it examines the managerial impacts and issues of intelligent big data analytics. The presentation also argues that Intelligent Big Data Analytics = AI + Big Data Analytics with applications in healthcare, driverless car, mobile commerce. It introduces the presenter's research in big data, AI and intelligent big data analytics in recent years. The approach proposed in the presentation is a part of the book with the same title Intelligent Big Data Analytics: Foundations and Applications ©. It is a part of a research paper entitled "Fundamentals of Intelligent Big Data Analytics"©.

Keywords: big data, analytics, artificial intelligence, Intelligent Big Data Analytics, driverless car.

Assessing Pricing Variables of Wooden Carvings in an Urban Settlement and the Associated Marketing Challenges: A Case Study in Labis Kitava Settlement, Alotau Town - Milne Bay Province

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Abstract

Wood carving industry is a very old industry that has both ornamental value and cultural or spiritual values in many societies of the world. The industry has evolved over the last century to a more modern form of cash income earning opportunity for rural and marginalized population. This study was undertaken in 2016 in Milne Bay Province focusing on production input variables that may affect the pricing of the carvings apart from the supply and demand. Structured questionnaires were administered to about 15 carvers randomly of which 13 were men and 2 were females. A total of 30 various wooden carvings were assessed. The variables assessed were tree species used for carving, size of the carving, density of the designs, appearance of the wood, the experience of the carver in years and the gender of the carvers.

The case study community is located within at the periphery of Alotau town and was purposely selected as they originate from the Trobriand Islands renown in the province for their rich cultural arts and crafts including wooden carvings. The Trobriand Islanders have been trading carvings for centuries within the famous Kula ring trade through the traditional gift economy. Considering the change in trade environment and the need for constant cash to sustain livelihood in the urban center, the study attempts to identify variables influencing price of wood carving and identify challenges in marketing the wooden carvings. The presentation will also recommend areas of further research.

Wild Relatives of the Rice Plant from Papua New Guinea

Dr Tom Okpul
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Abstract

Several wild relatives of the rice plant thrive well naturally under various environments in several provinces of Papua New Guinea. These species are potential donors of valuable gene(s) that may confer agronomically important trait(s), which can be used in the genetic improvement of rice. However, national efforts devoted to rice improvement, in most instances, have overlooked the importance of these wild species. Their status in natural habitats, together with efforts of several networks, in their acquisition, conservation, evaluation and utilization will be presented.

Urban Planning Inputs in Sustainable Land Development in Papua New Guinea

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Abstract

This study is a scenario analysis designed to critically examine how urban planning inputs during the development process can enhance city sustainability in Papua New Guinea. Due to scathing criticisms against the development control system, the study contends that urban planners, as development approving officers and public interest specialists operating under the aegis of local planning authorities, are better positioned than allied professionals to increase city sustainability through a holistic development process that benefits from the concept of *strong sustainability* as posited by ecological economists. In terms of methodology, the paper simulates the 56-cell holistic land development model as a tool for achieving an urban planner-led vision of project sustainability, which passes the test of basic investment return-risk tradeoff, and adopts a hypothetical block of 40 apartments (flats) in Lae city as a scenario. This is supported with secondary data and the author's local experience as an urban planner, valuer and realtor who has lived in Lae city for more than four years. Based on findings from two research questions examined, the paper argues that urban planners can seize the opportunity of being leaders of the land development team to synergize the risks and value creation in land development that are key drivers of *strong sustainability*. The paper outlines some policy implications for sustainable real estate projects that may be replicated on a city-wide scale for averting disasters like fire hazards, earthquakes, tremors, and even terror attacks in towns and cities.

Cyber Security

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Abstract

Cyber Security plays an important role in the field of information technology.Securing the information have become one of the biggest challenges in the present day. Whenever we think about the cyber security the first thing that comes to our mind is Cyber Threats, which are increasing enormously day by day. Various organization are taking many measures in order to prevent these cyber threats. Besides various measures cyber security is still a very big concern to many. This seminar mainly focuses on challenges faced by cyber security on the latest technologies like IOT, Medical & automobile industries etc. It also focuses on latest about the cyber security techniques, ethics and the trends changing the face of cyber security (world war III).

The English for Academic Purposes (EAP) Program at PNGUoT: Its Role, Challenges and the Way Forward

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Abstract

Globally, due to the rise in the number of English as a second language (ESL/L2) international or new immigrant students across English-speaking countries and the number of non-native English (NNE) speaking students in universities in which its medium of instruction is in English, the demand for English for different purposes is on the increase for both under-graduate and post-graduate students. With the emergence of a global village with English as its primary language, the demand for English in different spheres of life is on the increase. Correspondingly, research has increasingly begun to focus on these students' academic acculturation to their new learning environments in identifying the factors most closely related to academic success and the impact of English for academic purposes (EAP) programs and its significance for *the international education community* as a whole, for *individual institutions of higher learning* and *for the students themselves***.** The communicative role that English plays as the language of globalisation has resulted in its high demand in many spheres of human endeavours. In academia, many students are grossly deficient in English. Their deficiency cuts across the four language skills (listening, speaking, reading and writing).This presentation will give an insight of the EAP program offered by the Department of Communication and Development Studies (CDS) at the Papua New Guinea University of Technology (PNGUoT), the challenges and the paradigm shift of the existing EAP program towards the establishment of an Academic Resource Centre (ARC) at PNGUoT.

Energy Storage Technologies for Standby Electrical Power System

Dr. Raj Kumar

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Abstract

The requirement for stored energy in uninterruptible standby systems occurs during the transition from utility power to engine-generator power, or to restored utility power. Reliability of electric power supply for all types of industrial, commercial, and institutional customers using computer and electronic loads requires energy-storage means and inverters to transition intervals of electric utility interruption. Requirements for energy storage are divided into short-term for systems with engine-generator or alternate feeder backup, and long-term for systems that await utility restoration, or are part of the utility system. The various energy-storage technologies including batteries, flywheels, superconducting magnetic energy storage (SMES), compressed air, fuel cells, and ultra-capacitorsare described and compared. Comparison charts for cost, reliability, and other factors and references for additional information are included.

Best Practices, Factors, and Challenges in IHRM For International Construction Projects for New Zealand Companies

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Abstract

International construction has becoming more common over the years and today project managers in international projects have looked to manage their people effectively to gain a competitive advantage in the industry and in achieving project success. The construction industry is large, and many changes have happened in the past and even today. To have the kind of right people doing the job and looking after their wellbeing is critical to the success of the project. For a construction organisation to make better decisions and strategies for the organisation, it is important to know what affects the human resource (HR) in the organisation, factors that affect the implementations of the International Human Resource Management (IHRM) practices and the challenges faced. The objective of this research is to identify the human resource management practices that are used in international construction projects that can help in gaining a competitive advantage in the international market. Face to face interviews were done, literature reviews, company archives, and websites were analysed to research into the factors that affect the implementation of HR practices. And also, the challenges that are faced were investigated so that an understanding of international human resource management can be gained. Though the research did not include the opinion of the companies and academics in New Zealand, the practices that were practiced around the world are highlighted in this paper. Findings are: (1) Cultural awareness training can be used as a tool in gaining an advantage in the construction industry. Culture has a very large influence on the organisations and the company that takes time and effort in understanding the culture that it will be working in can make a difference in the project success. (2) Risk evaluation methods must be used to evaluate the different risks that are involved in construction industry. Construction is a high risk, and high complexity industry and evaluating the risk is recommended. However, too much evaluation must be avoided as it will discourage business from

venturing overseas. Having a set of methods to evaluate the risk and deciding the best options in going overseas was determined as the best option. (3) and evaluating the risk will lead to deciding the approaches that the construction firm needs to take in order to implement best practices in any locations. This is done so that HR personals are aware of what needs to happen when practices are emerging; After the research into the best practises in IHRM, the practises that are implemented within an organisation depends on the top management, the extent of commercialisation of the organisation and company strategy for success. This is true, especially for the construction industry.

Metal-Organic Frameworks: A new class of porous crystalline materials

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Abstract

Metal-organic frameworks (MOFs) are polymeric crystalline materials that are constructed using metal ions and organic linkers as the two building blocks. In ideal cases, MOFs can be easily prepared. These materials are robust, with high surface areas and permanent porosity. MOFs were first reported by Prof. Yaghiin his Nature paper. Thereafter, the research community has witnessed an extensive and intense research in this area from the last decade or so. However, MOF research is still in its infancy and hoping to have many advances in the near future. The present talk will focuses onthe preparation of MOF materials, insights into some of my previous research in this area and the potential application of these materials in future.

A Technical Review Report on Alternative Renewable Energy – its Advantages and Disadvantages

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Abstract

Although Solar, Hydro and Wind energy are at the major type of renewable energy but there are other forms of renewable energy out there that remain neglected as their potential is either not completely explored or their present estimated energy output is not pragmatically comparable with the Solar, Hydro or Wind energy. In yester years, a 60-Watt incandescent bulb consumed 1500 kWh of electricity when used over 25,000 hours, today a LED equivalent of same output wattage consumes only 1/7 of that energy (212.5 kWh). With advancement in technology, as equipment are getting more energy efficient by the day, other renewable forms of energy like *thermal, electromagnetic, electro-chemical, triboelectric, elastic, surface tension, hydrogen, biomass, wave & tide* are becoming more affordable and easily deployable and therefore a competitive option to meet the global energy demand. This technical report is intended to review the alternative energies and discuss the advantages and disadvantages in its implementation.

Effect of Nutrition-Improved Wheat-Based Food on the Health of Primary School Children Aged 6-12 Years in the Morobe Province – A Collaboration Research Between UNSW (Australia) and PNG UNITECH

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Overview of the research study

The 2005 PNG National Nutrition survey (NNS) identified micronutrients, Vitamin A, iron and iodine deficiencies of major concern in the population. Micronutrient malnutrition contributes to a vicious cycle of poor health and depressed productivity, trapping families in poverty and eroding economic security in dozens of countries worldwide. Ensuring adequate intake of these essential nutrients by vulnerable populations will offer enhanced protection from a range of disabilities and diseases, help children grow and learn, and improve health and productivity for adults.

Food fortification is one strategy to address nutritional deficiencies. To improve the nutritional status of its population, PNG has mandated fortification of salt with iodine and fortification of rice with thiamine, niacin and iron. The National Department of Health is interested in mandating the fortification of wheat flour to ensure that improved nutrition can be delivered to more of the population.

In order to assist the PNG health authorities in their deliberations with regard to the fortification of wheat flour, our study will show the efficacy of fortification through ex-vivo bioavailability studies and in vivo validation in school children in PNG in the Morobe Province. The hypothesis being tested is that fortification will improve the test population's nutritional status, and impart subsequent biochemical, and physical improvements as compared to a control population which receives an unfortified wheat-based biscuit. All students, intervention and control, will continue to be provided food currently served in pre-existing school meal programs.

This study is a partnership between the University of New South Wales (Australia) and PNG Unitech, it is currently in progress in two primary schools in Lae and will end at the end of this year.

Fog Computing Based Education System

Dr Daiyon Cho
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School of Management and Economics
Handong Global University, Pohang, Gyungbuk, Korea
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Abstract

Nowadays, internet is everywhere. But there are still places where internet is not available. A cloud computing that is available only in a restricted region is called a fog computing. Fog computing based on wireless network or WiFi system is very useful especially where there is no or very slow internet. A fog computing-based education system or e-learning system is introduced and give a demonstration of how it is working. Some educational contents are also introduced to be used for this fog computing based education system.

And how to make a syllabus and upload it to the fog computing system is also introduced. Basics of Raspbian operating system, Linux and HTML is introduced to create a syllabus and upload it to the system.

Waste Cooking Oil as Energy Source

Dr John Pumwa
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Department of Mechanical Engineering
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Abstract

Almost all cities and towns in Papua New Guinea are producing tonnes of waste vegetable oils annually, mainly from industrial deep fryers in potato processing plants, snack food factories, fast food restaurants and institutional dinning facilities. These waste vegetable oils are directed to waterways, rivers and finally into the ocean which destroys the ocean shores and damaging the environment. With increasing population, not only the demand for cooking oil will increase but also the environmental problems caused by the waste cooking oil. Most brands of cooking oil that is used in Papua New Guinea are from locally produced palm oil. Palm oil consists mainly of triglycerides made up of a range of fatty acids and contains other minor constituents, such as free fatty acids and non-glyceride components. This composition determines the oil's chemical and physical characteristics. This is an attempt to improve the waste vegetable oil's chemical and physical characteristics that will allow the oil to be used as an energy source and at the same time reducing the associated environmental problems. It has been observed that the waste cooking oil can be converted into a useful energy source using the transesterification process. The converted fuel has been tested and found its performance to be equivalent to petroleum diesel.

Measurement of Magnetic Resonance of Electron Spin

Dr Jojo Panakal[*] John & Prof Pilar Iñiguez
Professor[*]
Department of Applied Physics
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Abstract

Electron has angular momentum corresponding to the turn in an orbit as well as its intrinsic spin.

So to say that the electron is like a tiny magnet resulting from its orbital and independent intrinsic movements. Employing classical as well as quantum physics we can describe this magnetism and can observe how the magnetic moment of the electron manifests itself through an anomalous gyromagnetic constantcalled Landég factor and can be obtained experimentally.In an external magnetic field, the spinning electron, due to the inertia of the rotation, will make a precession movement around the applied field with a frequency called the Larmor frequency.

The constant of proportionality between the frequency and the field which is same as that between the magnetic moment and the angular momentum, is called the gyromagnetic constant. In an electron system orbiting with its randomly oriented magnetic moments, the presence of the external field will cause all of them to preces around the field, each with its angle and all with the same frequency. To obtain the gyromagnetic constant, we use the principle of resonant absorption of energy.The electron absorbs energy from the oscillating field to vary its precession angle. This is the resonance phenomenon that will give us an energy absorption signal.The experimental set up and the procedure will be discussed in detail in the presentation.

Note: This is one of the experiments, I carried out in the University of Valladolid, Spain during my visit there under the ICM of Erasumus+ scholarship.

Supported Cobalt Catalysts for Ammonia Synthesis

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Abstract

The Haber–Bosch process has been used for the industrial production of ammonia for over a century. Application of iron based catalysts in the process is well known. A contemporary interest is in the development of small scale localised ammonia production facilities based on renewable hydrogen generated from water via electrolysis powered by sustainable electricity, derived from – for example – wind energy. To this end, it will be necessary to develop novel ammonia synthesis catalysts more suited to small scale production. It is notable that some of the more active synthesis catalysts comprise cobalt in addition to other components. Examples include Co_3Mo_3N and CoRe. The activity of the former has been explained on the basis of a Sabatier volcano relationship wherein the combination of comparatively low activity Co and Mo components leads to the generation of a catalytic material of comparable activity to Ru, an optimum catalyst. However, there is reason to believe that Co in itself might possess higher activity than implied in this relationship.

In this study, cobalt catalysts were prepared using different supports and tested for ammonia synthesis. 5% and 10% wt. Cobalt metal were loaded onto 5g of four different supports – amorphous silica (SiO_2), alumina (α–Al_2O_3), monoclinic zirconia (ZrO_2) and ceria (CeO_2) via the wetness impregnation technique. The materials were dried overnight, calcined at 600°C for 4 hours, and then pre-treated at 600°C under N_2/H_2 (1:3) gas mixture for 3 hours prior ammonia synthesis. Characterization techniques were used to analyse the materials before and after ammonia synthesis.

Stakeholder Organizational Culture Profile Model for Improving Performance in the Papua New Guinea Construction Industry

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Abstract

The construction industry is claimed to be lagging behind most other industries in its performance. There have been attempts in improving the culture of the industry and recently, the concern on the adversarial effects of organizational cultures of project stakeholders on project performance have begun to emerge. Stakeholder organizations have unique and varying organizational cultures which become problematic in the creation of project cultures. This is described as the *stakeholder- culture-barrier* phenomenon. So far, development work in the issue has rather been limited to profiling only a single organization or profiling and comparing only two stakeholders of projects. This research therefore will attempt to pursue development work in the issue by doing a comparative analysis of five stakeholders; client, project management, consultant, main contractor and the subcontractor. The exercise will be conducted for the construction industry in Papua New Guinea. The industry wide survey to be conducted will offer a rich and firm database which should yield invaluable results. The Competing Value Framework will be used to audit and compare organizational culture. Moreover, the combination of the Typology and Dimension theory will be used to remove ambiguity and give a complete and accurate profile of the cultures. A stakeholder organizational culture profile model for improving productivity in the construction industry in Papua New Guinea is developed.

Metal Oxide Nanomaterials for Energy Storage Devices Applications

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Abstract

The need for an efficient and environment friendly energy resource has been increasing over the past decade, mainly due to the exhaustion of fossil fuels as well as an increase in the pollution levels worldwide. The widely researched technologies are the batteries and electrochemical capacitors for energy conversion and storage in various applications. Apparently long term usage of the batteries has shown reduced power density by a decline in their charge/discharge rates along with an increase in the energy density. In contrast, the conventional dielectric capacitors have shown to possess high power density but lack larger energy density. However, compared to the two, supercapacitors dominates the present research work for their high power density, reversibility long cycle life and most important being eco-friendly. Hence, a significant increase in the use of it in various commercial applications including computer memory back-ups, medicals and electronic equipments, wearable and portable electronics, hybrid electric vehicles, space applications etc.

The present research work includes the synthesis of metal oxide nano-materials, and their structural and morphological properties, as confirmed by XRD, SEM and TEM analysis for pseudocapacitor electrode material applications. Followed by the preparation of pseudocapacitive electrode and its performances were tested using electrochemical work station. Finally, the complete asymmetric device was constructed and tested for future energy storage devices applications.

Beat Plastic Pollution in Papua New Guinea

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Abstract

The United Nations Environment theme for 2018 is "Beat Plastic Pollution". It is aimed that people may do their best to change their everyday lives to reduce the heavy burden of plastic pollution on natural places, wildlife and own health. In this context, UNITECH's research committee seminar on beat plastic pollution is a huge historical eye-opener for Papua New Guineans and helpful in preserving and enhancing the environment.

Plastics are unmatched by any other material and become a part of our daily lives. Unfortunately, these affect human health and cause severe environmental consequences. Many plastics release vinyl chloride and other harmful gases or contain phthalates that can lead to cancer, birth defects, and lung and liver disease. Many sea turtles have been found dead with plastic bags in their stomachs. In one dead turtle found off Hawaii in the Pacific more than 1000 pieces of plastic were found in the stomach. Hundreds of cows die in New Delhi city alone every year when they choke on plastic bags while trying to eat vegetable waste stuffed in the garbage.

Betel-nut stains are not the only obscenity in Papua New Guinea, another threatening nuisance is the level of careless disposal of plastics. Plastics clog up the drainage system forcing the water onto the roads and destroying the roads is the problem.

Hence, it's the right time to beat plastic pollution and start acting with responsibility.

Grey-DEMATEL Based Modelling for Sustainable Energy System Development and Management in Indian Context

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Abstract

Sustainability in Energy System Development and Management (ESDM) is getting a significant attention among energy policy makers of developing and developed nations for accomplishing the goals of green energy and security. Among developing nations, India has a huge energy demand due to its exponentially growing population and economic growth. Therefore, it is important to address sustainability in energy system to cope with energy demand and security related aspects in India. For adoption of sustainable development in energy system management, this work is an original attempt that aims to list and evaluate important indicators for sustainability assessment of ESDM scenario in India. A total of eighteen sustainability assessment indicators were listed based on relevant literature and expert's inputs. The identified indicators were then evaluated to know their causal interactions by dividing them into cause and effect groups using grey based Decision Making Trial and Evaluation Laboratory technique. This work is an effort to distinguish how the sustainability assessment indicators are interrelated in terms of causal relations, and the outcomes are beneficial to governmental bodies and energy development practitioners in analyzing the appropriate strategies for assessing the sustainability in energy planning, development and management decisions in India.

The Linkages, Persistence, Asymmetry in the Volatility, the Price Discovery and Efficiency, and the Effect of the US Subprime Mortgage Financial Crisis on the Spot and the Futures Market's Returns: The Case of India

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Abstract

The first part of the seminar gives an introduction to Futures markets and theories of the price determination in futures markets, for a general understanding. The second part, a paper on the aforesaid title in the Indian context is presented which is an empirical study and published in the Applied Economics along with my coauthor James Kimatta (**Applied Economics Taylor and Francis 2016 issues. Volume 48, issue 8, pp. 669-683**

This paper examines the effects of persistence, asymmetry, and the US Subprime Mortgage crisis on the volatility of the returns and also the price discovery, efficiency and the linkages and causality between the spot and futures volatility by using various classes of the ARCH and GARCH models, and through the Granger's causality. We have used two indices: one for spot and the other for futures, for the daily data from, June 12th 2000 to Sept.30th 2013 from Nifty stock indices. We have then tested for ARCH effects, and subsequently employed various models of the ARCH and GARCH conditional volatility. The GARCH (1,1) model is found to be significant, and it implies that the returns are not autocorrelated, and have 'short memory'. It supports the hypothesis of the efficiency of the markets. The negative 'news' has more significant effect on volatility, corroborating the 'leverage impact' in finance on market volatility. We have also tested the volatility spillover effects. The two methods we employed support the spillover effects and the causality is bidirectional. We also have used the dummy variable for the US Subprime mortgage financial crisis and found that they are statistically significant. Indian stock market is thus integrated to the world stock markets.